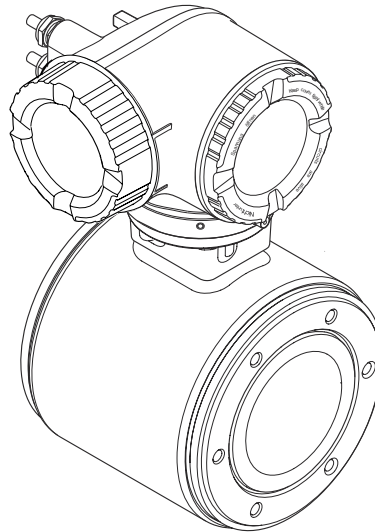


Operating Instructions

Proline Promag H 300

FOUNDATION Fieldbus

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 organization will supply you with current information and updates to this manual.

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1 About this document

1.1 Document function

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

1.2 Symbols

1.2.1 Safety symbols

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.






CAUTION

This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.


NOTICE

This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.




1.2.2 Electrical symbols

| Symbol | Meaning |
|---|--|
|  | Direct current |
|  | Alternating current |
|  | Direct current and alternating current |
|  | Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
|  | Potential equalization connection (PE: protective earth) Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: <ul style="list-style-type: none"> ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system. |













1.2.3 Communication-specific symbols

| Symbol | Meaning |
|---|---|
|  | Wireless Local Area Network (WLAN) Communication via a wireless, local network. |








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

1.2.6 Symbols in graphics


| Symbol | Meaning |
|---|--------------------------------|
|  | Item numbers |
|  | Series of steps |
|  | Views |
|  | Sections |
|  | Hazardous area |
|  | Safe area (non-hazardous area) |
|  | Flow direction |

1.3 Documentation

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

- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

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

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

1.4 Registered trademarks

FOUNDATION™ Fieldbus

Registration-pending trademark of the FieldComm Group, Austin, Texas, USA

TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

2 Safety instructions

2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

- ▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

2.2 Intended use

Application and media

The measuring device described in this manual is intended only for the flow measurement of liquids with a minimum conductivity of 5 $\mu\text{S}/\text{cm}$.

Depending on the version ordered, the measuring instrument can also be used to measure potentially explosive ¹⁾, flammable, toxid and oxidizing media.

Measuring instruments for use in hazardous areas, in hygienic applications, or where there is an increased risk due to pressure, are specially labeled on the nameplate.

To ensure that the measuring instrument is in perfect condition during operation:

- ▶ Only use the measuring instrument in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ Using 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 instrument only for media to which the process-wetted materials are sufficiently resistant.
- ▶ Keep within the specified pressure and temperature range.
- ▶ Keep within the specified ambient temperature range.
- ▶ Protect the measuring instrument permanently against corrosion from environmental influences.

Incorrect use

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

WARNING

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

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

1) Not applicable for IO-Link measuring instruments

NOTICE**Verification for borderline cases:**

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

Residual risks**⚠ CAUTION**

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

- ▶ Mount suitable touch protection.

2.3 Workplace safety

When working on and with the device:

- ▶ Wear the required personal protective equipment as per national regulations.

2.4 Operational safety

Damage to the device!

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

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers!

- ▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to the repair of an electrical device.
- ▶ Use only original spare parts and accessories.

2.5 Product safety

This 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. The manufacturer confirms this by affixing the CE mark to the device..





2.6 IT security

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

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


2.7 Device-specific IT security

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

| Function/interface | Factory setting | Recommendation |
|---|--------------------|---|
| Write protection via hardware write protection switch →  11 | Not enabled | On an individual basis following risk assessment |
| Access code (also applies to web server login or FieldCare connection) →  11 | Not enabled (0000) | Assign a customized access code during commissioning |
| WLAN (order option in display module) | Enabled | On an individual basis following risk assessment |
| WLAN security mode | Enabled (WPA2-PSK) | Do not change |
| WLAN passphrase (Password) →  12 | Serial number | Assign an individual WLAN passphrase during commissioning |
| WLAN mode | Access point | On an individual basis following risk assessment |
| Web server →  12 | Enabled | On an individual basis following risk assessment |
| Service interface CDI-RJ45 | – | On an individual basis following risk assessment |

2.7.1 Protecting access via hardware write protection

Write access to the parameters of the device 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 main electronics module). When hardware write protection is enabled, only read access to the parameters is possible.


Hardware write protection is disabled when the device is delivered →  114.

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.
- **Infrastructure mode**
When the device is operated in infrastructure mode, the WLAN passphrase corresponds to the WLAN passphrase configured on the operator side.


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 (→  112).

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

WLAN passphrase: Operation as WLAN access point


A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→  65), which can be ordered as an optional extra, 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 (→  106).


Infrastructure mode

A connection between the device and WLAN access point is protected by means of an SSID and passphrase on the system side. Please contact the relevant system administrator for access.

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning for safety reasons.
- Follow the general rules for generating a secure password when defining and managing the access code and 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, for example, see "Write protection via access code" →  112.

2.7.3 Access via web server

The integrated web server can be used to operate and configure the device via a web browser →  57. The connection is established 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 via the **Web server functionality** parameter if necessary (e.g., after commissioning).

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



Detailed information on the device parameters:
"Description of device parameters" document .

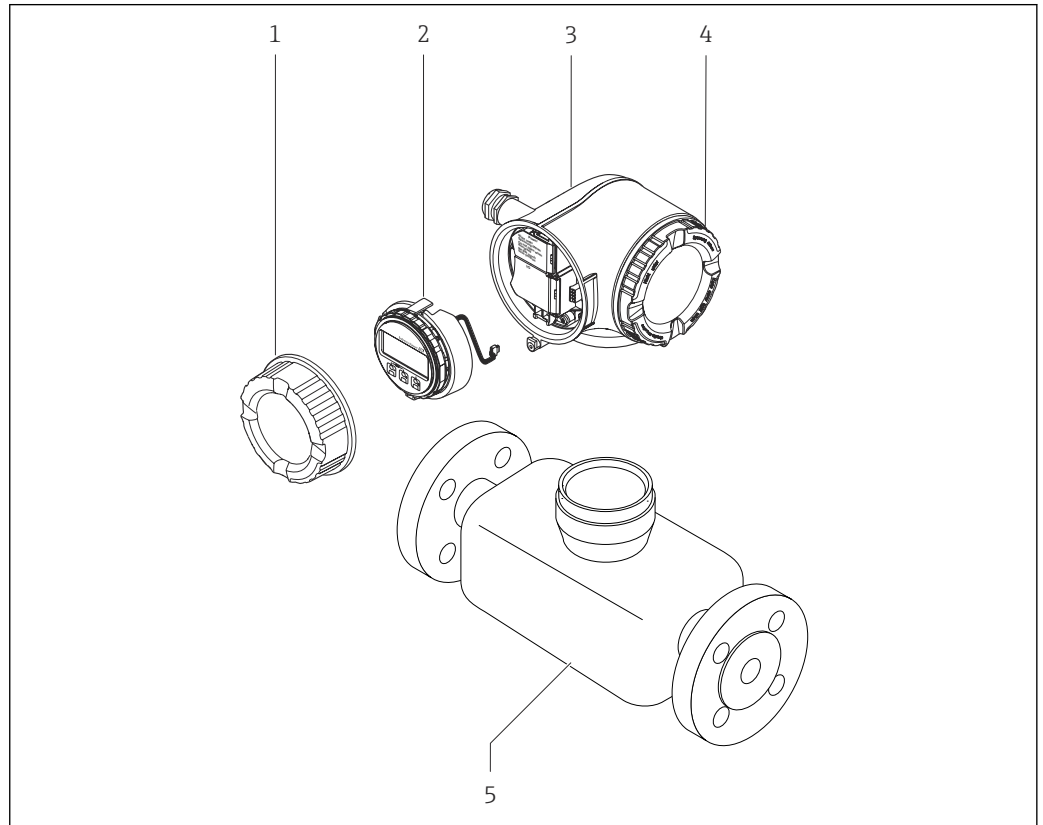
3 Product description


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



 1 Important components of a measuring device

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


A0029586

4 Incoming acceptance and product identification

4.1 Incoming acceptance

On receipt of the delivery:

1. Check the packaging for damage.
 - ↳ Report all damage immediately to the manufacturer.
Do not install damaged components.
2. Check the scope of delivery using the delivery note.
3. Compare the data on the nameplate with the order specifications on the delivery note.
4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.

 If one of the conditions is not satisfied, contact the manufacturer.

4.2 Product identification

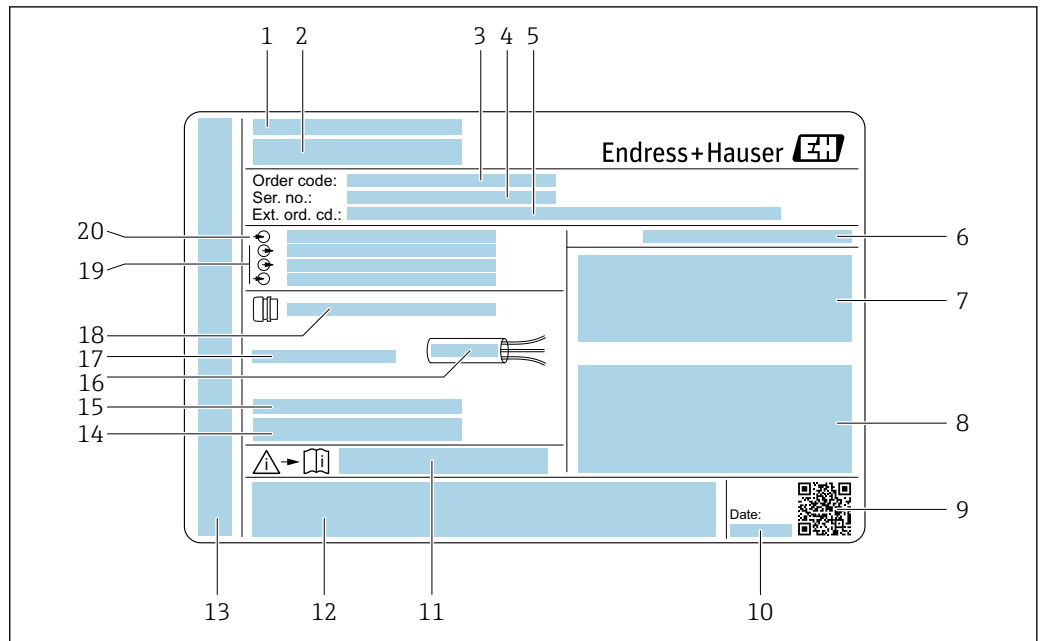
The device can be identified in the following ways:

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

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

- The "Additional standard device documentation" and "Supplementary device-dependent documentation" sections
- The *Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations app*: Enter the serial number from the nameplate or scan the DataMatrix code on the nameplate.

4.2.1 Transmitter nameplate

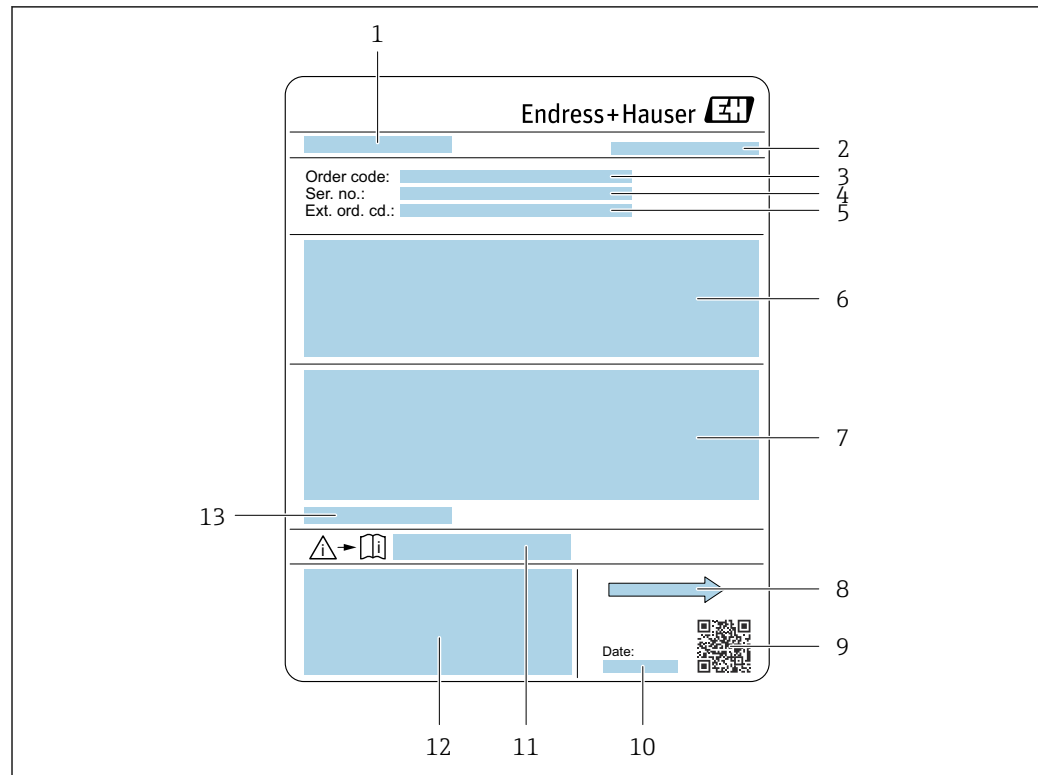


A0029192

2 Example of a transmitter nameplate

- 1 Manufacturer address/certificate holder
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number
- 5 Extended order code
- 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 Date of manufacture: year-month
- 11 Document number of safety-related supplementary documentation
- 12 Space for approvals and certificates: e.g. CE mark, RCM 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



A0029204

3 Example of sensor nameplate

- 1 Name of sensor
- 2 Manufacturer address/certificate holder
- 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; static pressure; medium temperature range; material of liner and electrodes
- 7 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 8 Flow direction
- 9 2-D matrix code
- 10 Date of manufacture: year-month
- 11 Document number of safety-related supplementary documentation
- 12 CE mark, RCM-Tick mark
- 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 the device

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

5 Storage and transport

5.1 Storage conditions

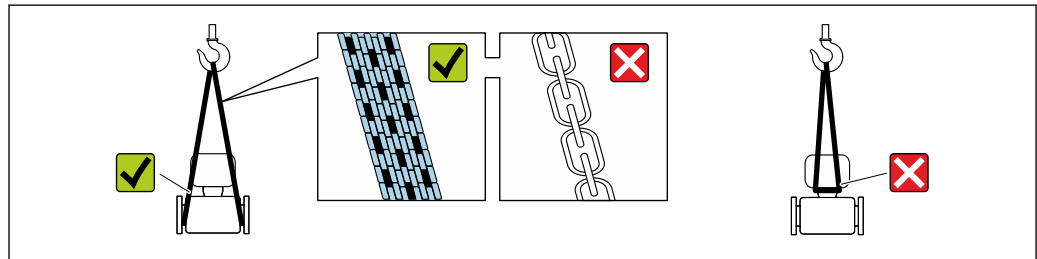
Observe the following notes for storage:

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


Storage temperature →  182

5.2 Transporting the product

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



A0029252

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

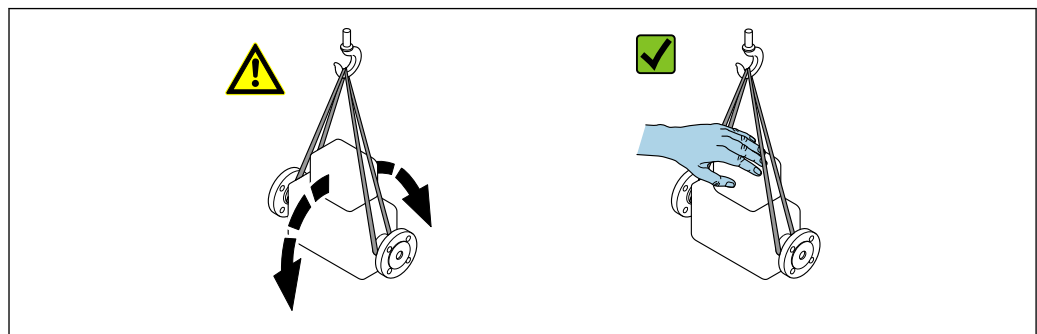
5.2.1 Measuring devices without lifting lugs

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).



A0029214

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.

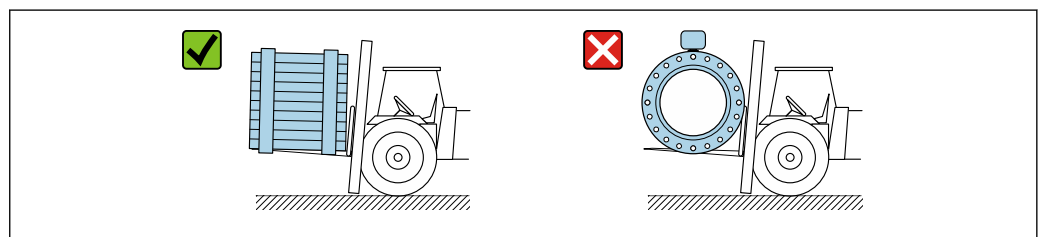
5.2.3 Transporting with a fork lift

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.



A0029319

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

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

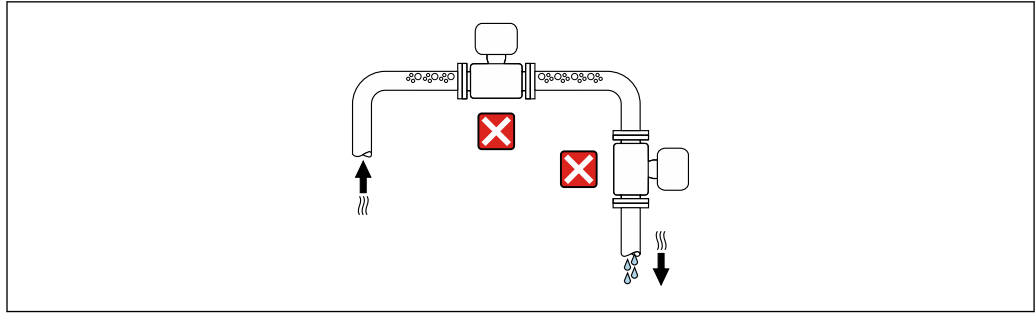
6 Mounting

6.1 Mounting requirements

6.1.1 Mounting position

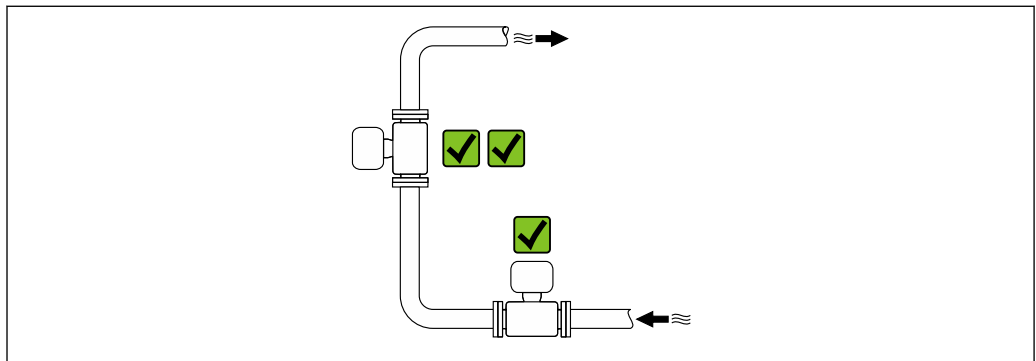
Mounting location

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



A0042317

The device should ideally be installed in an ascending pipe.



A0042317

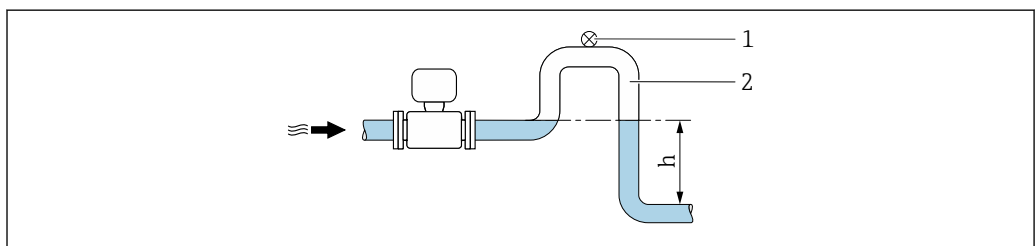
Installation upstream from a down pipe

NOTICE

Negative pressure in the measuring pipe can damage the liner!

- ▶ If installing upstream of down pipes whose length $h \geq 5 \text{ m}$ (16.4 ft): install a siphon with a vent valve downstream of the device.

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

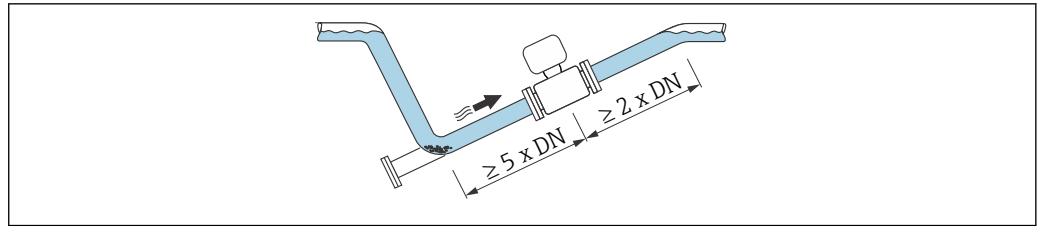


A0028981

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

Installation with partially filled pipes

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



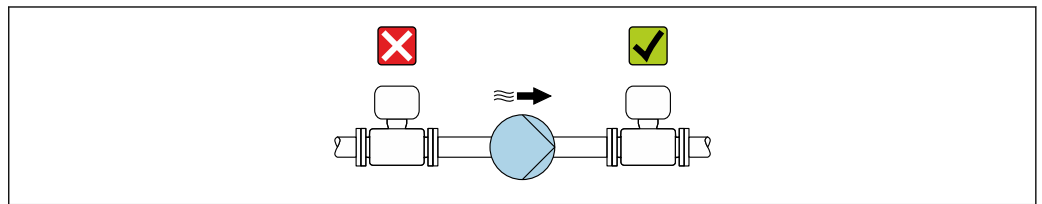
A0041088

Installation near pumps

NOTICE

Negative pressure in the measuring tube can damage the liner!

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



A0041083

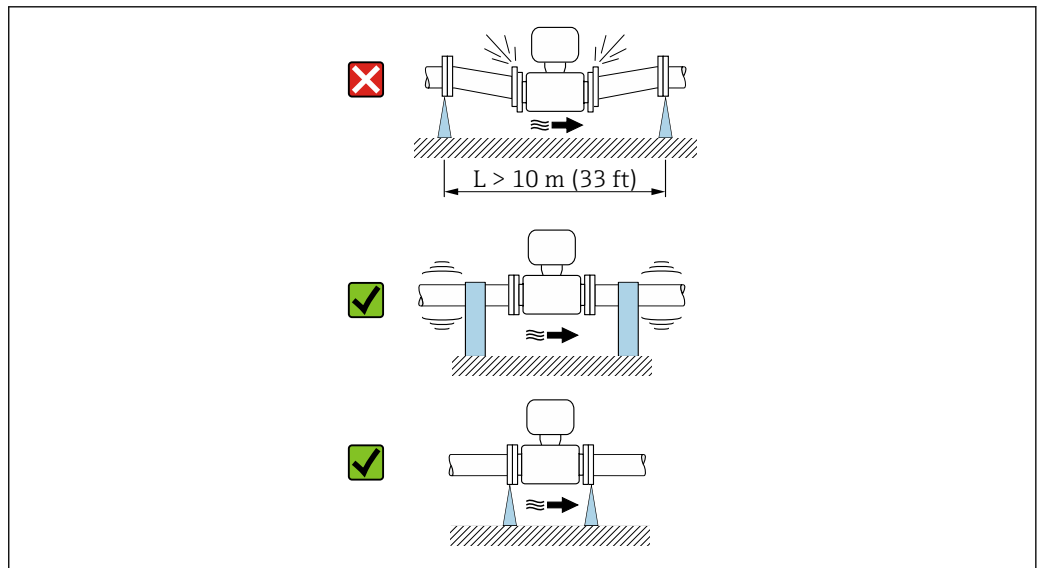
- Information on the liner's resistance to partial vacuum
- Information on the measuring system's resistance to vibration and shock → 183

Installation in event of pipe vibrations

NOTICE

Pipe vibrations can damage the device!

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

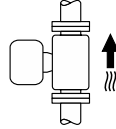
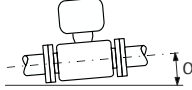
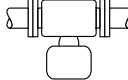



A0041092

- Information on the measuring system's resistance to vibration and shock → 183

Orientation

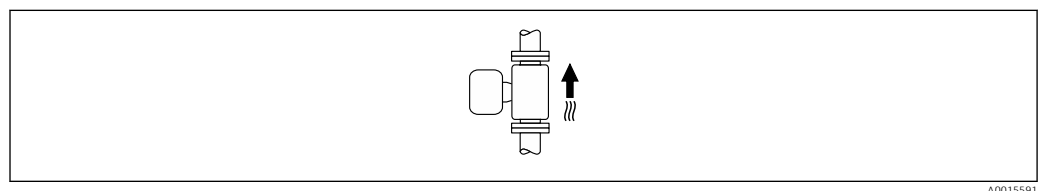
The direction of the arrow on the nameplate helps you to install the measuring device according to the flow direction (direction of medium flow through the piping).

| Orientation | | Recommendation |
|---|---|---|
| Vertical orientation |  <p style="text-align: right; font-size: small;">A0015591</p> | <p style="text-align: center;">☑☑☑</p> |
| Horizontal orientation |  <p style="text-align: right; font-size: small;">A0041328</p> | <p style="text-align: center;">☑ 1)</p> |
| Horizontal orientation, transmitter at bottom |  <p style="text-align: right; font-size: small;">A0015590</p> | <p style="text-align: center;">☑☑☑ 2) 3) ☒ 4)</p> |
| Horizontal orientation, transmitter at side |  <p style="text-align: right; font-size: small;">A0015592</p> | <p style="text-align: center;">☒</p> |

- 1) The measuring device should be self-draining for hygiene applications. A vertical orientation is recommended for this. If only a horizontal orientation is possible, an angle of inclination $\alpha \geq 10^\circ$ is recommended.
- 2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
- 3) To prevent the electronics from overheating in the event of strong heat formation (e.g. CIP or SIP cleaning process), install the device with the transmitter part pointing downwards.
- 4) With the empty pipe detection function switched on: empty pipe detection only works if the transmitter housing is pointing upwards.

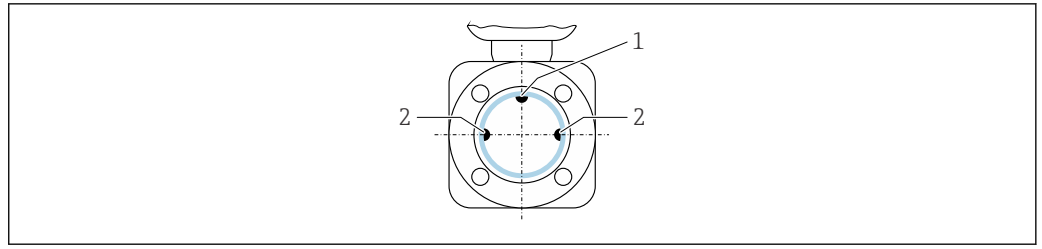
Vertical

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



Horizontal

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



A0028998

- 1 EPD electrode for empty pipe detection, available from \geq DN 15 (1/2")
- 2 Measuring electrodes for signal detection

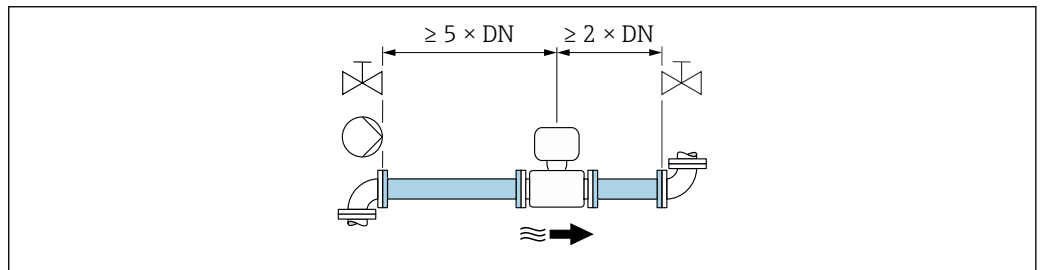
i Measuring instruments with a nominal diameter $<$ DN 15 (1/2") do not have an EPD electrode. In this case, empty pipe detection is performed via the measuring electrodes.

Inlet and outlet runs

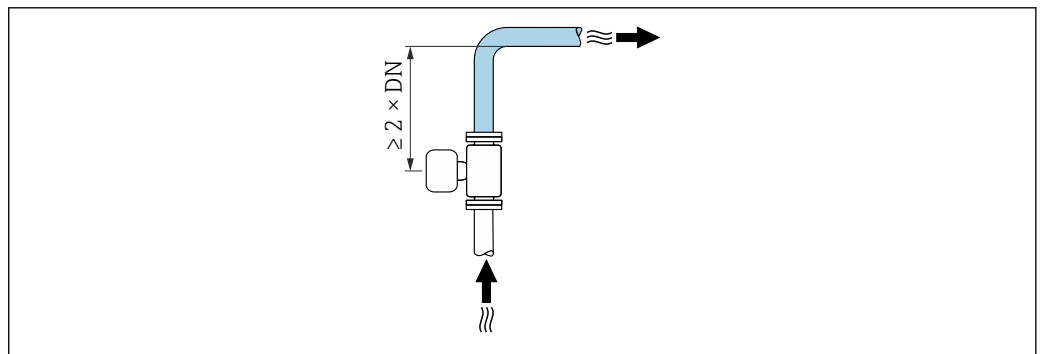
Installation with inlet and outlet runs

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

Maintain straight, unimpeded inlet and outlet runs.



A0028997



A0042132

Installation dimensions

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

6.1.2 Environmental and process requirements

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 | -40 to +60 °C (-40 to +140 °F) |
| Liner | Do not exceed or fall below the permitted temperature range of the liner . |


If operating outdoors:

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

System pressure


Installation near pumps →  21

Vibrations

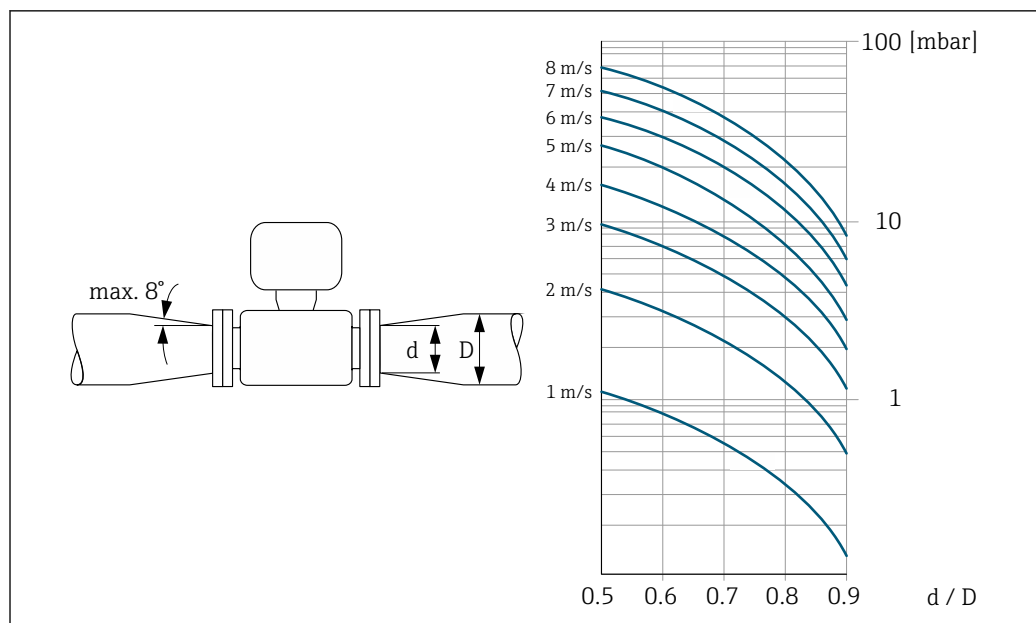
Installation in event of pipe vibrations →  21

Adapters

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

-  ■ The nomogram only applies to liquids with a viscosity similar to that of water.
- If the medium has a high viscosity, a larger measuring tube diameter can be considered in order to reduce pressure loss.

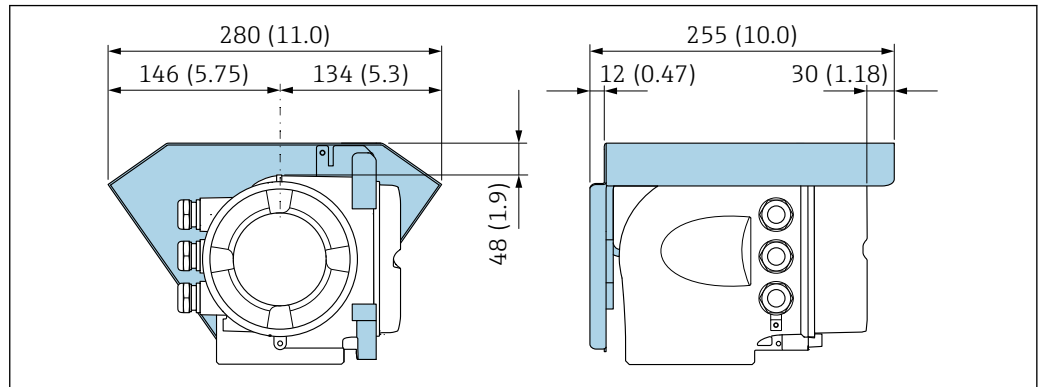
1. Calculate the ratio of the diameters d/D .
2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



A0029002

6.1.3 Special mounting instructions

Weather protection cover



4 Engineering unit mm (in)

A0029553

Hygienic compatibility

- i** ■ When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 194
- In the case of measuring devices with the order code for "Housing", option B "Stainless, hygienic", to seal the connection compartment cover, screw it closed finger-tight and tighten it by another 45° (corresponds to 15 Nm).

6.2 Mounting the measuring instrument

6.2.1 Required tools

For sensor

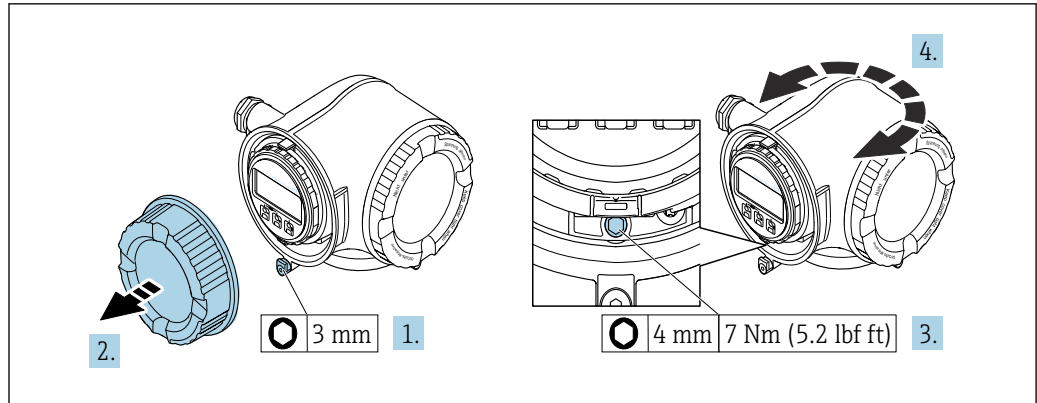
For flanges and other process connections: Use a suitable mounting tool.

6.2.2 Preparing the measuring device

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

6.2.3 Turning the transmitter housing

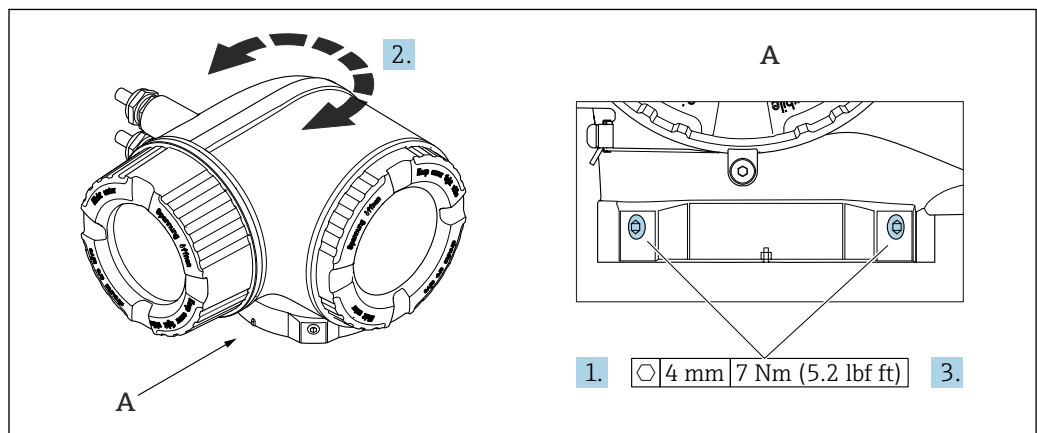
To provide easier access to the connection compartment or display module, the transmitter housing can be turned.



A0029993

5 Housing in non-Ex version

1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Loosen the fixing screw.
4. Turn the housing to the desired position.
5. 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.



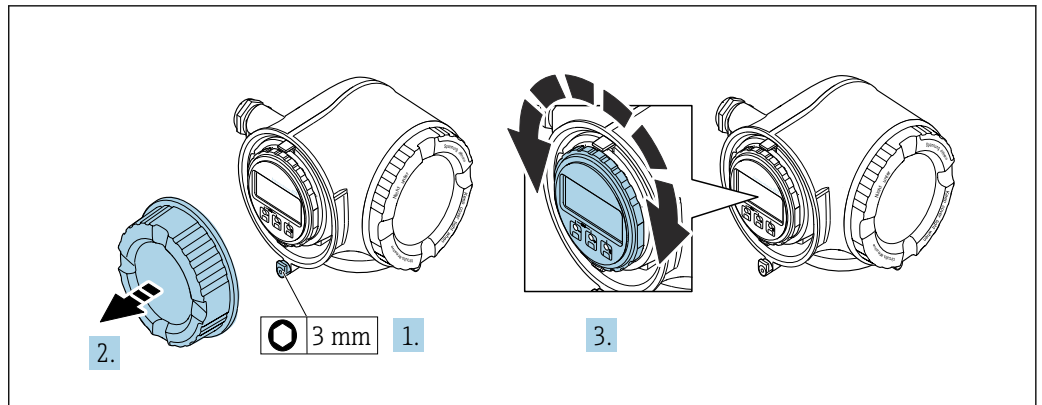
A0043150

6 Ex housing

1. Loosen the fixing screws.
2. Turn the housing to the desired position.
3. Tighten the securing screws.

6.2.4 Turning the display module

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



A0030035

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-mounting 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"> ▪ Process temperature ▪ Pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document. ▪ Ambient temperature ▪ Measuring range | <input type="checkbox"/> |
| Has the correct orientation been selected for the sensor → 22 ? <ul style="list-style-type: none"> ▪ According to sensor type ▪ According to medium temperature ▪ According to medium properties (outgassing, with entrained solids) | <input type="checkbox"/> |
| Does the arrow on the sensor nameplate match the actual direction of flow of the fluid through the piping → 22? | <input type="checkbox"/> |
| Are the measuring point identification and labeling correct (visual inspection)? | <input type="checkbox"/> |
| Have the fixing screws been tightened with the correct tightening torque? | <input type="checkbox"/> |

7 Electrical connection

WARNING

Live parts! Incorrect work performed on the electrical connections can result in an electric shock.

- ▶ Set up a disconnecting device (switch or power-circuit breaker) to easily disconnect the device from the supply voltage.
- ▶ In addition to the device fuse, include an overcurrent protection unit with max. 10 A in the plant installation.

7.1 Electrical safety

In accordance with applicable national regulations.

7.2 Connecting requirements

7.2.1 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 ≤ 3 mm (0.12 in)

7.2.2 Requirements for connection cable

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

Protective grounding cable for the outer ground terminal

Conductor cross-section < 2.1 mm² (14 AWG)

The use of a cable lug enables the connection of larger cross-sections.

The grounding impedance must be less than 2 Ω .

Permitted temperature range

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

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

Standard installation cable is sufficient.

Signal cable

FOUNDATION Fieldbus

Twisted, shielded two-wire cable.



For further information on planning and installing FOUNDATION Fieldbus networks see:

- Operating Instructions for "FOUNDATION Fieldbus Overview" (BA00013S)
- FOUNDATION Fieldbus Guideline
- IEC 61158-2 (MBP)

Current output 0/4 to 20 mA

Standard installation cable is sufficient.

Pulse /frequency /switch 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 mm² (24 to 12 AWG).

Requirements for connecting cable – remote display and operating module DKX001

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**

| | |
|---------------------------------|--|
| Standard cable | 2 × 2 × 0.34 mm ² (22 AWG) PVC cable with common shield (2 pairs, pair-stranded) |
| Flame resistance | According to DIN EN 60332-1-2 |
| Oil resistance | According to DIN EN 60811-2-1 |
| Shield | Tin-plated copper braid, optical cover ≥ 85 % |
| Capacitance: core/shield | ≤ 200 pF/m |
| L/R | ≤ 24 µH/Ω |
| Available cable length | 5 m (15 ft)/10 m (35 ft)/20 m (65 ft)/30 m (100 ft) |
| Operating temperature | 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

With the following order option, no cable is supplied with the device and must be provided by the customer:

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

A standard cable with the following minimum requirements can be used as the connecting cable, even in the hazardous area (Zone 2, Class I, Division 2 and Zone 1, Class I, Division 1):



| | |
|---------------------------------|---|
| Standard cable | 4 wires (2 pairs); pair-stranded with common shield, minimum wire cross-section 0.34 mm ² (22 AWG) |
| Shield | Tin-plated copper braid, optical cover ≥ 85 % |
| Cable impedance (pair) | Minimum 80 Ω |
| Cable length | Maximum 300 m (1000 ft), maximum loop impedance 20 Ω |
| Capacitance: core/shield | Maximum 1 000 nF for Zone 1, Class I, Division 1 |
| L/R | Maximum 24 μH/Ω for Zone 1, Class I, Division 1 |

7.2.3 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 (A) | 27 (B) | 24 (+) | 25 (-) | 22 (+) | 23 (-) |
| Device-specific terminal assignment: adhesive label in terminal cover. | | | | | | | |

 Terminal assignment of the remote display and operating module →  36.

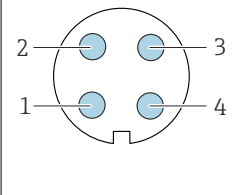
7.2.4 Available device plugs

 Device plugs may not be used in hazardous areas!

Order code for "Input; output 1", option SA "FOUNDATION Fieldbus"

| Order code for "Electrical connection" | Cable entry/connection | |
|---|------------------------|---|
| | 2 | 3 |
| M, 3, 4, 5 | 7/8" connector | - |

7.2.5 device plug pin assignment

|  | Pin | Assignment | Coding | Plug/socket | |
|---|-----|------------|--------------|-------------|------|
| | 1 | + | Signal + | A | Plug |
| | 2 | - | Signal - | | |
| | 3 | | Grounding | | |
| | 4 | | Not assigned | | |

7.2.6 Shielding and grounding

Optimal electromagnetic compatibility (EMC) of the fieldbus system can be guaranteed only if the system components and, in particular, the lines are shielded and the shield forms as complete a cover as possible. A shield coverage of 90 % is ideal.

1. To ensure optimal EMC protection, connect the shield to the reference ground as often as possible.
2. For reasons concerning explosion protection, it is recommended that grounding be dispensed with.

To comply with both requirements, there are basically three different types of shielding in the fieldbus system:

- Shielding at both ends
- Shielding at one end on the feed side with capacitance termination at the field device
- Shielding at one end on the feed side

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding on the feed side (without capacitance termination at the field device). Appropriate measures with regard to input wiring must be taken to allow

unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

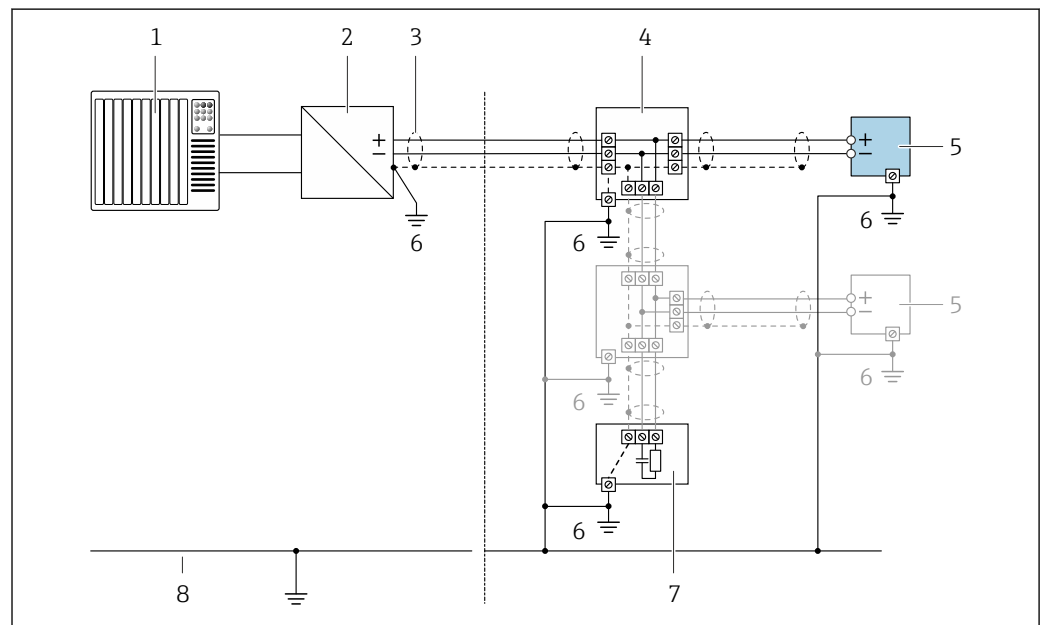
1. Observe national installation requirements and guidelines during installation.
2. Where there are large differences in potential between the individual grounding points, connect only one point of the shielding directly to the reference ground.
3. In systems without potential equalization, the cable shielding of fieldbus systems should be grounded on one side only, for example at the fieldbus supply unit or at safety barriers.

NOTICE

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

Damage to the bus cable shield.

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



7 Connection example for FOUNDATION Fieldbus

- 1 Control system (e.g. PLC)
- 2 Power conditioner (FOUNDATION Fieldbus)
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential equalization conductor

7.2.7 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 → 28.

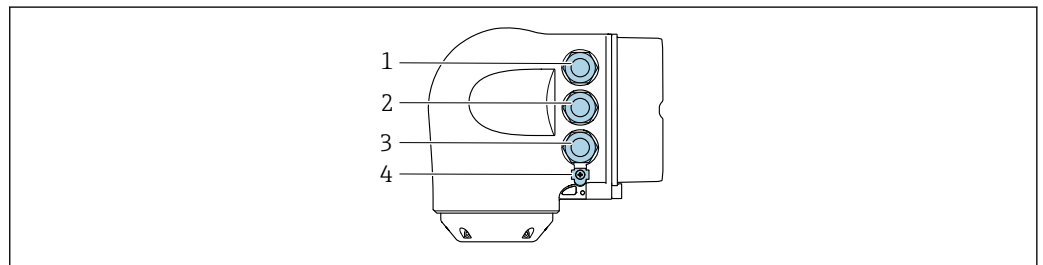
7.3 Connecting the measuring instrument

NOTICE

An incorrect connection compromises electrical safety!

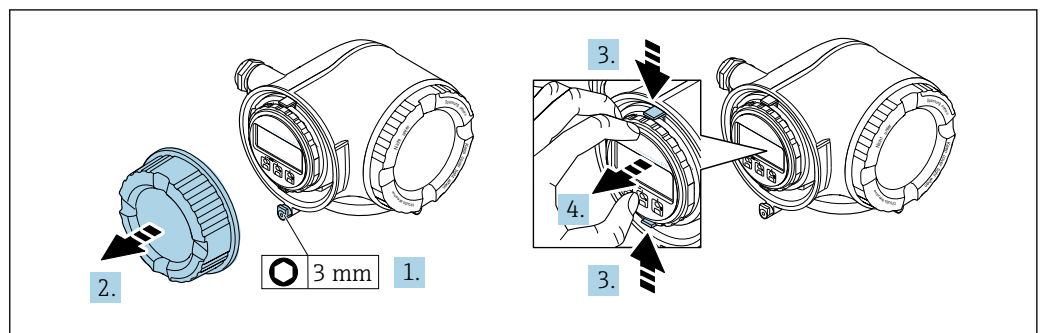
- ▶ Only properly trained specialist staff may perform electrical connection work.
- ▶ Observe applicable federal/national installation codes and regulations.
- ▶ Comply with local workplace safety regulations.
- ▶ Always connect the protective ground cable ⊕ before connecting additional cables.
- ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

7.3.1 Connecting the transmitter



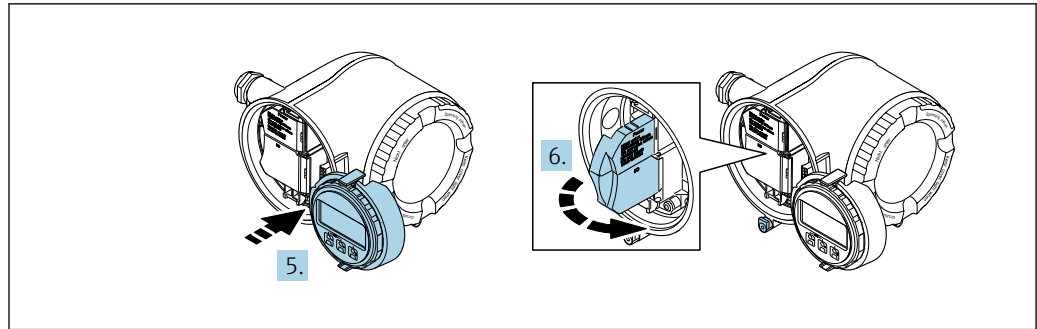
A0026781

- 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)



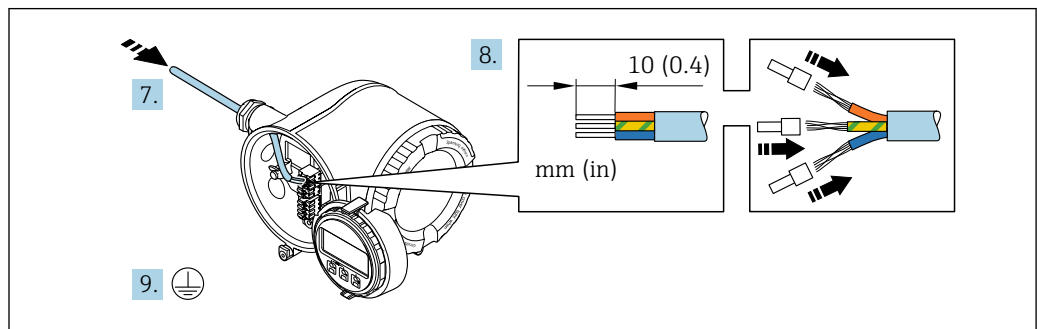
A0029813

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.



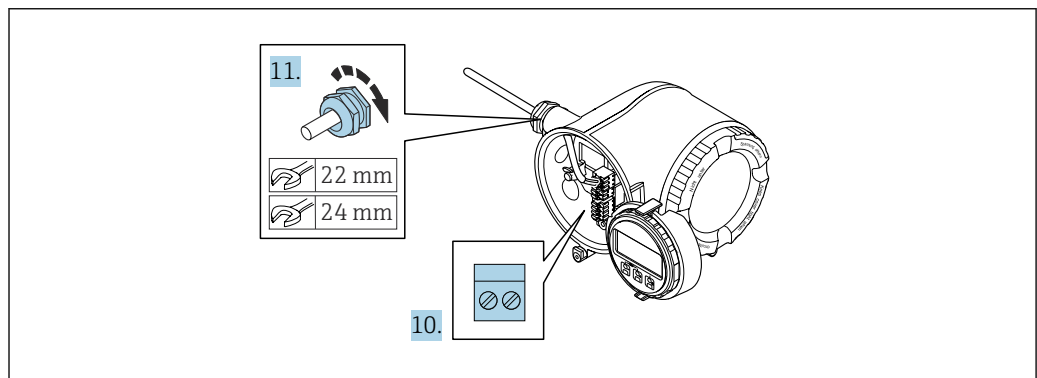
A0029814

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.

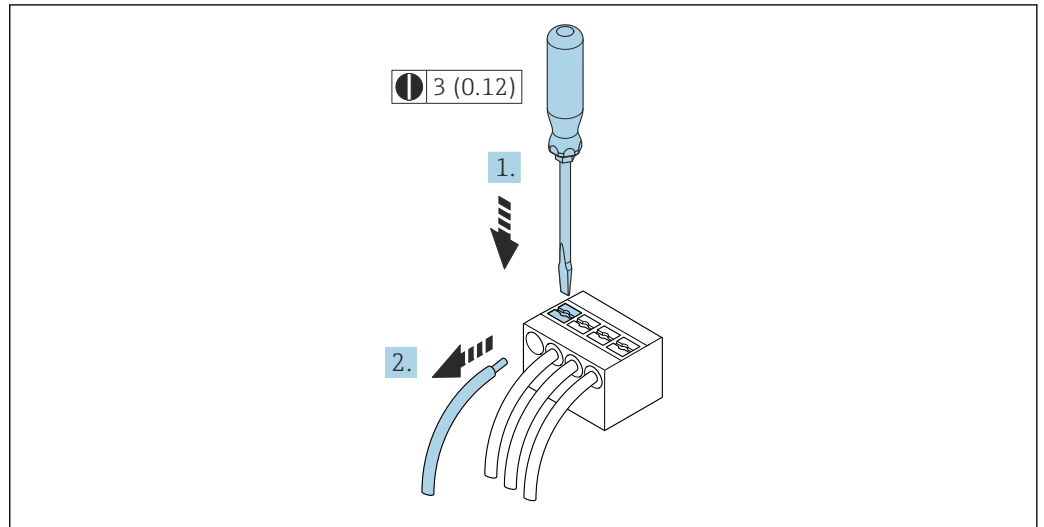


A0029816

10. Connect the cable according to the terminal assignment.
 - ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
 - Supply voltage connection terminal assignment:** Adhesive label in the terminal cover or → 31.
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

To remove a cable from the terminal:



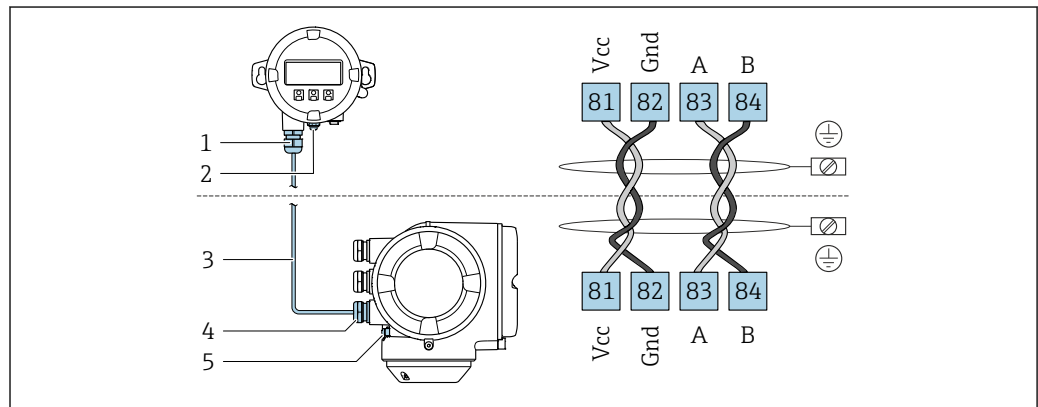
8 Engineering unit mm (in)

1. Use a flat-blade screwdriver to press down on the slot between the two terminal holes.
2. Remove the cable end from the terminal.

7.3.2 Connecting the remote display and operating module DKX001

i The remote display and operating module DKX001 is available as an optional extra
→ 166..

- The remote display and operating module DKX001 is only available for the following housing version: order code for "Housing": option A "Aluminum, coated"
- The measuring instrument is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring instrument. 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 instrument 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 Terminal connection for potential equalization (PE)
- 3 Connecting cable
- 4 Measuring instrument
- 5 Terminal connection for potential equalization (PE)

7.4 Ensuring potential equalization

7.4.1 Requirements

For potential equalization:

- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electric potential
- Use a ground cable with a minimum cross-section of 6 mm² (10 AWG) and a cable lug for potential equalization connections

7.4.2 Connection example, standard scenario

Metal process connections

Potential equalization is generally via the metal process connections that are in contact with the medium and mounted directly on the sensor. Therefore there is generally no need for additional potential equalization measures.

7.4.3 Connection example in special situations

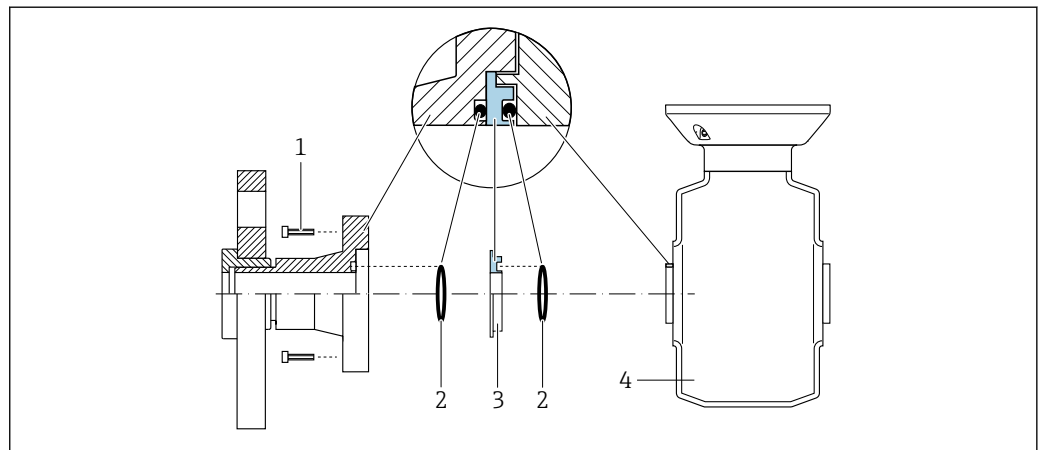
Plastic process connections

In the case of plastic process connections, additional grounding rings or process connections with an integrated grounding electrode must be used to ensure potential matching between the sensor and the fluid. If there is no potential matching, this can affect the measuring accuracy or cause the destruction of the sensor as a result of the electrochemical decomposition of the electrodes.

Note the following when using grounding rings:

- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. These plastic disks only act as "spacers" and do not have any potential matching function. Furthermore, they also perform a significant sealing function at the sensor/connection interface. Therefore, in the case of process connections without metal grounding rings, these plastic disks/seals should never be removed and should always be installed!
- Grounding rings can be ordered separately as accessory DK5HR* from Endress+Hauser (does not contain any seals). When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion!
- If seals are required, they can be additionally ordered with seal set DK5G*.
- Grounding rings including seals are mounted inside the process connections. This does not affect the installed length.

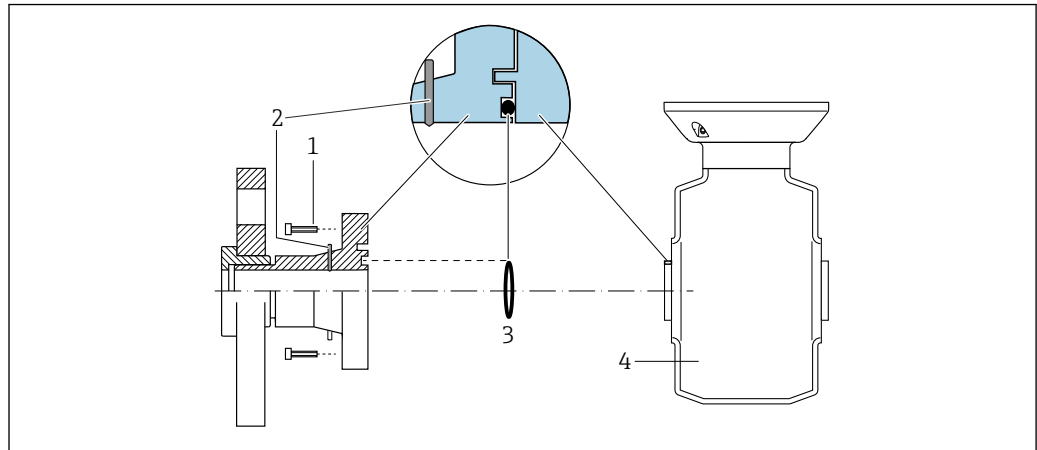
Potential equalization via additional grounding ring



A0028971

- 1 Hexagonal-headed bolts of process connection
- 2 O-ring seals
- 3 Plastic disk (spacer) or grounding ring
- 4 Sensor

Potential equalization via grounding electrodes on process connection



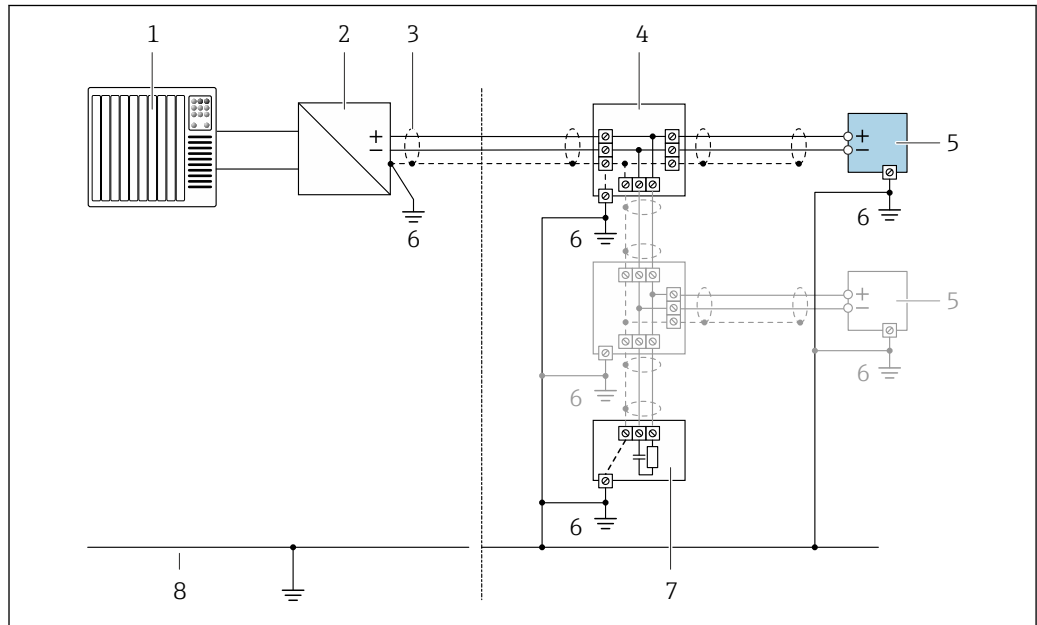
A0028972

- 1 Hexagonal-headed bolts of process connection
- 2 Integrated grounding electrodes
- 3 O-ring seal
- 4 Sensor

7.5 Special connection instructions

7.5.1 Connection examples

FOUNDATION Fieldbus

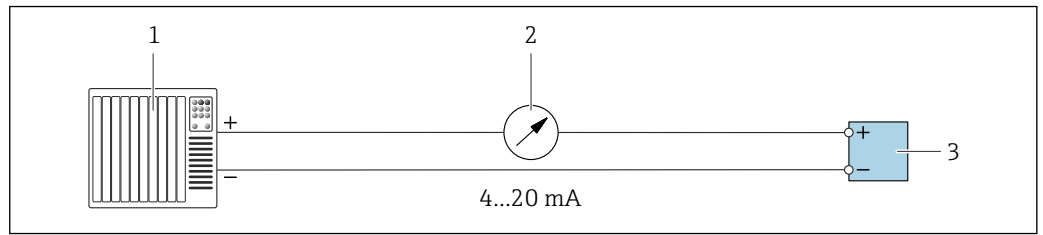


A0028768

9 Connection example for FOUNDATION Fieldbus

- 1 Control system (e.g. PLC)
- 2 Power Conditioner (FOUNDATION Fieldbus)
- 3 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

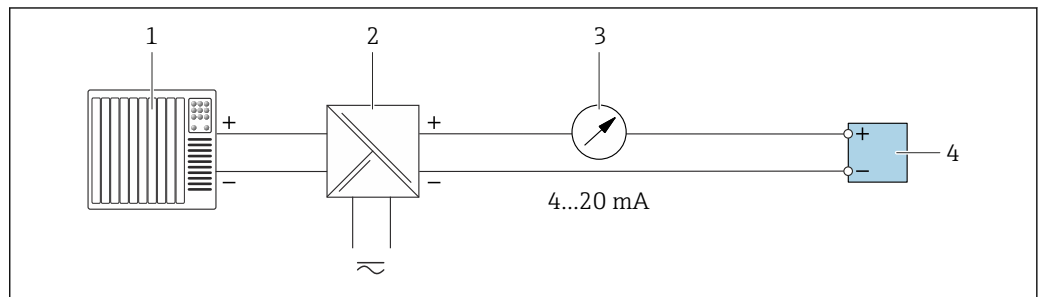
Current output 4-20 mA



A0028758

10 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

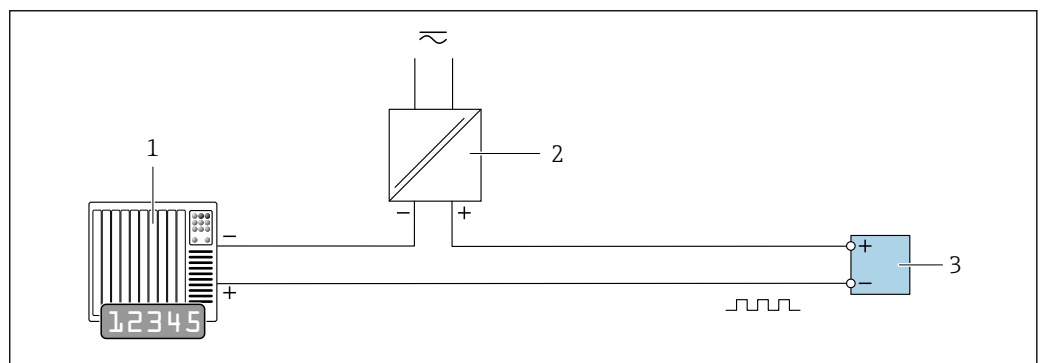


A0028759

11 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

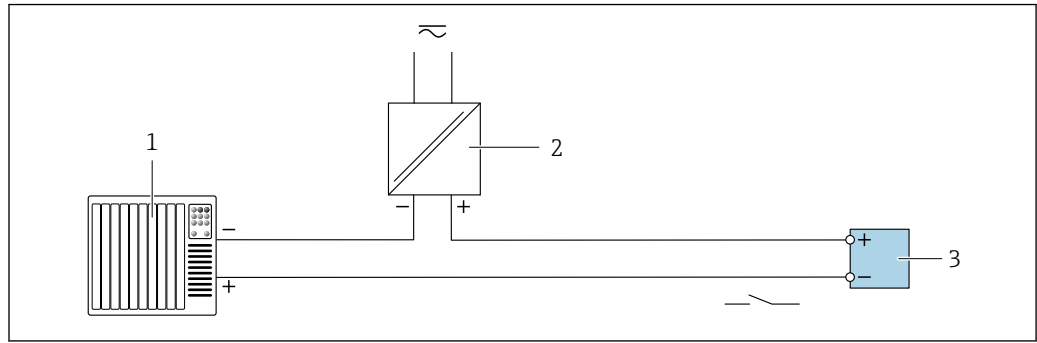


A0028761

12 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 174

Switch output

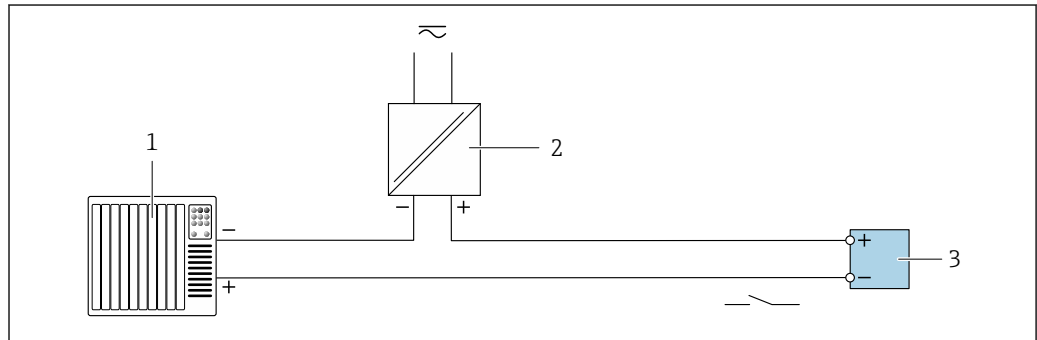


A0028760

13 Connection example for switch output (passive)

- 1 Automation system with switch input (e.g. PLC with a 10 k Ω pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 174

Relay output

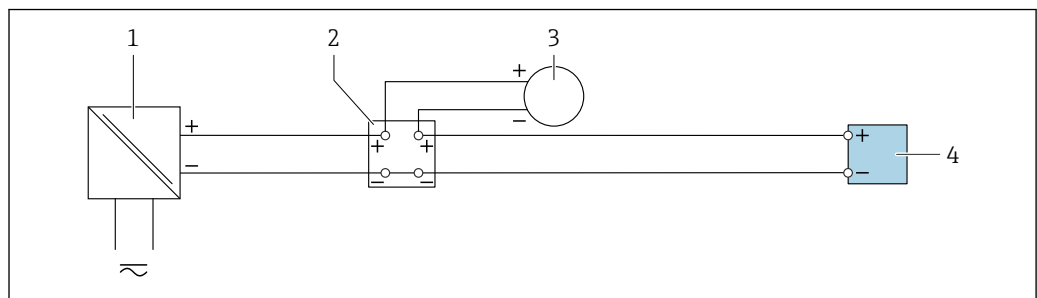


A0028760

14 Connection example for relay output (passive)

- 1 Automation system with relay input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: observe input values → 175

Current input

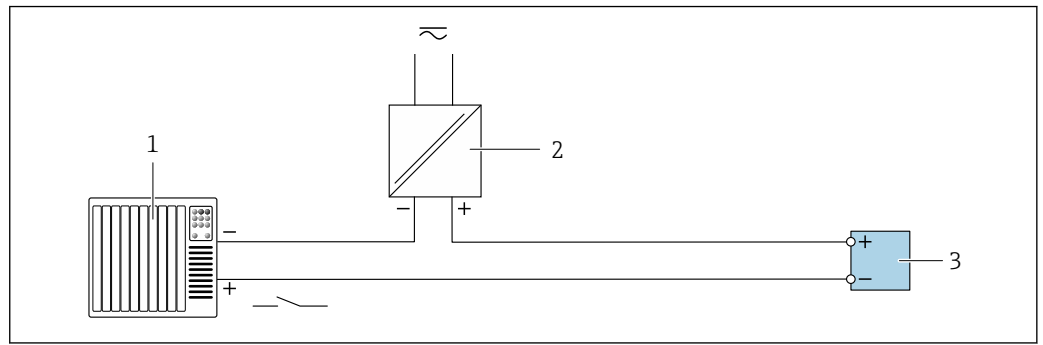


A0028915

15 Connection example for 4 to 20 mA current input

- 1 Power supply
- 2 Terminal box
- 3 External measuring device (to read in pressure or temperature, for instance)
- 4 Transmitter

Status input



16 Connection example for status input

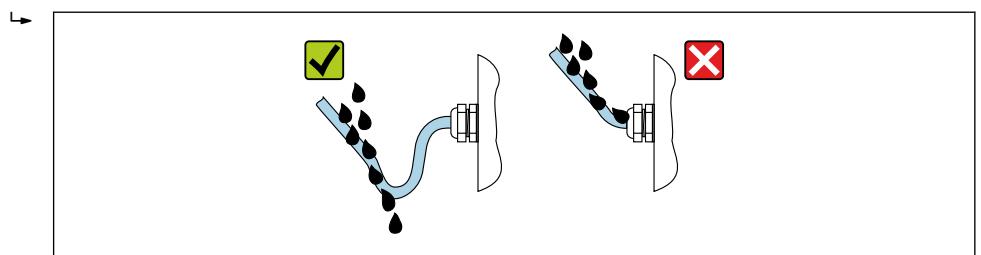
- 1 Automation system with status output (e.g. PLC)
- 2 Power supply
- 3 Transmitter

7.6 Ensuring the degree of protection

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

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

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



6. The cable glands supplied do not ensure housing protection when not in use. They must therefore be replaced by dummy plugs corresponding to the housing protection.

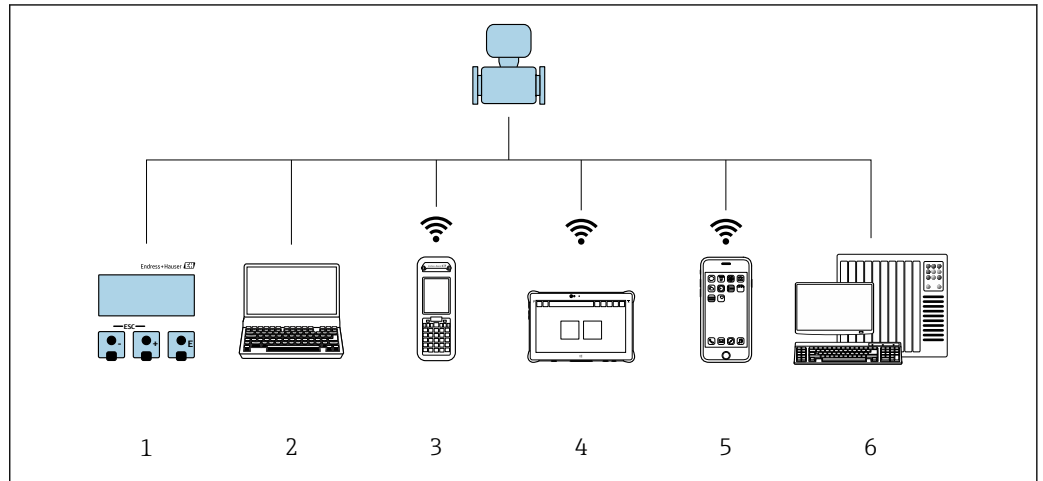
7.7 Post-connection check

| | |
|---|--------------------------|
| Are cables or the device undamaged (visual inspection)? | <input type="checkbox"/> |
| Is the protective earthing established correctly? | <input type="checkbox"/> |
| Do the cables used comply with the requirements ? | <input type="checkbox"/> |
| Are the mounted cables relieved of tension? | <input type="checkbox"/> |
| Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 41? | <input type="checkbox"/> |
| Is the terminal assignment correct ? | <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"/> |
| Are dummy plugs inserted in unused cable entries and have transportation plugs been replaced with dummy plugs? | <input type="checkbox"/> |

8 Operation options

8.1 Overview of operation options





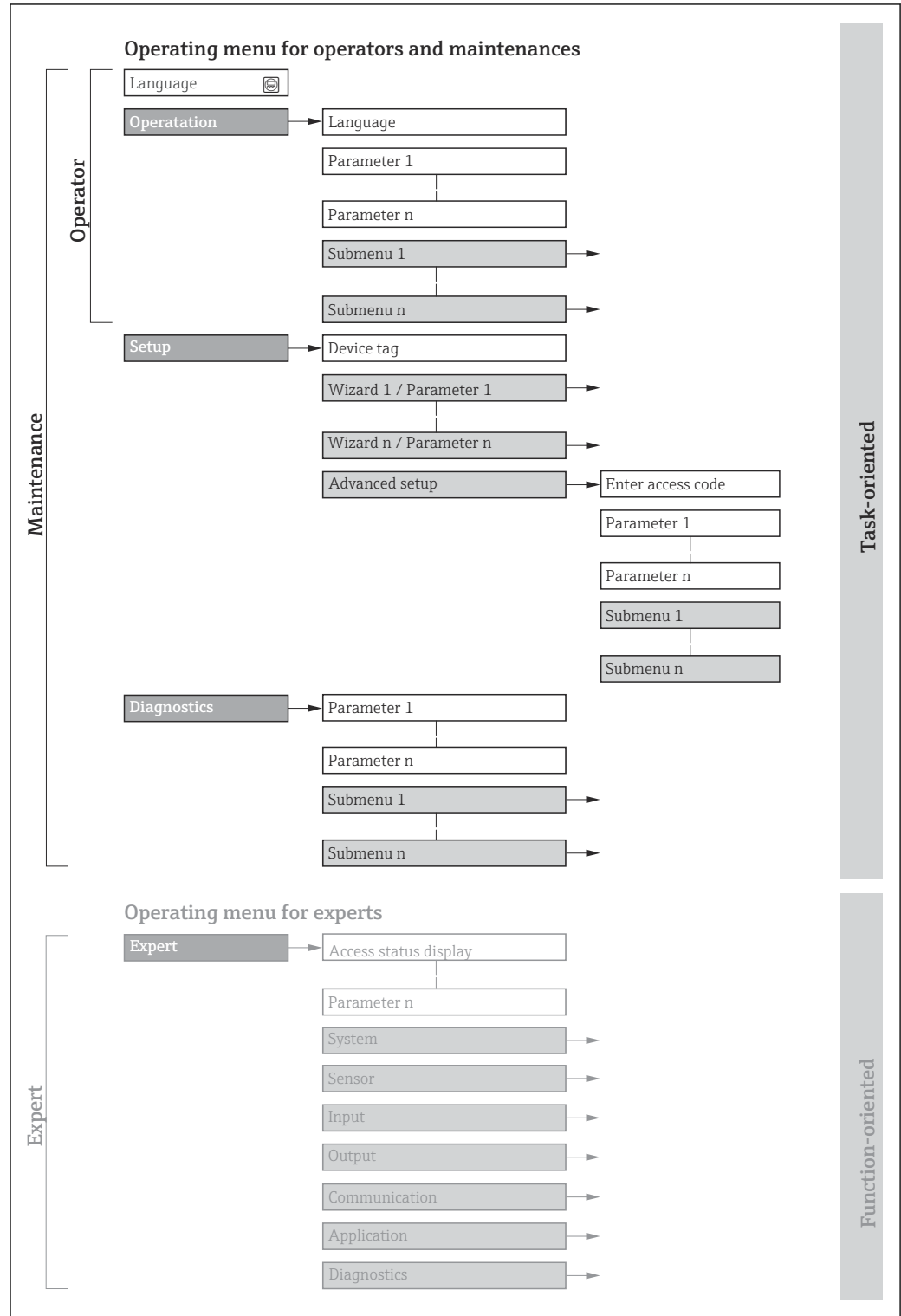
A0034513

- 1 Local operation via display module
- 2 Computer with web browser or operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 3 Field Xpert SFX350 or SFX370
- 4 Field Xpert SMT70
- 5 Mobile handheld terminal
- 6 Automation 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: see the "Description of Device Parameters" document supplied with the device →  197



A0018237-EN

 17 Schematic structure of the operating menu

8.2.2 Operating philosophy

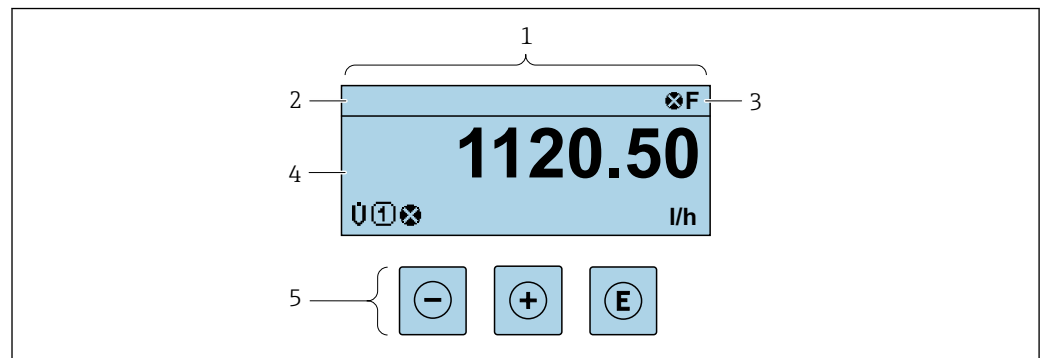
The individual parts of the operating menu are assigned to certain user roles (e.g. operator, maintenance etc.). Each user role contains typical tasks within the device life cycle.

| Menu/parameter | | User role and tasks | Content/meaning |
|----------------|---------------|---|---|
| Language | Task-oriented | Role "Operator", "Maintenance" Tasks during operation: <ul style="list-style-type: none"> ▪ Configuration of the operational display ▪ Reading measured values | <ul style="list-style-type: none"> ▪ Defining the operating language ▪ Defining the Web server operating language ▪ Resetting and controlling totalizers |
| Operation | | | <ul style="list-style-type: none"> ▪ Configuration of the operational display (e.g. display format, display contrast) ▪ Resetting and controlling totalizers |
| Setup | | "Maintenance" role Commissioning: <ul style="list-style-type: none"> ▪ Configuration of the measurement ▪ Configuration of the inputs and outputs ▪ Configuration of the communication interface | Wizards for fast commissioning: <ul style="list-style-type: none"> ▪ Configuring the system units ▪ Displaying the I/O configuration ▪ Configuring the inputs ▪ Configuring the outputs ▪ Configuration of the operational display ▪ Configuring the low flow cut off ▪ Configuring empty pipe detection Advanced setup <ul style="list-style-type: none"> ▪ For more customized configuration of the measurement (adaptation to special measuring conditions) ▪ Configuration of totalizers ▪ Configuration of electrode cleaning (optional) ▪ Configuration of WLAN settings ▪ Administration (define access code, reset measuring device) |
| Diagnostics | | "Maintenance" role Troubleshooting: <ul style="list-style-type: none"> ▪ Diagnostics and elimination of process and device errors ▪ Measured value simulation | Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> ▪ Diagnostic list Contains up to 5 currently pending diagnostic messages. ▪ Event logbook Contains event messages that have occurred. ▪ Device information Contains information for identifying the device ▪ Measured values Contains all current measured values. ▪ Data logging submenu with the "Extended HistoROM" order option Storage and visualization of measured values ▪ Heartbeat Technology Verification of device functionality on request and documentation of verification results ▪ Simulation Used to simulate measured values or output values. |

| Menu/parameter | User role and tasks | Content/meaning |
|----------------|---------------------|--|
| Expert | Function-oriented | <p>Tasks that require detailed knowledge of the function of the device:</p> <ul style="list-style-type: none"> ▪ Commissioning measurements under difficult conditions ▪ Optimal adaptation of the measurement to difficult conditions ▪ Detailed configuration of the communication interface ▪ Error diagnostics in difficult cases <p>Contains all of the device parameters and allows direct access to these by means of an access code. The structure of this menu is based on the function blocks of the device:</p> <ul style="list-style-type: none"> ▪ System Contains all higher-level device parameters that do not affect measurement or measured value communication ▪ Sensor Configuration of the measurement. ▪ Output Configuration of the pulse/frequency/switch output ▪ Input Configuration of the status input ▪ Output Configuration of the analog current outputs as well as the pulse/frequency and switch output ▪ Communication Configuration of the digital communication interface and the Web server ▪ Submenus for function blocks (e.g. "Analog Inputs") Configuration of function blocks ▪ Application Configuration of the functions that go beyond the actual measurement (e.g. totalizer) ▪ Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology. |

8.3 Access to operating menu via local display

8.3.1 Operational display









A0029346

- 1 Operational display
- 2 Device tag → 77
- 3 Status area
- 4 Display range for measured values (up to 4 lines)
- 5 Operating elements → 52

Status area

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



- Status signals →  128
 - **F**: Failure
 - **C**: Function check
 - **S**: Out of specification
 - **M**: Maintenance required
- Diagnostic behavior →  129
 - : 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 variables


| Symbol | Meaning |
|----------|--------------|
| G | Conductivity |
| m | Mass flow |

-  The number and display format of the measured variables can be configured via the **Format display** parameter (→  94).



Totalizer

| Symbol | Meaning |
|----------|---|
| Σ | Totalizer  The measurement channel number indicates which of the three totalizers is displayed. |



Input


| Symbol | Meaning |
|---|--------------|
|  | Status input |

Measurement channel numbers

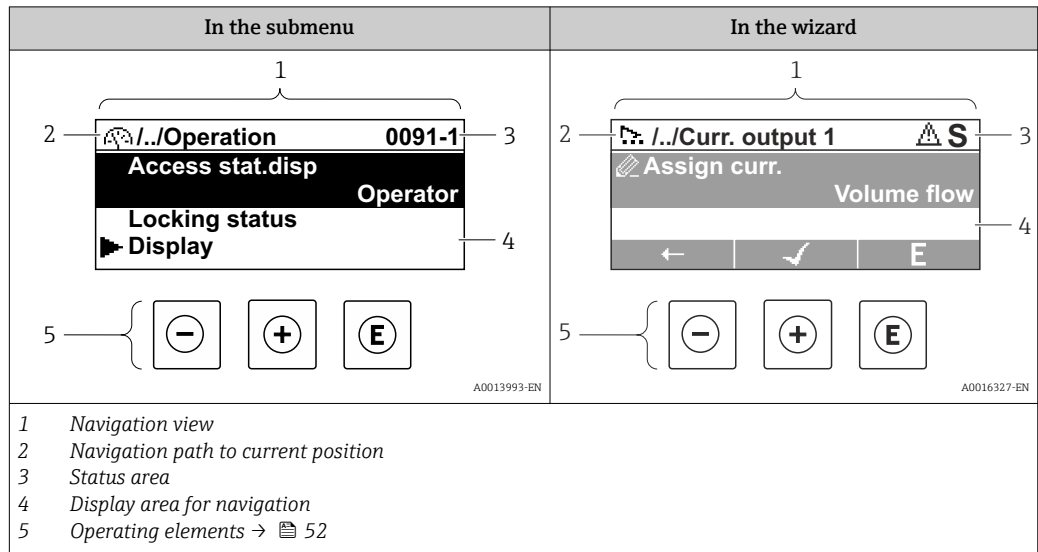
| Symbol | Meaning |
|---|---|
|  | Measurement channel 1 to 4  The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. totalizer 1 to 3). |

Diagnostic behavior

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

-  The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable.

8.3.2 Navigation view



Navigation path

The navigation path to the current position is displayed at the top left in the navigation view and consists of the following elements:

- The display symbol for the menu/submenu (▶) or the wizard (⚙).
- An omission symbol (/ ../) for operating menu levels in between.
- Name of the current submenu, wizard or parameter

| | Display symbol | Omission symbol | Parameter |
|---------|----------------|-----------------|------------|
| | ↓ | ↓ | ↓ |
| Example | ▶ | / ../ | Indication |

i For more information about the icons in the menu, refer to the "Display area" section → 48

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 to the parameter (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

i ▪ For information on the diagnostic behavior and status signal → 128
 ▪ For information on the function and entry of the direct access code → 54





Display area

Menus


| Symbol | Meaning |
|--------|--|
| | Operation Is displayed: <ul style="list-style-type: none"> ▪ In the menu next to the "Operation" selection ▪ At the left in the navigation path in the Operation menu |

| | |
|---|--|
|  | <p>Setup Is displayed:</p> <ul style="list-style-type: none"> ▪ In the menu next to the "Setup" selection ▪ At the left in the navigation path in the Setup menu |
|  | <p>Diagnosis Is displayed:</p> <ul style="list-style-type: none"> ▪ In the menu next to the "Diagnostics" selection ▪ At the left in the navigation path in the Diagnostics menu |
|  | <p>Expert Is displayed:</p> <ul style="list-style-type: none"> ▪ In the menu next to the "Expert" selection ▪ At the left in the navigation path in the Expert menu |




Submenus, wizards, parameters

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

Locking procedure

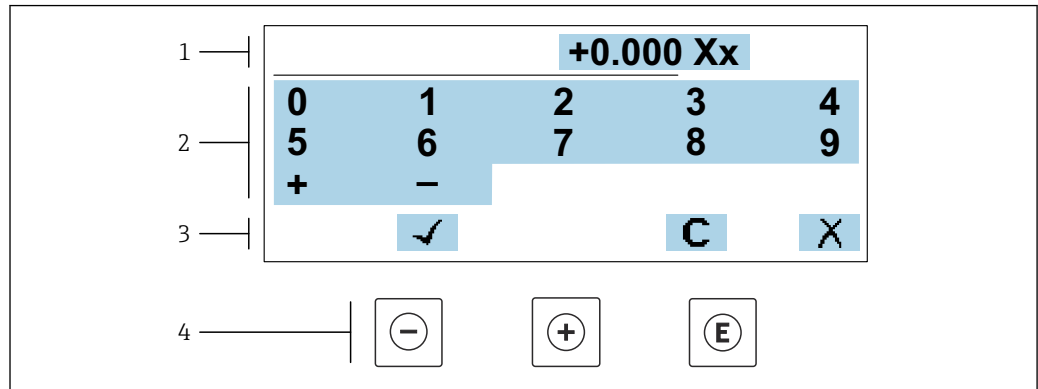
| Symbol | Meaning |
|---|---|
|  | <p>Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked.</p> <ul style="list-style-type: none"> ▪ By a user-specific access code ▪ By the hardware write protection switch |

Wizards

| 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

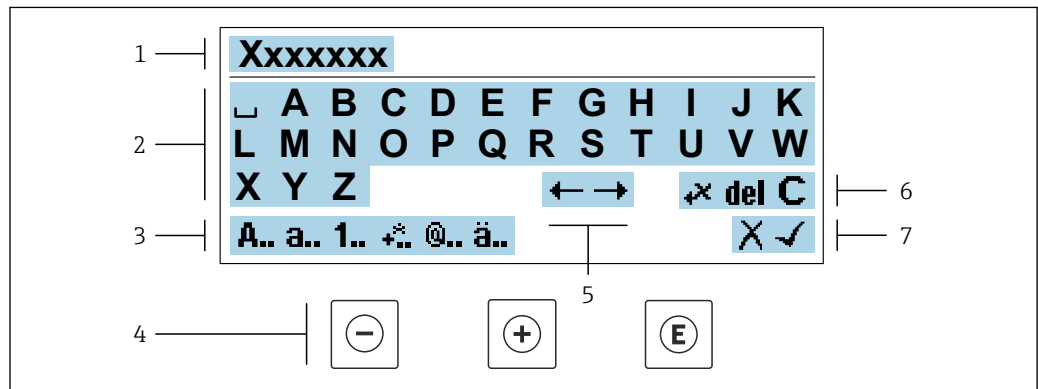


A0034250

18 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




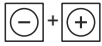
A0034114

19 For entering text in parameters (e.g. device tag)

- 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 | Meaning |
|---------------|--|
| | Minus key Move the entry position to the left. |
| | Plus key Move the entry position to the right. |

| Operating key | Meaning |
|---|---|
|  | Enter key <ul style="list-style-type: none"> Pressing the key briefly confirms your selection. Pressing the key for 2 s confirms your entry. |
|  | Escape key combination (press keys simultaneously) Close the editing view without accepting a change. |






Input screens

| Symbol | Meaning |
|------------|---|
| A.. | Upper case |
| a.. | Lower case |
| 1.. | Numbers |
| +.. | Punctuation marks and special characters: = + - * / ² ³ ¼ ½ ¾ () [] < > { } |
| @.. | Punctuation marks and special characters: " ' ^ . , ; : ? ! % μ ° € \$ £ ¥ § @ # / \ ~ & _ |
| ä.. | 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 |
| del | Delete character immediately to the right of the entry position |
| C | Clear all the characters entered |

8.3.4 Operating elements

| Operating key | Meaning |
|---|--|
|  | <p>Minus key</p> <p><i>In menu, submenu</i> Moves the selection bar upwards in a picklist</p> <p><i>In wizards</i> Goes to previous parameter</p> <p><i>In the text and numeric editor</i> Move the entry position to the left.</p> |
|  | <p>Plus key</p> <p><i>In menu, submenu</i> Moves the selection bar downwards in a picklist</p> <p><i>In wizards</i> Goes to the next parameter</p> <p><i>In the text and numeric editor</i> Move the entry position to the right.</p> |
|  | <p>Enter key</p> <p><i>In the operational display</i> Pressing the key briefly opens the operating menu.</p> <p><i>In menu, submenu</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly: <ul style="list-style-type: none"> ▪ Opens the selected menu, submenu or parameter. ▪ Starts the wizard. ▪ If help text is open, closes the help text of the parameter. ▪ Pressing the key for 2 s in a parameter: <ul style="list-style-type: none"> ▪ If present, opens the help text for the function of the parameter. <p><i>In wizards</i> Opens the editing view of the parameter and confirms the parameter value</p> <p><i>In the text and numeric editor</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly confirms your selection. ▪ Pressing the key for 2 s confirms your entry. |
|  | <p>Escape key combination (press keys simultaneously)</p> <p><i>In menu, submenu</i></p> <ul style="list-style-type: none"> ▪ Pressing the key briefly: <ul style="list-style-type: none"> ▪ Exits the current menu level and takes you to the next higher level. ▪ If help text is open, closes the help text of the parameter. ▪ Pressing the key for 2 s returns you to the operational display ("home position"). <p><i>In wizards</i> Exits the wizard and takes you to the next higher level</p> <p><i>In the text and numeric editor</i> Exits the Editing view without applying the changes.</p> |
|  | <p>Minus/Enter key combination (press and hold down the keys simultaneously)</p> <ul style="list-style-type: none"> ▪ If keypad lock is active: <ul style="list-style-type: none"> ▪ Pressing the key for 3 s deactivates the keypad lock. ▪ If keypad lock is not active: <ul style="list-style-type: none"> ▪ Pressing the key for 3 s opens the context menu including the option for activating the keypad lock. |



8.3.5 Opening the context menu

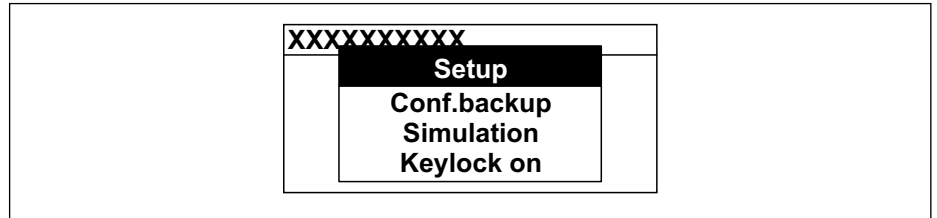
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation



Calling up and closing the context menu

The user is in the operational display.



1. Press the  and  keys for longer than 3 seconds.
 - ↳ The context menu opens.



A0034608-EN

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

Calling up the menu via the context menu

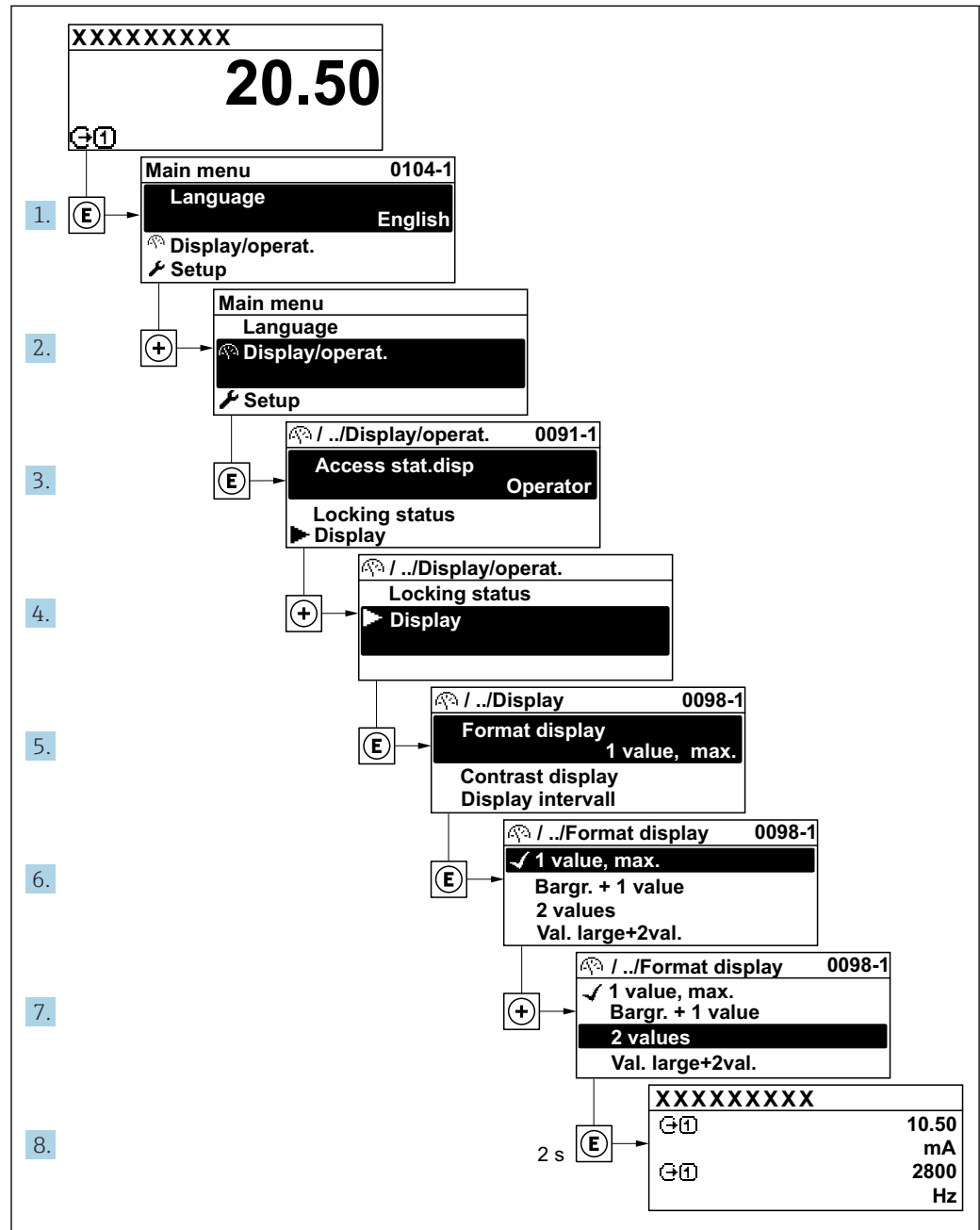
1. Open the context menu.
2. Press  to navigate to the desired menu.
3. Press  to confirm the selection.
 - ↳ The selected menu opens.

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.

i For an explanation of the navigation view with symbols and operating elements → 48

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



A0029562-EN

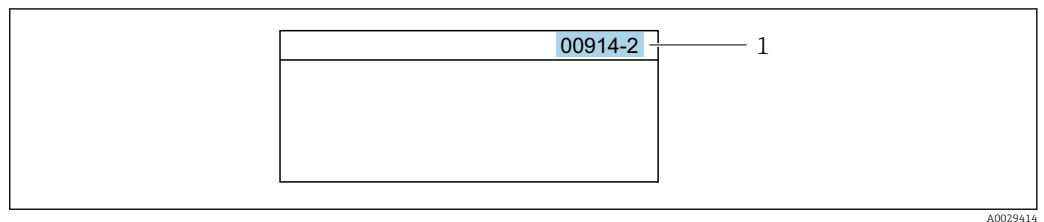
8.3.7 Calling the parameter directly

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 opened automatically.
Example: Enter 00914 → **Assign process variable** parameter
- If a different channel is opened: 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

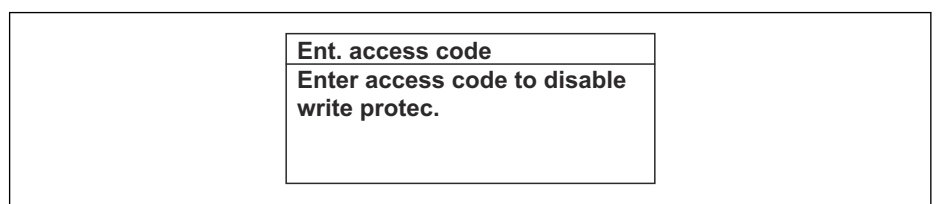
8.3.8 Calling up help text


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.



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

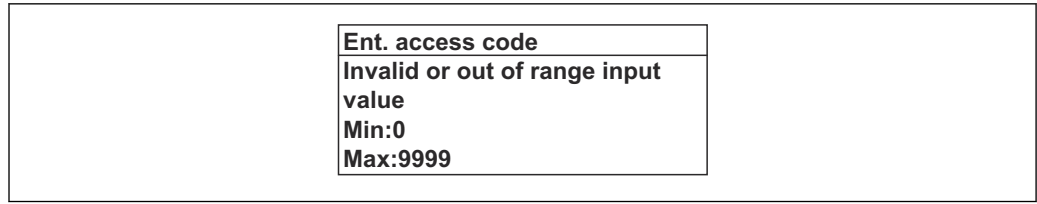
2. Press  +  simultaneously.
↳ The help text is closed.

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.



A0014049-EN

i For a description of the editing view - consisting of the text editor and numeric editor - with symbols → 50, for a description of the operating elements → 52

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 → 112.

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. | ✓ | ✓ ¹⁾ |

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. | ✓ | - ¹⁾ |

1) Despite the defined access code, certain parameters can always be modified and thus are excluded from the write protection as they do not affect the measurement: write protection via access code → 112


i 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 → 112.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→ 99) 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 the  and  keys for 3 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


- ▶ The keypad lock is switched on.
Press the  and  keys for 3 seconds.
 - ↳ The keypad lock is switched off.

8.4 Access to operating menu via web browser

8.4.1 Function range

With the integrated web server, the device can be operated and configured via a web browser service interface (CDI-RJ45) or 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 displayed and can be used to monitor device health. 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, see the Special Documentation for the device.


8.4.2 Requirements

Computer hardware




| Hardware | Interface | |
|------------|---|--|
| | CDI-RJ45 | WLAN |
| Interface | The computer must have a RJ45 interface. ¹⁾ | The operating unit must have a WLAN interface. |
| Connection | | Connection via Wireless LAN. |
| Screen | Recommended size: ≥12" (depends on the screen resolution) | |

- 1) Recommended cable: CAT5e, CAT6 or CAT7, with shielded plug (e.g. YAMAICHI product; part no. Y-ConProfixPlug63/Prod. ID: 82-006660)

Computer software


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

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 (e.g. 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 disabled . | |
| JavaScript | <p>JavaScript must be enabled.</p> <p> If JavaScript cannot be enabled: Enter <code>http://192.168.1.212/servlet/basic.html</code> in the address bar 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) under Internet options in the web browser.</p> | <p>JavaScript must be enabled.</p> <p> The WLAN display requires JavaScript support.</p> |
| Network connections | Only use the active network connections to the measuring device. | |
| | Switch off all other network connections such as WLAN for example. | Switch off all other network connections. |

 In the event of connection problems: →  126

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 → 63 |

Measuring device: via WLAN interface

| Device | WLAN interface |
|------------------|---|
| Measuring device | The measuring device has a WLAN antenna: <ul style="list-style-type: none"> ▪ Transmitter with integrated WLAN antenna ▪ Transmitter with external WLAN antenna |
| Web server | Web server and WLAN must be enabled; factory setting: ON  For information on enabling the Web server → 63 |

8.4.3 Connecting the device

Via service interface (CDI-RJ45)

Preparing the measuring device

1. Depending on the housing version:
Loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version:
Unscrew or open the housing cover.
3. Connect the computer to the RJ45 plug 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 the computer to the RJ45 plug via the standard Ethernet cable → 64.
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**Note the following to avoid a network conflict:**

- ▶ Avoid accessing the measuring device simultaneously from the same mobile terminal via the service interface (CDI-RJ45) and the WLAN interface.
- ▶ Only activate one service interface (CDI-RJ45 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 on the mobile terminal.

Establishing a WLAN 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).
 - ↳ The LED on the 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.

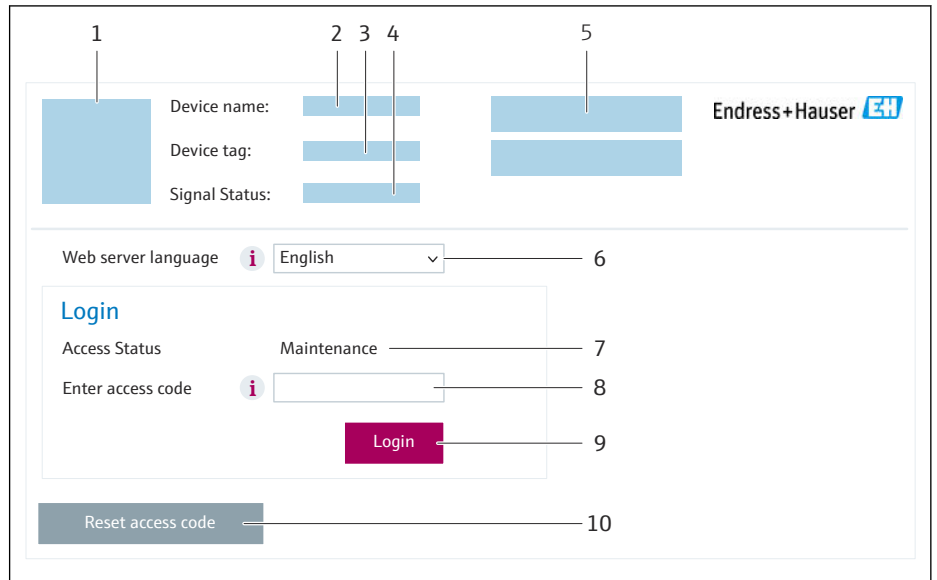
Terminating the WLAN connection

- ▶ After configuring the device:
Terminate the WLAN connection between the mobile terminal 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.



A0053670

- 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 (→ 109)

i If a login page does not appear, or if the page is incomplete → 126

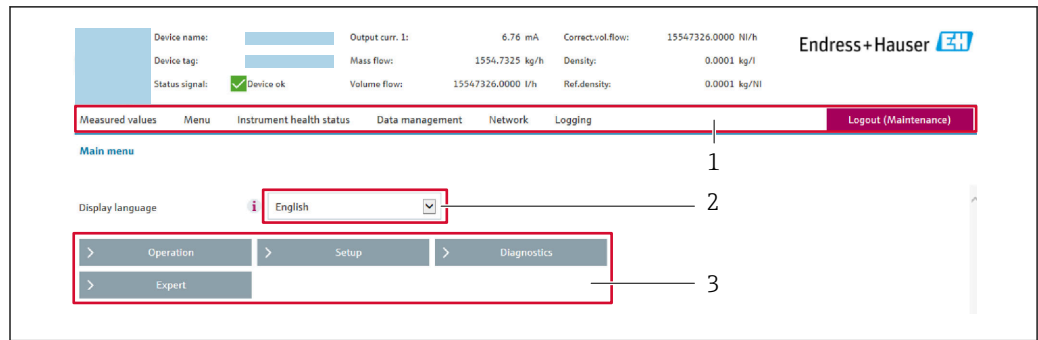
8.4.4 Logging on

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 |
|--------------------|--|

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

8.4.5 User interface



A0029418

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

Header

The following information appears in the header:

- Device name
- Device tag
- Device status with status signal → 131
- Current measured values

Function row

| Functions | Meaning |
|-----------------|---|
| Measured values | Displays the measured values of the device |
| Menu | <ul style="list-style-type: none"> ■ Access to the operating menu from the measuring device ■ The structure of the operating menu is the same as for the local display 📖 Detailed information on the operating menu structure: Description of Device Parameters |
| Device status | Displays the diagnostic messages currently pending, listed in order of priority |
| Data management | <p>Data exchange between computer and measuring device:</p> <ul style="list-style-type: none"> ■ Device configuration: <ul style="list-style-type: none"> ■ Load settings from the device (XML format, save configuration) ■ Save settings to the device (XML format, restore configuration) ■ Logbook - Export Event logbook (.csv file) ■ Documents - Export documents: <ul style="list-style-type: none"> ■ Export backup data record (.csv file, create documentation of the measuring point configuration) ■ Verification report (PDF file, only available with the "Heartbeat Verification" application package) ■ File for system integration - If using fieldbuses, upload device drivers for system integration from the measuring device: FOUNDATION Fieldbus: DD file ■ Firmware update - Flashing a firmware version |
| Network | <p>Configuration and checking of all the parameters required for establishing the connection to the measuring device:</p> <ul style="list-style-type: none"> ■ Network settings (e.g. IP address, MAC address) ■ Device information (e.g. serial number, firmware version) |
| Logout | End the operation and call up the login page |

Navigation area

The menus, the associated submenus and parameters can be selected in the navigation area.

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 |
|--------------------------|-----------------------------------|---|
| Web server functionality | Switch the Web server on and off. | <ul style="list-style-type: none"> ▪ Off ▪ HTML Off ▪ On |

Function scope of the "Web server functionality" parameter


| Option | Description |
|----------|---|
| Off | <ul style="list-style-type: none"> ▪ The Web server is completely disabled. ▪ Port 80 is locked. |
| HTML Off | The HTML version of the Web server is not available. |
| On | <ul style="list-style-type: none"> ▪ The complete Web server functionality is available. ▪ JavaScript is used. ▪ The password is transferred in an encrypted state. ▪ Any change to the password is also transferred in an encrypted state. |

Enabling the Web server

If the Web server is disabled it can only be re-enabled with the **Web server functionality** parameter via the following operating options:

- Via 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 the modified properties of the Internet protocol (TCP/IP) →  59.

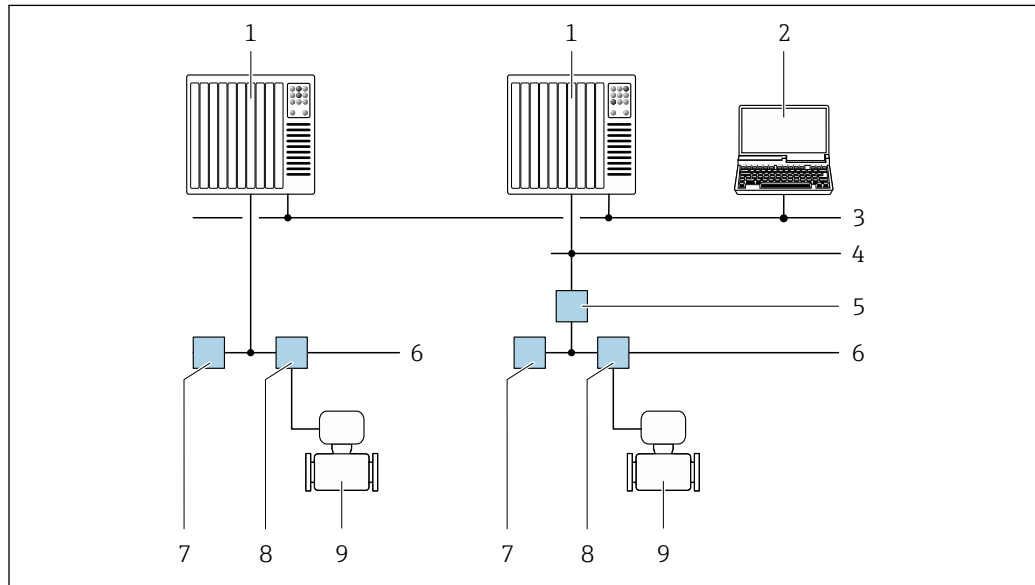
8.5 Access to the operating menu via the operating tool


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 FOUNDATION Fieldbus network

This communication interface is available in device versions with FOUNDATION Fieldbus.




 21 Options for remote operation via FOUNDATION Fieldbus network

- 1 Automation system
- 2 Computer with FOUNDATION Fieldbus network card
- 3 Industry network
- 4 High Speed Ethernet FF-HSE network
- 5 Segment coupler FF-HSE/FF-H1
- 6 FOUNDATION Fieldbus FF-H1 network
- 7 Power supply FF-H1 network
- 8 T-box
- 9 Measuring device

Service interface

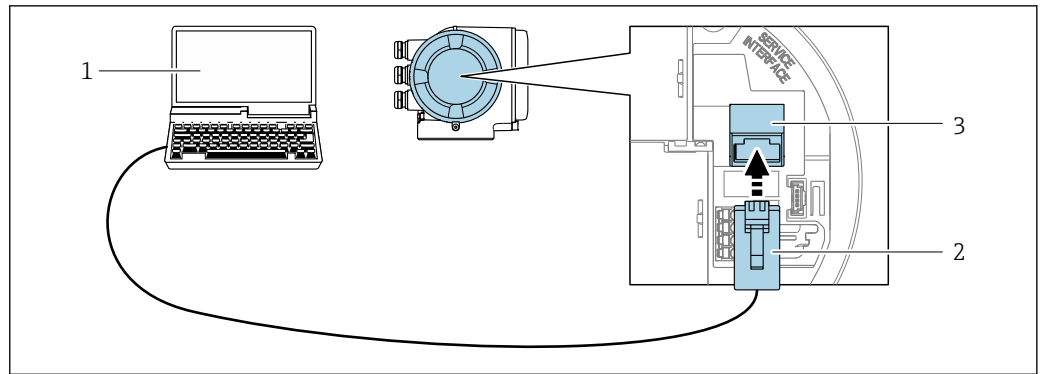
Via service interface (CDI-RJ45)

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.

-  An adapter for the RJ45 to the M12 plug is optionally available for the non-hazardous area:

Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

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



A0027563

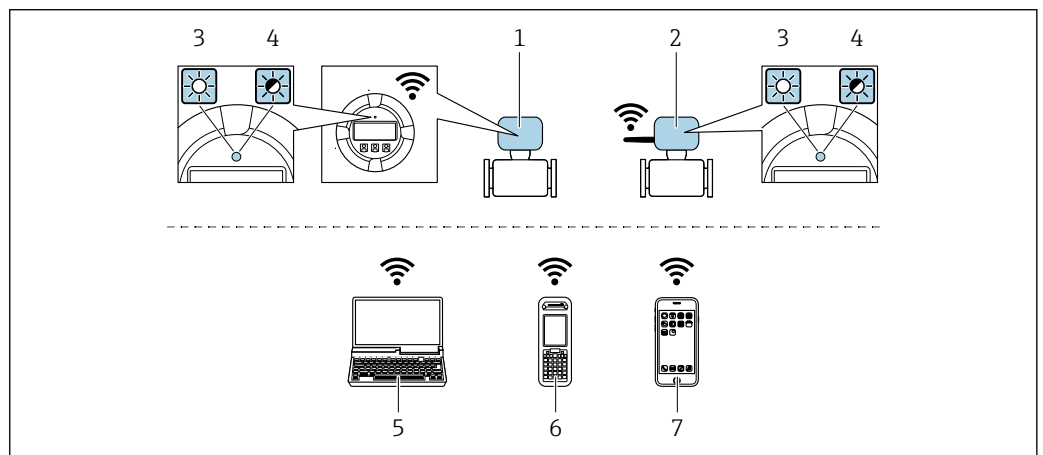
22 Connection via service interface (CDI-RJ45)

- 1 Computer with web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated web server or with "FieldCare" operating tool, "DeviceCare" with COM DTM "CDI Communication TCP/IP"
- 2 Standard Ethernet connecting cable with RJ45 plug
- 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; touch control + WLAN"



A0034570

- 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 Smart phone or tablet (e.g. Field Xpert SMT70)

| | |
|----------------------------|--|
| Function | WLAN: IEEE 802.11 b/g (2.4 GHz) |
| Encryption | WPA2-PSK AES-128 (in accordance with IEEE 802.11i) |
| Configurable WLAN channels | 1 to 11 |
| Degree of protection | IP67 |
| Available antennas | <ul style="list-style-type: none"> ▪ Internal antenna ▪ External antenna (optional) In the event of poor transmission/reception conditions at the place of installation. <p> Only 1 antenna is active at any one time!</p> |

| | |
|------------------------------|---|
| Range | <ul style="list-style-type: none"> ▪ Internal antenna: typically 10 m (32 ft) ▪ External antenna: typically 50 m (164 ft) |
| Materials (external antenna) | <ul style="list-style-type: none"> ▪ Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass ▪ Adapter: Stainless steel and nickel-plated brass ▪ Cable: Polyethylene ▪ Plug: Nickel-plated brass ▪ Angle bracket: Stainless steel |

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

Note the following to avoid a network conflict:


- ▶ Avoid accessing the measuring device simultaneously from the same mobile terminal via the service interface (CDI-RJ45) and the WLAN interface.
- ▶ Only activate one service interface (CDI-RJ45 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 on the mobile terminal.

Establishing a WLAN 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).
↳ The LED on the 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.


Terminating the WLAN connection

- ▶ After configuring the device:
Terminate the WLAN connection between the mobile terminal and measuring device.


8.5.2 Field Xpert SFX350, SFX370

Function scope

Field Xpert SFX350 and Field Xpert SFX370 are mobile computers for commissioning and maintenance. They enable efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-hazardous area** (SFX350, SFX370) and **hazardous area** (SFX370).

 For details, see Operating Instructions BA01202S

Source for device description files



See information →  70

8.5.3 FieldCare

Function range

FDT-based (Field Device Technology) plant asset management tool from Endress+Hauser. It can configure all smart field units 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 →  64
- WLAN interface →  65


Typical functions:

- Transmitter parameter configuration
- Loading and saving of device data (upload/download)
- Documentation of the measuring point
- Visualization of the measured value memory (line recorder) and event logbook



- Operating Instructions BA00027S
- Operating Instructions BA00059S



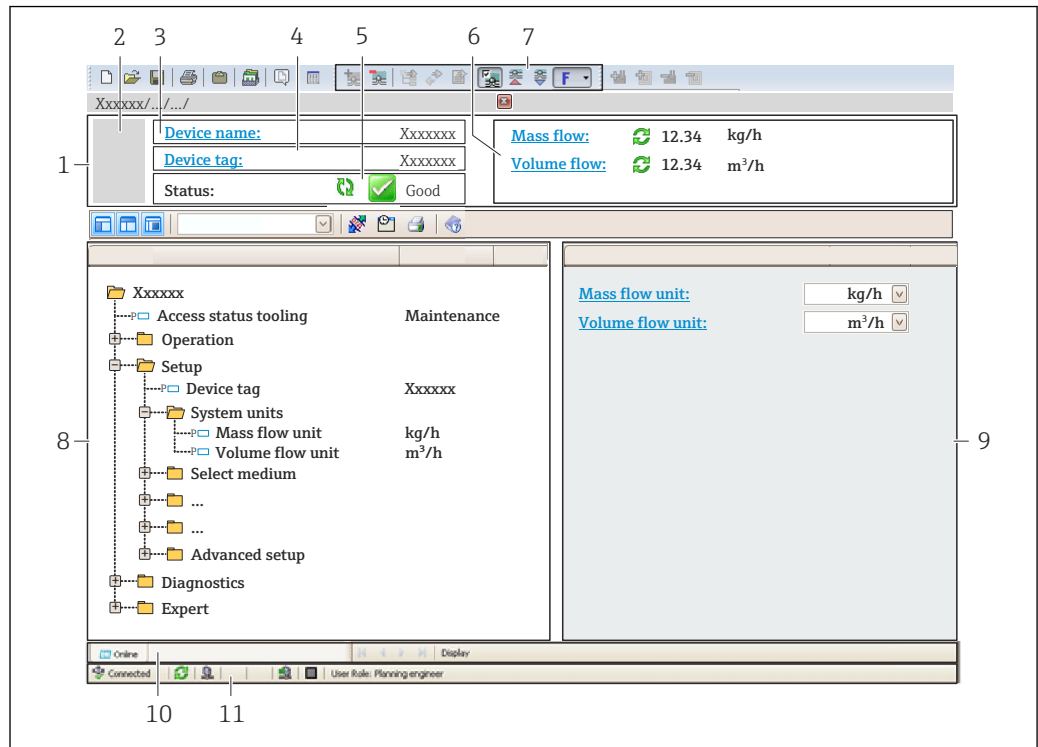
Source for device description files →  70

Establishing a connection



- Operating Instructions BA00027S
- Operating Instructions BA00059S

User interface



A0021051-EN


- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Device tag
- 5 Status area with status signal → 131
- 6 Display area for current measured values
- 7 Editing toolbar with additional functions such as save/load, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Work area
- 10 Action area
- 11 Status area


8.5.4 DeviceCare

Function range

Tool for connecting and configuring 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.


 Innovation brochure IN01047S

 Source for device description files → 70

8.5.5 AMS Device Manager

Function range

Program from Emerson Process Management for operating and configuring measuring devices via FOUNDATION Fieldbus H1 protocol.

 Source for device description files → 70

8.5.6 Field Communicator 475

Function scope

Industrial handheld terminal from Emerson Process Management for remote configuration and measured value display via FOUNDATION Fieldbus H1 protocol.

Source for device description files

See information →  70

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

| | | |
|----------------------------------|-------------------------------------|---|
| Firmware version | 01.00.zz | <ul style="list-style-type: none"> ▪ On the title page of the manual ▪ On the transmitter nameplate ▪ Firmware version Diagnostics → Device information → Firmware version |
| Release date of firmware version | 02.2017 | --- |
| Manufacturer ID | 0x452B48 (hex) | Manufacturer ID Diagnostics → Device information → Manufacturer ID |
| Device type code | 0x103C (hex) | Device type Diagnostics → Device information → Device type |
| Device revision | 1 | <ul style="list-style-type: none"> ▪ On the transmitter nameplate ▪ Device revision Diagnostics → Device information → Device revision |
| DD revision | Information and files available at: | |
| CFF revision | | |
| | | <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.fieldbus.org |



For an overview of the various firmware versions for the device → 162

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 FOUNDATION Fieldbus | Sources for obtaining device descriptions |
|--|---|
| FieldCare | <ul style="list-style-type: none"> ▪ www.endress.com → Downloads area ▪ USB stick (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser) |
| DeviceCare | <ul style="list-style-type: none"> ▪ www.endress.com → Downloads area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser) |
| <ul style="list-style-type: none"> ▪ Field Xpert SMT70 ▪ Field Xpert SMT77 | Use update function of handheld terminal |
| AMS Device Manager (Emerson Process Management) | www.endress.com → Downloads area |
| Field Communicator 475 (Emerson Process Management) | Use update function of handheld terminal |

9.2 Cyclic data transmission

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

9.2.1 Block model

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

| Display text (xxxx... = serial number) | Base index | Description |
|--|------------|---|
| RESOURCE_XXXXXXXXXX | 400 | Resource block |
| SETUP_XXXXXXXXXX | 600 | "Setup" Transducer block |
| TRDDISP_XXXXXXXXXX | 800 | "Display" Transducer block |
| TRDHROM_XXXXXXXXXX | 1000 | "HistoROM" Transducer block |
| TRDDIAG_XXXXXXXXXX | 1200 | "Diagnostic" Transducer block |
| EXPERT_CONFIG_XXXXXXXXXX | 1400 | "Expert configuration" Transducer block |
| SERVICE_SENSOR_XXXXXXXXXX | 1600 | "Service sensor" Transducer block |
| TRDTIC_XXXXXXXXXX | 1800 | "Totalizer" Transducer block |
| TRDHBT_XXXXXXXXXX | 2000 | "Heartbeat results" Transducer block |
| ANALOG_INPUT_1_XXXXXXXXXX | 3400 | Analog Input function block 1 (AI) |
| ANALOG_INPUT_2_XXXXXXXXXX | 3600 | Analog Input function block 2 (AI) |
| ANALOG_INPUT_3_XXXXXXXXXX | 3800 | Analog Input function block 3 (AI) |
| ANALOG_INPUT_4_XXXXXXXXXX | 4000 | Analog Input function block 4 (AI) |
| ANALOG_INPUT_5_XXXXXXXXXX | 4200 | Analog Input function block 5 (AI) |
| MAO_XXXXXXXXXX | 4400 | Multiple Analog Output block (MAO) |
| DIGITAL_INPUT_1_XXXXXXXXXX | 4600 | Digital Input function block 1 (DI) |
| DIGITAL_INPUT_2_XXXXXXXXXX | 4800 | Digital Input function block 2 (DI) |
| MDO_XXXXXXXXXX | 5000 | Multiple Digital Output block (MDO) |
| PID_XXXXXXXXXX | 5200 | PID function block (PID) |
| INTEGRATOR_XXXXXXXXXX | 5400 | Integrator function block (INTG) |

9.2.2 Assignment of the measured values in the function blocks

The input value of a module/function block is defined via the CHANNEL parameter.

AI module (Analog Input)

Five Analog Input blocks are available.

| CHANNEL | Measured variable |
|---------|---------------------------------|
| 0 | Uninitialized (factory setting) |
| 7 | Temperature |
| 9 | Volume flow |
| 11 | Mass flow |
| 12 | Flow velocity |
| 13 | Corrected volume flow |
| 16 | Totalizer 1 |
| 17 | Totalizer 2 |
| 18 | Totalizer 3 |
| 65 | Electronic temperature |
| 70 | Conductivity |
| 71 | Corrected conductivity |
| 99 | Current input 1 |

MAO module (Multiple Analog Output)

| Channel | Description |
|---------|-------------|
| 121 | Channel_0 |

Structure

| Channel_0 | | | | | | | |
|-----------|---------|---------|---------|---------|---------|---------|---------|
| Value 1 | Value 2 | Value 3 | Value 4 | Value 5 | Value 6 | Value 7 | Value 8 |
| | | | | | | | |

| Values | Measured variable |
|---------|---------------------------|
| Value 1 | Temperature ¹⁾ |
| Value 2 | Density ¹⁾ |
| Value 3 | Not assigned |
| Value 4 | Not assigned |
| Value 5 | Not assigned |
| Value 6 | Not assigned |
| Value 7 | Not assigned |
| Value 8 | Not assigned |

1) The external measured values must be transmitted to the device in the SI basic unit



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

DI module (Discrete Input)

Two Discrete Input blocks are available.

| CHANNEL | Device function | Status |
|---------|---------------------------------|---------------------|
| 0 | Uninitialized (factory setting) | – |
| 101 | Switch output state | 0 = off, 1 = active |
| 103 | Low flow cut off | 0 = off, 1 = active |

| CHANNEL | Device function | Status |
|---------|-----------------------------------|--|
| 104 | Empty pipe detection | 0 = off, 1 = active |
| 105 | Verification status ¹⁾ | <p>Overall result of verification</p> <p>Verification:</p> <ul style="list-style-type: none"> ■ 16 = Failed ■ 32 = Passed ■ 64 = Not performed <p>Verification status</p> <p>Verification:</p> <ul style="list-style-type: none"> ■ 1 = Not performed ■ 2 = Failed ■ 4 = Being performed ■ 8 = Finished <p>Status; result</p> <ul style="list-style-type: none"> ■ 17 = Status: not performed; Result: failed ■ 18 = Status: failed; Result: failed ■ 20 = Status: being performed; Result: failed ■ 24 = Status: finished; Result: failed ■ 33 = Status: not performed; Result: passed ■ 34 = Status: failed; Result: passed ■ 36 = Status: being performed; Result: passed ■ 40 = Status: finished; Result: passed ■ 65 = Status: not performed; Result: not performed ■ 66 = Status: failed; Result: not performed ■ 68 = Status: being performed; Result: not performed ■ 72 = Status: finished; Result: not performed |

1) Only available with the Heartbeat Verification application package

MDO module (Multiple Discrete Output)

| Channel | Description |
|---------|-------------|
| 122 | Channel_DO |

Structure

| Channel_DO | | | | | | | |
|------------|---------|---------|---------|---------|---------|---------|---------|
| Value 1 | Value 2 | Value 3 | Value 4 | Value 5 | Value 6 | Value 7 | Value 8 |

| Value | Device function | Status |
|---------|--|----------------------|
| Value 1 | Reset totalizer 1 | 0 = off, 1 = execute |
| Value 2 | Reset totalizer 2 | 0 = off, 1 = execute |
| Value 3 | Reset totalizer 3 | 0 = off, 1 = execute |
| Value 4 | Flow override | 0 = off, 1 = active |
| Value 5 | Start Heartbeat Verification ¹⁾ | 0 = off, 1 = start |
| Value 6 | Status output | 0 = off, 1 = active |



| Value | Device function | Status |
|---------|-----------------|--------|
| Value 7 | Not used | – |
| Value 8 | Not used | – |

1) Only available with the Heartbeat Verification application package

9.2.3 Execution times

| Function block | Execution time (ms) |
|-------------------------------------|---------------------|
| Analog Input function block (AI) | 6 |
| Digital Input function block (DI) | 4 |
| PID function block (PID) | 5 |
| Multiple Analog Output block (MAO) | 4 |
| Multiple Digital Output block (MDO) | 4 |
| Integrator function block (INTG) | 5 |

9.2.4 Methods

| Method | Block | Navigation | Description |
|---|-----------------------------|--|--|
| Set to "AUTO" mode | Resource block | Via menu: Expert → Communication → Resource block → Target mode | This method sets the Resource Block and all the Transducer Blocks to the AUTO (Automatic) mode. |
| Set to "OOS" mode | Resource block | Via menu: Expert → Communication → Resource block → Target mode | This method sets the Resource Block and all the Transducer Blocks to the OOS (Out of service) mode. |
| Restart | Resource block | Via menu: Expert → Communication → Resource block → Restart | This method is used to select the configuration for the Restart parameter in the Resource Block. This resets device parameters to a specific value. The following options are supported: <ul style="list-style-type: none"> ▪ Uninitialized ▪ Run ▪ Resource ▪ Defaults ▪ Processor ▪ To delivery settings |
| ENP parameter | Resource block | Via menu: Actions → Methods → Calibrate → ENP parameter | This method is used to display and configure the parameters of the electronic nameplate (ENP). |
| Overview diagnostics - Remedy information | Diagnostic Transducer Block | Via link: Namur symbol | This method is used to display the diagnostic event with the highest priority that is currently active and the corresponding remedial measures. |
| Actual diagnostics - Remedy information | Diagnostic Transducer Block | Via menu: <ul style="list-style-type: none"> ▪ Configure/Setup → Diagnostics → Actual diagnostics ▪ Device/Diagnostics → Diagnostics | This method is used to display remedial measures for the diagnostic event with the highest priority that is currently active.  This method is available only if an appropriate diagnostic event has occurred. |
| Previous diagnostics - Remedy information | Diagnostic Transducer Block | Via menu: <ul style="list-style-type: none"> ▪ Configure/Setup → Diagnostics → Previous diagnostics ▪ Device/Diagnostics → Diagnostics | This method is used to display remedial measures for the previous diagnostic event.  This method is available only if an appropriate diagnostic event has occurred. |

10 Commissioning

10.1 Post-mounting and post-connection check

Before commissioning the device:

- ▶ Make sure that the post-installation and post-connection checks have been performed successfully.
- Checklist for "Post-mounting" check → 27
- Checklist for "Post-connection check" → 41

10.2 Switching on the measuring device

- ▶ Switch on the device upon successful completion of the post-mounting and post-connection check.
 - ↳ After a successful startup, the local display switches automatically from the startup display to the operational display.

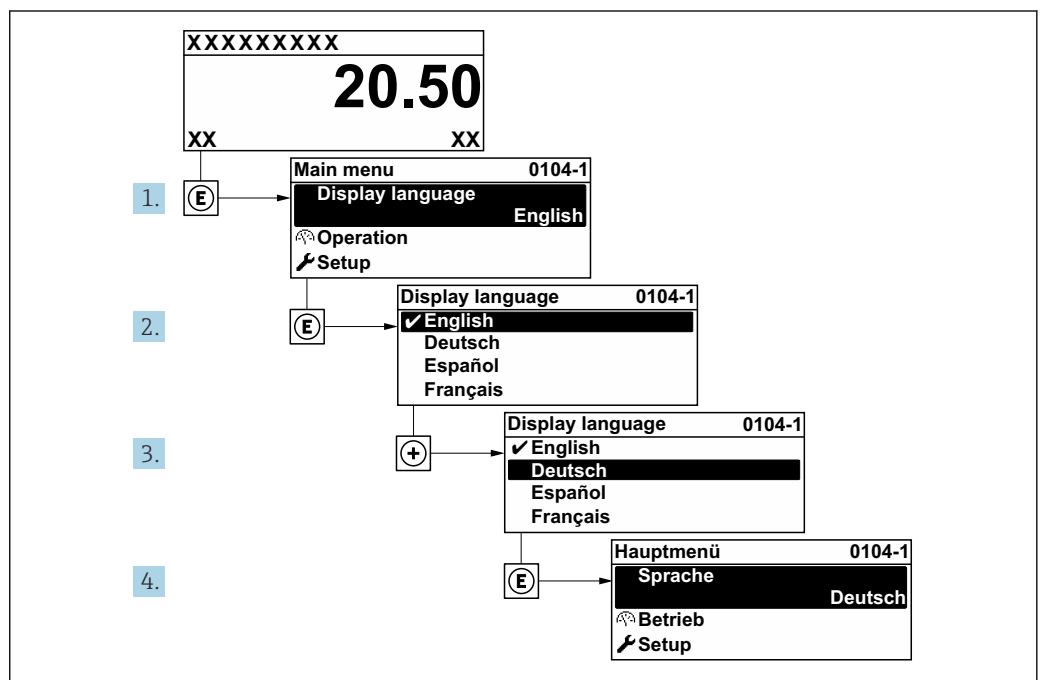
If nothing appears on the local display or if a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" → 125.

10.3 Connecting via FieldCare

- For connecting FieldCare → 64
- For connecting via FieldCare → 67
- For user interface of FieldCare → 68

10.4 Setting the operating language

Factory setting: English or ordered local language

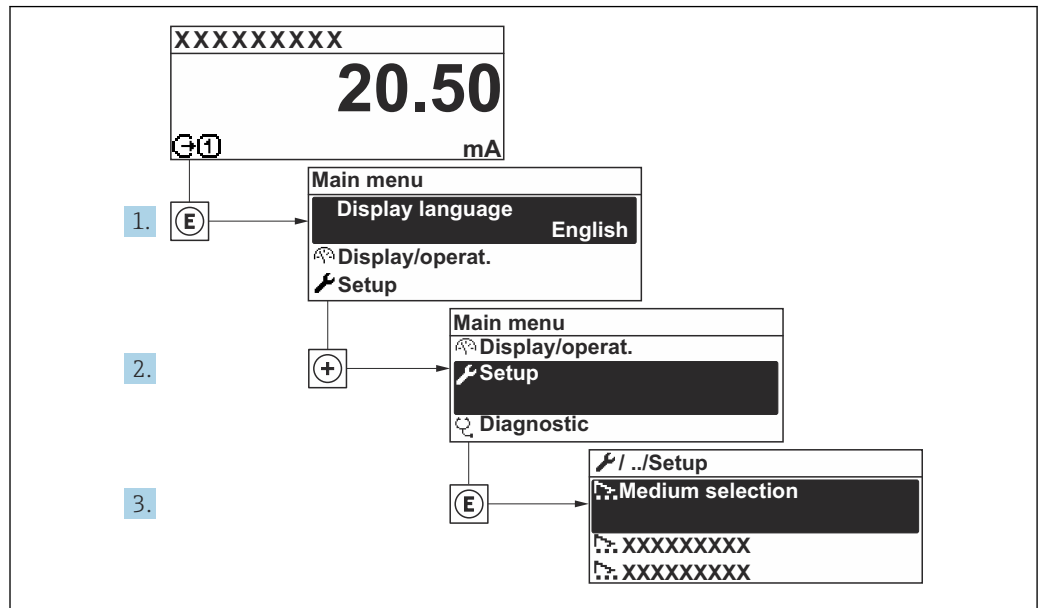


23 Taking the example of the local display

A0029420

10.5 Configuring the measuring instrument

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



24 Navigation to "Setup" menu using the example of the local display

i The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation

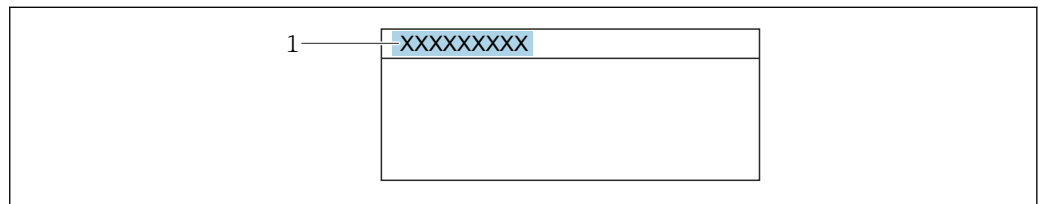
"Setup" menu

| 🔧 Setup | |
|--|------|
| Device tag | → 77 |
| ▶ System units | → 77 |
| ▶ Analog inputs | → 80 |
| ▶ I/O configuration | → 80 |
| ▶ Current input 1 to n | → 81 |
| ▶ Status input 1 to n | → 82 |
| ▶ Current output 1 to n | → 83 |
| ▶ Pulse/frequency/switch output 1 to n | → 86 |

| | |
|------------------------|------|
| ▶ Relay output 1 to n | → 92 |
| ▶ Display | → 94 |
| ▶ Low flow cut off | → 95 |
| ▶ Empty pipe detection | → 97 |
| ▶ Advanced setup | → 98 |

10.5.1 Defining the device tag

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.



A0029422

25 Header of the operational display with tag name

1 Tag name

i Enter the tag name in the "FieldCare" operating tool → 68

Navigation

"Setup" menu → Device tag

Parameter overview with brief description

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

10.5.2 Setting the system units









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

i The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation


"Setup" menu → System units

| | |
|------------------|------|
| ▶ System units | |
| Volume flow unit | → 78 |

| | |
|----------------------------|--|
| Volume unit | →  78 |
| Conductivity unit | →  78 |
| Temperature unit | →  78 |
| Mass flow unit | →  78 |
| Mass unit | →  78 |
| Density unit | →  79 |
| Corrected volume flow unit | →  79 |
| Corrected volume unit | →  79 |

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 to: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ l/h ▪ gal/min (us) |
| Volume unit | – | Select volume unit. | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ m³ ▪ gal (us) |
| Conductivity unit | The On option is selected in the Conductivity measurement parameter. | Select conductivity unit. <i>Result</i> The selected unit applies to: Simulation process variable | Unit choose list | – |
| Temperature unit | – | Select temperature unit. <i>Result</i> The selected unit applies to: <ul style="list-style-type: none"> ▪ Temperature parameter ▪ Maximum value parameter ▪ Minimum value parameter ▪ External temperature parameter ▪ Maximum value parameter ▪ Minimum value parameter | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ °C ▪ °F |
| Mass flow unit | – | Select mass flow unit. <i>Result</i> The selected unit applies to: <ul style="list-style-type: none"> ▪ Output ▪ Low flow cut off ▪ Simulation process variable | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ kg/h ▪ lb/min |
| Mass unit | – | Select mass unit. | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ kg ▪ lb |

| Parameter | Prerequisite | Description | Selection | Factory setting |
|----------------------------|--------------|---|------------------|--|
| Density unit | – | Select density unit. <i>Result</i> The selected unit applies to: <ul style="list-style-type: none"> ▪ Output ▪ Simulation process variable | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ kg/l ▪ lb/ft³ |
| Corrected volume flow unit | – | Select corrected volume flow unit. <i>Result</i> The selected unit applies to: Corrected volume flow parameter (→  116) | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ NI/h ▪ Sft³/h |
| Corrected volume unit | – | Select corrected volume unit. | Unit choose list | Country-specific: <ul style="list-style-type: none"> ▪ Nm³ ▪ Sft³ |

10.5.3 Configuring the analog inputs

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

Navigation

"Setup" menu → Analog inputs

► Analog inputs

► Analog input 1 to n

Block tag → 80

Channel → 80

Process Value Filter Time → 80

Parameter overview with brief description

| Parameter | Description | User entry / Selection | Factory setting |
|---------------------------|--|--|------------------------------------|
| Block tag | Unique name of the measuring device. | Max. 32 characters such as letters, numbers or special characters (e. g. @, %, /). | ANALOG_INPUT_1 ... 4_Serial number |
| Channel | Use this function to select the process variable. | <ul style="list-style-type: none"> ▪ Uninitialized ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 ▪ Current input 1 * | – |
| Process Value Filter Time | Enter the filter time specification for the filtering of the unconverted input value (PV). | Positive floating-point number | – |

* Visibility depends on order options or device settings

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 → 81

| | |
|-------------------------------|------|
| I/O module 1 to n information | → 81 |
| I/O module 1 to n type | → 81 |
| Apply I/O configuration | → 81 |
| Conversion code | → 81 |

Parameter overview with brief description

| Parameter | Description | User interface / Selection / User entry |
|-----------------------------|---|--|
| I/O module terminal numbers | Shows the terminal numbers used by the I/O module. | <ul style="list-style-type: none"> ▪ Not used ▪ 26-27 (I/O 1) ▪ 24-25 (I/O 2) |
| I/O module information | Shows information of the plugged I/O module. | <ul style="list-style-type: none"> ▪ Not plugged ▪ Invalid ▪ Not configurable ▪ Configurable ▪ Fieldbus |
| I/O module type | Shows the I/O module type. | <ul style="list-style-type: none"> ▪ Off ▪ Current output ▪ Current input ▪ Status input ▪ Pulse/frequency/switch output ▪ Double pulse output ▪ Relay output |
| Apply I/O configuration | Apply parameterization of the freely configurable I/O module. | <ul style="list-style-type: none"> ▪ No ▪ Yes |
| Conversion code | Enter the code in order to change the I/O configuration. | Positive integer |

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 | |
| Terminal number | → 82 |
| Signal mode | → 82 |
| 0/4 mA value | → 82 |
| 20 mA value | → 82 |
| Current span | → 82 |

| | |
|---------------|------|
| Failure mode | → 82 |
| Failure value | → 82 |

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"> ▪ Not used ▪ 24-25 (I/O 2) | – |
| Signal mode | The measuring device is not 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"> ▪ Passive ▪ Active | Active |
| 0/4 mA value | – | Enter 4 mA value. | Signed floating-point number | – |
| 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"> ▪ 4...20 mA ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 0...20 mA | Country-specific: <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US |
| Failure mode | – | Define input behavior in alarm condition. | <ul style="list-style-type: none"> ▪ Alarm ▪ Last valid value ▪ Defined value | – |
| Failure value | In the Failure mode parameter, the Defined value option is selected. | Enter value to be used by the device if input value from external device is missing. | Signed floating-point number | – |

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 1 to n

| | |
|-----------------------|------|
| ▶ Status input 1 to n | |
| Assign status input | → 83 |
| Terminal number | → 83 |
| Active level | → 83 |
| Terminal number | → 83 |

| | |
|----------------------------|------|
| Response time status input | → 83 |
| Terminal number | → 83 |

Parameter overview with brief description

| Parameter | Description | Selection / User interface / User entry |
|----------------------------|---|---|
| Assign status input | Select function for the status input. | <ul style="list-style-type: none"> ■ Off ■ Reset totalizer 1 ■ Reset totalizer 2 ■ Reset totalizer 3 ■ Reset all totalizers ■ Flow override |
| Terminal number | Shows the terminal numbers used by the status input module. | <ul style="list-style-type: none"> ■ Not used ■ 24-25 (I/O 2) |
| Active level | Define input signal level at which the assigned function is triggered. | <ul style="list-style-type: none"> ■ High ■ Low |
| 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 |

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 | |
| Terminal number | → 84 |
| Signal mode | → 84 |
| Assign current output 1 | → 84 |
| Current span | → 84 |
| 0/4 mA value | → 84 |
| 20 mA value | → 84 |
| Fixed current | → 84 |
| Failure mode | → 85 |
| Failure current | → 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 output module. | <ul style="list-style-type: none"> ▪ Not used ▪ 24-25 (I/O 2) | – |
| Signal mode | – | Select the signal mode for the current output. | <ul style="list-style-type: none"> ▪ Passive ▪ Active | Active |
| Assign current output | – | Select process variable for current output. | <ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity * ▪ Temperature * ▪ Electronic temperature | – |
| Current span | – | Select current range for process value output and upper/lower level for alarm signal. | <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA ▪ Fixed current | Depends on country: <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US |
| 0/4 mA value | In Current span parameter (→  84), one of the following options is selected: <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA | Enter 4 mA value. | Signed floating-point number | Depends on country: <ul style="list-style-type: none"> ▪ 0 l/h ▪ 0 gal/min (us) |
| 20 mA value | In Current span parameter (→  84), one of the following options is selected: <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA | Enter 20 mA value. | Signed floating-point number | Depends on country and nominal diameter |
| Fixed current | The Fixed current option is selected in the Current span parameter (→  84). | Defines the fixed output current. | 0 to 22.5 mA | 22.5 mA |
| Damping output | A process variable is selected in the Assign current output parameter (→  84) and one of the following options is selected in the Current span parameter (→  84): <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA | Set reaction time for output signal to fluctuations in the measured value. | 0.0 to 999.9 s | – |

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|-----------------|---|--|---|-----------------|
| Failure mode | A process variable is selected in the Assign current output parameter (→ 84) and one of the following options is selected in the Current span parameter (→ 84): <ul style="list-style-type: none"> ▪ 4...20 mA NAMUR ▪ 4...20 mA US ▪ 4...20 mA ▪ 0...20 mA | Define output behavior in alarm condition. | <ul style="list-style-type: none"> ▪ Min. ▪ Max. ▪ Last valid value ▪ Actual value ▪ Defined value | – |
| Failure current | The Defined value option is selected in the Failure mode parameter. | Enter current output value in alarm condition. | 0 to 22.5 mA | 22.5 mA |

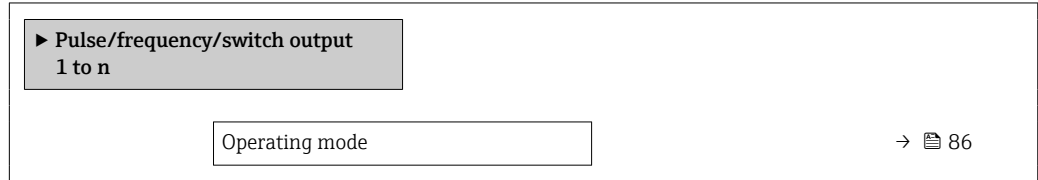
* Visibility depends on order options or device settings

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



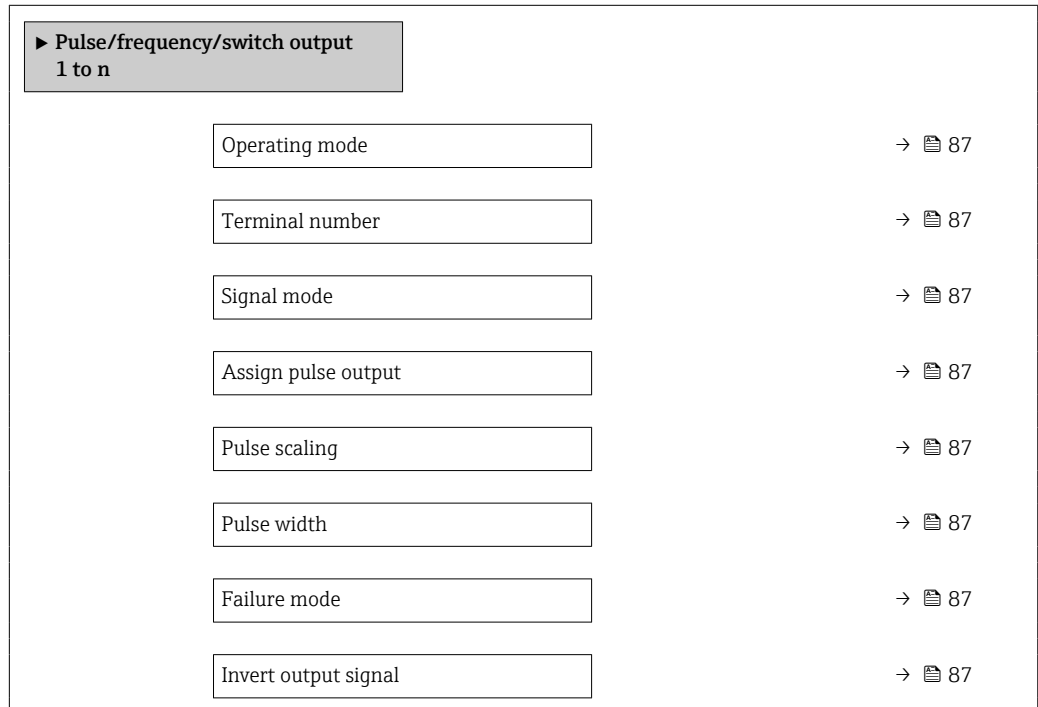
Parameter overview with brief description

| Parameter | Description | Selection |
|----------------|---|--|
| Operating mode | Define the output as a pulse, frequency or switch output. | <ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch |

Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output



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"> ■ Pulse ■ Frequency ■ Switch | – |
| Terminal number | – | Shows the terminal numbers used by the PFS output module. | <ul style="list-style-type: none"> ■ Not used ■ 24-25 (I/O 2) | – |
| Signal mode | – | Select the signal mode for the PFS output. | <ul style="list-style-type: none"> ■ Passive ■ Active | – |
| Assign pulse output 1 to n | The Pulse option is selected in the Operating mode parameter. | Select process variable for pulse output. | <ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow | – |
| Value per pulse | The Pulse option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign pulse output parameter (→ 87). | Enter measured value at which a pulse is output. | Positive floating point number | Depends on country and nominal diameter |
| Pulse width | The Pulse option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign pulse output parameter (→ 87). | Define time width of the output pulse. | 0.05 to 2000 ms | – |
| Failure mode | The Pulse option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign pulse output parameter (→ 87). | Define output behavior in alarm condition. | <ul style="list-style-type: none"> ■ Actual value ■ No pulses | – |
| Invert output signal | – | Invert the output signal. | <ul style="list-style-type: none"> ■ No ■ Yes | – |

Configuring the frequency output

Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequency/switch output 1 to n

| | |
|-------------------------|------|
| Operating mode | → 88 |
| Terminal number | → 88 |
| Signal mode | → 88 |
| Assign frequency output | → 88 |
| Minimum frequency value | → 88 |

| | |
|--------------------------------------|------|
| Maximum frequency value | → 88 |
| Measuring value at minimum frequency | → 89 |
| Measuring value at maximum frequency | → 89 |
| Failure mode | → 89 |
| Failure frequency | → 89 |
| Invert output signal | → 89 |

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"> ▪ Pulse ▪ Frequency ▪ Switch | – |
| Terminal number | – | Shows the terminal numbers used by the PFS output module. | <ul style="list-style-type: none"> ▪ Not used ▪ 24-25 (I/O 2) | – |
| Signal mode | – | Select the signal mode for the PFS output. | <ul style="list-style-type: none"> ▪ Passive ▪ Active | – |
| Assign frequency output | The Frequency option is selected in Operating mode parameter (→ 86). | Select process variable for frequency output. | <ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity * ▪ Conductivity * ▪ Corrected conductivity * ▪ Temperature * ▪ Electronic temperature | – |
| Minimum frequency value | The Frequency option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign frequency output parameter (→ 88). | Enter minimum frequency. | 0.0 to 10 000.0 Hz | – |
| Maximum frequency value | The Frequency option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign frequency output parameter (→ 88). | Enter maximum frequency. | 0.0 to 10 000.0 Hz | – |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|--------------------------------------|---|--|---|---|
| Measuring value at minimum frequency | The Frequency option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign frequency output parameter (→ 88). | Enter measured value for minimum frequency. | Signed floating-point number | Depends on country and nominal diameter |
| Measuring value at maximum frequency | The Frequency option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign frequency output parameter (→ 88). | Enter measured value for maximum frequency. | Signed floating-point number | Depends on country and nominal diameter |
| Failure mode | The Frequency option is selected in the Operating mode parameter (→ 86) and a process variable is selected in the Assign frequency output parameter (→ 88). | Define output behavior in alarm condition. | <ul style="list-style-type: none"> ■ Actual value ■ Defined value ■ 0 Hz | – |
| Failure frequency | In the Operating mode parameter (→ 86), the Frequency option is selected, in the Assign frequency output parameter (→ 88) a process variable is selected, and in the Failure mode parameter, the Defined value option is selected. | Enter frequency output value in alarm condition. | 0.0 to 12 500.0 Hz | – |
| Invert output signal | – | Invert the output signal. | <ul style="list-style-type: none"> ■ No ■ Yes | – |

* 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 | → 90 |
| Terminal number | → 90 |
| Signal mode | → 90 |
| Switch output function | → 91 |
| Assign diagnostic behavior | → 91 |
| Assign limit | → 91 |
| Assign flow direction check | → 91 |
| Assign status | → 91 |
| Switch-on value | → 91 |
| Switch-off value | → 91 |
| Switch-on delay | → 91 |
| Switch-off delay | → 92 |
| Failure mode | → 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"> ▪ Pulse ▪ Frequency ▪ Switch | – |
| Terminal number | – | Shows the terminal numbers used by the PFS output module. | <ul style="list-style-type: none"> ▪ Not used ▪ 24-25 (I/O 2) | – |
| Signal mode | – | Select the signal mode for the PFS output. | <ul style="list-style-type: none"> ▪ Passive ▪ Active | – |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|-----------------------------|---|--|---|---|
| Switch output function | The Switch option is selected in the Operating mode parameter. | Select function for switch output. | <ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Status | – |
| Assign diagnostic behavior | <ul style="list-style-type: none"> ■ In the Operating mode parameter, the Switch option is selected. ■ In the Switch output function parameter, the Diagnostic behavior option is selected. | Select diagnostic behavior for switch output. | <ul style="list-style-type: none"> ■ Alarm ■ Alarm or warning ■ Warning | – |
| Assign limit | <ul style="list-style-type: none"> ■ The Switch option is selected in Operating mode parameter. ■ The Limit option is selected in Switch output function parameter. | Select process variable for limit function. | <ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity* ■ Conductivity* ■ Corrected conductivity* ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Temperature* ■ Electronic temperature | – |
| Assign flow direction check | <ul style="list-style-type: none"> ■ The Switch option is selected in the Operating mode parameter. ■ The Flow direction check option is selected in the Switch output function parameter. | Select process variable for flow direction monitoring. | | – |
| Assign status | <ul style="list-style-type: none"> ■ The Switch option is selected in Operating mode parameter. ■ The Status option is selected in Switch output function parameter. | Select device status for switch output. | <ul style="list-style-type: none"> ■ Empty pipe detection ■ Low flow cut off ■ Digital output 6 | – |
| Switch-on value | <ul style="list-style-type: none"> ■ The Switch option is selected in the Operating mode parameter. ■ The Limit option is selected in the Switch output function parameter. | Enter measured value for the switch-on point. | Signed floating-point number | Depends on country: <ul style="list-style-type: none"> ■ 0 l/h ■ 0 gal/min (us) |
| Switch-off value | <ul style="list-style-type: none"> ■ The Switch option is selected in the Operating mode parameter. ■ The Limit option is selected in the Switch output function parameter. | Enter measured value for the switch-off point. | Signed floating-point number | Depends on country: <ul style="list-style-type: none"> ■ 0 l/h ■ 0 gal/min (us) |
| Switch-on delay | <ul style="list-style-type: none"> ■ The Switch option is selected in the Operating mode parameter. ■ The Limit option is selected in the Switch output function parameter. | Define delay for the switch-on of status output. | 0.0 to 100.0 s | – |

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

* Visibility depends on order options or device settings

10.5.9 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

| ► Relay output 1 to n | |
|-----------------------------|------|
| Terminal number | → 93 |
| Relay output function | → 93 |
| Assign flow direction check | → 93 |
| Assign limit | → 93 |
| Assign diagnostic behavior | → 93 |
| Assign status | → 93 |
| Switch-off value | → 93 |
| Switch-off delay | → 93 |
| Switch-on value | → 93 |
| Switch-on delay | → 93 |
| Failure mode | → 93 |
| Switch status | → 93 |
| Powerless relay status | → 93 |

Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|-----------------------------|---|---|---|--|
| Terminal number | – | Shows the terminal numbers used by the relay output module. | <ul style="list-style-type: none"> ■ Not used ■ 24-25 (I/O 2) | – |
| Relay output function | – | Select the function for the relay output. | <ul style="list-style-type: none"> ■ Closed ■ Open ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Digital Output | – |
| Assign flow direction check | The Flow direction check option is selected in the Relay output function parameter. | Select process variable for flow direction monitoring. | | – |
| Assign limit | The Limit option is selected in the Relay output function parameter. | Select process variable for limit function. | <ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity * ■ Corrected conductivity * ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Temperature * ■ Electronic temperature | – |
| Assign diagnostic behavior | In the Relay output function parameter, the Diagnostic behavior option is selected. | Select diagnostic behavior for switch output. | <ul style="list-style-type: none"> ■ Alarm ■ Alarm or warning ■ Warning | – |
| Assign status | In the Relay output function parameter, the Digital Output option is selected. | Select device status for switch output. | <ul style="list-style-type: none"> ■ Partially filled pipe detection ■ Low flow cut off ■ Digital output 6 | – |
| Switch-off value | The Limit option is selected in the Relay output function parameter. | Enter measured value for the switch-off point. | Signed floating-point number | Depends on country: <ul style="list-style-type: none"> ■ 0 l/h ■ 0 gal(us)/min |
| Switch-off delay | In the Relay output function parameter, the Limit option is selected. | Define delay for the switch-off of status output. | 0.0 to 100.0 s | – |
| Switch-on value | The Limit option is selected in the Relay output function parameter. | Enter measured value for the switch-on point. | Signed floating-point number | Depends on country: <ul style="list-style-type: none"> ■ 0 l/h ■ 0 gal(us)/min |
| Switch-on delay | In the Relay output function parameter, the Limit option is selected. | Define delay for the switch-on of status output. | 0.0 to 100.0 s | – |
| Failure mode | – | Define output behavior in alarm condition. | <ul style="list-style-type: none"> ■ Actual status ■ Open ■ Closed | – |
| Switch status | – | Shows the current relay switch status. | <ul style="list-style-type: none"> ■ Open ■ Closed | – |
| Powerless relay status | – | | <ul style="list-style-type: none"> ■ Open ■ Closed | – |

* Visibility depends on order options or device settings

10.5.10 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 | → | 📖 94 |
| Value 1 display | → | 📖 94 |
| 0% bargraph value 1 | → | 📖 94 |
| 100% bargraph value 1 | → | 📖 95 |
| Value 2 display | → | 📖 95 |
| Value 3 display | → | 📖 95 |
| 0% bargraph value 3 | → | 📖 95 |
| 100% bargraph value 3 | → | 📖 95 |
| Value 4 display | → | 📖 95 |

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"> ▪ 1 value, max. size ▪ 1 bargraph + 1 value ▪ 2 values ▪ 1 value large + 2 values ▪ 4 values | – |
| 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"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Corrected conductivity * ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 ▪ Current output 1 ▪ Temperature * ▪ Electronic temperature | – |
| 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"> ▪ 0 l/h ▪ 0 gal/min (us) |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|-----------------------|---|---|---|--|
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |
| 0% bargraph value 3 | A selection was made in the Value 3 display parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific: <ul style="list-style-type: none"> ■ 0 l/h ■ 0 gal/min (us) |
| 100% bargraph value 3 | A selection was made in the Value 3 display parameter. | Enter 100% value for bar graph display. | Signed floating-point number | - |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |
| Value 5 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |
| Value 6 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |
| Value 7 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |
| Value 8 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | - |

* Visibility depends on order options or device settings

10.5.11 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 | → 96 |
| On value low flow cutoff | → 96 |
| Off value low flow cutoff | → 96 |
| Pressure shock suppression | → 96 |

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"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow | – |
| On value low flow cutoff | A process variable is selected in the Assign process variable parameter (→ 96). | Enter on value for low flow cut off. | Positive floating-point number | Depends on country and nominal diameter |
| Off value low flow cutoff | A process variable is selected in the Assign process variable parameter (→ 96). | Enter off value for low flow cut off. | 0 to 100.0 % | – |
| Pressure shock suppression | A process variable is selected in the Assign process variable parameter (→ 96). | Enter time frame for signal suppression (= active pressure shock suppression). | 0 to 100 s | – |

10.5.12 Configuring empty pipe detection






 The measuring instruments are calibrated with water (approx. 500 µS/cm) at the factory. For liquids with a lower conductivity, it is advisable to perform a new full pipe adjustment onsite.

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 | →  97 |
| New adjustment | →  97 |
| Progress | →  97 |
| Switch point empty pipe detection | →  97 |
| Response time empty pipe detection | →  97 |

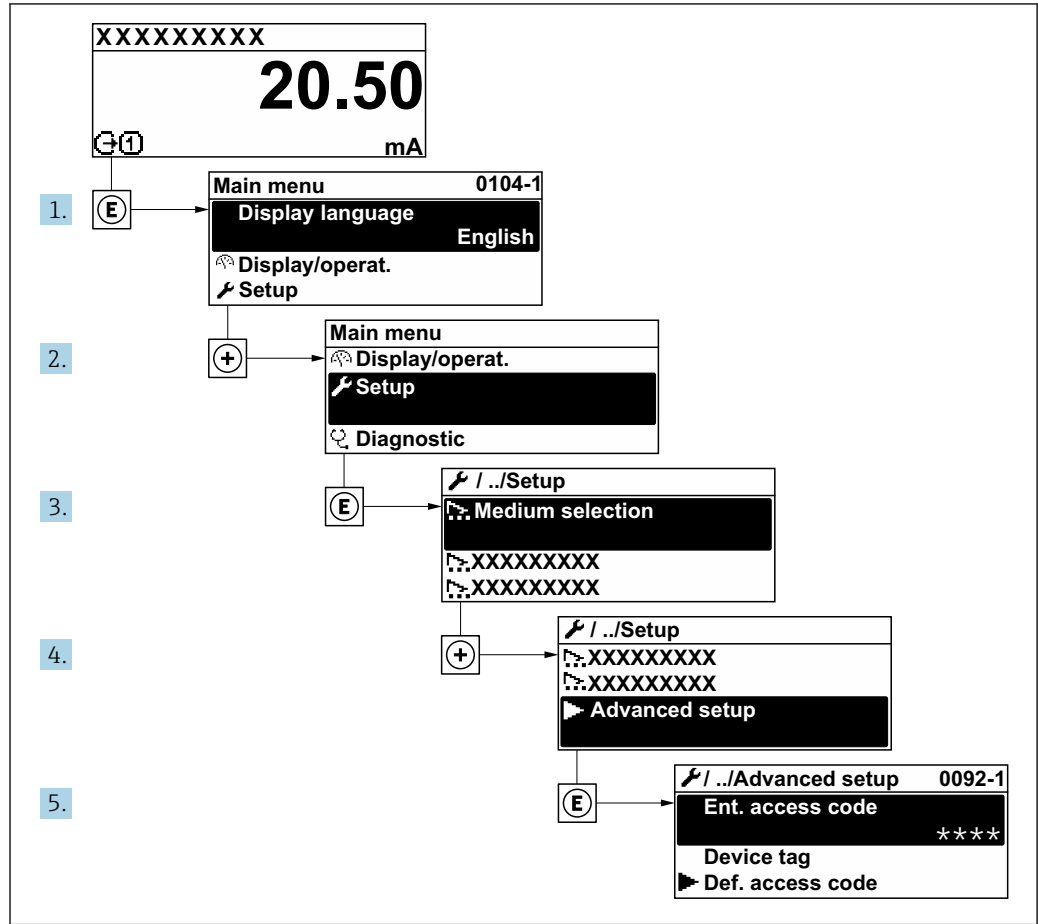
Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|------------------------------------|--|---|---|-----------------|
| Empty pipe detection | – | Switch empty pipe detection on and off. | <ul style="list-style-type: none"> ■ Off ■ On | – |
| New adjustment | The On option is selected in the Empty pipe detection parameter. | Select type of adjustment. | <ul style="list-style-type: none"> ■ Cancel ■ Empty pipe adjust ■ Full pipe adjust | – |
| Progress | The On option is selected in the Empty pipe detection parameter. | Shows the progress. | <ul style="list-style-type: none"> ■ Ok ■ Busy ■ Not ok | – |
| Switch point empty pipe detection | The On option is selected in the Empty pipe detection parameter. | Enter hysteresis in %, below this value the measuring tube will be detected as empty. | 0 to 100 % | – |
| Response time empty pipe detection | A process variable is selected in the Assign process variable parameter (→  97). | Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Empty pipe" is triggered in the event of a partially filled or empty measuring pipe. | 0 to 100 s | – |

10.6 Advanced settings

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

Navigation to the "Advanced setup" submenu

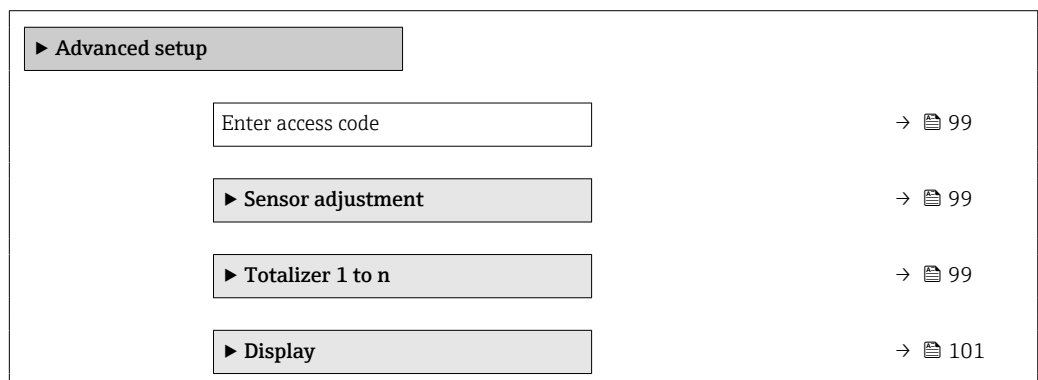


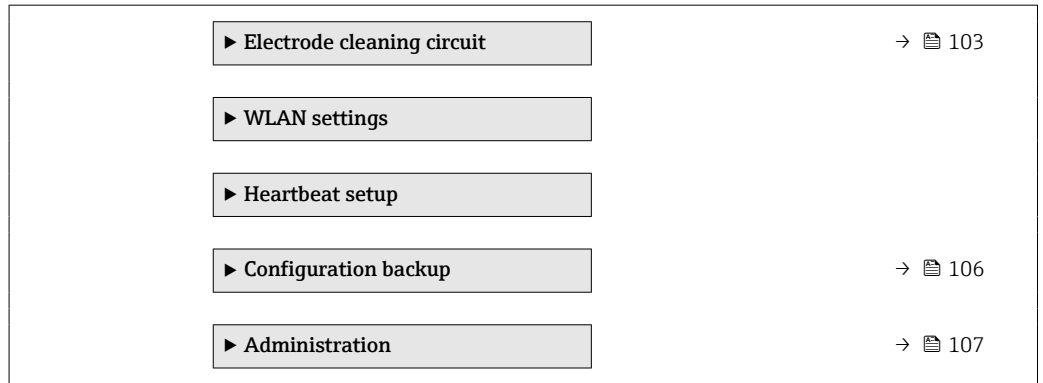
A0032223-EN

i The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operating Instructions. Instead a description is provided in the Special Documentation for the device ("Supplementary documentation").

Navigation

"Setup" menu → Advanced setup





10.6.1 Using the parameter to enter the access code

Navigation

"Setup" menu → Advanced setup

Parameter overview with brief description

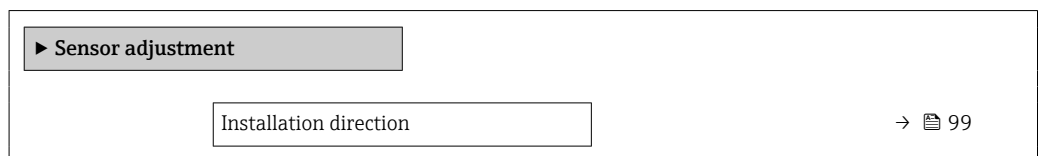
| Parameter | Description | User entry |
|-------------------|--|---|
| Enter access code | Enter access code to disable write protection of parameters. | Max. 16-digit character string comprising numbers, letters and special characters |

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



Parameter overview with brief description

| Parameter | Description | Selection |
|------------------------|---|---|
| Installation direction | Set sign of flow direction to match the direction of the arrow on the sensor. | <ul style="list-style-type: none"> ■ Flow in arrow direction ■ Flow against arrow direction |

10.6.3 Configuring the totalizer

In the **"Totalizer 1 to n"** submenu, you can configure the specific totalizer.

Navigation

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

| | |
|---------------------------|-------|
| ▶ Totalizer 1 to n | |
| Assign process variable | → 100 |
| Unit totalizer 1 to n | → 100 |
| Totalizer operation mode | → 100 |
| Failure mode | → 100 |

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"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow | – |
| Unit totalizer 1 to n | A process variable is selected in the Assign process variable parameter (→ 100) of the Totalizer 1 to n submenu. | Select process variable totalizer unit. | Unit choose list | Depends on country: <ul style="list-style-type: none"> ▪ l ▪ gal (us) |
| Totalizer operation mode | A process variable is selected in the Assign process variable parameter (→ 100) of the Totalizer 1 to n submenu. | Select totalizer calculation mode. | <ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total | – |
| Failure mode | A process variable is selected in the Assign process variable parameter (→ 100) of the Totalizer 1 to n submenu. | Define totalizer behavior in alarm condition. | <ul style="list-style-type: none"> ▪ Stop ▪ Actual value ▪ Last valid value | – |

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 | → 102 |
| Value 1 display | → 102 |
| 0% bargraph value 1 | → 102 |
| 100% bargraph value 1 | → 102 |
| Decimal places 1 | → 102 |
| Value 2 display | → 102 |
| Decimal places 2 | → 102 |
| Value 3 display | → 102 |
| 0% bargraph value 3 | → 102 |
| 100% bargraph value 3 | → 102 |
| Decimal places 3 | → 102 |
| Value 4 display | → 102 |
| Decimal places 4 | → 103 |
| Display language | → 103 |
| Display interval | → 103 |
| Display damping | → 103 |
| Header | → 103 |
| Header text | → 103 |
| Separator | → 103 |
| Backlight | → 103 |

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"> ▪ 1 value, max. size ▪ 1 bargraph + 1 value ▪ 2 values ▪ 1 value large + 2 values ▪ 4 values | – |
| 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"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Corrected conductivity * ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 ▪ Current output 1 ▪ Temperature * ▪ Electronic temperature | – |
| 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"> ▪ 0 l/h ▪ 0 gal/min (us) |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Decimal places 1 | A measured value is specified in the Value 1 display parameter. | Select the number of decimal places for the display value. | <ul style="list-style-type: none"> ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx | – |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | – |
| Decimal places 2 | A measured value is specified in the Value 2 display parameter. | Select the number of decimal places for the display value. | <ul style="list-style-type: none"> ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx | – |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | – |
| 0% bargraph value 3 | A selection was made in the Value 3 display parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific: <ul style="list-style-type: none"> ▪ 0 l/h ▪ 0 gal/min (us) |
| 100% bargraph value 3 | A selection was made in the Value 3 display parameter. | Enter 100% value for bar graph display. | Signed floating-point number | – |
| Decimal places 3 | A measured value is specified in the Value 3 display parameter. | Select the number of decimal places for the display value. | <ul style="list-style-type: none"> ▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx | – |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see Value 1 display parameter (→ 94) | – |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|------------------|---|---|--|--|
| Decimal places 4 | A measured value is specified in the Value 4 display parameter. | Select the number of decimal places for the display value. | <ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx | – |
| Display language | A local display is provided. | Set display language. | <ul style="list-style-type: none"> ■ English ■ Deutsch * ■ Français * ■ Español * ■ Italiano * ■ Nederlands * ■ Portuguesa * ■ Polski * ■ русский язык (Russian) * ■ Svenska * ■ Türkçe * ■ 中文 (Chinese) * ■ 日本語 (Japanese) * ■ 한국어 (Korean) * ■ tiếng Việt (Vietnamese) * ■ čeština (Czech) * | English (alternatively, the ordered language is preset in the device) |
| Display interval | A local display is provided. | Set time measured values are shown on display if display alternates between values. | 1 to 10 s | – |
| Display damping | A local display is provided. | Set display reaction time to fluctuations in the measured value. | 0.0 to 999.9 s | – |
| Header | A local display is provided. | Select header contents on local display. | <ul style="list-style-type: none"> ■ Device tag ■ Free text | – |
| Header text | The Free text option is selected in the Header parameter. | Enter display header text. | Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /) | – |
| Separator | A local display is provided. | Select decimal separator for displaying numerical values. | <ul style="list-style-type: none"> ■ . (point) ■ , (comma) | . (point) |
| Backlight | One of the following conditions is met: <ul style="list-style-type: none"> ■ Order code for "Display; operation", option F "4-line, illum.; touch control" ■ Order code for "Display; operation", option G "4-line, illum.; touch control +WLAN" ■ Order code for "Display; operation", option O "Remote display 4-line illuminated; 10m/30ft cable; touch control" | Switch the local display backlight on and off. | <ul style="list-style-type: none"> ■ Disable ■ Enable | – |

* Visibility depends on order options or device settings

10.6.5 Performing electrode cleaning

The **Electrode cleaning cycle** submenu contains the parameters that must be set 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 cycle

| ▶ Electrode cleaning circuit | |
|------------------------------|---------|
| Electrode cleaning circuit | → ⓘ 104 |
| ECC duration | → ⓘ 104 |
| ECC recovery time | → ⓘ 104 |
| ECC cleaning cycle | → ⓘ 104 |
| ECC Polarity | → ⓘ 104 |

Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|----------------------------|--|---|--|---|
| Electrode cleaning circuit | For the following order code: "Application package", option EC "ECC electrode cleaning" | Enable the cyclic electrode cleaning circuit. | <ul style="list-style-type: none"> ▪ Off ▪ On | On |
| ECC duration | For the following order code: "Application package", option EC "ECC electrode cleaning" | Enter the duration of electrode cleaning in seconds. | 0.01 to 30 s | – |
| ECC recovery time | For the following order code: "Application package", option EC "ECC electrode cleaning" | Define recovery time after electrode cleaning. During this time the current output values will be held at last valid value. | 1 to 600 s | – |
| ECC cleaning cycle | For the following order code: "Application package", option EC "ECC electrode cleaning" | Enter the pause duration between electrode cleaning cycles. | 0.5 to 168 h | – |
| ECC Polarity | For the following order code: "Application package", option EC "ECC electrode cleaning" | Select the polarity of the electrode cleaning circuit. | <ul style="list-style-type: none"> ▪ Positive ▪ Negative | Depends on the electrode material: <ul style="list-style-type: none"> ▪ Tantalum: Negative option ▪ Platinum, Alloy C22, stainless steel: Positive option |

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 | → ⓘ 105 |

| | |
|--------------------------|---------|
| WLAN mode | → ⓘ 105 |
| SSID name | → ⓘ 105 |
| Network security | → ⓘ 105 |
| Security identification | → ⓘ 105 |
| User name | → ⓘ 105 |
| WLAN password | → ⓘ 105 |
| WLAN IP address | → ⓘ 105 |
| WLAN MAC address | → ⓘ 106 |
| WLAN passphrase | → ⓘ 106 |
| Assign SSID name | → ⓘ 106 |
| SSID name | → ⓘ 106 |
| Connection state | → ⓘ 106 |
| Received signal strength | → ⓘ 106 |

Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|-------------------------|--------------------------|--|--|-----------------|
| WLAN | - | Switch WLAN on and off. | <ul style="list-style-type: none"> ■ Disable ■ Enable | - |
| WLAN mode | - | Select WLAN mode. | <ul style="list-style-type: none"> ■ WLAN access point ■ WLAN Client | - |
| SSID name | The client is activated. | Enter the user-defined SSID name (max. 32 characters). | - | - |
| Security type | - | Select the security type of the WLAN interface. | <ul style="list-style-type: none"> ■ Unsecured ■ WPA2-PSK | - |
| Security identification | - | Select security settings and download these settings via menu Data management > Security > WLAN. | <ul style="list-style-type: none"> ■ Root certificate ■ Device certificate ■ Device private key | - |
| User name | - | Enter user name. | - | - |
| WLAN password | - | Enter WLAN password. | - | - |
| WLAN IP address | - | Enter IP address of the device WLAN interface. | 4 octet: 0 to 255 (in the particular octet) | - |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|--------------------------|--|--|--|--|
| WLAN MAC address | – | | Unique 12-digit character string comprising letters and numbers | Each measuring device is given an individual address. |
| WLAN passphrase | The WPA2-PSK option is selected in the Security type 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 (without spaces) | 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"> ▪ Device tag ▪ User-defined | – |
| SSID name | <ul style="list-style-type: none"> ▪ The User-defined option is selected in the Assign SSID name parameter. ▪ The WLAN access point option is selected in the WLAN mode parameter. | 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) |
| Connection state | – | Displays the connection status. | <ul style="list-style-type: none"> ▪ Connected ▪ Not connected | – |
| Received signal strength | – | Shows the received signal strength. | <ul style="list-style-type: none"> ▪ Low ▪ Medium ▪ High | – |

10.6.7 Configuration management

After commissioning, you can save the current device configuration or restore the previous device configuration. The device configuration is managed via the **Configuration management** parameter.

Navigation

"Setup" menu → Advanced setup → Configuration backup

| ► Configuration backup | |
|--------------------------|---------|
| Operating time | → ⓘ 107 |
| Last backup | → ⓘ 107 |
| Configuration management | → ⓘ 107 |
| Backup state | → ⓘ 107 |
| Comparison result | → ⓘ 107 |

Parameter overview with brief description

| Parameter | Description | User interface / Selection |
|--------------------------|--|---|
| 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 embedded HistoROM. | Days (d), hours (h), minutes (m) and seconds (s) |
| Configuration management | Select action for managing the device data in the embedded HistoROM. | <ul style="list-style-type: none"> ■ Cancel ■ Execute backup ■ Restore ■ Compare ■ Clear backup data |
| Backup state | Shows the current status of data saving or restoring. | <ul style="list-style-type: none"> ■ None ■ Backup in progress ■ Restoring in progress ■ Delete in progress ■ Compare in progress ■ Restoring failed ■ Backup failed |
| Comparison result | Comparison of current device data with embedded HistoROM. | <ul style="list-style-type: none"> ■ Settings identical ■ Settings not identical ■ No backup available ■ Backup settings corrupt ■ Check not done ■ Dataset incompatible |

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 | | → 108 |
| ▶ Reset access code | | → 108 |
| Device reset | | → 109 |

Using the parameter to define the access code**Navigation**

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

| | | |
|----------------------|--|-------|
| ▶ Define access code | | |
| Define access code | | → 108 |
| Confirm access code | | → 108 |

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 | | → 109 |
| Reset access code | | → 109 |

Parameter overview with brief description

| Parameter | Description | User interface / User entry |
|-------------------|--|---|
| 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"> ▪ Web browser ▪ DeviceCare, FieldCare (via CDI-RJ45 service interface) ▪ Fieldbus | Character string comprising numbers, letters and special characters |

Using the parameter to reset the device

Navigation

"Setup" menu → Advanced setup → Administration

Parameter overview with brief description

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

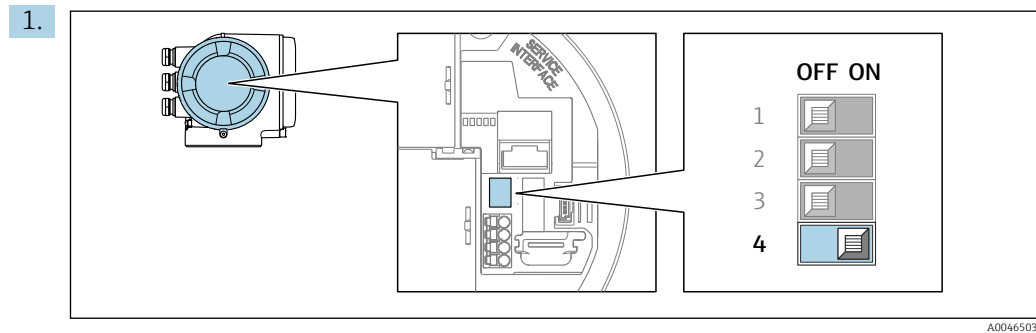
10.7 Simulation

Via the **Simulation** submenu, it is possible to simulate various process variables in the process and the device alarm mode and verify downstream signal chains (switching valves or closed-control loops). The simulation can be performed without a real measurement (no flow of medium through the device).

Activating and deactivating simulation mode via DIP switch

The following hardware settings can be made for the FOUNDATION Fieldbus via DIP switch 4 on the main electronics module:

- Enable/block simulation mode in the function blocks (e.g. **Analog Input** or **Discrete Output** function block)
- Simulation mode enabled (factory setting) = simulation in the **Analog Input** or **Discrete Output** function block possible
- Simulation mode blocked = simulation in the **Analog Input** or **Discrete Output** function block not possible



Set the write protection switch (SIM) on the main electronics module to the **ON** position (factory setting):

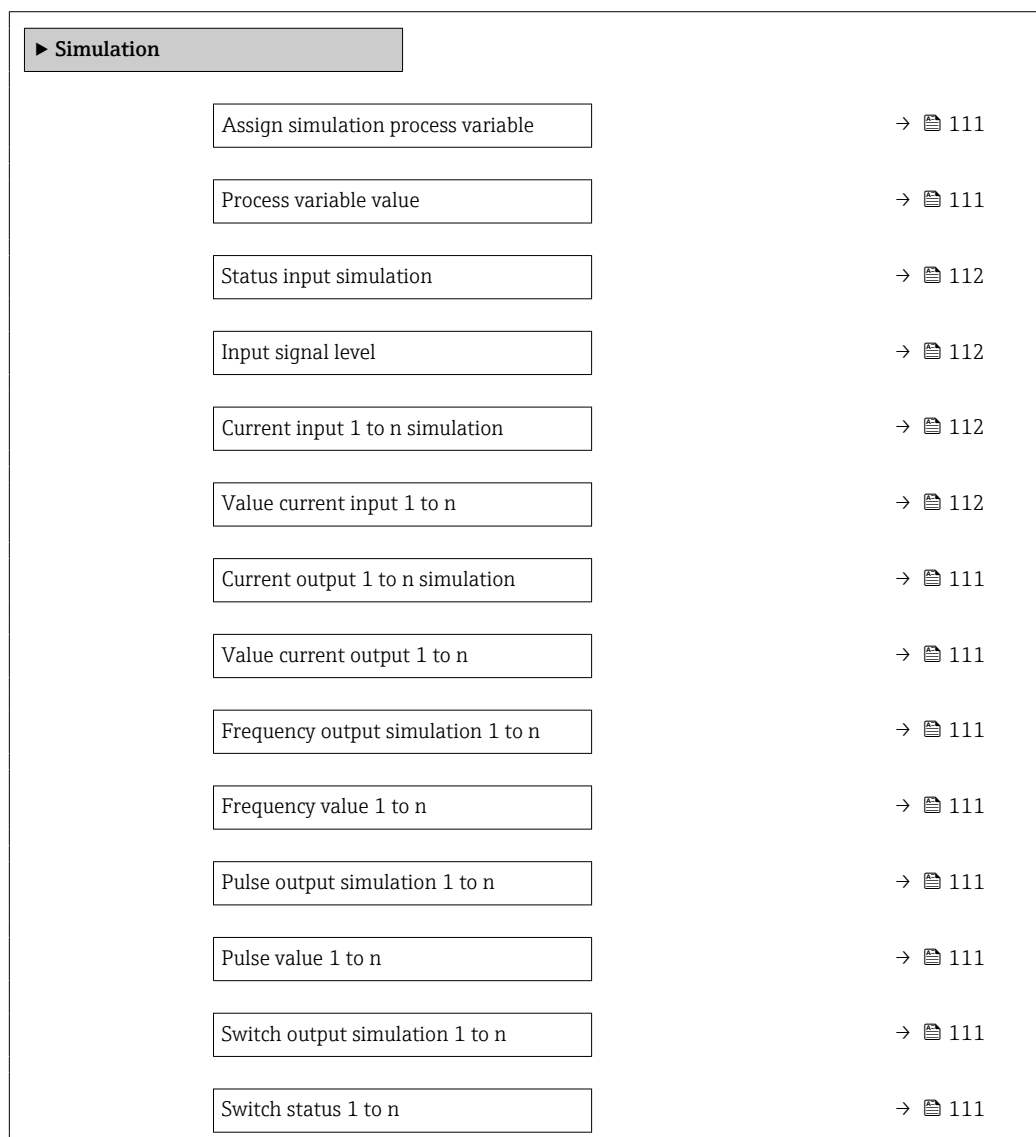
↳ Simulation mode enabled.

2. Set the write protection switch (SIM) on the main electronics module to the **OFF** position:

↳ Simulation mode disabled.


Navigation

"Diagnostics" menu → Simulation



| | |
|--------------------------------|---------|
| Relay output 1 to n simulation | → ⓘ 111 |
| Switch status 1 to n | → ⓘ 111 |
| Device alarm simulation | → ⓘ 111 |
| Diagnostic event category | → ⓘ 112 |
| Diagnostic event simulation | → ⓘ 112 |

Parameter overview with brief description





| Parameter | Prerequisite | Description | Selection / User entry |
|------------------------------------|--|---|---|
| Assign simulation process variable | – | Select a process variable for the simulation process that is activated. | <ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity* ■ Corrected conductivity* ■ Temperature* |
| Process variable value | A process variable is selected in the Assign simulation process variable parameter (→ ⓘ 111). | Enter the simulation value for the selected process variable. | Depends on the process variable selected |
| Current output simulation | – | Switch the simulation of the current output on and off. | <ul style="list-style-type: none"> ■ Off ■ On |
| Value current output | In the Current output 1 to n simulation parameter, the On option is selected. | Enter the current value for simulation. | 3.59 to 22.5 mA |
| Frequency output simulation | In the Operating mode parameter, the Frequency option is selected. | Switch the simulation of the frequency output on and off. | <ul style="list-style-type: none"> ■ Off ■ On |
| Frequency value | In the Frequency output simulation 1 to n parameter, the On option is selected. | Enter the frequency value for the simulation. | 0.0 to 12 500.0 Hz |
| Pulse output simulation | In the Operating mode parameter, the Pulse option is selected. | Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→ ⓘ 87) defines the pulse width of the pulses output. | <ul style="list-style-type: none"> ■ Off ■ Fixed value ■ Down-counting value |
| Pulse value | In the Pulse output simulation 1 to n parameter, the Down-counting value option is selected. | Enter the number of pulses for simulation. | 0 to 65 535 |
| Switch output simulation | In the Operating mode parameter, the Switch option is selected. | Switch the simulation of the switch output on and off. | <ul style="list-style-type: none"> ■ Off ■ On |
| Switch status | – | Select the status of the status output for the simulation. | <ul style="list-style-type: none"> ■ Open ■ Closed |
| Relay output simulation | – | Switch simulation of the relay output on and off. | <ul style="list-style-type: none"> ■ Off ■ On |
| Switch status | The On option is selected in the Switch output simulation 1 to n parameter. | Select status of the relay output for the simulation. | <ul style="list-style-type: none"> ■ Open ■ Closed |
| Device alarm simulation | – | Switch the device alarm on and off. | <ul style="list-style-type: none"> ■ Off ■ On |

| Parameter | Prerequisite | Description | Selection / User entry |
|-----------------------------|--|---|---|
| Diagnostic event category | – | Select a diagnostic event category. | <ul style="list-style-type: none"> ■ Sensor ■ Electronics ■ Configuration ■ Process |
| Diagnostic event simulation | – | Select a diagnostic event to simulate this event. | <ul style="list-style-type: none"> ■ Off ■ Diagnostic event picklist (depends on the category selected) |
| Current input simulation | – | Switch simulation of the current input on and off. | <ul style="list-style-type: none"> ■ Off ■ On |
| Value current input | In the Current input 1 to n simulation parameter, the On option is selected. | Enter the current value for simulation. | 0 to 22.5 mA |
| Status input simulation | – | Switch simulation of the status input on and off. | <ul style="list-style-type: none"> ■ Off ■ On |
| Input signal level | In the Status input simulation parameter, the On option is selected. | Select the signal level for the simulation of the status input. | <ul style="list-style-type: none"> ■ High ■ Low |

* 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 →  112
- Protect access to local operation via key locking →  57
- Protect access to measuring device via write protection switch →  114
- Protect access to parameters via block operation →  114


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 the local display

1. Navigate to the **Define access code** parameter (→  108).
2. Maximum of 16-digit character string comprising numbers, letters and special characters as the access code.
3. Enter the access code again in the **Confirm access code** parameter (→  108) to confirm.

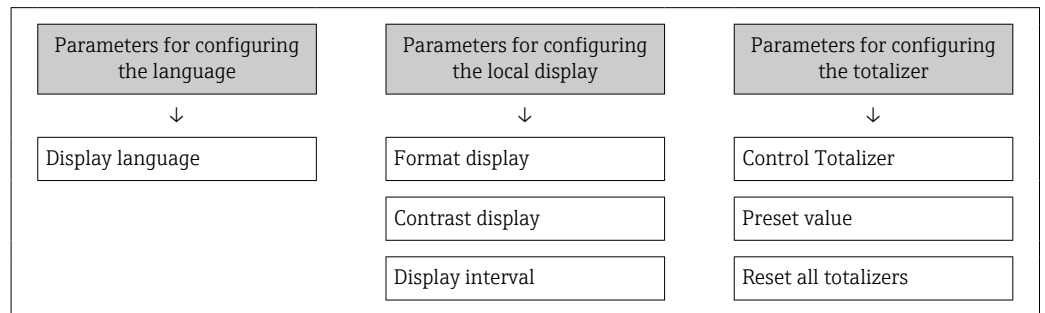
↳ The  symbol appears in front of all write-protected parameters.

-  ■ Disabling parameter write protection via access code →  56.
- If the access code is lost: Resetting the access code →  113.
- The user role with which the user is currently logged in is displayed in **Access status** parameter.
 - Navigation path: Operation → Access status
 - User roles and their access rights →  56







- 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.

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 (→  108).
 2. Define a 16-digit (max.) numeric code as the access code.
 3. Enter the access code again in the **Confirm access code** parameter (→  108) to confirm.
 - ↳ The web browser switches to the login page.
-  **Disabling parameter write protection via access code** →  56.
- If the access code is lost: **Resetting the access code** →  113.
 - The **Access status** parameter shows which user role the user is currently logged in with.
 - Navigation path: Operation → Access status
 - User roles and their access rights →  56

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



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

 You can only obtain a reset code from your local Endress+Hauser service organization. The code must be calculated explicitly for every device.

1. Note down the serial number of the device.
2. Read off the **Operating time** parameter.
3. Contact the local Endress+Hauser service organization and tell them the serial number and the operating time.
 - ↳ Get the calculated reset code.

4. Enter the reset code in the **Reset access code** parameter (→  109).
 - ↳ The access code has been reset to the factory setting **0000**. It can be redefined →  112.

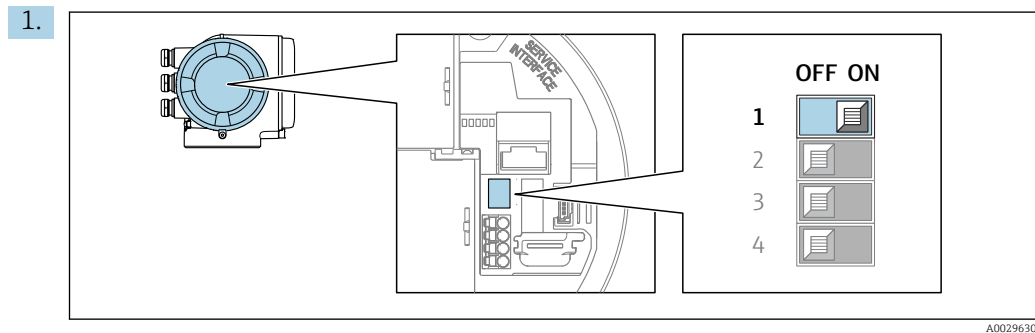
 For IT security reasons, the calculated reset code is only valid for 96 hours from the specified operating time and for the specific serial number. If you cannot return to the device within 96 hours, you should either increase the operating time you read out by a few days or switch off the device.

10.8.2 Write protection via write protection switch



Unlike parameter write protection via a user-specific access code, this allows the user to lock write access to the entire operating menu - apart from the **"Contrast display" parameter**.

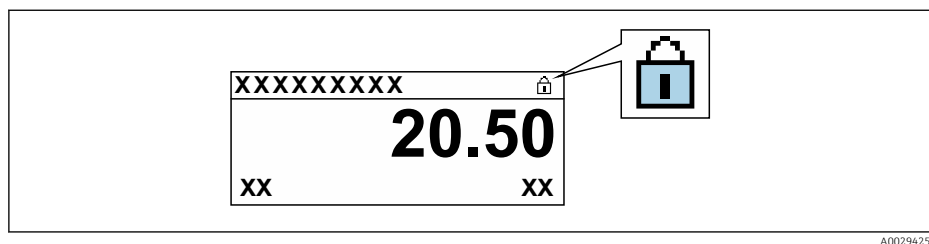
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):



- Via local display
- Via FOUNDATION Fieldbus



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 →  115. 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 →  115. 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.

10.8.3 Write protection via block operation

Locking via block operation:

- Block: **DISPLAY (TRDDISP)**; parameter: **Define access code**
- Block: **EXPERT_CONFIG (TRDEXP)**; parameter: **Enter access code**



11 Operation

11.1 Reading off 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 authorization displayed in the Access status parameter applies →  56. 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) →  114. |
| 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 Adjusting the operating language

 Detailed information:

- To configure the operating language →  75
- For information on the operating languages supported by the measuring device →  188

11.3 Configuring the display

Detailed information:





- On the basic settings for the local display →  94
- On the advanced settings for the local display →  101

11.4 Reading off measured values

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

Navigation

"Diagnostics" menu → Measured values

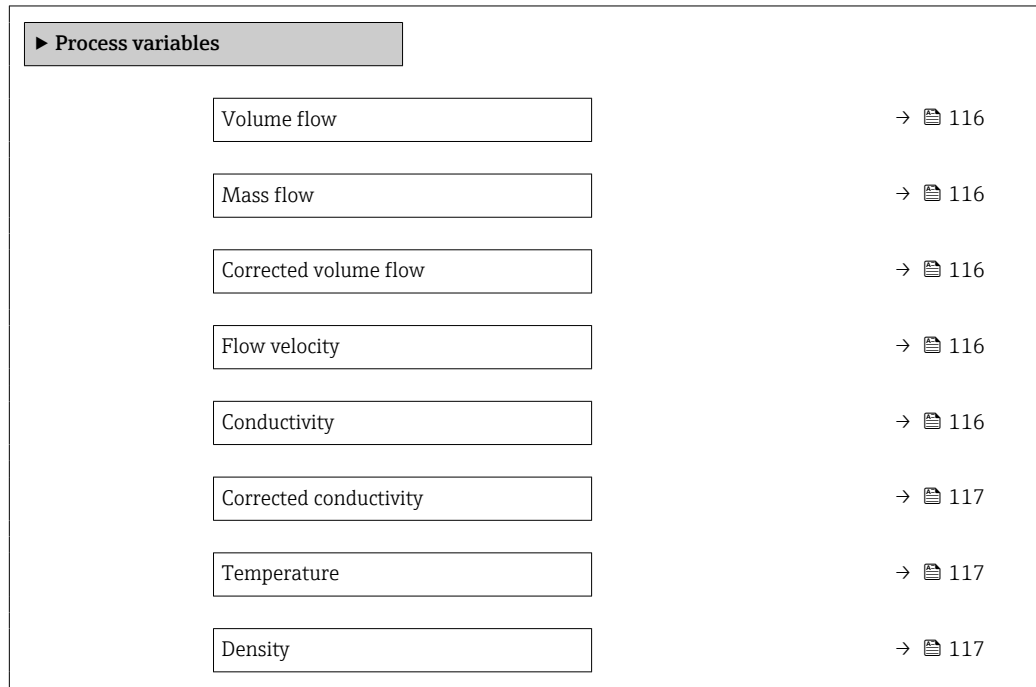
| | |
|---------------------|---|
| ▶ Measured values | |
| ▶ Process variables | →  116 |
| ▶ Input values | →  117 |
| ▶ Output values | →  119 |
| ▶ Totalizer | →  117 |

11.4.1 "Process variables" submenu

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



Navigation

"Diagnostics" menu → Measured values → Process variables



Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface |
|-----------------------|--------------|---|------------------------------|
| Volume flow | – | Displays the volume flow that is currently measured. <i>Dependency</i> The unit is taken from: Volume flow unit parameter (→ 78) | Signed floating-point number |
| Mass flow | – | Displays the mass flow that is currently calculated. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→ 78). | Signed floating-point number |
| Corrected volume flow | – | Displays the corrected volume flow that is currently calculated. <i>Dependency</i> The unit is taken from: Corrected volume flow unit parameter (→ 79) | Signed floating-point number |
| Flow velocity | – | Displays the flow velocity that is currently calculated. | Signed floating-point number |
| Conductivity | – | Displays the conductivity that is currently measured. <i>Dependency</i> The unit is taken from the Conductivity unit parameter (→ 78). | Signed floating-point number |

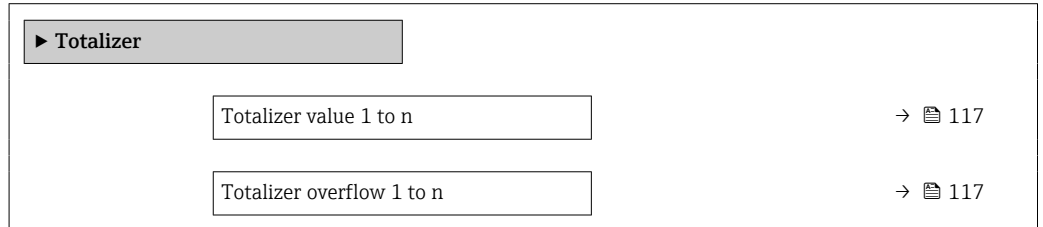
| Parameter | Prerequisite | Description | User interface |
|------------------------|--|---|--------------------------------|
| Corrected conductivity | One of the following conditions is met: <ul style="list-style-type: none"> Order code for "Sensor option", option CI "Medium temperature measurement" 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: Conductivity unit parameter (→  78) | Positive floating-point number |
| Temperature | One of the following conditions is met: <ul style="list-style-type: none"> Order code for "Sensor option", option CI "Medium temperature measurement" or The temperature is read into the flowmeter from an external device. | Displays the temperature that is currently calculated. <i>Dependency</i> The unit is taken from: Temperature unit parameter (→  78) | 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: Density unit parameter | Signed floating-point number |

11.4.2 "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



Parameter overview with brief description

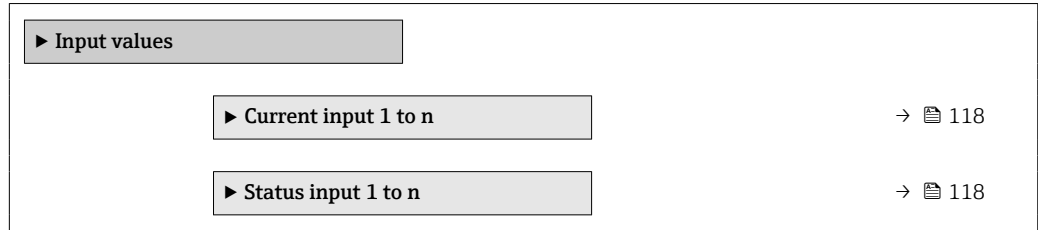
| Parameter | Prerequisite | Description | User interface |
|---------------------------|--|---|------------------------------|
| Totalizer value 1 to n | A process variable is selected in the Assign process variable parameter (→  100) of the Totalizer 1 to n submenu. | Displays the current totalizer counter value. | Signed floating-point number |
| Totalizer overflow 1 to n | A process variable is selected in the Assign process variable parameter (→  100) of the Totalizer 1 to n submenu. | Displays the current totalizer overflow. | Integer with sign |

11.4.3 "Input values" submenu

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

Navigation

"Diagnostics" menu → Measured values → Input values

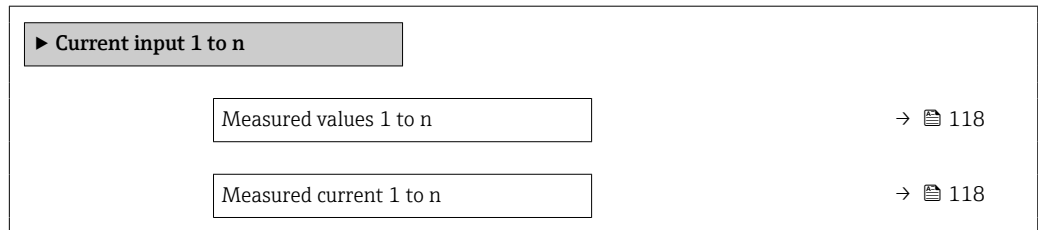


Input values of current input

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



Parameter overview with brief description

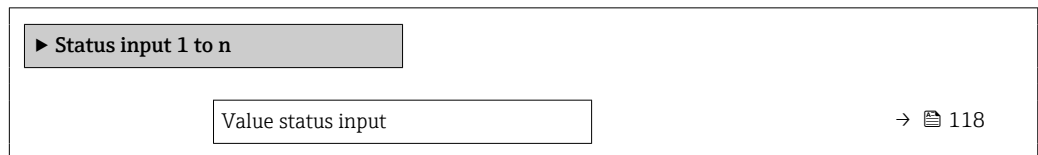
| Parameter | Description | User interface |
|------------------|--|------------------------------|
| Measured values | Displays the current input value. | Signed floating-point number |
| Measured current | Displays the current value of the current input. | 0 to 22.5 mA |

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



Parameter overview with brief description

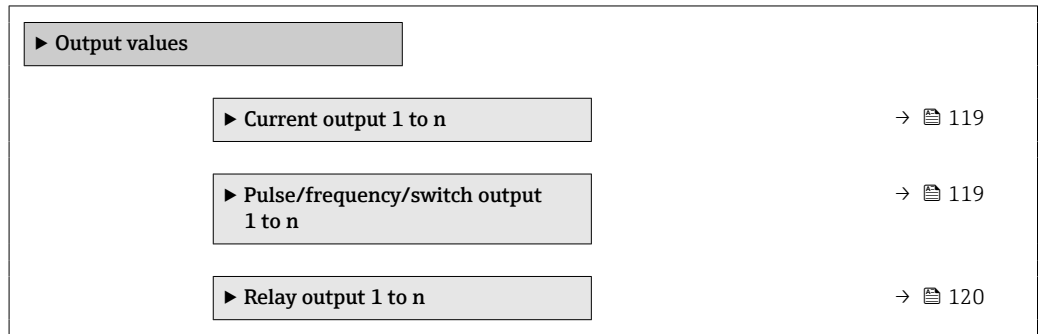
| Parameter | Description | User interface |
|--------------------|---------------------------------------|---|
| Value status input | Shows the current input signal level. | <ul style="list-style-type: none"> ▪ High ▪ Low |

11.4.4 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

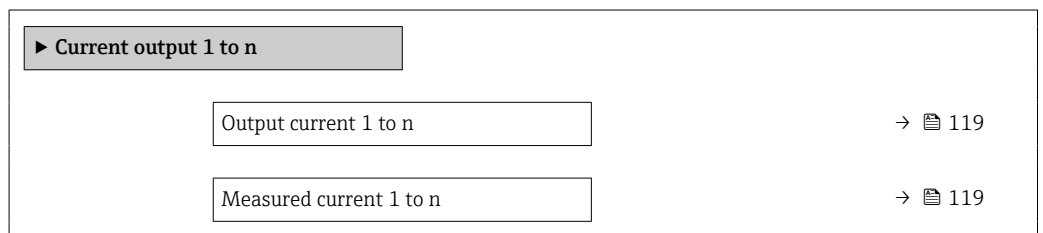


Output values of current output

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



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 | → 120 |
| Pulse output 1 to n | → 120 |
| Switch status 1 to n | → 120 |

Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface |
|------------------|---|---|--|
| Output frequency | In the Operating mode parameter, the Frequency option is selected. | Displays the value currently measured for the frequency output. | 0.0 to 12 500.0 Hz |
| Pulse output | The Pulse option is selected in the Operating mode parameter parameter. | Displays the pulse frequency currently output. | Positive floating-point number |
| Switch status | The Switch option is selected in the Operating mode parameter. | Displays the current switch output status. | <ul style="list-style-type: none"> ■ Open ■ Closed |

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 | → 120 |
| Switch cycles | → 120 |
| Max. switch cycles number | → 120 |

Parameter overview with brief description

| Parameter | Description | User interface |
|---------------------------|---|--|
| Switch status | Shows the current relay switch status. | <ul style="list-style-type: none"> ■ Open ■ Closed |
| 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 |

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→  76)
- Advanced settings using the **Advanced setup** submenu (→  98)





11.6 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 | →  121 |
| Preset value 1 to n | →  121 |
| Totalizer value 1 to n | →  121 |
| Reset all totalizers | →  121 |

Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface |
|--------------------------|--|---|--|
| Control Totalizer 1 to n | A process variable is selected in the Assign process variable parameter (→  100) of the Totalizer 1 to n submenu. | Control totalizer value. | <ul style="list-style-type: none"> ■ Totalize ■ Reset + hold ■ Preset + hold ■ Reset + totalize ■ Preset + totalize ■ Hold |
| Preset value 1 to n | A process variable is selected in the Assign process variable parameter (→  100) of the Totalizer 1 to n submenu. | Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is defined in the Unit totalizer parameter (→  100) for the totalizer. | Signed floating-point number |
| Totalizer value | A process variable is selected in the Assign process variable parameter (→  100) of the Totalizer 1 to n submenu. | Displays the current totalizer counter value. | Signed floating-point number |
| Reset all totalizers | – | Reset all totalizers to 0 and start. | <ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize |

11.6.1 Function scope of "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 ¹⁾ | The totaling process is stopped and the totalizer is set to its defined start value from the Preset value parameter. |
| Reset + totalize | The totalizer is reset to 0 and the totaling process is restarted. |
| Preset + totalize ¹⁾ | The totalizer is set to the defined start value in the Preset value parameter and the totaling process is restarted. |
| Hold | Totalizing is stopped. |



1) Visible depending on the order options or device settings

11.6.2 Function range of "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 previously aggregated flow values. |

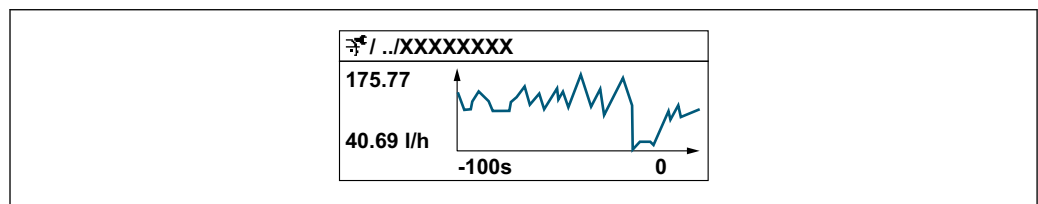
11.7 Displaying the measured value history

The **Extended HistoROM** application package must be enabled in the device (order option) for the **Data logging** submenu to appear. This contains all the parameters for the measured value history.

-  Data logging is also available via:
 - Plant Asset Management Tool FieldCare →  67.
 - Web browser


Function range

- A total of 1000 measured values can be stored
- 4 logging channels
- Adjustable logging interval for data logging
- Measured value trend for each logging channel displayed in the form of a chart



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- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

 If the length of the logging interval or the assignment of the process variables to the channels is changed, the content of the data logging is deleted.

Navigation

"Diagnostics" menu → Data logging

| | |
|----------------------------|-------|
| ► Data logging | |
| Assign channel 1 | → 124 |
| Assign channel 2 | → 124 |
| Assign channel 3 | → 124 |
| Assign channel 4 | → 124 |
| Logging interval | → 124 |
| Clear logging data | → 124 |
| Data logging | → 124 |
| Logging delay | → 124 |
| Data logging control | → 124 |
| Data logging status | → 124 |
| Entire logging duration | → 124 |
| ► Display channel 1 | |
| ► Display channel 2 | |
| ► Display channel 3 | |
| ► Display channel 4 | |

Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface |
|-------------------------|--|--|--|
| Assign channel 1 | The Extended HistoROM application package is available. | Assign process variable to logging channel. | <ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity* ■ Conductivity* ■ Corrected conductivity* ■ Current output 1 ■ Temperature* ■ Electronic temperature |
| Assign channel 2 | The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter. | Assign a process variable to logging channel. | For the picklist, see Assign channel 1 parameter (→  124) |
| Assign channel 3 | The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter. | Assign a process variable to logging channel. | For the picklist, see Assign channel 1 parameter (→  124) |
| Assign channel 4 | The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter. | Assign a process variable to logging channel. | For the picklist, see Assign channel 1 parameter (→  124) |
| Logging interval | The Extended HistoROM application package is available. | Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory. | 0.1 to 999.0 s |
| Clear logging data | The Extended HistoROM application package is available. | Clear the entire logging data. | <ul style="list-style-type: none"> ■ Cancel ■ Clear data |
| Data logging | – | Select the type of data logging. | <ul style="list-style-type: none"> ■ Overwriting ■ Not overwriting |
| Logging delay | In the Data logging parameter, the Not overwriting option is selected. | Enter the time delay for measured value logging. | 0 to 999 h |
| Data logging control | In the Data logging parameter, the Not overwriting option is selected. | Start and stop measured value logging. | <ul style="list-style-type: none"> ■ None ■ Delete + start ■ Stop |
| Data logging status | In the Data logging parameter, the Not overwriting option is selected. | Displays the measured value logging status. | <ul style="list-style-type: none"> ■ Done ■ Delay active ■ Active ■ Stopped |
| Entire logging duration | In the Data logging parameter, the Not overwriting option is selected. | Displays the total logging duration. | Positive floating-point number |

* Visibility depends on order options or device settings

12 Diagnostics and troubleshooting

12.1 General troubleshooting

For local display

| Error | Possible causes | Remedial action |
|---|---|--|
| 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 dark and no output signals | Supply voltage does not match the voltage specified on the nameplate. | Apply the correct supply voltage → 33. |
| Local display dark and no output signals | Supply voltage has incorrect polarity. | Reverse polarity of supply voltage. |
| Local display dark and no output signals | No contact between connecting cables and terminals. | Ensure electrical contact between the cable and the terminal. |
| Local display dark and no output signals | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ I/O electronics module is defective. ▪ Main electronics module is defective. | Order spare part → 164. |
| Local display cannot be read, but signal output is within the valid range | Display is set too bright or too dark. | <ul style="list-style-type: none"> ▪ Set the display brighter by simultaneously pressing $\square + \square$. ▪ Set the display darker by simultaneously pressing $\square + \square$. |
| Local display is dark, but signal output is within the valid range | Display module is defective. | Order spare part → 164. |
| Backlighting of local display is red | Diagnostic event with "Alarm" diagnostic behavior has occurred. | Take remedial measures → 137 |
| Text on local display appears in a language that cannot be understood. | The selected operating language cannot be understood. | <ol style="list-style-type: none"> 1. Press $\square + \square$ for 2 s ("home position"). 2. Press \square. 3. Configure the required language in the Display language parameter (→ 103). |
| Message on local display: "Communication Error" "Check Electronics" | Communication between the display module and the electronics is interrupted. | <ul style="list-style-type: none"> ▪ Check the cable and the connector between the main electronics module and display module. ▪ Order spare part → 164. |

For output signals

| Error | Possible causes | Remedial action |
|---|--|---|
| Signal output outside the valid range | Main electronics module is defective. | Order spare part → 164. |
| Device shows correct value on local display, but signal output is incorrect, though in the valid range. | Parameter configuration error | Check and adjust parameter configuration. |
| Device measures incorrectly. | Configuration error or device is operated outside the application. | <ol style="list-style-type: none"> 1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data". |

For access

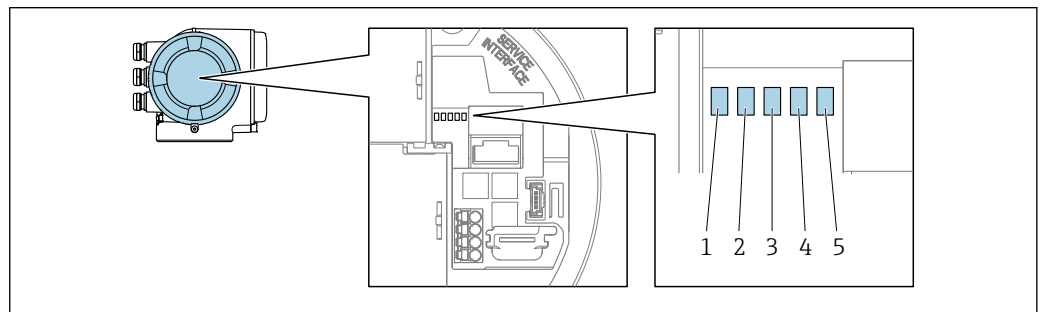
| Error | Possible causes | Remedial action |
|---|---|---|
| Write access to parameter not possible. | Hardware write protection is enabled. | Set the write protection switch on the main electronics module to the OFF position → ☰ 114. |
| Write access to parameter not possible. | Current user role has limited access authorization. | 1. Check user role → ☰ 56. 2. Enter correct customer-specific access code → ☰ 56. |
| Connection via FOUNDATION Fieldbus is not possible. | Device plug is connected incorrectly. | Check the pin assignment of the device plugs . |
| Connection to the web server is not possible. | Web server is disabled. | Use the "FieldCare" or "DeviceCare" operating tool to check if the web server of the device is enabled and enable if necessary → ☰ 63. |
| | The Ethernet interface is incorrectly configured on the PC. | <ul style="list-style-type: none"> ▶ Check the properties of the Internet protocol (TCP/IP) → ☰ 59. ▶ Check the network settings with the IT manager. |
| Connection to the web server is not possible. | The IP address is incorrectly configured on the PC. | Check the IP address: 192.168.1.212 → ☰ 59 |
| Connection to the web server is not possible. | WLAN access data are incorrect. | <ul style="list-style-type: none"> ▪ Check WLAN network status. ▪ Log on to the device again using WLAN access data. ▪ Check that WLAN is enabled for the device and operating device → ☰ 59. |
| | WLAN communication is disabled. | – |
| It is not possible to connect to the web server, FieldCare or DeviceCare. | WLAN network is not available. | <ul style="list-style-type: none"> ▪ Check whether WLAN reception is available: LED on the display module lights up in blue. ▪ Check if the WLAN connection is enabled: LED on display module flashes blue. ▪ Switch on instrument function. |
| No network connection or unstable network connection. | WLAN network is weak. | <ul style="list-style-type: none"> ▪ Operating device outside of receiving range: Check the network status on the operating device. ▪ To improve network performance, use an external WLAN antenna. |
| | Parallel WLAN and Ethernet communication. | <ul style="list-style-type: none"> ▪ Check network settings. ▪ Temporarily enable only the WLAN as an interface. |
| Web browser is frozen and no further operation possible. | Data transfer is active. | Wait until data transfer or current action is finished. |
| | Connection lost | <ul style="list-style-type: none"> ▶ Check cable connection and power supply. ▶ Refresh web browser and restart if necessary. |
| The web browser contents are difficult to read or incomplete. | The web browser version used is not the best option. | <ul style="list-style-type: none"> ▶ Use correct web browser version → ☰ 58. ▶ Empty the web browser cache. ▶ Restart the web browser. |
| | Unsuitable view settings. | Change the font size/display ratio of the Web browser. |
| No contents displayed in the web browser or contents incomplete. | <ul style="list-style-type: none"> ▪ JavaScript is not enabled. ▪ JavaScript cannot be enabled. | <ul style="list-style-type: none"> ▶ Enable JavaScript. ▶ Enter http://XXX.XXX.X.XX/servlet/basic.html as the IP address. |

| Error | Possible causes | Remedial action |
|--|---|--|
| Operation with FieldCare or DeviceCare not possible via CDI-RJ45 service interface (port 8000). | Firewall of the PC or network prevents communication. | Depending on the settings of the firewall used on the PC or in the network, the firewall must be disabled or adjusted for FieldCare/DeviceCare access. |
| Flashing of firmware with FieldCare or DeviceCare not possible via CDI-RJ45 service interface (port 8000 or TFTP ports). | Firewall of the PC or network prevents communication. | Depending on the settings of the firewall used on the PC or in the network, the firewall must be disabled or adjusted for 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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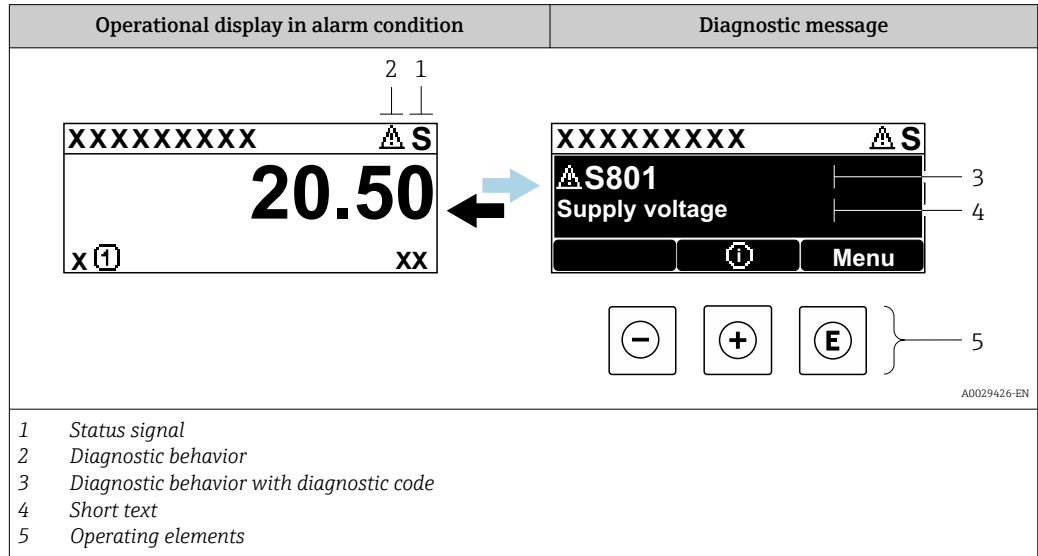
- 1 Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active

| LED | Color | Meaning |
|------------------------------------|---------------------|---|
| 1 Supply voltage | Green | Supply voltage is OK. |
| | Off | Supply voltage is off or too low. |
| 2 Device status (normal operation) | Red | Error |
| | Flashing red | Warning |
| 2 Device status (during start-up) | Flashes red slowly | If > 30 seconds: problem with the boot loader. |
| | Flashes red quickly | If > 30 seconds: compatibility problem when reading the firmware. |
| 3 Not used | – | – |
| 4 Communication | White | Communication active. |
| 5 Service interface (CDI) | Yellow | Connection established. |
| | Flashing yellow | Communication active. |
| | Off | No connection. |

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.

- i** Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
 - Via parameter → 156
 - Via submenus → 157



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).

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

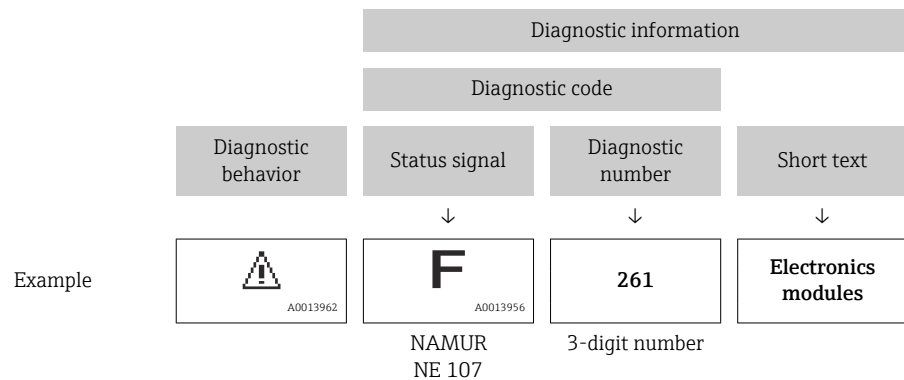
| Symbol | Meaning |
|----------|---|
| F | Failure A device error has occurred. The measured value is no longer valid. |
| C | Function check The device is in service mode (e.g. during a simulation). |
| S | Out of specification The device is being operated: Outside its technical specification limits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

Diagnostic behavior



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

Diagnostic information

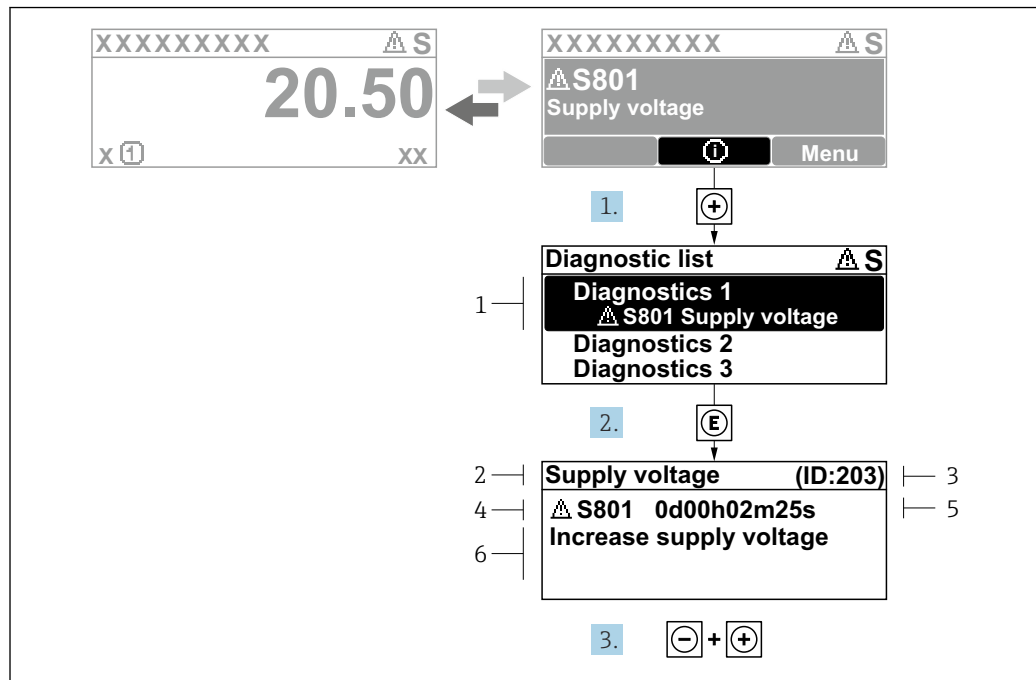
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



Operating elements

| Operating key | Meaning |
|---|--|
|  | Plus key <i>In menu, submenu</i> Opens the message about the remedial measures. |
|  | Enter key <i>In menu, submenu</i> Opens the operating menu. |

12.3.2 Calling up remedial measures



26 Message for remedial measures

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

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

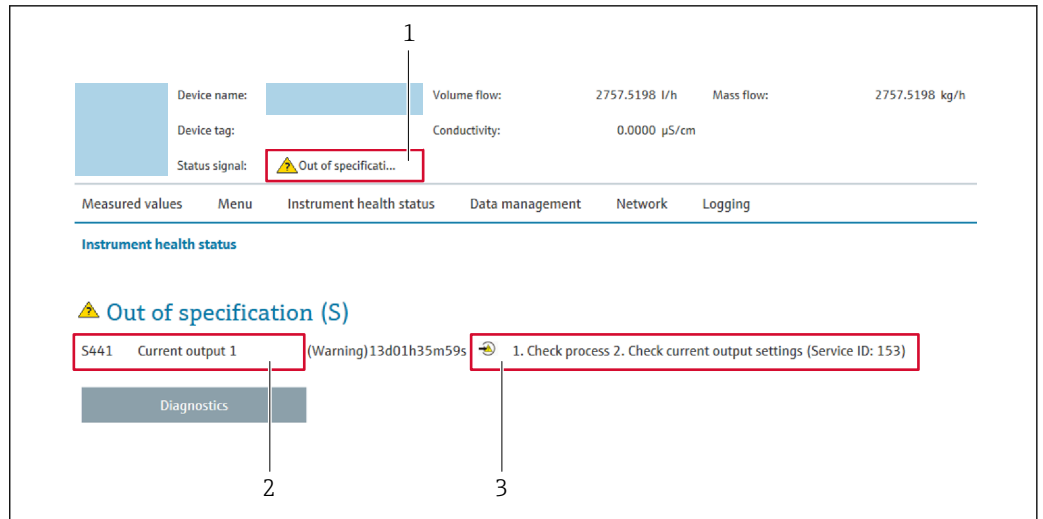
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

1. Press \boxminus .
↳ 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
- 3 Remedial measures with service ID

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

- Via parameter → 156
- Via submenu → 157

Status signals

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

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

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

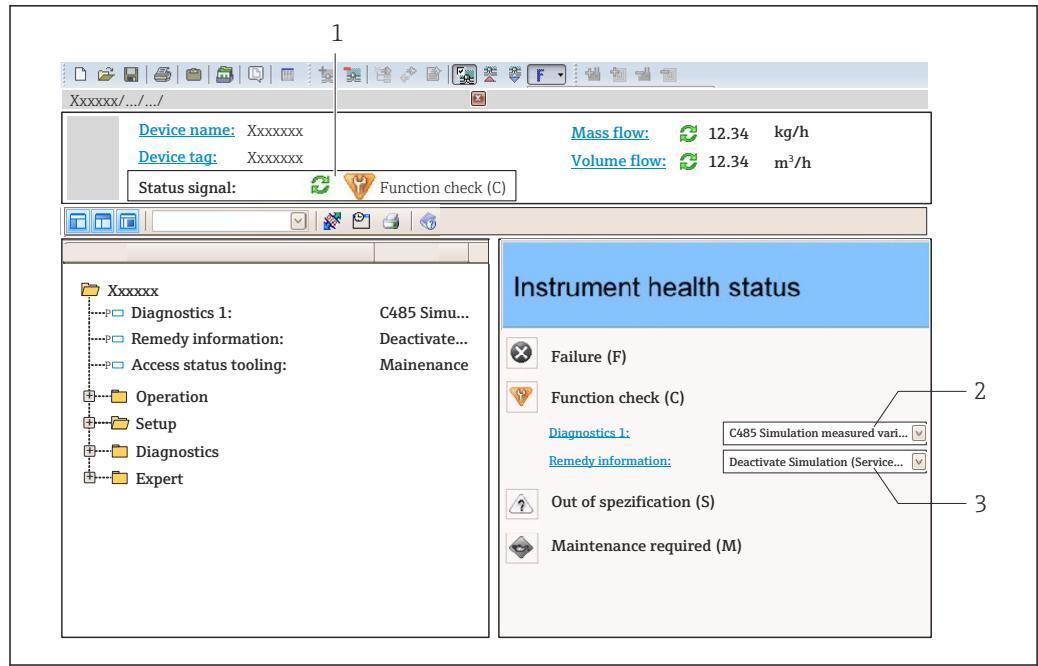
12.4.2 Calling up remedy information

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 FieldCare or DeviceCare

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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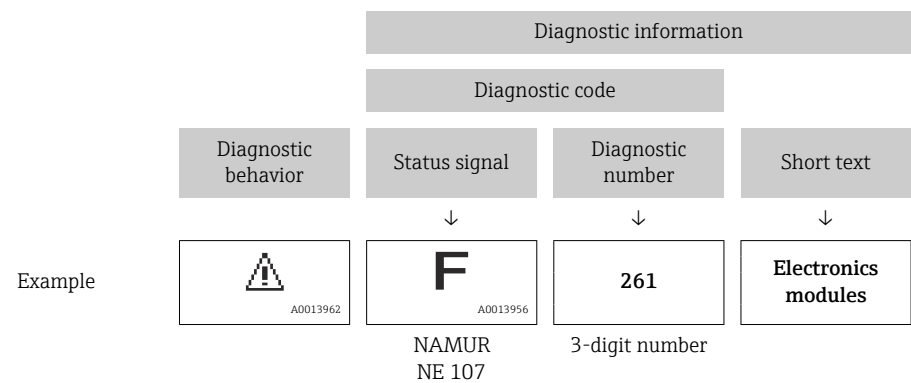
- 1 Status area with status signal → 128
- 2 Diagnostic information → 129
- 3 Remedial measures with service ID

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

- Via parameter → 156
- Via submenu → 157

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.

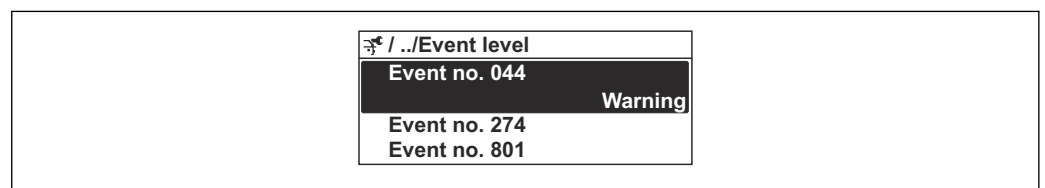
1. Call up the desired parameter.
2. On the right in the working area, mouse over the parameter.
 - ↳ A tool tip with remedy information for the diagnostic event appears.

12.6 Adapting the diagnostic information

12.6.1 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



27 Using the example of the local display

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

| Options | Description |
|--------------------|---|
| Alarm | The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated. The background lighting changes to red. |
| Warning | The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated. |
| Logbook entry only | The device continues to measure. The diagnostic message is only displayed in the Event logbook submenu (Event list submenu) and is not displayed in alternating sequence with the operational display. |
| Off | The diagnostic event is ignored, and no diagnostic message is generated or entered. |

12.6.2 Adapting the status signal

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

Expert → Communication → Diagnostic event category

Available status signals

Configuration as per FOUNDATION Fieldbus Specification (FF912), in accordance with NAMUR NE107.

| Symbol | Meaning |
|-------------------------------------|---|
| F <small>A0013956</small> | Failure A device error has occurred. The measured value is no longer valid. |
| C <small>A0013959</small> | Function check The device is in service mode (e.g. during a simulation). |

| Symbol | Meaning |
|-------------------------------------|---|
| S <small>A0013958</small> | Out of specification The device is being operated: Outside its technical specification limits (e.g. outside the process temperature range) |
| M <small>A0013957</small> | Maintenance required Maintenance is required. The measured value remains valid. |

Enabling the configuration of the diagnostic information according to FF912

For compatibility reasons, the configuration of the diagnostic information according to FOUNDATION Fieldbus Specification FF912 is not enabled when the device is delivered from the factory.

Enabling the configuration of the diagnostic information according to FOUNDATION Fieldbus Specification FF912

1. Open the Resource block.
2. In **Feature Selection** parameter, select **Multi-bit Alarm (Bit-Alarm) Support** option.
 - ↳ The diagnostic information can be configured according to FOUNDATION Fieldbus Specification FF912.

Grouping the diagnostic information

Diagnostic information is assigned to different groups. The groups differ depending on the weighting (severity) of the diagnostic event:


- Highest weighting
- High weighting
- Low weighting

Assignment of the diagnostic information (factory setting)

The assignment of the diagnostic information ex-works is indicated in the following tables.

The individual ranges of the diagnostic information can be assigned to another status signal → [135](#).

Some diagnostic information can be assigned individually, irrespective of their range → [136](#).

 Overview and description of all diagnostic information → [137](#)

| Weighting | Status signal (factory setting) | Allocation | Diagnostic information range |
|-----------|---------------------------------|---------------|------------------------------|
| Highest | Failure (F) | Sensor | F000 to 199 |
| | | Electronics | F200 to 399 |
| | | Configuration | F400 to 700 |
| | | Process | F800 to 999 |



| Weighting | Status signal (factory setting) | Allocation | Diagnostic information range |
|-----------|---------------------------------|---------------|------------------------------|
| High | Function check (C) | Sensor | C000 to 199 |
| | | Electronics | C200 to 399 |
| | | Configuration | C400 to 700 |
| | | Process | C800 to 999 |

| Weighting | Status signal (factory setting) | Allocation | Diagnostic information range |
|-----------|---------------------------------|---------------|------------------------------|
| Low | Out of specification (S) | Sensor | S000 to 199 |
| | | Electronics | S200 to 399 |
| | | Configuration | S400 to 700 |
| | | Process | S800 to 999 |

| Weighting | Status signal (factory setting) | Allocation | Diagnostic information range |
|-----------|---------------------------------|---------------|------------------------------|
| Low | Maintenance required (M) | Sensor | M000 to 199 |
| | | Electronics | M200 to 399 |
| | | Configuration | M400 to 700 |
| | | Process | M800 to 999 |

Changing the assignment of the diagnostic information

The individual ranges of the diagnostic information can be assigned to another status signal. This is done by changing the bit in the associated parameter. The bit change always applies for the entire range of the diagnostic information.

 Some diagnostic information can be assigned individually, irrespective of their range
 →  136

Each status signal has a parameter in the Resource Block in which it is possible to define the diagnostic event for which the status signal is transmitted:

- Failure (F): **FD_FAIL_MAP** parameter
- Function check (C): **FD_CHECK_MAP** parameter
- Out of specification (S): **FD_OFFSPEC_MAP** parameter
- Maintenance required (M): **FD_MAINT_MAP** parameter

Structure and assignment of the parameters for the status signals (factory setting)

| Weighting | Allocation | Bit | FD_FAIL_MAP | FD_CHECK_MAP | FD_OFFSPEC_MAP | FD_MAINT_MAP |
|-----------|---------------|-----|-------------|--------------|----------------|--------------|
| Highest | Sensor | 31 | 1 | 0 | 0 | 0 |
| | Electronics | 30 | 1 | 0 | 0 | 0 |
| | Configuration | 29 | 1 | 0 | 0 | 0 |
| | Process | 28 | 1 | 0 | 0 | 0 |
| High | Sensor | 27 | 0 | 1 | 0 | 0 |
| | Electronics | 26 | 0 | 1 | 0 | 0 |
| | Configuration | 25 | 0 | 1 | 0 | 0 |
| | Process | 24 | 0 | 1 | 0 | 0 |
| Low | Sensor | 23 | 0 | 0 | 1 | 0 |
| | Electronics | 22 | 0 | 0 | 1 | 0 |
| | Configuration | 21 | 0 | 0 | 1 | 0 |
| | Process | 20 | 0 | 0 | 1 | 0 |
| Low | Sensor | 19 | 0 | 0 | 0 | 1 |
| | Electronics | 18 | 0 | 0 | 0 | 1 |
| | Configuration | 17 | 0 | 0 | 0 | 1 |
| | Process | 16 | 0 | 0 | 0 | 1 |

| Weighting | Allocation | Bit | FD_FAIL_MAP | FD_CHECK_MAP | FD_OFFSPEC_MAP | FD_MAINT_MAP |
|--------------------------------|------------|---------|-------------|--------------|----------------|--------------|
| Configurable range → 136 | | 15 to 1 | 0 | 0 | 0 | 0 |
| Reserved (Fieldbus Foundation) | | 0 | 0 | 0 | 0 | 0 |

Changing the status signal for a range of diagnostic information

Example: The status signal for the diagnostic information for electronics with the "Highest" weighting is to be changed from failure (F) to function check (C).


1. Set the Resource Block to the **OOS** block mode.
2. Open the **FD_FAIL_MAP** parameter in the Resource Block.
3. Change **Bit 30** to **0** in the parameter.
4. Open the **FD_CHECK_MAP** parameter in the Resource Block.
5. Change **Bit 26** to **1** in the parameter.
 - ↳ If a diagnostic event occurs for electronics with the "Highest weighting", the diagnostic information to this effect is displayed with the function check (C) status signal.
6. Set the Resource Block to the **AUTO** block mode.

NOTICE

No status signal is assigned to an area of diagnostic information.

If a diagnostic event occurs in this area, no status signal is transmitted to the control system.

- ▶ If you are changing the parameters, make sure that a status signal is assigned to all areas.

 If FieldCare is used, the status signal is enabled and disabled using the check box of the particular parameter.

Assigning diagnostic information individually to a status signal

Some diagnostic information can be individually assigned to a status signal, irrespective of their original range.

Assigning diagnostic information individually to a status signal via FieldCare.

1. In the FieldCare navigation window: **Expert** → **Communication** → **Field diagnostics** → **Alarm detection enable**
2. Select the desired diagnostic information from one of the fields **Configurable Area Bits 1** to **Configurable Area Bits 15**.
3. Press Enter to confirm.
4. When selecting the desired status signal (e.g. Offspec Map), also select the **Configurable Area Bit 1** to **Configurable Area Bit 15** that was assigned previously to the diagnostic information (step 2).
5. Press Enter to confirm.
 - ↳ The diagnostic event of the selected diagnostic information is recorded.
6. In the FieldCare navigation window: **Expert** → **Communication** → **Field diagnostics** → **Alarm broadcast enable**
7. Select the desired diagnostic information from one of the fields **Configurable Area Bits 1** to **Configurable Area Bits 15**.
8. Press Enter to confirm.

9. When selecting the desired status signal (e.g. Offspec Map), also select the **Configurable Area Bit 1** to **Configurable Area Bit 15** that was assigned previously to the diagnostic information (step 7).

10. Press Enter to confirm.
 ↳ The selected diagnostic information is transmitted over the bus when a diagnostic event to this effect occurs.

i A change in the status signal does not affect diagnostic information that already exists. The new status signal is only assigned if this error occurs again after the status signal has changed.

Transmitting the diagnostic information over the bus

Prioritizing diagnostic information for transmission over the bus

Diagnostic information is only transmitted over the bus if its priority is between 2 and 15. Priority 1-events are displayed but are not transmitted over the bus. Diagnostic information with priority 0 (factory setting) is ignored.

It is possible to change the priority individually for the different status signals. The following parameters of the Resource Block are used for this purpose:

- FD_FAIL_PRI
- FD_CHECK_PRI
- FD_OFFSPEC_PRI
- FD_MAINT_PRI

Suppressing certain diagnostic information

It is possible to suppress certain events during transmission over the bus using a mask. While these events are displayed they are not transmitted over the bus. This mask is in FieldCare **Expert** → **Communication** → **Field diagnostics** → **Alarm broadcast enable**. The mask is a negative selection mask, i.e. if a field is selected the associated diagnostic information is not transmitted over the bus.

12.7 Overview of diagnostic information

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

i In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Change the diagnostic information → 133

12.7.1 Diagnostic of sensor

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|--|---|--------------|
| No. | Short text | | | |
| 043 | Sensor short circuit | 1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ²⁾ | | | |
| | S | | | |
| | Diagnostic behavior [from the factory] ³⁾ | | | |
| | Warning | | | |

1) Quality can be changed. This causes the overall status of the measured variable to change.
 2) Status signal can be changed.
 3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|----------------|
| No. | Short text | | | |
| 082 | Data storage | 1. Check module connections 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Sensor failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|----------------|
| No. | Short text | | | |
| 083 | Memory content | 1. Restart device 2. Restore HistoROM S-DAT backup ('Device reset' parameter) 3. Replace HistoROM S-DAT | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Sensor failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---------------------------------------|--|----------------|
| No. | Short text | | | |
| 170 | Coil resistance | Check ambient and process temperature | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Sensor failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|--|----------------|
| No. | Short text | | | |
| 180 | Temperature sensor defective | 1. Check sensor connections 2. Replace sensor cable or sensor 3. Turn off temperature measurement | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Sensor failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|---|----------------|--|
| No. | Short text | | | | |
| 181 | Sensor connection | 1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Sensor failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

12.7.2 Diagnostic of electronic

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 201 | Device failure | 1. Restart device 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 242 | Software incompatible | 1. Check software 2. Flash or change main electronics module | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 252 | Modules incompatible | 1. Check electronic modules 2. Change electronic modules | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 262 | Sensor electronic connection faulty | <ol style="list-style-type: none"> 1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics 2. Check or replace ISEM or main electronics | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|-------------------------------|---|----------------|--|
| No. | Short text | | | | |
| 270 | Main electronic failure | Change main electronic module | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 271 | Main electronic failure | <ol style="list-style-type: none"> 1. Restart device 2. Change main electronic module | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 272 | Main electronic failure | <ol style="list-style-type: none"> 1. Restart device 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---------------------|---|----------------|--|
| No. | Short text | | | | |
| 273 | Main electronic failure | Change electronic | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---------------------|---|----------------|--|
| No. | Short text | | | | |
| 275 | I/O module 1 to n defective | Change I/O module | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 276 | I/O module 1 to n faulty | <ol style="list-style-type: none"> 1. Restart device 2. Change I/O module | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 283 | Memory content | <ol style="list-style-type: none"> 1. Reset device 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|--|---|--------------|
| No. | Short text | | | |
| 302 | Device verification active | Device verification active, please wait. | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | C |
| Diagnostic behavior [from the factory] ³⁾ | Warning | | | |

1) Quality can be changed. This causes the overall status of the measured variable to change.

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|--|---|----------------|
| No. | Short text | | | |
| 311 | Electronic failure | <ol style="list-style-type: none"> 1. Do not reset device 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Device failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | M |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|--|---|----------------|
| No. | Short text | | | |
| 332 | Writing in embedded HistoROM failed | Replace user interface board Ex d/XP: replace transmitter | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Device failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|----------------|
| No. | Short text | | | |
| 361 | I/O module 1 to n faulty | <ol style="list-style-type: none"> 1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Device failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|---|----------------|--|
| No. | Short text | | | | |
| 372 | Sensor electronic (ISEM) faulty | 1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM) | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|---|----------------|--|
| No. | Short text | | | | |
| 373 | Sensor electronic (ISEM) faulty | 1. Transfer data or reset device 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|---|----------------|--|
| No. | Short text | | | | |
| 375 | I/O- 1 to n communication failed | 1. Restart device 2. Check if failure recurs 3. Replace module rack inclusive electronic modules | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Device failure | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|---|--------------|--|
| No. | Short text | | | | |
| 376 | Sensor electronic (ISEM) faulty | 1. Replace sensor electronic module (ISEM) 2. Turn off diagnostic message | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status [from the factory] ¹⁾ | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ²⁾ | | | F | |
| | Diagnostic behavior [from the factory] ³⁾ | | | Warning | |

1) Quality can be changed. This causes the overall status of the measured variable to change.

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|--|--|--------------|
| No. | Short text | | | |
| 377 | Sensor electronic (ISEM) faulty | <ol style="list-style-type: none"> 1. Check sensor cable and sensor 2. Perform Heartbeat Verification 3. Replace sensor cable or sensor | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | F |
| Diagnostic behavior [from the factory] ³⁾ | Warning | | | |

1) Quality can be changed. This causes the overall status of the measured variable to change.

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|--|----------------|
| No. | Short text | | | |
| 382 | Data storage | <ol style="list-style-type: none"> 1. Insert T-DAT 2. Replace T-DAT | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Device failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|----------------|
| No. | Short text | | | |
| 383 | Memory content | <ol style="list-style-type: none"> 1. Restart device 2. Delete T-DAT via 'Reset device' parameter 3. Replace T-DAT | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Device failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|------------------------------|---|----------------|
| No. | Short text | | | |
| 387 | Embedded HistoROM failed | Contact service organization | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Device failure |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|--------------|
| No. | Short text | | | |
| 512 | Sensor electronic (ISEM) faulty | 1. Check ECC recovery time 2. Turn off ECC | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Uncertain |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ¹⁾ | | | F |
| | Diagnostic behavior | | | Alarm |

1) Status signal can be changed.

12.7.3 Diagnostic of configuration

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|-------------------------------|--------------|
| No. | Short text | | | |
| 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 | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ¹⁾ | | | M |
| | Diagnostic behavior | | | Warning |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|---------------------|
| No. | Short text | | | |
| 330 | Flash file invalid | 1. Update firmware of device 2. Restart device | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Configuration error |
| | Status signal [from the factory] ¹⁾ | | | M |
| | Diagnostic behavior | | | Warning |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|---------------------|
| No. | Short text | | | |
| 331 | Firmware update failed | 1. Update firmware of device 2. Restart device | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Configuration error |
| | Status signal [from the factory] ¹⁾ | | | F |
| | Diagnostic behavior | | | Warning |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|---------------------|
| No. | Short text | | | |
| 410 | Data transfer | 1. Check connection 2. Retry data transfer | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Configuration error |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|------------------------------|---|---------------------|
| No. | Short text | | | |
| 412 | Processing download | Download active, please wait | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Configuration error |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 431 | Trim 1 to n | Carry out trim | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|---|---------------------|
| No. | Short text | | | |
| 437 | Configuration incompatible | 1. Restart device 2. Contact service | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status | | | |
| | Quality | | | Bad |
| | Quality substatus | | | Configuration error |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|---|--------------|--|
| No. | Short text | | | | |
| 438 | Dataset | 1. Check data set file 2. Check device configuration 3. Up- and download new configuration | <ul style="list-style-type: none"> ■ Density option ■ Empty pipe detection option ■ Low flow cut off option ■ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Uncertain | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | M | |
| | Diagnostic behavior | | | Warning | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 441 | Current output 1 to n | 1. Check process 2. Check current output settings | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | S | |
| | Diagnostic behavior [from the factory] ²⁾ | | | Warning | |

1) Status signal can be changed.

2) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 442 | Frequency output 1 to n | 1. Check process 2. Check frequency output settings | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | S | |
| | Diagnostic behavior [from the factory] ²⁾ | | | Warning | |

1) Status signal can be changed.

2) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 443 | Pulse output 1 to n | 1. Check process 2. Check pulse output settings | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | S | |
| | Diagnostic behavior [from the factory] ²⁾ | | | Warning | |

1) Status signal can be changed.

2) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 444 | Current input 1 to n | 1. Check process 2. Check current input settings | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | S | |
| | Diagnostic behavior [from the factory] ²⁾ | | | Warning | |

1) Status signal can be changed.

2) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--------------------------|---|--------------|--|
| No. | Short text | | | | |
| 453 | Flow override | Deactivate flow override | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | C | |
| | Diagnostic behavior | | | Warning | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|---|---------------------|--|
| No. | Short text | | | | |
| 463 | Analog input 1 to n selection invalid | 1. Check module/channel configuration 2. Check I/O module configuration | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Configuration error | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|-----------------------|---|---------------------|--|
| No. | Short text | | | | |
| 484 | Failure mode simulation | Deactivate simulation | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Configuration error | |
| | Status signal [from the factory] ¹⁾ | | | C | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|-----------------------|---|--------------|--|
| No. | Short text | | | | |
| 485 | Measured variable simulation | Deactivate simulation | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | C | |
| | Diagnostic behavior | | | Warning | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|-----------------------|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 486 | Current input 1 to n simulation | Deactivate simulation | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | C | |
| | Diagnostic behavior | | | Warning | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|-----------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 491 | Current output 1 to n simulation | Deactivate simulation | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|--|-------------------------------|--------------|
| No. | Short text | | | |
| 492 | Simulation frequency output 1 to n | Deactivate simulation frequency output | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|------------------------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 493 | Simulation pulse output 1 to n | Deactivate simulation pulse output | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|-------------------------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 494 | Switch output simulation 1 to n | Deactivate simulation switch output | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|-----------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 495 | Diagnostic event simulation | Deactivate simulation | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ¹⁾ C | | | |
| | Diagnostic behavior | | | Warning |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|------------------------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 496 | Status input simulation | Deactivate simulation status input | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ¹⁾ C | | | |
| | Diagnostic behavior | | | Warning |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|-----------------------|-------------------------------|--------------|
| No. | Short text | | | |
| 497 | Simulation block output | Deactivate simulation | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ¹⁾ C | | | |
| | Diagnostic behavior | | | Warning |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|--|-------------------------------|--------------|
| No. | Short text | | | |
| 511 | Sensor electronic (ISEM) faulty | 1. Check measuring period and integration time 2. Check sensor properties | - | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | Status signal [from the factory] ¹⁾ C | | | |
| | Diagnostic behavior | | | Alarm |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---|-------------------------------|--------------|
| No. | Short text | | | |
| 520 | I/O 1 to n hardware configuration invalid | <ol style="list-style-type: none"> 1. Check I/O hardware configuration 2. Replace wrong I/O module 3. Plug the module of double pulse output on correct slot | – | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Alarm | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|---------------------|--|--------------|
| No. | Short text | | | |
| 530 | Electrode cleaning is running | Turn off ECC | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | C |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|------------------------|--|--------------|
| No. | Short text | | | |
| 531 | Empty pipe detection | Execute EPD adjustment | <ul style="list-style-type: none"> ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | S |
| Diagnostic behavior [from the factory] ³⁾ | Warning | | | |

1) Quality can be changed. This causes the overall status of the measured variable to change.

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|------------------------|--|--|-------------------------------|--------------|
| No. | Short text | | | |
| 537 | Configuration | <ol style="list-style-type: none"> 1. Check IP addresses in network 2. Change IP address | – | |
| | Measured variable status | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ¹⁾ | | | F |
| Diagnostic behavior | Warning | | | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|-------------------------------------|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 594 | Relay output simulation | Deactivate simulation switch output | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | C | |
| | Diagnostic behavior | | | Warning | |

1) Status signal can be changed.

12.7.4 Diagnostic of process

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 803 | Current loop 1 to n | 1. Check wiring 2. Change I/O module | - | | |
| | Measured variable status | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|----------------------------|---|--------------|--|
| No. | Short text | | | | |
| 832 | Electronic temperature too high | Reduce ambient temperature | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | | |
| | Measured variable status [from the factory] ¹⁾ | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ²⁾ | | | S | |
| | Diagnostic behavior [from the factory] ³⁾ | | | Warning | |

1) Quality can be changed. This causes the overall status of the measured variable to change.

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|------------------------------|---|--------------|
| No. | Short text | | | |
| 833 | Electronic temperature too low | Increase ambient temperature | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option ▪ Switch output status option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | S |
| Diagnostic behavior [from the factory] ³⁾ | Warning | | | |

- 1) Quality can be changed. This causes the overall status of the measured variable to change.
 2) Status signal can be changed.
 3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|----------------------------|--|--------------|
| No. | Short text | | | |
| 834 | Process temperature too high | Reduce process temperature | <ul style="list-style-type: none"> ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | S |
| Diagnostic behavior [from the factory] ³⁾ | Warning | | | |

- 1) Quality can be changed. This causes the overall status of the measured variable to change.
 2) Status signal can be changed.
 3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|------------------------------|--|--------------|
| No. | Short text | | | |
| 835 | Process temperature too low | Increase process temperature | <ul style="list-style-type: none"> ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | S |
| Diagnostic behavior [from the factory] ³⁾ | Warning | | | |

- 1) Quality can be changed. This causes the overall status of the measured variable to change.
 2) Status signal can be changed.
 3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|---|-------------------------------|--------------|--|
| No. | Short text | | | | |
| 842 | Process limit | Low flow cut off active! 1. Check low flow cut off configuration | - | | |
| | Measured variable status | | | | |
| | Quality | | | Uncertain | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | S | |
| | Diagnostic behavior | | | Warning | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|--|--------------|--|
| No. | Short text | | | | |
| 882 | Input signal | 1. Check input configuration 2. Check external device or process conditions | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | | |
| | Measured variable status | | | | |
| | Quality | | | Bad | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ¹⁾ | | | F | |
| | Diagnostic behavior | | | Alarm | |

1) Status signal can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | | |
|------------------------|--|--|--|--------------|--|
| No. | Short text | | | | |
| 937 | EMC interference | 1. Eliminate external magnetic field near sensor 2. Turn off diagnostic message | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | | |
| | Measured variable status [from the factory] ¹⁾ | | | | |
| | Quality | | | Good | |
| | Quality substatus | | | Non specific | |
| | Status signal [from the factory] ²⁾ | | | S | |
| | Diagnostic behavior [from the factory] ³⁾ | | | Warning | |

1) Quality can be changed. This causes the overall status of the measured variable to change.

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|---|---|--------------|
| No. | Short text | | | |
| 938 | EMC interference | 1. Check ambient conditions regarding EMC influence 2. Turn off diagnostic message | <ul style="list-style-type: none"> ▪ Density option ▪ Empty pipe detection option ▪ Low flow cut off option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | F |
| Diagnostic behavior [from the factory] ³⁾ | | Alarm | | |






- 1) Quality can be changed. This causes the overall status of the measured variable to change.
 2) Status signal can be changed.
 3) Diagnostic behavior can be changed.



| Diagnostic information | | Remedy instructions | Influenced measured variables | |
|--|--|---|-------------------------------|--------------|
| No. | Short text | | | |
| 962 | Empty pipe | 1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection | Low flow cut off option | |
| | Measured variable status [from the factory] ¹⁾ | | | |
| | Quality | | | Good |
| | Quality substatus | | | Non specific |
| | | | | |
| | Status signal [from the factory] ²⁾ | | | S |
| Diagnostic behavior [from the factory] ³⁾ | | Warning | | |

- 1) Quality can be changed. This causes the overall status of the measured variable to change.
 2) Status signal can be changed.
 3) Diagnostic behavior can be changed.

12.8 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 →  130
 - Via web browser →  131
 - Via "FieldCare" operating tool →  132
 - Via "DeviceCare" operating tool →  132

-  Other pending diagnostic events can be displayed in the **Diagnostic list** submenu →  157.


Navigation

"Diagnostics" menu

| | |
|--|---|
|  Diagnostics | |
| Actual diagnostics | →  157 |
| Previous diagnostics | →  157 |

| | |
|-----------------------------|---|
| Operating time from restart | →  157 |
| Operating time | →  157 |

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) |

12.9 Diagnostic messages in the DIAGNOSTIC Transducer Block

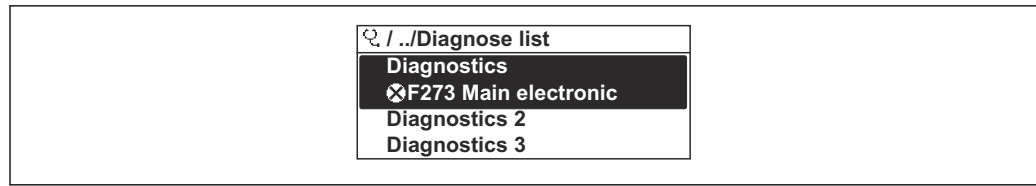
- The **Actual diagnostics** parameter (**actual diagnostics**) displays the message with the highest priority.
- A list of the active alarms can be viewed via the **Diagnostics 1** parameter (**diagnostics_1**) to Diagnostics 5 (**diagnostics 5**). If more than 5 messages are pending, the messages with the highest priority are shown on the display.
- You can view the last alarm that is no longer active via the **Previous diagnostics** parameter (**previous_diagnostics**).

12.10 Diagnostics list

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

Navigation path

Diagnostics → Diagnostic list



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28 Using the example of the local display

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

- Via local display → 130
- Via web browser → 131
- Via "FieldCare" operating tool → 132
- Via "DeviceCare" operating tool → 132

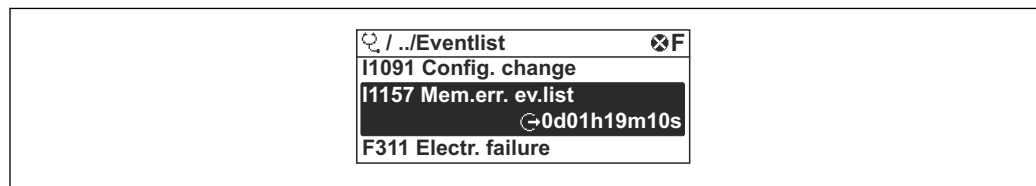
12.11 Event logbook

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 → Events list



A0014006-EN

29 Using 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 → 159

In addition to the operating time when the event occurred, each event is also assigned a symbol that indicates whether the event has occurred or is finished:

- Diagnostics event
 - ☺: Occurrence of the event
 - ☹: End of the event
- Information event
 - ☺: Occurrence of the event

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

- Via local display → 130
- Via web browser → 131
- Via "FieldCare" operating tool → 132
- Via "DeviceCare" operating tool → 132

i For filtering the displayed event messages → 159

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 | Embedded HistoROM 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 verific. failed |
| I1512 | Download started |

| Info number | Info name |
|-------------|---|
| I1513 | Download finished |
| I1514 | Upload started |
| I1515 | Upload finished |
| I1618 | I/O module replaced |
| I1619 | I/O module replaced |
| I1621 | I/O module 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 | Parameter factory reset |
| I1635 | Parameter delivery reset |
| I1637 | FOUNDATION Fieldbus specific reset done |
| I1639 | Max. switch cycles number reached |
| I1649 | Hardware write protection activated |
| I1650 | Hardware write protection deactivated |
| I1712 | New flash file received |
| I1725 | Sensor electronic module (ISEM) changed |
| I1726 | Configuration backup failed |

12.12 Resetting the measuring instrument

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

12.12.1 Function range of "Restart" parameter

| Options | Description |
|----------------------|---|
| Uninitialized | The selection has no effect on the device. |
| Run | The selection has no effect on the device. |
| Resource | The selection has no effect on the device. |
| Defaults | All FOUNDATION Fieldbus blocks are reset to their factory settings. Example: Analog Input Channel to the Uninitialized option. |
| Processor | The device is restarted. |
| To delivery settings | Advanced FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information) and device parameters for which a customer-specific default setting was ordered are reset to this customer-specific value. |

12.12.2 Function range of "Service reset" parameter

| Options | Description |
|----------------------------|---|
| Uninitialized | The selection has no effect on the device. |
| To delivery settings + MIB | Advanced FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information, device tag and device address) and the device parameters for which a customer-specific default setting was ordered, are reset to this customer-specific value. |
| ENP restart | The parameters of the electronic name plate are reset. The device is restarted. |

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 | → ⓘ 161 |
| Serial number | → ⓘ 161 |
| Device name | → ⓘ 161 |
| Firmware version | → ⓘ 162 |
| Order code | → ⓘ 162 |
| Extended order code 1 | → ⓘ 162 |
| Extended order code 2 | → ⓘ 162 |
| ENP version | → ⓘ 162 |


Parameter overview with brief description


| Parameter | Description | User entry / User interface | Factory setting |
|---------------|--|---|-----------------|
| Device tag | Enter the name for the measuring point. | Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /) | – |
| Serial number | Displays the serial number of the measuring device. | Max. 11-digit character string comprising letters and numbers. | – |
| Device name | Shows the name of the transmitter. The name can be found on the nameplate of the transmitter. | Promag 300/500 | – |


| Parameter | Description | User entry / User interface | Factory setting |
|-----------------------|--|---|-----------------|
| Firmware version | Shows the device firmware version installed. | Character string with the following format: xx.yy.zz | – |
| 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 | – |
| 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 | – |
| 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 | – |
| ENP version | Shows the version of the electronic nameplate (ENP). | Character string in the format xx.yy.zz | – |

12.14 Firmware history

| Release date | Firmware version | Order code for "Firmware version" | Firmware Changes | Documentation type | Documentation |
|--------------|------------------|-----------------------------------|-------------------|------------------------|----------------------|
| 02.2017 | 01.00.zz | Option 72 | Original firmware | Operating Instructions | BA01477D/06/EN/01.16 |

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

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

 The manufacturer's information is available:

- In the Download Area of the Endress+Hauser web site: www.endress.com → Downloads
- Specify the following details:
 - Product root: e.g. 5H3B
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 work

No special maintenance work is required.

13.1.1 Exterior cleaning

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

13.1.2 Interior cleaning


Cleaning with pigs

It is essential to take the internal diameters of the measuring tube and process connection into account when cleaning with pigs. All the dimensions and lengths of the sensor and transmitter are provided in the separate "Technical Information" document.

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) →  197

13.2 Measuring and test equipment


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

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

List of some of the measuring and testing equipment: →  168

13.3 Endress+Hauser services

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

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

14 Repair

14.1 General notes

14.1.1 Repair and conversion concept

The Endress+Hauser repair and conversion concept provides for the following:

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

14.1.2 Notes for repair and conversion


For repair and conversion of a measuring device, observe the following notes:

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

14.2 Spare parts


Device Viewer (www.endress.com/deviceviewer):

All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

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

14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

14.4 Return

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

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

14.5 Disposal



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

14.5.1 Removing the measuring device

1. Switch off the device.

WARNING

Danger to persons from process conditions!

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

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

14.5.2 Disposing of the measuring device

WARNING

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

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

Observe the following notes during disposal:












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

15 Accessories


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

15.1 Device-specific accessories





15.1.1 For the transmitter

| Accessories | Description |
|--|--|
| Proline 300 transmitter | <p>Transmitter for replacement or storage. Use the order code to define the following specifications:</p> <ul style="list-style-type: none"> ▪ Approvals ▪ Output ▪ Input ▪ Display/operation ▪ Housing ▪ Software <p> Order code: 5X3BXX</p> <p> Installation Instructions EA01199D</p> |
| Remote display and operating module DKX001 | <ul style="list-style-type: none"> ▪ If ordered directly with the measuring device: Order code for "Display; operation", option O "Remote display 4-line, illuminated; 10 m (30 ft) cable; touch control" ▪ If ordered separately: <ul style="list-style-type: none"> ▪ Measuring device: order code for "Display; operation", option M "W/o, prepared for remote display" ▪ DKX001: Via the separate product structure DKX001 ▪ If ordered subsequently: DKX001: Via the separate product structure DKX001 <p>Mounting bracket for DKX001</p> <ul style="list-style-type: none"> ▪ If ordered directly: order code for "Accessory enclosed", option RA "Mounting bracket, pipe 1/2" ▪ If ordered subsequently: order number: 71340960 <p>Connecting cable (replacement cable) Via the separate product structure: DKX002</p> <p> Further information on display and operating module DKX001 →  189.</p> <p> Special Documentation SD01763D</p> |
| External WLAN antenna | <p>External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area".</p> <p> <ul style="list-style-type: none"> ▪ The external WLAN antenna is not suitable for use in hygienic applications. ▪ Additional information regarding the WLAN interface →  65. </p> <p> Order number: 71351317</p> <p> Installation Instructions EA01238D</p> |
| Weather protection 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> Installation Instructions EA01160D</p> |



15.1.2 For the sensor

| Accessories | Description |
|-------------------|--|
| Adapter set | Adapter connections for installing a Promag H instead of a Promag 30/33 A or Promag 30/33 H (DN 25). Consists of: <ul style="list-style-type: none"> ▪ 2 process connections ▪ Screws ▪ Seals |
| Seal set | For the regular replacement of seals for the sensor. |
| Spacer | If replacing a DN 80/100 sensor in an existing installation, a spacer is needed if the new sensor is shorter. |
| Welding jig | Welding socket as process connection: welding jig for installation in pipe. |
| Grounding rings | Are used to ground the medium in lined measuring tubes to ensure proper measurement.  Grounding rings can be ordered via the device order structure or configured and ordered as an accessory via the DK5HR order structure. |
| Mounting kit | Consists of: <ul style="list-style-type: none"> ▪ 2 process connections ▪ Screws ▪ Seals |
| Wall mounting kit | Wall mounting kit for measuring device (only DN 2 to 25 (1/12 to 1")) |



15.2 Communication-specific accessories

| Accessories | Description |
|-------------------|---|
| Fieldgate FXA42 | Transmission of the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices  <ul style="list-style-type: none"> ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42 |
| Field Xpert SMT50 | The Field Xpert SMT50 table PC for device configuration enables mobile plant asset management. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.  <ul style="list-style-type: none"> ▪ Technical Information TI01555S ▪ Operating Instructions BA02053S ▪ Product page: www.endress.com/smt50 |
| Field Xpert SMT70 | The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.  <ul style="list-style-type: none"> ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt70 |
| Field Xpert SMT77 | The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.  <ul style="list-style-type: none"> ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77 |

15.3 Service-specific accessories

| Accessories | Description |
|-------------|--|
| Applicator | <p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> ▪ Choice of measuring devices for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. ▪ Graphic illustration of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. <p>Applicator is available:</p> <ul style="list-style-type: none"> ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ As a downloadable DVD for local PC installation. |
| Netilion | <p>IIoT ecosystem: Unlock knowledge</p> <p>Endress+Hauser's Netilion IIoT ecosystem enables you to optimize your plant performance, digitize workflows, share knowledge and improve collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem that enables you to gain useful insights from data. This knowledge can be used to optimize processes, leading to higher plant availability, efficiency and reliability, and ultimately to a more profitable plant.</p> <p>www.netilion.endress.com</p> |
| FieldCare | <p>FDT-based plant asset management tool from Endress+Hauser. 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> Operating Instructions BA00027S and BA00059S</p> |
| DeviceCare | <p>Tool to connect and configure Endress+Hauser field devices.</p> <p> Innovation brochure IN01047S</p> |

15.4 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> <ul style="list-style-type: none"> ▪ Technical Information TI00133R ▪ Operating Instructions BA00247R </p> |
| iTEMP | <p>The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.</p> <p> "Fields of Activity" document FA00006T</p> |

16 Technical data

16.1 Application


The measuring device is intended only for the 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 *Faraday's law of magnetic induction*.

Measuring system 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.
For information on the structure of the measuring instrument →  13

16.3 Input

Measured variable **Direct measured variables**

- Volume flow (proportional to induced voltage)
- Temperature ²⁾
- Electrical conductivity

Calculated measured variables

- Mass flow
- Corrected volume flow
- Corrected electrical conductivity ²⁾

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

Flow characteristic values in SI units: DN 2 to 125 ($1/12$ to $5''$)

| Nominal diameter | | Recommended flow min./max. full scale value ($v \sim 0.3/10$ m/s) [dm ³ /min] | Factory settings | | |
|------------------|--------|--|--|--|--|
| [mm] | [in] | | Full scale value current output ($v \sim 2.5$ m/s) [dm ³ /min] | Pulse value (~ 2 pulse/s) [dm ³] | Low flow cut off ($v \sim 0.04$ m/s) [dm ³ /min] |
| 2 | $1/12$ | 0.06 to 1.8 | 0.5 | 0.005 | 0.01 |
| 4 | $5/32$ | 0.25 to 7 | 2 | 0.025 | 0.05 |

2) Available only for nominal diameters DN 15 to 150 ($1/2$ to $6''$) and with the order code for "Sensor option", option CI "Medium temperature measurement".

| Nominal diameter | | Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) [dm ³ /min] | Factory settings | | |
|------------------|-------|--|--|--|--|
| [mm] | [in] | | Full scale value current output (v ~ 2.5 m/s) [dm ³ /min] | Pulse value (~ 2 pulse/s) [dm ³] | Low flow cut off (v ~ 0.04 m/s) [dm ³ /min] |
| 8 | 5/16 | 1 to 30 | 8 | 0.1 | 0.1 |
| 15 | 1/2 | 4 to 100 | 25 | 0.2 | 0.5 |
| 25 ¹⁾ | 1 | 9 to 300 | 75 | 0.5 | 1 |
| 40 | 1 1/2 | 25 to 700 | 200 | 1.5 | 3 |
| 50 | 2 | 35 to 1 100 | 300 | 2.5 | 5 |
| 65 | - | 60 to 2 000 | 500 | 5 | 8 |
| 80 | 3 | 90 to 3 000 | 750 | 5 | 12 |
| 100 | 4 | 145 to 4 700 | 1200 | 10 | 20 |
| 125 | 5 | 220 to 7 500 | 1850 | 15 | 30 |

1) The values apply for the product version: 5HxB26

Flow characteristic values in SI units: DN 150 (6")

| Nominal diameter | | Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) [m ³ /h] | Factory settings | | |
|------------------|------|---|---|---|---|
| [mm] | [in] | | Full scale value current output (v ~ 2.5 m/s) [m ³ /h] | Pulse value (~ 2 pulse/s) [m ³] | Low flow cut off (v ~ 0.04 m/s) [m ³ /h] |
| 150 | 6 | 20 to 600 | 150 | 0.03 | 2.5 |



Flow characteristic values in US units: 1/12 - 6" (DN 2 - 150)


| Nominal diameter | | Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) [gal/min] | Full scale value current output (v ~ 2.5 m/s) [gal/min] | Pulse value (~ 2 pulse/s) [gal] | Low flow cut off (v ~ 0.04 m/s) [gal/min] |
|------------------|------|---|---|---------------------------------------|---|
| [in] | [mm] | | | | |
| 1/12 | 2 | 0.015 to 0.5 | 0.1 | 0.001 | 0.002 |
| 1/32 | 4 | 0.07 to 2 | 0.5 | 0.005 | 0.008 |
| 5/16 | 8 | 0.25 to 8 | 2 | 0.02 | 0.025 |
| 1/2 | 15 | 1 to 27 | 6 | 0.05 | 0.1 |
| 1 ¹⁾ | 25 | 2.5 to 80 | 18 | 0.2 | 0.25 |
| 1 1/2 | 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 1250 | 300 | 2 | 4 |

| Nominal diameter | | Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) [gal/min] | Factory settings | | |
|------------------|------|---|---|---|--|
| [in] | [mm] | | Full scale value current output (v ~ 2.5 m/s) [gal/min] | Pulse value (~ 2 pulse/s) [gal] | Low flow cut off (v ~ 0.04 m/s)) [gal/min] |
| 5 | 125 | 60 to 1950 | 450 | 5 | 7 |
| 6 | 150 | 90 to 2650 | 600 | 5 | 12 |

1) The values apply for the product version: 5HxB26


Recommended measuring range

 Flow limit →  184

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

Operable flow range

Over 1000 : 1



 For custody transfer, the operable flow range is 100 : 1 to 630 : 1, depending on the nominal diameter. Further details are specified by the applicable approval.

Input signal

External measured values

To increase the measurement accuracy of certain measured variables or to calculate the mass flow, the automation system can continuously write different measured values to the measuring instrument:

- Medium temperature enables temperature-compensated conductivity measurement (e.g. iTEMP)
- Reference density for calculating the mass flow

 Various pressure and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section →  168

It is recommended to read in external measured values to calculate the corrected volume flow.

Current input

The measured values are written from the automation system to the measuring device via the current input →  171.

Digital communication

The measured values are written by the automation system via FOUNDATION fieldbus.

Current input 0/4 to 20 mA

| | |
|-----------------------|---|
| Current input | 0/4 to 20 mA (active/passive) |
| Current span | <ul style="list-style-type: none"> ■ 4 to 20 mA (active) ■ 0/4 to 20 mA (passive) |
| Resolution | 1 µA |
| Voltage drop | Typically: 0.6 to 2 V for 3.6 to 22 mA (passive) |
| Maximum input voltage | ≤ 30 V (passive) |

| | |
|---------------------------------|--|
| Open-circuit voltage | ≤ 28.8 V (active) |
| Possible input variables | <ul style="list-style-type: none"> ▪ Temperature ▪ Density |

Status input

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

16.4 Output

Output signal

FOUNDATION Fieldbus

| | |
|---------------------------------|---|
| FOUNDATION Fieldbus | H1, IEC 61158-2, galvanically isolated |
| Data transfer | 31.25 kbit/s |
| Current consumption | 10 mA |
| Permitted supply voltage | 9 to 32 V |
| Bus connection | With integrated reverse polarity protection |

Current output 4 to 20 mA


| | |
|--------------------------------------|--|
| Signal mode | Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive |
| Current range | Can be set to: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA ▪ 0 to 20 mA (only if the signal mode is active) ▪ Fixed current |
| Maximum output values | 22.5 mA |
| 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 | Configurable: 0 to 999.9 s |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronics temperature |

Current output 4 to 20 mA Ex i passive

| | |
|------------------------------|---|
| Order code | "Output; input 2" (21), "Output; input 3" (022): Option C: current output 4 to 20 mA Ex i passive |
| Signal mode | Passive |
| Current range | Can be set to: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA ▪ Fixed current |
| Maximum output values | 22.5 mA |
| Maximum input voltage | DC 30 V |
| Load | 0 to 700 Ω |
| Resolution | 0.38 μA |

| | |
|--------------------------------------|--|
| Damping | Configurable: 0 to 999 s |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronics temperature |

Pulse/frequency/switch output

| | |
|--------------------------------------|--|
| Function | Can be configured as pulse, frequency or switch output |
| Version | Open collector Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive ▪ Passive NAMUR  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 |
| Pulse output | |
| 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 | Configurable: 0.05 to 2 000 ms |
| Maximum pulse rate | 10 000 Impulse/s |
| Pulse value | Configurable |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow |
| Frequency output | |
| 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 | Configurable: end value frequency 2 to 10 000 Hz ($f_{max} = 12\,500$ Hz) |
| Damping | Configurable: 0 to 999.9 s |
| Pulse/pause ratio | 1:1 |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronics temperature |
| Switch output | |
| 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 | Configurable: 0 to 100 s |
| Number of switching cycles | Unlimited |
| Assignable functions | <ul style="list-style-type: none"> ▪ Disable ▪ On ▪ Diagnostic behavior ▪ Limit value: <ul style="list-style-type: none"> ▪ Disable ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Totalizer 1-3 ▪ Temperature ▪ Electronics temperature ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> ▪ Empty pipe detection ▪ Buildup index ▪ HBSI limit value exceeded ▪ Low flow cut off |

Relay output

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

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

Signal on alarm

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

FOUNDATION Fieldbus

| | |
|---|---------------------------------------|
| Status and alarm messages | Diagnostics in accordance with FF-891 |
| Failure current FDE (Fault Disconnection Electronic) | 0 mA |

Current output 0/4 to 20 mA

4 to 20 mA

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

0 to 20 mA

| | |
|---------------------|--|
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ Maximum alarm: 22 mA ■ Definable value between: 0 to 20.5 mA |
|---------------------|--|

Pulse/frequency/switch output

| | |
|-------------------------|--|
| Pulse output | |
| Fault mode | Choose from: <ul style="list-style-type: none"> ■ Actual value ■ No pulses |
| Frequency output | |
| Fault mode | Choose from: <ul style="list-style-type: none"> ■ Actual value ■ 0 Hz ■ Definable value between: 2 to 12 500 Hz |
| Switch output | |
| Fault mode | Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed |

Relay output

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

Local display

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

 Status signal as per NAMUR recommendation NE 107

Interface/protocol



- Via digital communication:
FOUNDATION Fieldbus
- Via service interface
 - CDI-RJ45 service interface
 - WLAN interface

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

Web browser

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

Light emitting diodes (LED)

| | |
|---------------------------|--|
| Status information | Status indicated by various light emitting diodes The following information is displayed depending on the device version: <ul style="list-style-type: none"> ■ Supply voltage active ■ Data transmission active ■ Device alarm/error has occurred  Diagnostic information via light emitting diodes →  127 |
|---------------------------|--|

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

Galvanic isolation The outputs are galvanically isolated:

- from the power supply
- from one another
- from the potential equalization (PE) terminal

protocol-specific data

| | |
|---|---|
| Manufacturer ID | 0x452B48 (hex) |
| Ident number | 0x103C (hex) |
| Device revision | 1 |
| DD revision | Information and files under: |
| CFF revision | <ul style="list-style-type: none"> ■ www.endress.com ■ www.fieldcommgroup.org |
| Interoperability Test Kit (ITK) | Version 6.2.0 |
| ITK Test Campaign Number | Information: <ul style="list-style-type: none"> ■ www.endress.com ■ www.fieldcommgroup.org |
| Link Master capability (LAS) | Yes |
| Choice of "Link Master" and "Basic Device" | Yes Factory setting: Basic Device |

| | |
|---|---|
| Node address | Factory setting: 247 (0xF7) |
| Supported functions | The following methods are supported: <ul style="list-style-type: none"> ▪ Restart ▪ ENP Restart ▪ Diagnostic ▪ Set to OOS ▪ Set to AUTO ▪ Read trend data ▪ Read event logbook |
| Virtual Communication Relationships (VCRs) | |
| Number of VCRs | 44 |
| Number of link objects in VFD | 50 |
| Permanent entries | 1 |
| Client VCRs | 0 |
| Server VCRs | 10 |
| Source VCRs | 43 |
| Sink VCRs | 0 |
| Subscriber VCRs | 43 |
| Publisher VCRs | 43 |
| Device Link Capabilities | |
| Slot time | 4 |
| Min. delay between PDU | 8 |
| Max. response delay | 16 |
| System integration | Information regarding system integration → 70. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Description of the modules ▪ Execution times ▪ Methods |

16.5 Power supply

Terminal assignment → 31






Available device plugs → 31

Available device plugs → 31

| Supply voltage | Order code "Power supply" | | Terminal voltage | Frequency range |
|----------------|---------------------------|------------|------------------|-----------------|
| | Option D | DC 24 V | ±20% | – |
| Option E | AC 100 to 240 V | –15...+10% | 50/60 Hz, ±4 Hz | |
| Option I | DC 24 V | ±20% | – | |
| | AC 100 to 240 V | –15...+10% | 50/60 Hz, ±4 Hz | |

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

| | |
|--------------------------|---|
| switch-on current | Max. 36 A (<5 ms) as per NAMUR Recommendation NE 21 |
|--------------------------|---|

| | | | | | | | | | |
|--|---|-----------------------------------|---|-----------------------------|-------------------------|--|---|---|--------------------------------------|
| Current consumption | Transmitter <ul style="list-style-type: none"> ■ Max. 400 mA (24 V) ■ Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz) | | | | | | | | |
| Power supply failure | <ul style="list-style-type: none"> ■ Totalizers stop at the last value measured. ■ Depending on the device version, the configuration is retained in the device memory or in the pluggable data memory (HistoROM DAT). ■ Error messages (incl. total operated hours) are stored. | | | | | | | | |
| Overcurrent protection element | The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own. <ul style="list-style-type: none"> ■ The circuit breaker must be easy to reach and labeled accordingly. ■ Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A. | | | | | | | | |
| Electrical connection | →  33 | | | | | | | | |
| Potential equalization | | | | | | | | | |
| Terminals | Spring-loaded terminals: Suitable for strands and strands with ferrules. Conductor cross-section 0.2 to 2.5 mm ² (24 to 12 AWG). | | | | | | | | |
| Cable entries | <ul style="list-style-type: none"> ■ Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in) ■ Thread for cable entry: <ul style="list-style-type: none"> ■ NPT ½" ■ G ½" ■ M20 ■ Device plug for digital communication: M12 | | | | | | | | |
| Cable specification | →  28 | | | | | | | | |
| Overvoltage protection | <table border="1"> <tr> <td>Mains voltage fluctuations</td> <td>→  178</td> </tr> <tr> <td>Overvoltage category</td> <td>Overvoltage category II</td> </tr> <tr> <td>Short-term, temporary overvoltage</td> <td>Between cable and ground up to 1200 V, for max. 5 s</td> </tr> <tr> <td>Long-term, temporary overvoltage</td> <td>Between cable and ground up to 500 V</td> </tr> </table> | Mains voltage fluctuations | →  178 | Overvoltage category | Overvoltage category II | Short-term, temporary overvoltage | Between cable and ground up to 1200 V, for max. 5 s | Long-term, temporary overvoltage | Between cable and ground up to 500 V |
| Mains voltage fluctuations | →  178 | | | | | | | | |
| Overvoltage category | Overvoltage category II | | | | | | | | |
| Short-term, temporary overvoltage | Between cable and ground up to 1200 V, for max. 5 s | | | | | | | | |
| Long-term, temporary overvoltage | Between cable and ground up to 500 V | | | | | | | | |


16.6 Performance characteristics

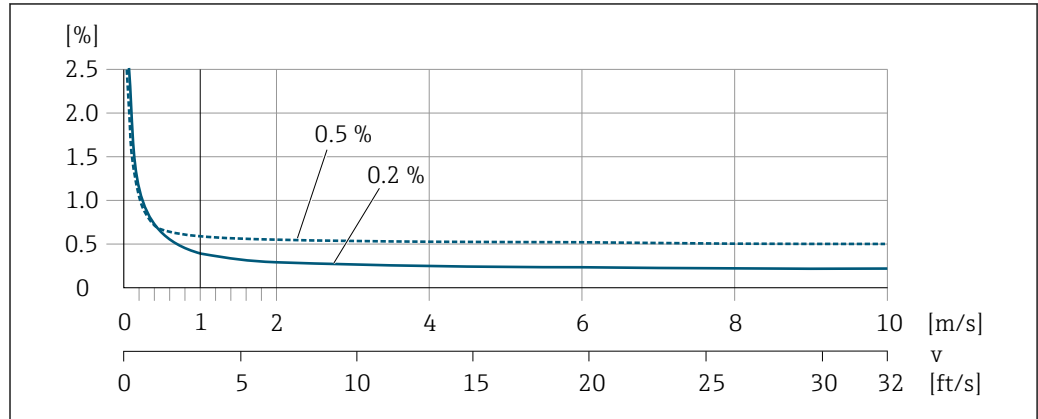
| | |
|--------------------------------|--|
| Reference operating conditions | <ul style="list-style-type: none"> ■ Error limits following DIN EN 29104, in future ISO 20456 ■ Water, typically: +15 to +45 °C (+59 to +113 °F); 0.5 to 7 bar (73 to 101 psi) ■ Data as indicated in the calibration protocol ■ Accuracy based on accredited calibration rigs according to ISO 17025 ■ Reference temperature for conductivity measurement: 25 °C (77 °F) |
| Maximum measurement error | o.r. = of reading |

Maximum permissible error under reference operating conditions


Volume flow

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

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



A0028974

 30 Maximum measured error in % o.r.

Temperature

±3 °C (±5.4 °F)

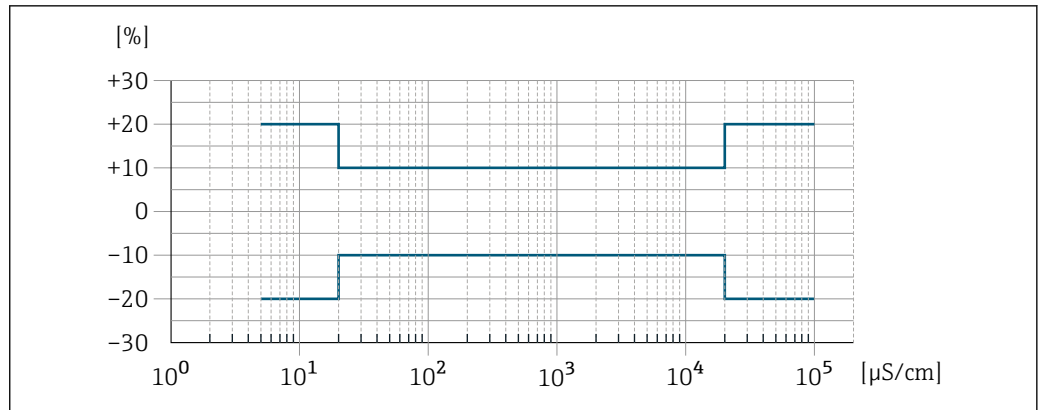
Electrical conductivity

The values apply for:

- Devices with stainless steel process connections
- Measurements at a reference temperature of 25 °C (77 °F). At different temperatures, attention must be paid to the temperature coefficient of the medium (typically 2.1 %/K)

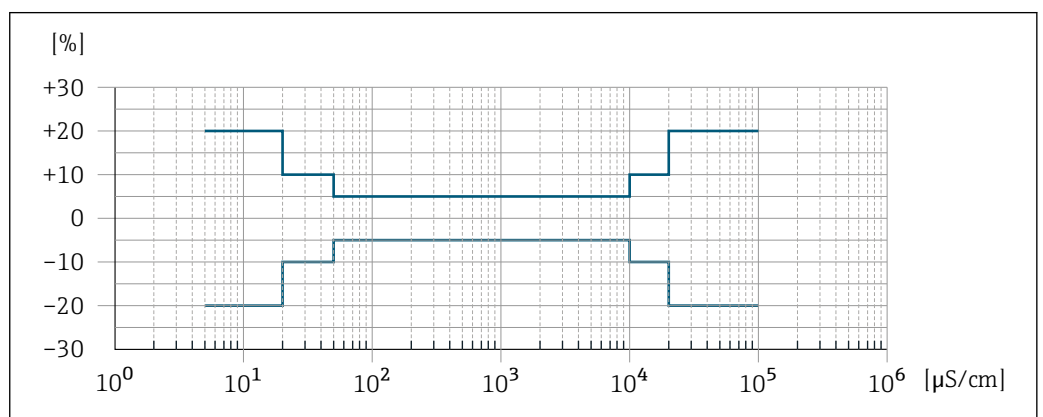
| Conductivity [μS/cm] | Nominal diameter | | Measurement error [%] of reading |
|-------------------------|------------------|------------------------------------|---|
| | [mm] | [in] | |
| 5 to 20 | 15...150 | ½...6 | ± 20% |
| > 20 to 50 | 15...150 | ½...6 | ± 10% |
| > 50 to 10 000 | 2...8 | ¼ ₁₂ to ⅝ ₁₆ | ± 10% |
| | 15...150 | ½...6 | <ul style="list-style-type: none"> ■ Standard: ± 10% ■ Optional ¹⁾: ± 5% |
| > 10 000 to 20 000 | 2...150 | ¼ ₁₂ to 6 | ± 10% |
| > 20 000 to 100 000 | 2...150 | ¼ ₁₂ to 6 | ± 20% |

1) Order code for "Calibrated conductivity measurement", option CW



31 Measurement error (standard)

A0042279



32 Measurement error (optional: order code for "Calibrated conductivity measurement", option CW)

A0047944

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)

Temperature

±0.5 °C (±0.9 °F)

Electrical conductivity

- Max. ±5 % o.r.
- Max. ±1 % o.r. for DN 15 to 150 in conjunction with process connections made of stainless steel 1.4404 (F316L)

Temperature measurement response time $T_{90} < 15 \text{ s}$

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 Mounting


Mounting requirements →  19

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

The storage temperature corresponds to the operating temperature range of the transmitter and the sensor →  24.

- 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.

Atmosphere

Additional protection against condensation and moisture: the sensor housing is potted with a gel.

Order code for "Sensor option", option CF "Harsh environment".

Relative humidity

The device is suitable for use outdoors and indoors with a relative humidity of 4 to 95 %.

Operating height

According to EN 61010-1

- $\leq 2\,000 \text{ m}$ (6 562 ft)
- $> 2\,000 \text{ m}$ (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

| | |
|----------------------|---|
| Degree of protection | <p>Transmitter</p> <ul style="list-style-type: none"> ■ IP66/67, Type 4X enclosure, suitable for pollution degree 4 ■ When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2 ■ Display module: IP20, Type 1 enclosure, suitable for pollution degree 2 |
|----------------------|---|

Optional



External WLAN antenna

IP67

| | |
|---|--|
| Vibration-resistance and shock-resistance | <p>Vibration sinusoidal, in accordance with IEC 60068-2-6</p> <ul style="list-style-type: none"> ■ 2 to 8.4 Hz, 3.5 mm peak ■ 8.4 to 2 000 Hz, 1 g peak <p>Vibration broad-band random, according to IEC 60068-2-64</p> <ul style="list-style-type: none"> ■ 10 to 200 Hz, 0.003 g²/Hz ■ 200 to 2 000 Hz, 0.001 g²/Hz ■ Total: 1.54 g rms <p>Shock half-sine, according to IEC 60068-2-27</p> <p>6 ms 30 g</p> <p>Rough handling shocks according to IEC 60068-2-31</p> |
|---|--|

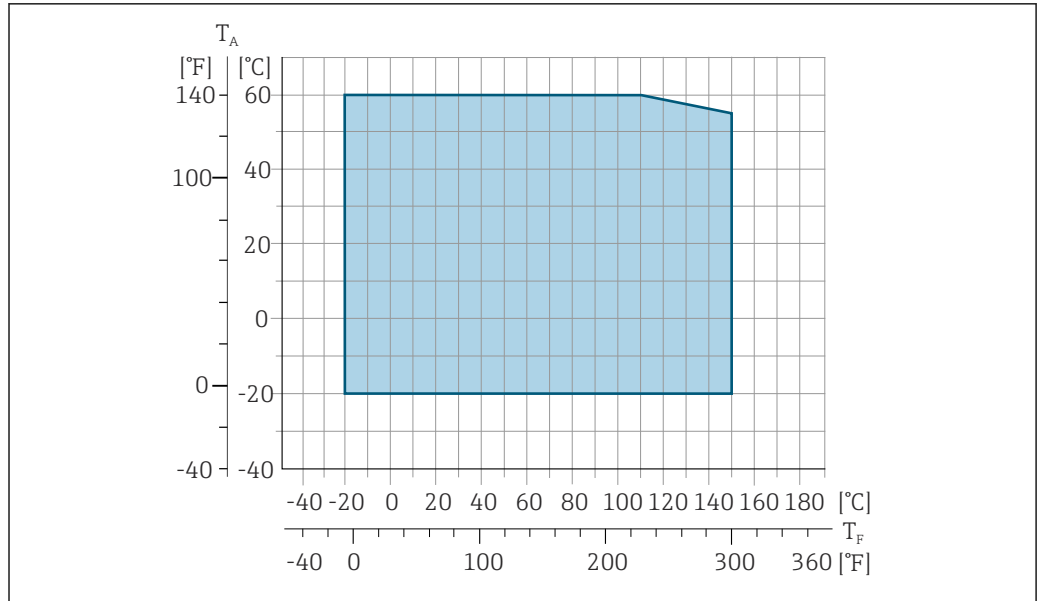
| | |
|-------------------|--|
| Internal cleaning | <ul style="list-style-type: none"> ■ CIP cleaning ■ SIP cleaning |
|-------------------|--|

| | |
|-----------------|---|
| Mechanical load | <p>Transmitter housing:</p> <ul style="list-style-type: none"> ■ Protect against mechanical effects, such as shock or impact ■ Do not use as a ladder or climbing aid |
|-----------------|---|

| | |
|-------------------------------------|--|
| Electromagnetic compatibility (EMC) | <p> Details are provided in the Declaration of Conformity.</p> <p> This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.</p> |
|-------------------------------------|--|

16.9 Process

| | |
|--------------------------|--------------------------------|
| Medium temperature range | -20 to +150 °C (-4 to +302 °F) |
|--------------------------|--------------------------------|



A0027450

T_A Ambient temperature range

T_F Fluid temperature

i The permitted fluid temperature in custody transfer is 0 to +50 °C (+32 to +122 °F).

Conductivity $\geq 5 \mu\text{S/cm}$ for liquids in general.

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

Pressure tightness *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 °C (+212 °F) | +130 °C (+266 °F) | +150 °C (+302 °F) |
| 2 to 150 | 1/12 to 6 | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |

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 medium:

- $v < 2 \text{ m/s}$ (6.56 ft/s): for low conductivity values
- $v > 2 \text{ m/s}$ (6.56 ft/s): for media producing buildup (e.g. milk with a high fat content)

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


- In the case of media with a high solids content, a sensor with a nominal diameter $> \text{DN } 8$ (3/8") can improve the signal stability and cleanability due to the larger electrodes.

Pressure loss

- No pressure loss occurs as of nominal diameter DN 8 (5/16") if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545
→ 24

System pressure →  24Vibrations →  24

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 with flanges of the standard pressure rating.
The weight may be lower than indicated depending on the pressure rating and design.
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)
- Transmitter version for hygienic area
(Order code for "Housing", option B "Stainless, hygienic"): +0.2 kg (+0.44 lbs)

| Nominal diameter | | Weight | |
|------------------|------|--------|-------|
| [mm] | [in] | [kg] | [lbs] |
| 2 | 1/12 | 4.7 | 10.4 |
| 4 | 5/32 | 4.7 | 10.4 |
| 8 | 5/16 | 4.7 | 10.4 |
| 15 | ½ | 4.6 | 10.1 |
| 25 | 1 | 5.5 | 12.1 |
| 40 | 1 ½ | 6.8 | 15.0 |
| 50 | 2 | 7.3 | 16.1 |
| 65 | – | 8.1 | 17.9 |
| 80 | 3 | 8.7 | 19.2 |
| 100 | 4 | 10.0 | 22.1 |
| 125 | 5 | 15.4 | 34.0 |
| 150 | 6 | 17.8 | 39.3 |

Measuring tube specification

| Nominal diameter | | Pressure rating ¹⁾ EN (DIN) [bar] | Process connection internal diameter | |
|------------------|------|--|--------------------------------------|--------------------|
| [mm] | [in] | | PFA | |
| [mm] | [in] | | [mm] | [in] |
| 2 | 1/12 | PN 16/40 | 2.25 | 0.09 |
| 4 | 5/32 | PN 16/40 | 4.5 | 0.18 |
| 8 | 5/16 | PN 16/40 | 9.0 | 0.35 |
| 15 | ½ | PN 16/40 | 16.0 | 0.63 |
| – | 1 | PN 16/40 | 22.6 ²⁾ | 0.89 ²⁾ |
| 25 | – | PN 16/40 | 26.0 ³⁾ | 1.02 ³⁾ |
| 40 | 1 ½ | PN 16/25/40 | 35.3 | 1.39 |

| Nominal diameter | | Pressure rating ¹⁾ EN (DIN) [bar] | Process connection internal diameter | |
|------------------|------|--|--------------------------------------|------|
| [mm] | [in] | | PFA | |
| | | | [mm] | [in] |
| 50 | 2 | PN 16/25 | 48.1 | 1.89 |
| 65 | - | PN 16/25 | 59.9 | 2.36 |
| 80 | 3 | PN 16/25 | 72.6 | 2.86 |
| 100 | 4 | PN 16/25 | 97.5 | 3.84 |
| 125 | 5 | PN 10/16 | 120.0 | 4.72 |
| 150 | 6 | PN 10/16 | 146.5 | 5.77 |

- 1) Depending on process connection and seals used
- 2) Order code 5H**22
- 3) Order code 5H**26

Materials

Transmitter housing

Order code for "Housing":

- Option **A** "Aluminum, coated": aluminum, AlSi10Mg, coated
- Option **B** "Stainless, hygienic": stainless steel, 1.4404 (316L)

Window material

Order code for "Housing":

- Option **A** "Aluminum, coated": glass
- Option **B** "Stainless, hygienic": polycarbonate

Seals

Order code for "Housing":

- Option **B** "Stainless, hygienic": EPDM and silicone

Cable entries/cable glands

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 |
|---|-------------------------------------|
| Compression fitting M20 × 1.5 | Non-Ex: plastic |
| | Z2, D2, Ex d/de: brass with plastic |
| Adapter for cable entry with female thread G ½" | Nickel-plated brass |
| Adapter for cable entry with female thread NPT ½" | |

Order code for "Housing", option B "Stainless, hygienic"

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

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

Device plug

| Electrical connection | Material |
|-----------------------|---|
| Plug M12x1 | <ul style="list-style-type: none"> ■ Socket: Stainless steel, 1.4404 (316L) ■ Contact housing: Polyamide ■ Contacts: Gold-plated brass |

Sensor housing

Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel 1.4301 (304)

Liner

PFA (USP Class VI, FDA 21 CFR 177.2600)

Process connections

- Stainless steel, 1.4404 (F316L)
- PVDF
- PVC adhesive sleeve

Electrodes

Standard: 1.4435 (316L)

Seals

- O-ring seal, DN 2 to 25 (1/12 to 1"): EPDM, FKM³⁾, Kalrez
- Aseptic⁴⁾ gasket seal, DN 2 to 150 (1/12 to 6"): EPDM, FKM³⁾, VMQ (silicone)

Accessories*Protective cover*

Stainless steel, 1.4404 (316L)

External WLAN antenna

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

Grounding rings

- Standard: 1.4435 (316L)
- Optional: Alloy C22, tantalum

Wall mounting kit

Stainless steel, 1.4301 (304)⁵⁾

Centering star



1.4435 (F316L)

3) USP Class VI, FDA 21 CFR 177.2600, 3A

4) In this context, aseptic means hygienic design

5) Does not meet the hygienic design installation guidelines.

| | |
|-------------------|--|
| Fitted electrodes | <ul style="list-style-type: none"> ■ 2 measuring electrodes for signal detection ■ 1 empty pipe detection electrode for empty pipe detection/temperature measurement (only DN 15 to 150 (½ to 6")) |
|-------------------|--|

| | |
|---------------------|---|
| Process connections | <p>With O-ring seal:</p> <ul style="list-style-type: none"> ■ Welding nipple (DIN EN ISO 1127, ODT/SMS, ISO 2037) ■ Flange (EN (DIN), ASME, JIS) ■ Flange from PVDF (EN (DIN), ASME, JIS) ■ Male thread ■ Female thread ■ Hose connection ■ PVC adhesive sleeve <p>With aseptic gasket seal:</p> <ul style="list-style-type: none"> ■ Coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145) ■ Flange DIN 11864-2 <p> For information on the different materials used in the process connections →  187</p> |
|---------------------|---|

| | |
|-------------------|--|
| Surface roughness | <p>Electrodes:</p> <ul style="list-style-type: none"> ■ Stainless steel, 1.4435 (316L) electropolished ≤ 0.5 µm (19.7 µin) ■ Alloy C22, 2.4602 (UNSN06022); tantalum ≤ 0.5 µm (19.7 µin) <p>(All data refer to parts in contact with the medium)</p> <p>Liner with PFA:</p> <p>≤ 0.4 µm (15.7 µin)</p> <p>(All data refer to parts in contact with the medium)</p> <p>Stainless steel process connections:</p> <ul style="list-style-type: none"> ■ With O-ring seal: ≤ 1.6 µm (63 µin) ■ With aseptic seal: Ra_{max} = 0.76 µm (31.5 µin) Optional: Ra_{max} = 0.38 µm (15 µin) electropolished <p>(All data refer to parts in contact with the medium)</p> |
|-------------------|--|

16.11 Operability



| | |
|-----------|---|
| Languages | <p>Can be operated in the following languages:</p> <ul style="list-style-type: none"> ■ Via local operation English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish ■ Via web browser English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Vietnamese, Czech, Swedish ■ Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese |
|-----------|---|

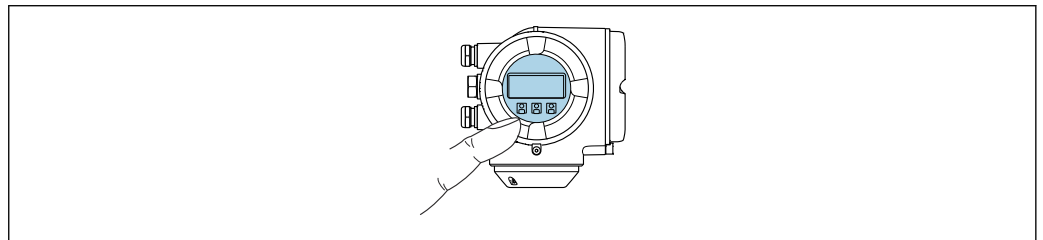
Onsite operation

Via display module


Features:

- 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 →  65






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 33 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

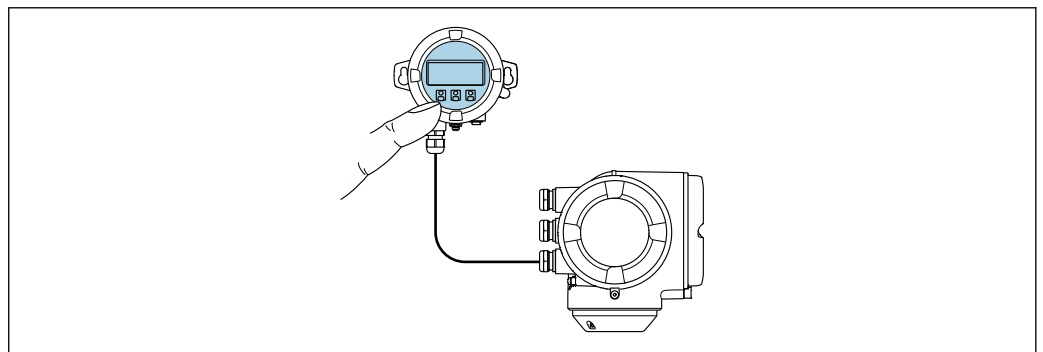
Operating elements

- 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 →  166..


- The remote display and operating module DKX001 is only available for the following housing version: order code for "Housing": option A "Aluminum, coated"
- The measuring instrument is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring instrument. 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 instrument display module. Only one display or operation unit may be connected to the transmitter at any one time.



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 34 Operation via remote display and operating module DKX001

Display and operating elements

The display and operating elements correspond to those of the display module →  189.

Housing material

The housing material of the display and operating module DKX001 corresponds to the selected material of the transmitter housing.

| 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

→  29

Dimensions





Information on the dimensions:


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

Remote operation →  64

Service interface →  64

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"> ■ CDI-RJ45 service interface ■ WLAN interface | Special Documentation for device |
| DeviceCare SFE100 | Notebook, PC or tablet with Microsoft Windows system | <ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface ■ Fieldbus protocol | →  168 |
| FieldCare SFE500 | Notebook, PC or tablet with Microsoft Windows system | <ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface ■ Fieldbus protocol | →  168 |

| Supported operating tools | Operating unit | Interface | Additional information |
|---------------------------|--|---|--|
| Field Xpert | SMT70/77/50 | <ul style="list-style-type: none"> ■ All fieldbus protocols ■ WLAN interface ■ Bluetooth ■ CDI-RJ45 service interface | Operating Instructions BA01202S Device description files: Use update function of handheld terminal |
| SmartBlue app | Smartphone or tablet with iOS or Android | WLAN | →  168 |

 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:

- FactoryTalk AssetCentre (FTAC) from Rockwell Automation → www.rockwellautomation.com
- Asset Management Solutions (AMS) from Emerson → www.emersonprocess.com
- FieldCommunicator 375/475 from Emerson → www.emersonprocess.com
- Field Device Manager (FDM) from Honeywell → www.process.honeywell.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The related device description files are available: www.endress.com → Download Area



Web server

With the integrated web server, the device can be operated and configured via a web browser service interface (CDI-RJ45) or 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 displayed and can be used to monitor device health. 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 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 report (PDF file, only available with the **Heartbeat Verification** →  196 application package)
- Flash firmware version for device firmware upgrade, for example
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package →  196)

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:

| | HistoROM backup | T-DAT | S-DAT |
|-------------------------|--|--|---|
| Available data | <ul style="list-style-type: none"> ▪ Event logbook, e.g. diagnostic events ▪ Parameter data record backup ▪ Device firmware package ▪ Driver for system integration for exporting via web server, e.g.: DD for FOUNDATION Fieldbus | <ul style="list-style-type: none"> ▪ Measured value logging ("Extended HistoROM" order option) ▪ Current parameter data record (used by firmware at run time) ▪ Indicator (minimum/maximum values) ▪ Totalizer value | <ul style="list-style-type: none"> ▪ Sensor data: e.g. nominal diameter ▪ Serial number ▪ Calibration data ▪ Device configuration (e.g. SW options, fixed I/O or multi I/O) |
| Storage location | Fixed on the user interface PC board in the connection compartment | Can be plugged into the user interface PC 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 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 transmission

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)
- Transmission of the drivers for system integration via Web server, e.g.: DD for FOUNDATION Fieldbus

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:


- Recording of 1 to 4 channels of up to 1 000 measured values (up to 250 measured values per channel)
- User configurable recording interval
- 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

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

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

| | |
|--------------|---|
| CE mark | <p>The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p> |
| UKCA marking | <p>The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.</p> <p>Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com</p> |
| RCM marking | <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> |


| | |
|-----------------------------------|---|
| Sanitary compatibility | <ul style="list-style-type: none"> ■ 3-A SSI 28-06 or more recent <ul style="list-style-type: none"> ■ Confirmation by affixing the 3-A logo for measuring devices with the order code for "Additional approval", option LP "3-A". ■ The 3-A approval refers to the measuring device. ■ When installing the measuring device, ensure that no liquid can accumulate on the outside of the measuring device. Remote transmitters must be installed in accordance with the 3-A Standard. ■ Accessories (e.g. weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard. Each accessory can be cleaned. Disassembly may be necessary under certain circumstances. ■ EHEDG Type EL Class I <ul style="list-style-type: none"> ■ Confirmation by affixing the EHEDG symbol for measuring devices with the order code for "Additional approval", option LT "EHEDG". ■ EPDM is not a suitable seal material for fluids with a fat content > 8 %. ■ To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (www.ehedg.org). ■ FDA 21 CFR 177 ■ Food Contact Materials Regulation (EC) 1935/2004 ■ Food Contact Materials Regulation China GB 4806 ■ Pasteurized Milk Ordinance (PMO) |
| Pharmaceutical compatibility | <ul style="list-style-type: none"> ■ FDA 21 CFR 177 ■ USP <87> ■ USP <88> Class VI 121 °C ■ TSE/BSE Certificate of Suitability ■ cGMP <p>Devices with the order code for "Test, certificate", option JG "Conformity with cGMP-derived requirements, declaration" comply with the requirements of cGMP with regard to the surfaces of parts in contact with the medium, design, FDA 21 CFR material conformity, USP Class VI tests and TSE/BSE conformity. A serial number-specific declaration is generated.</p> |
| FOUNDATION Fieldbus certification | <p>FOUNDATION Fieldbus interface</p> <p>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified in accordance with FOUNDATION Fieldbus H1 ■ Interoperability Test Kit (ITK), revision version 6.2.0 (certificate available on request) ■ Physical Layer Conformance Test ■ The device can also be operated with certified devices of other manufacturers (interoperability) |
| 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"> ■ With the marking <ul style="list-style-type: none"> a) PED/G1/x (x = category) or b) PESR/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" <ul style="list-style-type: none"> a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or b) Schedule 2 of Statutory Instruments 2016 No. 1105. ■ Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of <ul style="list-style-type: none"> a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105. The scope of application is indicated <ul style="list-style-type: none"> a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105. |
| Additional certification | <p>PWIS-free</p> <p>PWIS = paint-wetting impairment substances</p> <p>Order code for "Service":</p> <ul style="list-style-type: none"> ■ Option HC: PWIS-free (version A) ■ Option HD: PWIS-free (version B) ■ Option HE: PWIS-free (version C) <p> For more information on PWIS-free certification, see "Test specification" document TS01028D</p> |
| External standards and guidelines | <ul style="list-style-type: none"> ■ EN 60529 Degrees of protection provided by enclosures (IP code) ■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements ■ EN 61326-1/-2-3 EMC requirements for electrical equipment for measurement, control and laboratory use ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment ■ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices ■ NAMUR NE 107 Self-monitoring and diagnosis of field devices ■ NAMUR NE 131 Requirements for field devices for standard applications ■ ETSI EN 300 328 Guidelines for 2.4 GHz radio components. ■ EN 301489 Electromagnetic compatibility and radio spectrum matters (ERM). |

16.13 Application packages

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

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

| | |
|--------------------------|---|
| Diagnostic functionality | <p>Order code for "Application package", option EA "Extended HistoROM"</p> <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"> ■ Memory capacity for up to 1000 measured values is activated. ■ 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user. ■ Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server. <p> For detailed information, see the Operating Instructions for the device.</p> |
|--------------------------|---|



| | |
|----------------------|---|
| Heartbeat Technology | <p>Order code for "Application package", option EB "Heartbeat Verification + Monitoring"</p> <p>Heartbeat Verification</p> <p>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"> ■ Functional testing in the installed state without interrupting the process. ■ Traceable verification results on request, including a report. ■ Simple testing process via local operation or other operating interfaces. ■ Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications. ■ Extension of calibration intervals according to operator's risk assessment. <p>Heartbeat Monitoring</p> <p>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"> ■ Draw conclusions - using these data and other information - about the impact process influences (e.g. buildup, interference from the magnetic field) have on the measuring performance over time. ■ Schedule servicing in time. ■ Monitor the process or product quality . <p> For detailed information, see the Special Documentation for the device.</p> |
|----------------------|---|

| | |
|----------|---|
| Cleaning | <p>Order code for "Application package", option EC "ECC electrode cleaning "</p> <p>The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe₃O₄) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to</p> |
|----------|---|


the loss of signal. The application package is designed to avoid build-up of very conductive matter and thin layers (typical of magnetite).

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

16.14 Accessories

 Overview of accessories available to order →  166

16.15 Supplementary documentation

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

- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

Standard documentation **Brief Operating Instructions**

Brief Operating Instructions for the sensor

| Measuring device | Documentation code |
|------------------|--------------------|
| Proline Promag H | KA01289D |

Brief Operating Instructions for transmitter

| Measuring device | Documentation code |
|------------------|--------------------|
| Proline 300 | KA01294D |

Technical Information

| Measuring device | Documentation code |
|------------------|--------------------|
| Promag H 300 | TI01223D |

Description of Device Parameters

| Measuring device | Documentation code |
|------------------|--------------------|
| Promag 300 | GP01098D |

Supplementary device- **Safety instructions** dependent documentation

Safety instructions for electrical equipment 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 |

| Contents | Documentation code |
|--------------------|--------------------|
| INMETRO Ex d/Ex de | XA01518D |
| INMETRO Ex ec | XA01519D |
| NEPSI Ex d/Ex de | XA01520D |
| NEPSI Ex nA | XA01521D |
| EAC Ex d/Ex de | XA01656D |
| EAC Ex nA | XA01657D |
| JPN Ex d | XA01775D |

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 |
| Web server | SD01661D |
| Remote display and operating module DKX001 | SD01763D |

| Contents | Documentation code |
|----------------------|--------------------|
| Heartbeat Technology | SD01742D |
| Web server | SD01657D |

Installation instructions

| Contents | Note |
|---|---|
| Installation instructions for spare part sets and accessories | <ul style="list-style-type: none"> ▪ Access the overview of all the available spare part sets via <i>Device Viewer</i> →  164 ▪ Accessories available for order with Installation Instructions →  166 |

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