Operating Instructions
Proline Promass I 300

Coriolis flowmeter

HART

HART®
COMMUNICATION PROTOCOL

Endress+Hauser

People for Process Automation

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

Table of contents

1 About this document

1.1 Document function

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

1.2 Symbols

1.2.1 Safety symbols

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

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

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

NOTICE
This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Electrical symbols

Symbol	Meaning
⎓	Direct current
∼	Alternating current
⋍	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏦	**Potential equalization connection (PE: protective earth)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: • Interior ground terminal: potential equalization is connected to the supply network. • Exterior ground terminal: device is connected to the plant grounding system.

1.2.3 Communication-specific symbols

Symbol	Meaning
📶	**Wireless Local Area Network (WLAN)** Communication via a wireless, local network.
⊡	**LED** Light emitting diode is off.

Symbol	Meaning
☼	**LED** Light emitting diode is on.
☼	**LED** Light emitting diode is flashing.

1.2.4   Tool symbols

Symbol	Meaning
▮✎	Flat-blade screwdriver
⬡✎	Allen key
✎	Open-ended wrench

1.2.5   Symbols for certain types of information

Symbol	Meaning
✔	**Permitted** Procedures, processes or actions that are permitted.
✔✔	**Preferred** Procedures, processes or actions that are preferred.
✘	**Forbidden** Procedures, processes or actions that are forbidden.
ⓘ	**Tip** Indicates additional information.
🔲	Reference to documentation
🔲	Reference to page
🔲	Reference to graphic
▶	Notice or individual step to be observed
1. , 2. , 3....	Series of steps
↳	Result of a step
?	Help in the event of a problem
👁	Visual inspection

1.2.6   Symbols in graphics

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

Symbol	Meaning
⋈	Safe area (non-hazardous area)
≈➡	Flow direction

1.3   Documentation

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

1.3.1   Document function

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 guide** 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. They are an integral part of the Operating Instructions. ℹ️ The nameplate indicates which Safety Instructions (XA) apply to the device in question.
Supplementary device-dependent documentation	Additional documents are supplied depending on the device version ordered: Always comply strictly with the instructions in the supplementary documentation. The supplementary documentation is an integral part of the device documentation.

1.4   Registered trademarks

HART®
Registered 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 and gases.

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

Measuring devices for use in hazardous areas, in hygienic applications or in applications where there is an increased risk due to process pressure, are marked accordingly on the nameplate.

To ensure that the measuring device remains in proper condition for the operation time:
▶ Keep within the specified pressure and temperature range.
▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
▶ Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
▶ Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
▶ If the ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation→ 🕮 8.
▶ Protect the measuring device permanently against corrosion from environmental influences.

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

⚠ WARNING

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

NOTICE

Verification for borderline cases:

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

Residual risks

⚠ WARNING

If the temperature of the media or electronics unit is high or low, this may cause the surfaces of the device to become hot or cold. This poses a risk of burns or frostbite!

▶ In the case of hot or cold medium temperatures, install appropriate protection against contact.

2.3   Workplace safety

When working on and with the device:
▶ Wear the required personal protective equipment as per national regulations.

2.4   Operational safety

Risk of injury!
▶ Operate the device only if it is in proper technical condition, free from errors and faults.
▶ 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. Endress+Hauser confirms this by affixing the CE mark to the device.

Furthermore, the device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards.

By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

Contact address Endress+Hauser UK:
Endress+Hauser Ltd.
Floats Road
Manchester M23 9NF
United Kingdom
www.uk.endress.com

2.6   IT security

Our warranty is valid only if the 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. An overview of the most important functions is provided in the following section:

Function/interface	Factory setting	Recommendation
Write protection via hardware write protection switch → 🖺 11	Not enabled	On an individual basis following risk assessment
Access code (also applies for Web server login or FieldCare connection) → 🖺 12	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 a customized 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
CDI-RJ45 service interface → 🖺 13	–	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 → 🖺 135.

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 (→ 🖺 134).

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 (→ 🖺 66), 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 (→ 🖺 127).

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.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, for example, see the "Write protection via access code" section → 🖺 134

2.7.3   Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server (→ 🖺 57). The connection is via the service interface (CDI-RJ45) or the WLAN interface.

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

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

📖 For detailed information on device parameters, see:
The "Description of Device Parameters" document .

2.7.4   Access via OPC-UA

The device can communicate with OPC UA clients using the "OPC UA Server" application package.

The OPC UA server integrated in the device can be accessed via the WLAN access point using the WLAN interface - which can be ordered as an optional extra - or the service interface (CDI- RJ45) via Ethernet network. Access rights and authorization as per separate configuration.

The following Security Modes are supported as per the OPC UA Specification (IEC 62541):
- None
- Basic128Rsa15 – signed
- Basic128Rsa15 – signed and encrypted

2.7.5   Access via service interface (CDI-RJ45)

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

The use of relevant industrial standards and guidelines that have been defined by national and international safety committees, such as IEC/ISA62443 or the IEEE, is recommended. This includes organizational security measures such as the assignment of access authorization as well as technical measures such as network segmentation.

Transmitters with an Ex de approval may not be connected via the service interface (CDI-RJ45)!

Order code for "Approval transmitter + sensor", options (Ex de): BA, BB, C1, C2, GA, GB, MA, MB, NA, NB

3   Product description

The device consists of a transmitter and a sensor.

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

3.1   Product design
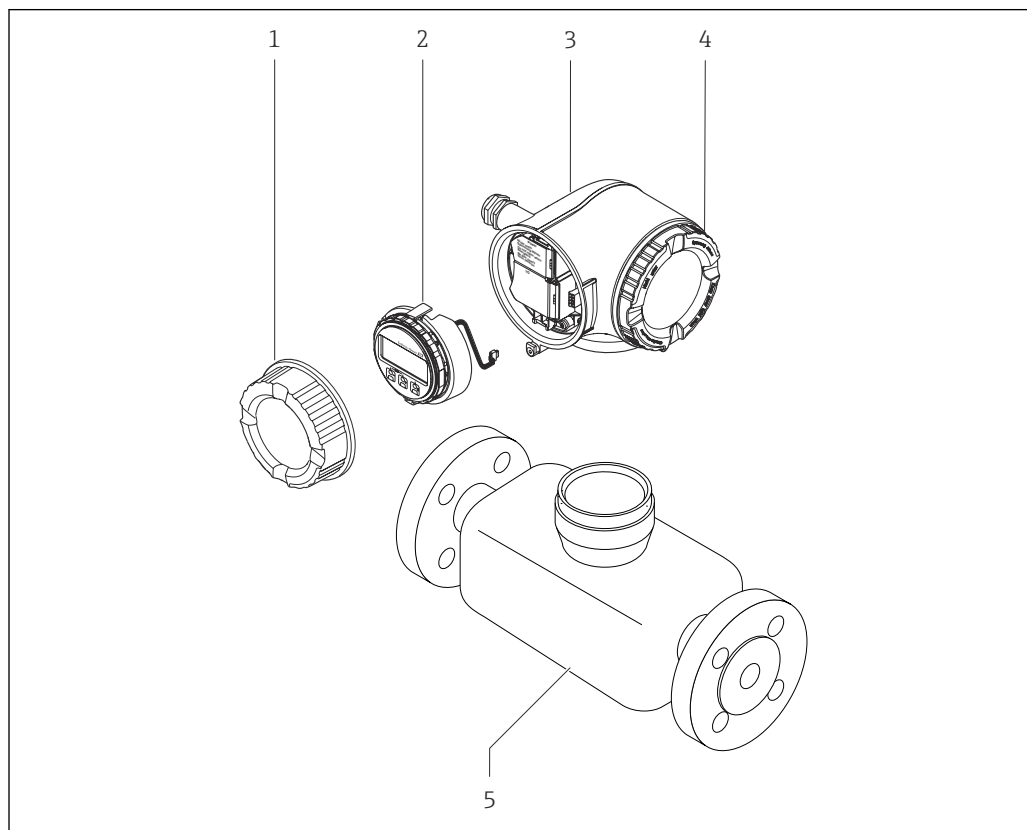
A0029586

⊡ *1   Important components of a measuring device*

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

4   Incoming acceptance and product identification

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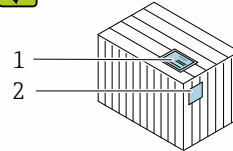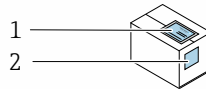
Are the order codes on the delivery note (1) and the product sticker (2) identical?
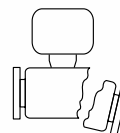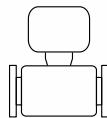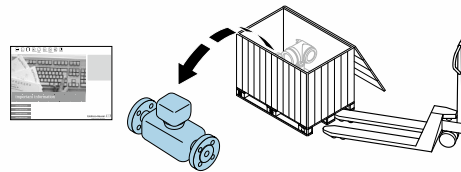
Are the goods undamaged?
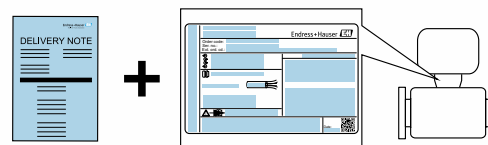
Do the data on the nameplate match the ordering information on the delivery note?

Is the envelope present with accompanying documents?

- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 🖹 16.

4.2   Product identification

The following options are available for identification of the device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter the serial numbers from the nameplates in 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 chapters "Additional standard documentation on the device" and "Supplementary device-dependent documentation"
- 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
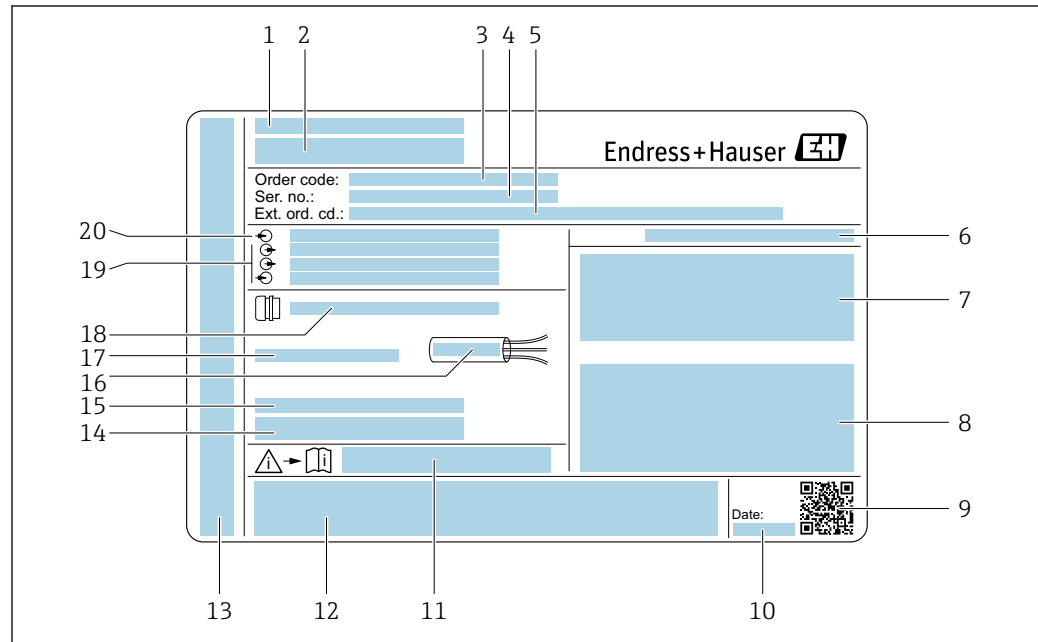
🖼 *2   Example of a transmitter nameplate*

- *1   Place of manufacture*
- *2   Name of the transmitter*
- *3   Order code*
- *4   Serial number (Ser. no.)*
- *5   Extended order code (Ext. ord. cd.)*
- *6   Degree of protection*
- *7   Space for approvals: use in hazardous areas*
- *8   Electrical connection data: available inputs and outputs*
- *9   2-D matrix code*
- *10   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
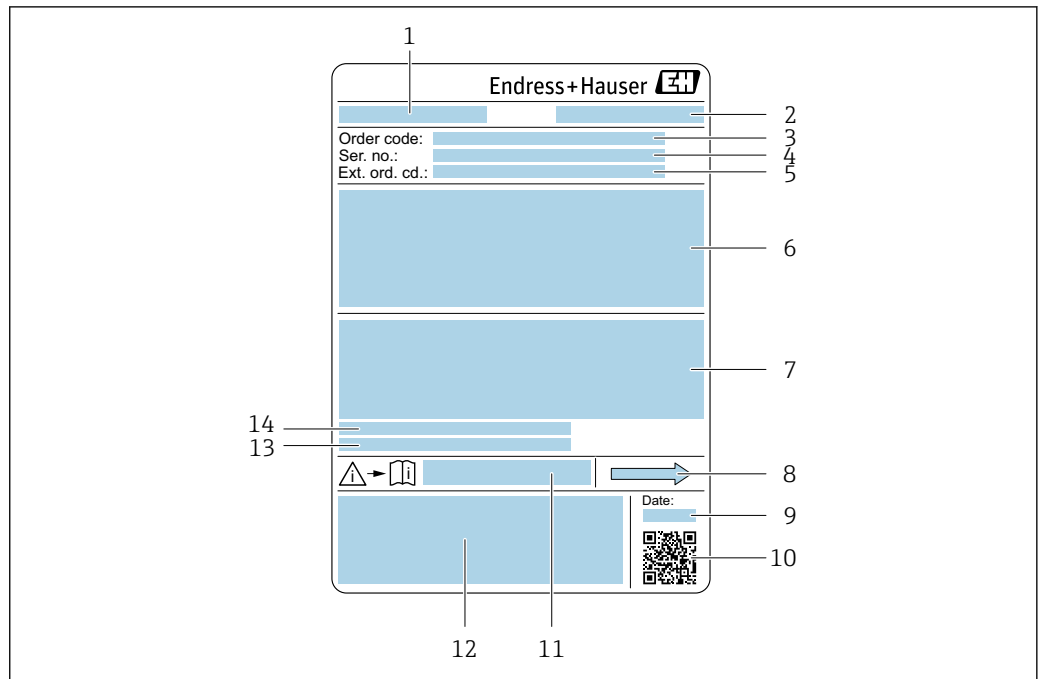
3   Example of a sensor nameplate

1   Name of the sensor
2   Place of manufacture
3   Order code
4   Serial number (Ser. no.)
5   Extended order code (Ext. ord. cd.)
6   Nominal diameter of the sensor; flange nominal diameter/nominal pressure; sensor test pressure; medium temperature range; material of measuring tube and manifold; sensor-specific information: e.g. pressure range of sensor housing, wide-range density specification (special density calibration)
7   Approval information for explosion protection, Pressure Equipment Directive and degree of protection
8   Flow direction
9   Manufacturing date: year-month
10   2-D matrix code
11   Document number of safety-related supplementary documentation
12   CE mark, RCM-Tick mark
13   Surface roughness
14   Permitted ambient temperature (T_a)

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

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

4.2.3 Symbols on measuring device

Symbol	Meaning
⚠	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. To determine the nature of the potential hazard and the measures required to avoid it, consult the documentation accompanying the measuring device.
📖	**Reference to documentation** Refers to the corresponding device documentation.
⏚	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.

5   Storage and transport

5.1   Storage conditions

Observe the following notes for storage:

▸ Store in the original packaging to ensure protection from shock.
▸ Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring pipe.
▸ Protect from direct sunlight to avoid unacceptably high surface temperatures.
▸ Store in a dry and dust-free place.
▸ Do not store outdoors.

Storage temperature → 🕮 199

5.2   Transporting the product

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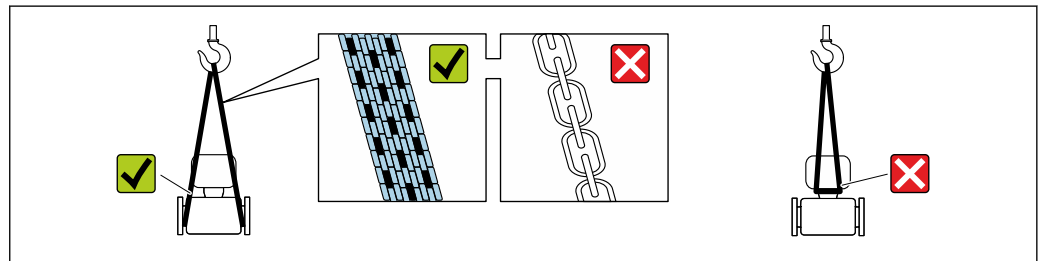
A0029252

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).
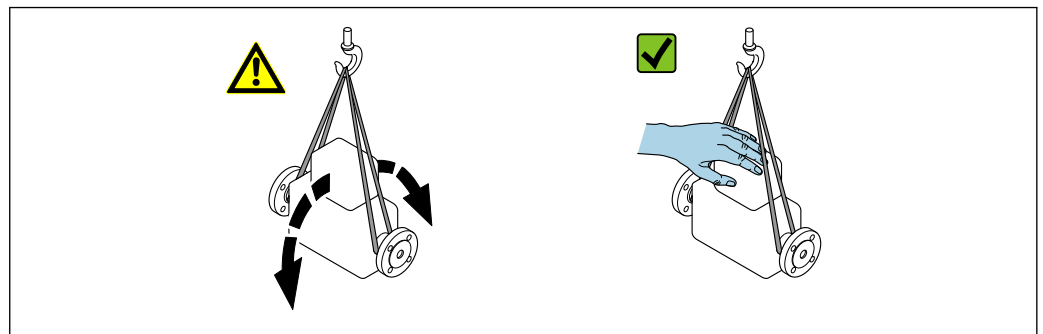
A0029214

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.

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:

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

6 Mounting

6.1 Mounting requirements

6.1.1 Mounting position

Mounting location
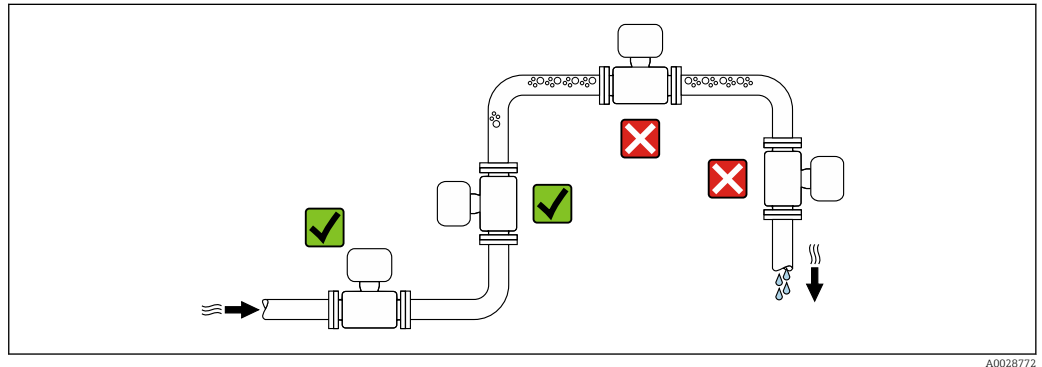
To prevent measuring errors arising from accumulation of gas bubbles in the measuring pipe, avoid the following mounting locations in the piping:
• Highest point of a pipeline.
• Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

However, the following installation suggestion allows for installation in an open vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.
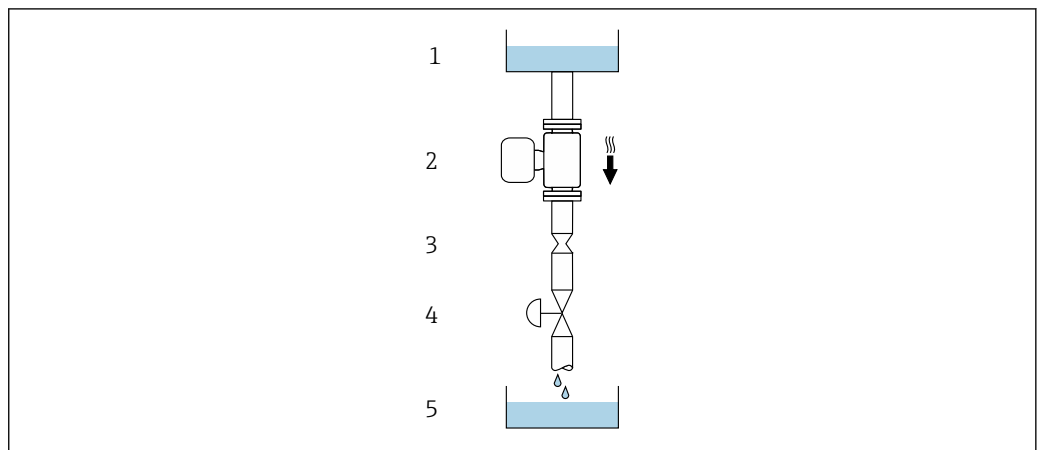
🖻 *4   Installation in a down pipe (e.g. for batching applications)*
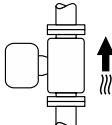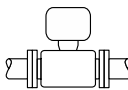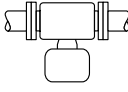
1   Supply tank
2   Sensor
3   Orifice plate, pipe restriction
4   Valve
5   Batching tank

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	⅜	6	0.24
15	½	10	0.40
15 FB	½ FB	15	0.60
25	1	14	0.55
25 FB	1 FB	24	0.95
40	1½	22	0.87
40 FB	1½ FB	35	1.38
50	2	28	1.10
50 FB	2 FB	54	2.13
80	3	50	1.97
FB = Full bore			

Orientation

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

	Orientation		Recommendation
A	Vertical orientation	A0015591	✓✓ [1] ✓✓
B	Horizontal orientation, transmitter at top	A0015589	✓✓ [2]
C	Horizontal orientation, transmitter at bottom	A0015590	✓✓ [3]
D	Horizontal orientation, transmitter at side	A0015592	✓✓

1) This orientation is recommended to ensure self-draining.
2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

Inlet and outlet runs

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 🖺 23.

Dimensions

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

6.1.2 Environment and process requirements

Ambient temperature range

Measuring device	• −40 to +60 ℃ (−40 to +140 ℉) • Order code for "Test, certificate", option JP: −50 to +60 ℃ (−58 to +140 ℉)
Readability of the local display	−20 to +60 ℃ (−4 to +140 ℉) The readability of the display may be impaired at temperatures outside the temperature range.

ℹ️ Dependency of ambient temperature on medium temperature → 🖹 200

▸ If operating outdoors:
Avoid direct sunlight, particularly in warm climatic regions.

ℹ️ You can order a weather protection cover from Endress+Hauser. → 🖹 179.

System pressure

It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

Cavitation is caused if the pressure drops below the vapor pressure:
• In liquids that have a low boiling point (e.g. hydrocarbons, solvents, liquefied gases)
• In suction lines

▸ Ensure the system pressure is sufficiently high to prevent cavitation and outgassing.

For this reason, the following mounting locations are recommended:
• At the lowest point in a vertical pipe
• Downstream from pumps (no danger of vacuum)

A0028777
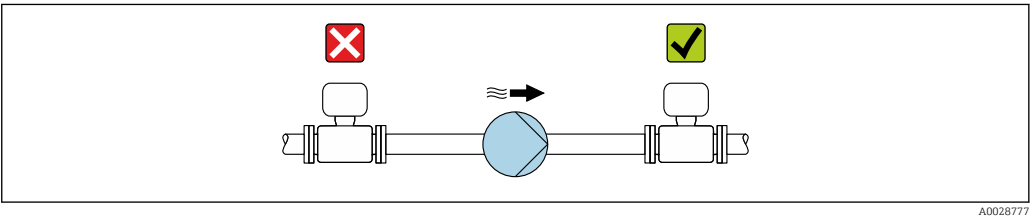
Thermal insulation

In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

The following device versions are recommended for versions with thermal insulation:
Version with extended neck for insulation:
Order code for "Sensor option", option CG with an extended neck length of
105 mm (4.13 in).

> **NOTICE**
>
> **Electronics overheating on account of thermal insulation!**
> ▶ Recommended orientation: horizontal orientation, transmitter housing pointing downwards.
> ▶ Do not insulate the transmitter housing .
> ▶ Maximum permissible temperature at the lower end of the transmitter housing: 80 ℃ (176 ℉)
> ▶ Thermal insulation with not isolated extended neck: We recommend that you do not insulate the extended neck in order to ensure optimum dissipation of heat.
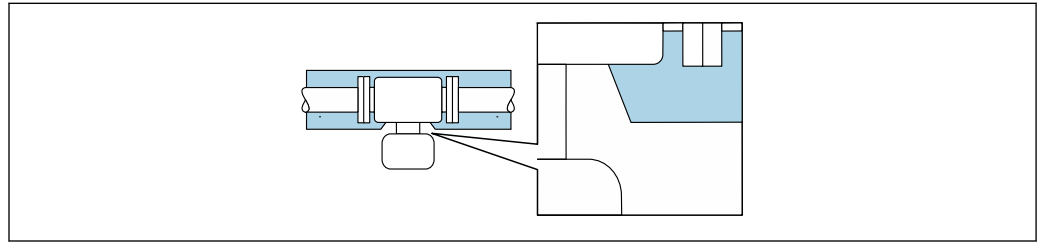
 🖼 *5   Thermal insulation with not isolated extended neck*

Heating

> **NOTICE**
>
> **Electronics can overheat due to elevated ambient temperature!**
> ▶ Observe maximum permitted ambient temperature for the transmitter.
> ▶ Depending on the medium temperature, take the device orientation requirements into account.

> **NOTICE**
>
> **Danger of overheating when heating**
> ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 ℃ (176 ℉).
> ▶ Ensure that sufficient convection takes place at the transmitter neck.
> ▶ Ensure that a sufficiently large area of the transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.
> ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

Heating options

If a fluid requires that no heat loss should occur at the sensor, users can avail of the following heating options:
- Electrical heating, e.g. with electric band heaters [1]
- Via pipes carrying hot water or steam
- Via heating jackets

Vibrations

The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

---

1) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems".

6.1.3   Special mounting instructions

Drainability

When installed vertically, the measuring tube can be drained completely and protected against buildup.

When the sensor is installed in a horizontal line, eccentric clamps can be used to ensure complete drainability. When the system is pitched in a specific direction and at a specific slope, gravity can be used to achieve complete drainability. The sensor must be mounted in the correct position to ensure full drainability in the horizontal position. Markings on the sensor show the correct mounting position to optimize drainability.

A0030297
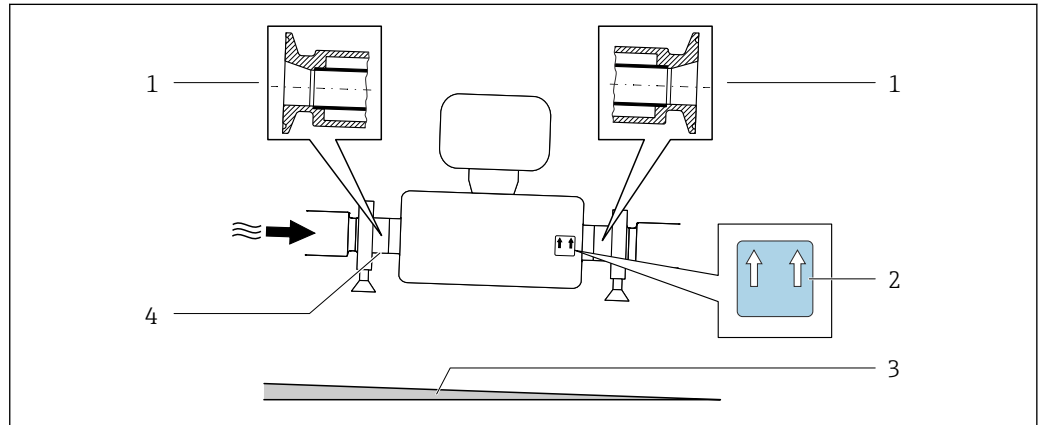
1   Eccentric clamp connection
2   "This side up" label indicates which side is up
3   Slope the device in accordance with the hygiene guidelines. Slope: approx. 2 % or 21 mm/m (0.24 in/feet)
4   Line on the underside indicates the lowest point of the eccentric process connection.

Hygienic compatibility

- When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 🗐 211
- 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).

Securing with mounting clamp in the case of hygiene connections

It is not necessary to provide additional support for the sensor for operational performance purposes. If, however, additional support is required for installation purposes, the following dimensions must be observed.

Use mounting clamp with lining between clamp and measuring instrument.
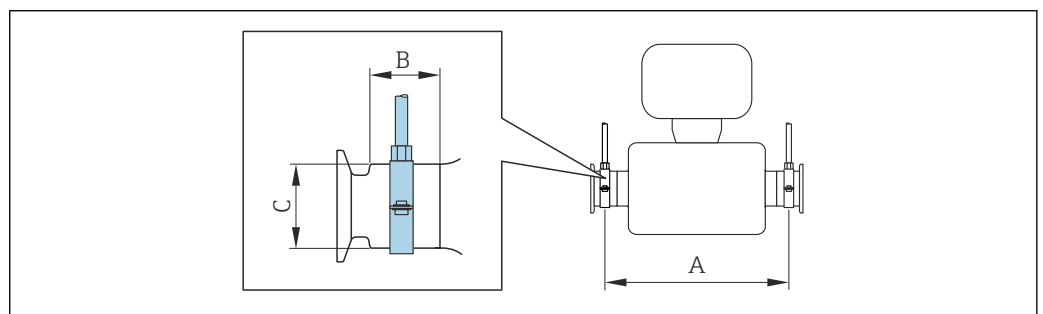
A0030298

DN		A		B		C	
[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
8	8	373	14.69	20	0.79	40	1.57
15	15	409	16.1	20	0.79	40	1.57
15 FB	15 FB	539	21.22	30	1.18	44.5	1.75
25	25	539	21.22	30	1.18	44.5	1.75
25 FB	25 FB	668	26.3	28	1.1	60	2.36
40	40	668	26.3	28	1.1	60	2.36
40 FB	40 FB	780	30.71	35	1.38	80	3.15
50	50	780	30.71	35	1.38	80	3.15
50 FB	50 FB	1 152	45.35	57	2.24	90	3.54
80	80	1 152	45.35	57	2.24	90	3.54

Weather protection cover
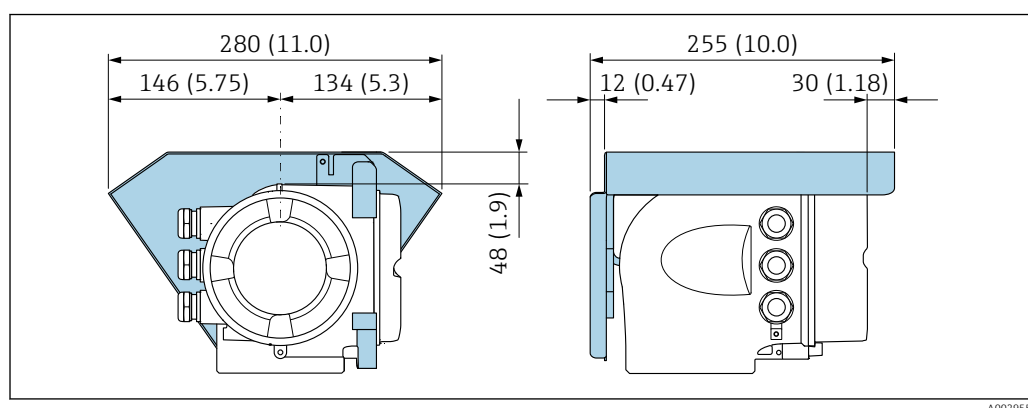
🖾 6   *Engineering unit mm (in)*

Cover lock

NOTICE

Order code "Housing", option L "Cast, stainless": The covers of the transmitter housing are provided with a borehole to lock the cover.
The cover can be locked using screws and a chain or cable provided by the customer on site.
▶ The use of stainless steel chains or cables is recommended.
▶ If a protective coating is applied, it is recommended to use a heat shrink tube to protect the housing paint.

A0029800
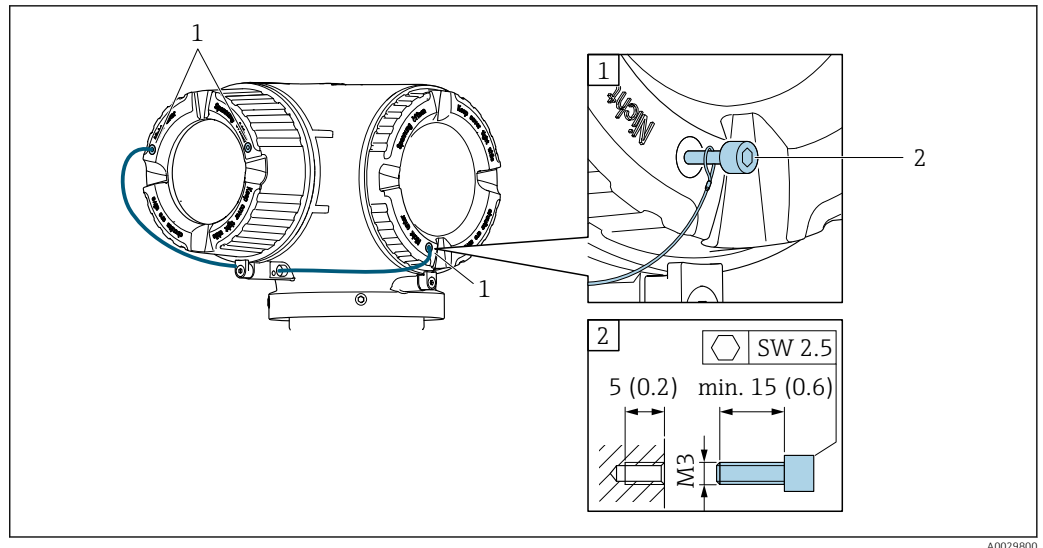
1   Cover borehole for the securing screw
2   Securing screw to lock the cover

6.2   Mounting the measuring device

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   Mounting the measuring device

⚠ **WARNING**

Danger due to improper process sealing!

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

1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the medium.

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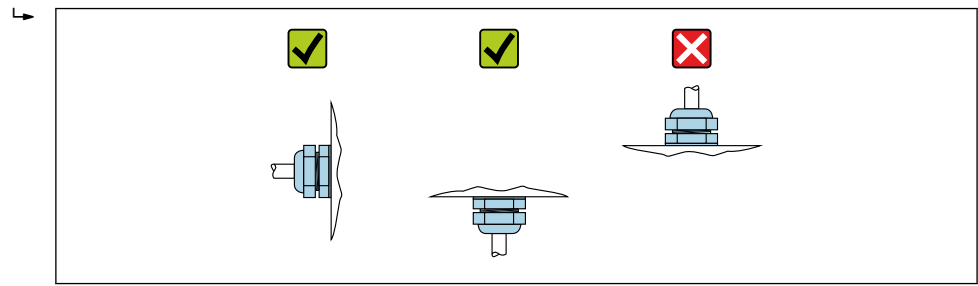
A0029263

6.2.4 Turning the transmitter housing

To provide easier access to the connection compartment or display module, the transmitter housing can be turned.
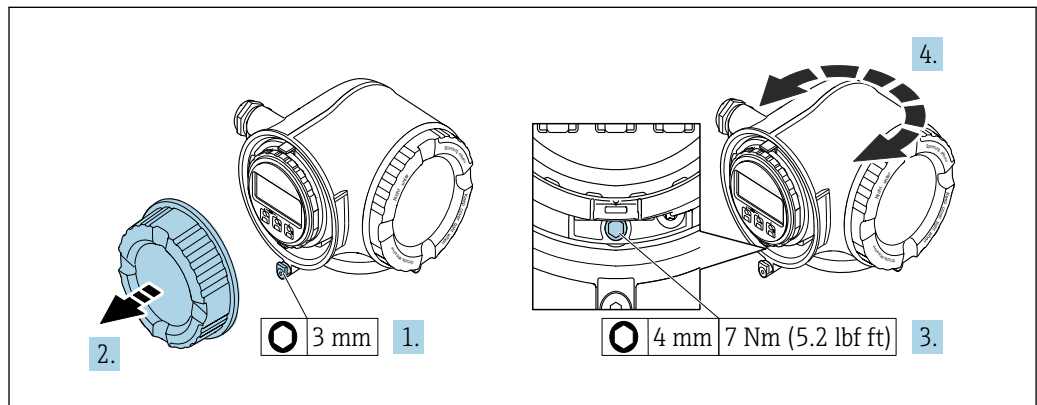
A0029993

🖼 7   *Non-Ex housing*

1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.

2. Unscrew the connection compartment cover.

3. Loosen the securing 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.
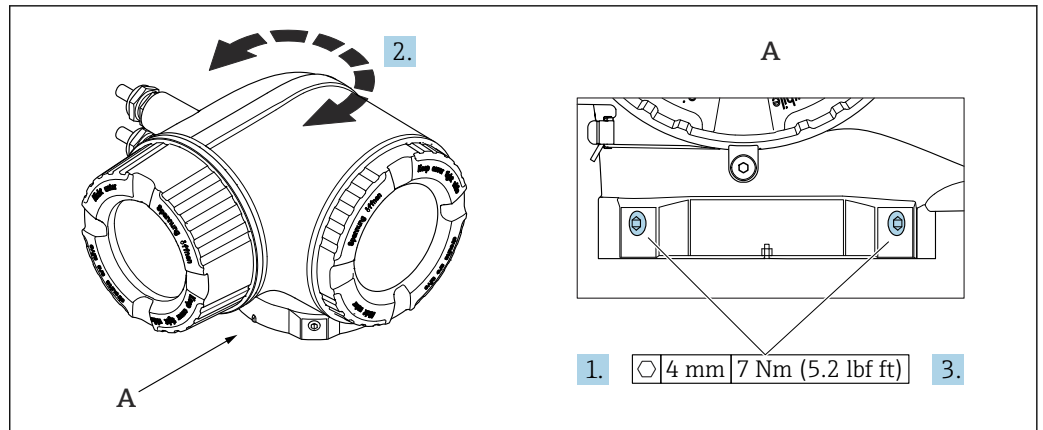
🖾 *8   Ex housing*

1. Loosen the fixing screws.

2. Turn the housing to the desired position.

3. Tighten the securing screws.

6.2.5   Turning the display module

The display module can be turned to optimize display readability and operability.
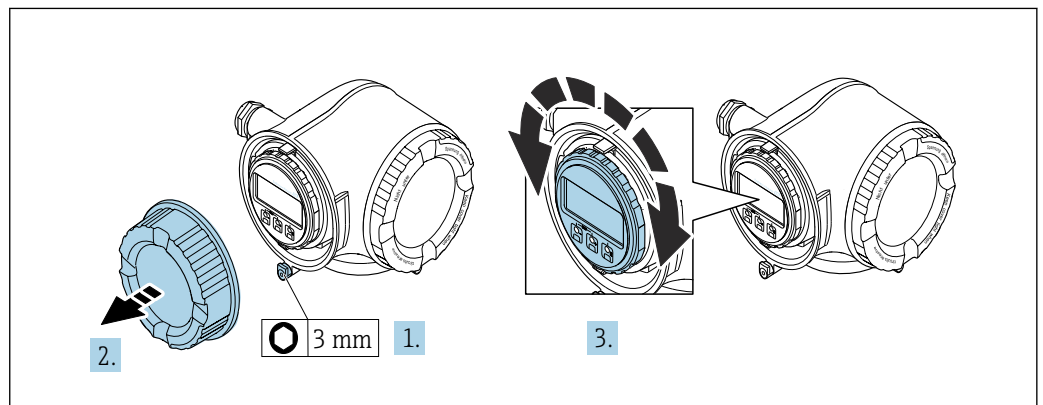
1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.

2. Unscrew the connection compartment cover.

3. Turn the display module to the desired position: max. 8 × 45° in each direction.

4. Screw on the connection compartment cover.

5. Depending on the device version: Attach the securing clamp of the connection compartment cover.

6.3   Post-installation check

Is the device undamaged (visual inspection)?	❑
Does the measuring device conform to the measuring point specifications? For example: • Process temperature → 🕮 200 • Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document) • Ambient temperature • Measuring range	❑
Has the correct orientation for the sensor been selected ? • According to sensor type • According to medium temperature • According to medium properties (outgassing, with entrained solids)	❑
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 🕮 22?	❑
Are the measuring point identification and labeling correct (visual inspection)?	❑
Is the device adequately protected from precipitation and direct sunlight?	❑
Are the securing screw and securing clamp tightened securely?	❑

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 connecting 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 mm^2 (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

Current output 4 to 20 mA HART

A shielded cable is recommended. Observe grounding concept of the plant.

Current output 0/4 to 20 mA

Standard installation cable is sufficient

Pulse /frequency /switch output

Standard installation cable is sufficient

Double pulse output

Standard installation cable is sufficient

Relay output

Standard installation cable is sufficient.

Current input 0/4 to 20 mA

Standard installation cable is sufficient

Status input

Standard installation cable is sufficient

Cable diameter

- Cable glands supplied:
  M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring-loaded terminals: Suitable for strands and strands with ferrules.
  Conductor cross-section 0.2 to 2.5 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 mm² (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 mm² (22 AWG)
Shield	Tin-plated copper braid, optical cover ≥ 85 %
Cable impedance (pair)	Minimum 80 Ω

Cable length	Maximum 300 m (1 000 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 (+)	27 (−)	24 (+)	25 (−)	22 (+)	23 (−)
		Device-specific terminal assignment: adhesive label in terminal cover.					

i Terminal assignment of the remote display and operating module → 🖺 37.

7.2.4   Preparing the measuring device

NOTICE

Insufficient sealing of the housing!
Operational reliability of the measuring device could be compromised.
▸ Use suitable cable glands corresponding to the degree of protection.

1. Remove dummy plug if present.

2. If the measuring device is supplied without cable glands:
    Provide suitable cable gland for corresponding connecting cable.

3. If the measuring device is supplied with cable glands:
    Observe requirements for connecting cables → 🖺 31.

7.3   Connecting the measuring device

NOTICE

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

7.3.1   Connecting the transmitter
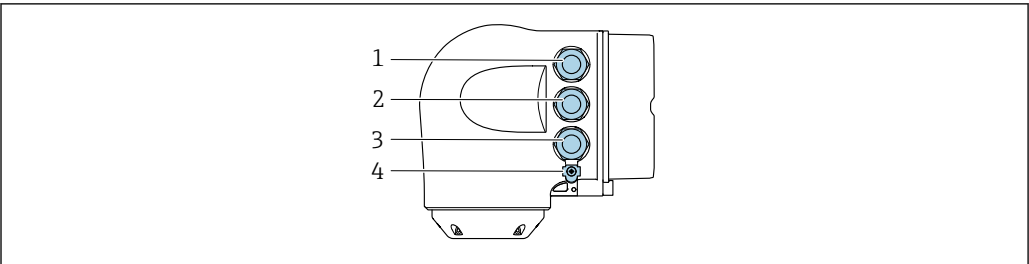
A0026781

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)
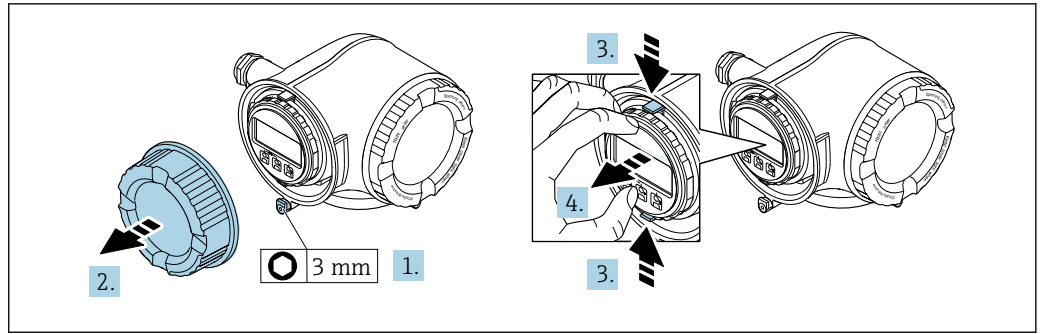
A0029813

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.
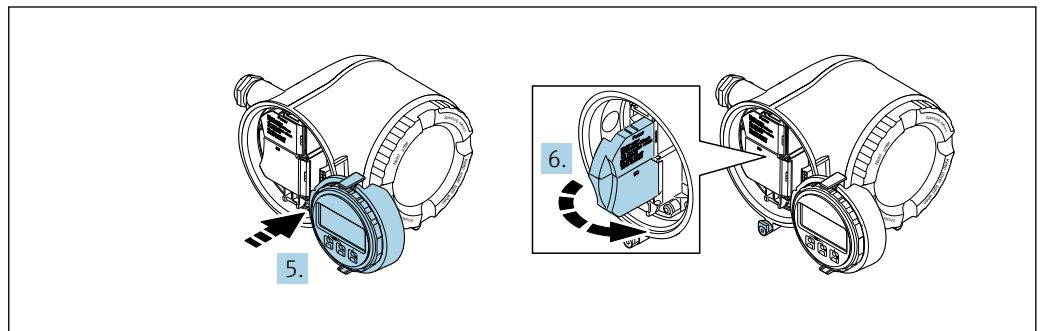
A0029814

5. Attach the holder to the edge of the electronics compartment.

6. Open the terminal cover.
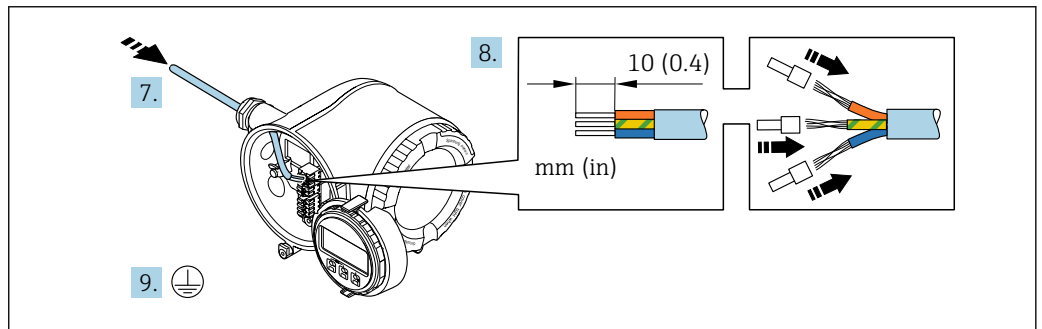
A0029815

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.
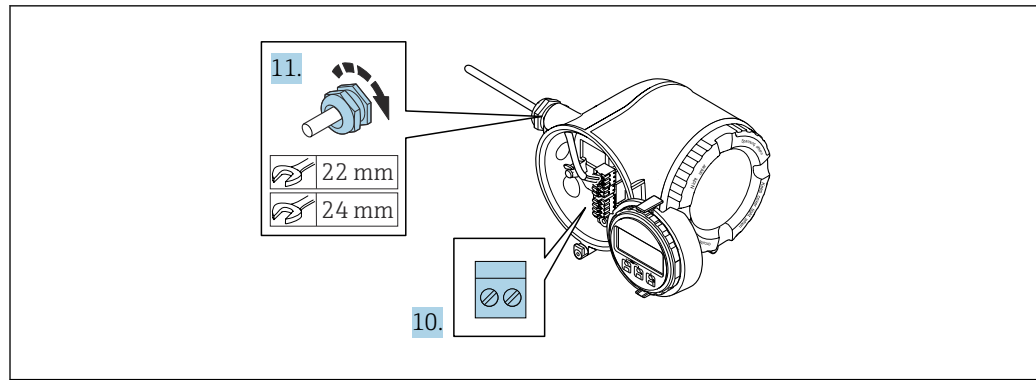
A0029816

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 terminal assignment: Adhesive label in the terminal cover or → 🖑 34.

11. Firmly tighten the cable glands.

   ↳ This concludes the cable connection process.

12. Close the terminal cover.

13. Fit the display module holder in the electronics compartment.

14. Screw on the connection compartment cover.

15. Secure the securing clamp of the connection compartment cover.

Removing a cable
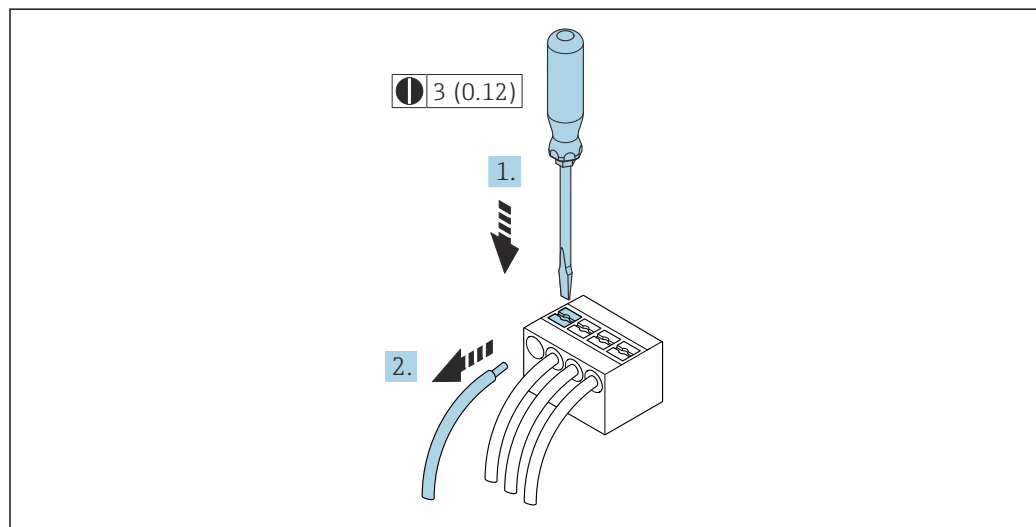
A0029598

🖼 *9   Engineering unit mm (in)*

1. To remove a cable from the terminal, use a flat-blade screwdriver to push the slot between the two terminal holes

2. while simultaneously pulling the cable end out of the terminal.

7.3.2   Connecting the remote display and operating module DKX001

The remote display and operating module DKX001 is available as an optional extra → 🖻 179.

- The remote display and operating module DKX001 is only available for the following housing versions, order code for "Housing":
  - Option A "Aluminum, coated"
  - Option L "Cast, stainless"
- The measuring device is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring device. Display or operation at the transmitter is not possible in this case.
- If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring device display module. Only one display or operation unit may be connected to the transmitter at any one time.

A0027518

1   Remote display and operating module DKX001
2   Terminal connection for potential equalization (PE)
3   Connecting cable
4   Measuring device
5   Terminal connection for potential equalization (PE)

7.4   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 electrical potential
- Use a ground cable with a minimum cross-section of 6 mm² (0.0093 in²) and a cable lug for potential equalization connections

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

7.5   Special connection instructions

7.5.1   Connection examples

Current output 4 to 20 mA HART
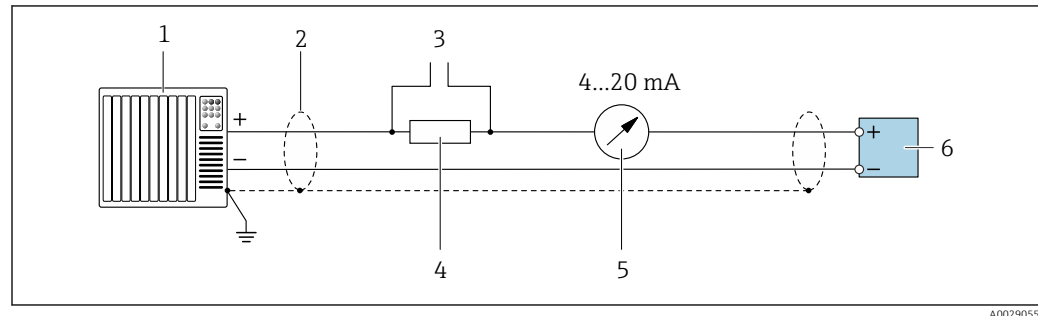
※ *10   Connection example for 4 to 20 mA HART current output (active)*

1   Automation system with current input (e.g. PLC)
2   Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
3   Connection for HART operating devices → ▤ 64
4   Resistor for HART communication (≥ 250 Ω): observe maximum load → ▤ 186
5   Analog display unit: observe maximum load → ▤ 186
6   Transmitter
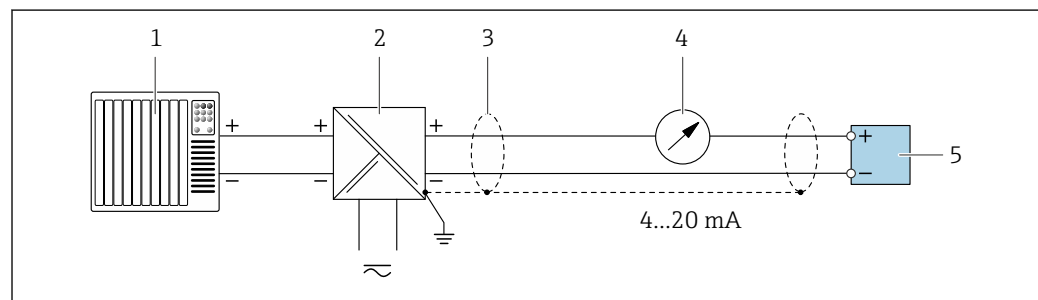
※ *11   Connection example for 4 to 20 mA HART current output (passive)*

1   Automation system with current input (e.g. PLC)
2   Power supply
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   Analog display unit: observe maximum load → ▤ 186
5   Transmitter

HART input
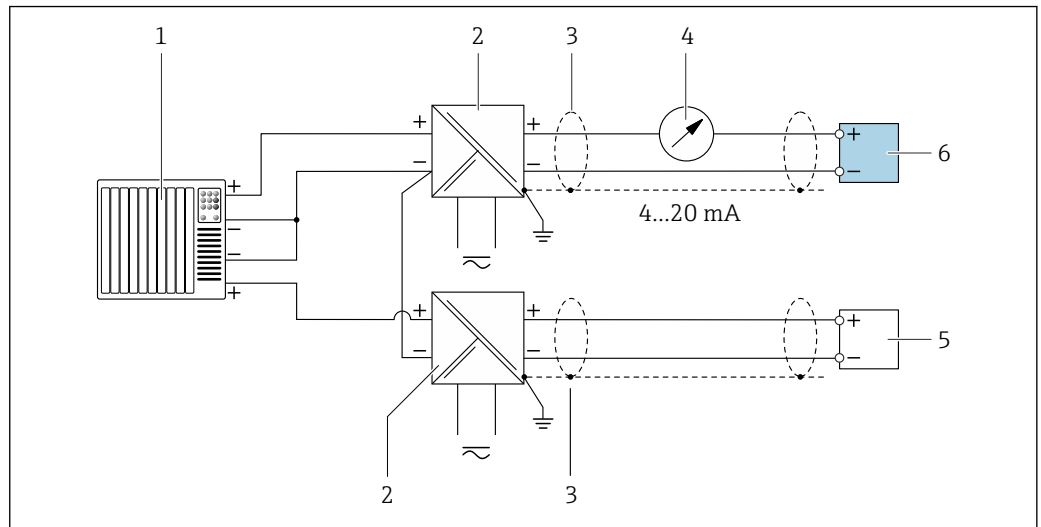
A0028763

🖻 *12   Connection example for HART input with a common negative (passive)*

1   Automation system with HART output (e.g. PLC)
2   Active barrier for power supply (e.g. RN221N)
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   Analog display unit: observe maximum load → 🖺 186
5   Pressure transmitter (e.g. Cerabar M, Cerabar S): see requirements
6   Transmitter

Current output 4-20 mA
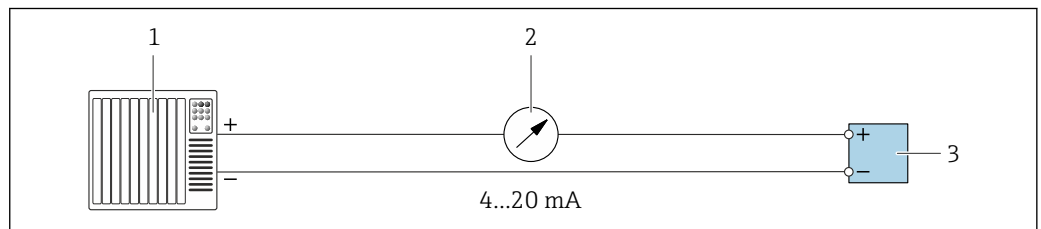
A0028758

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

1   Automation system with current input (e.g. PLC)
2   Analog display unit: observe maximum load → 🖺 186
3   Transmitter
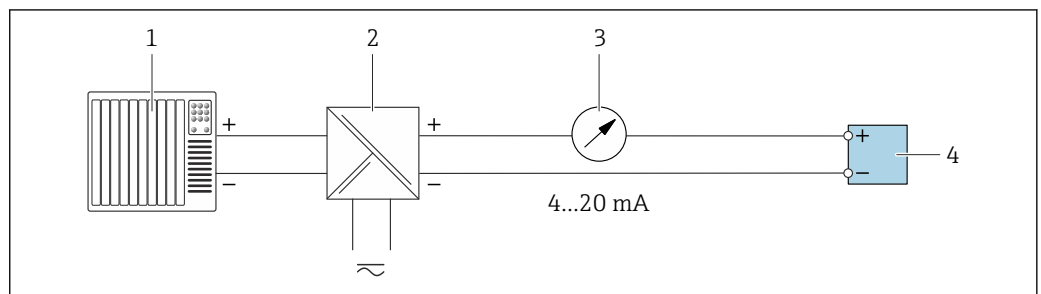
A0028759

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

1   Automation system with current input (e.g. PLC)
2   Active barrier for power supply (e.g. RN221N)
3   Analog display unit: observe maximum load → 🖺 186
4   Transmitter

Pulse/frequency output
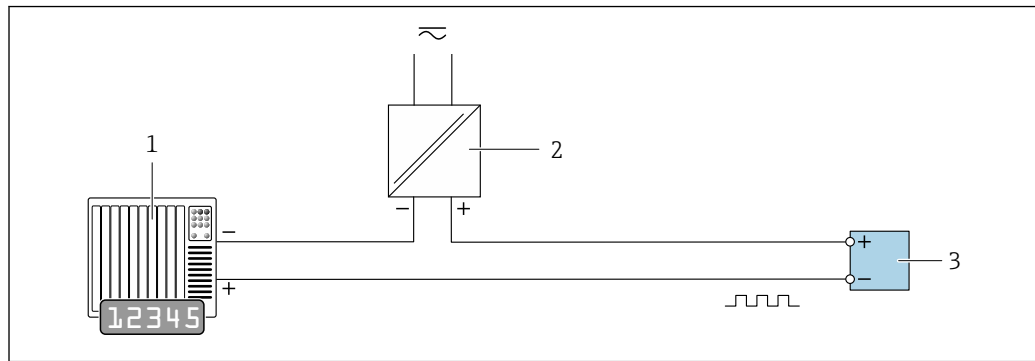
A0028761

▣ *15   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 → 🖹 188

Switch output
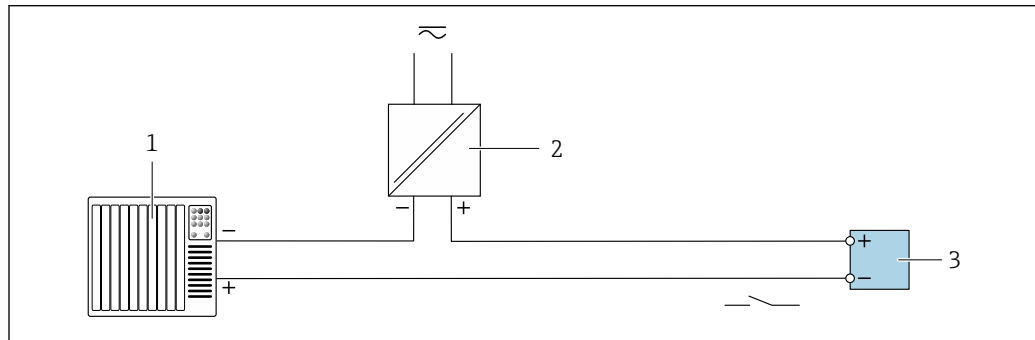
A0028760

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

1   Automation system with switch input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)
2   Power supply
3   Transmitter: observe input values → 🖹 188

Double pulse output
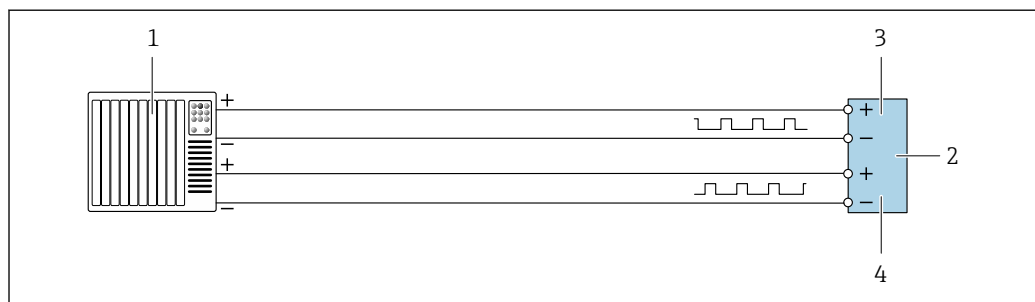
A0029280

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

1   Automation system with double pulse input (e.g. PLC)
2   Transmitter: observe input values → 🖹 189
3   Double pulse output
4   Double pulse output (slave), phase-shifted
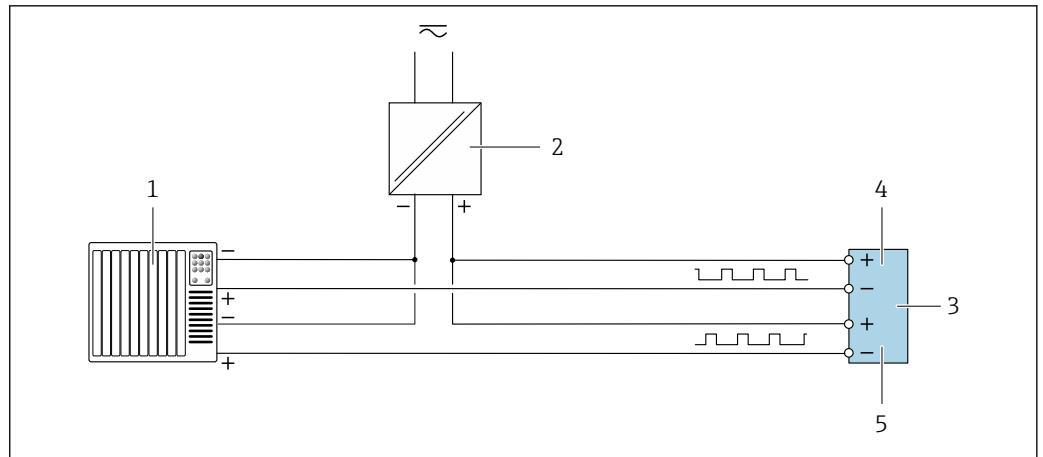
18   Connection example for double pulse output (passive)

1   Automation system with double pulse input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)
2   Power supply
3   Transmitter: observe input values → ▤ 189
4   Double pulse output
5   Double pulse output (slave), phase-shifted

Relay output
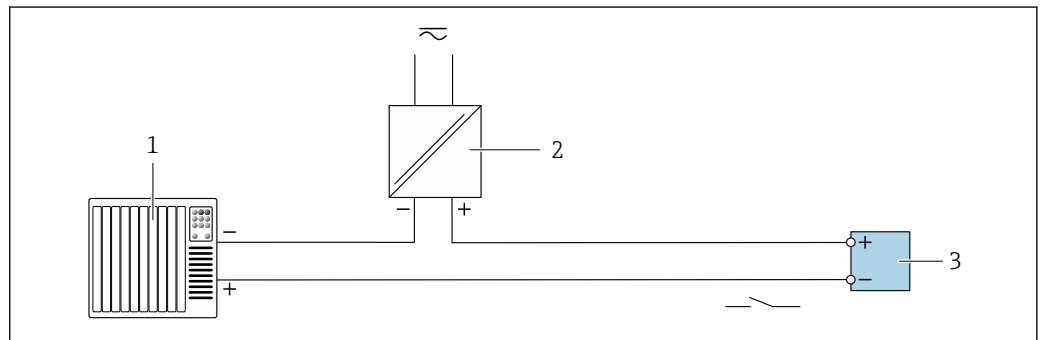
19   Connection example for relay output (passive)

1   Automation system with relay input (e.g. PLC)
2   Power supply
3   Transmitter: observe input values → ▤ 190

Current input
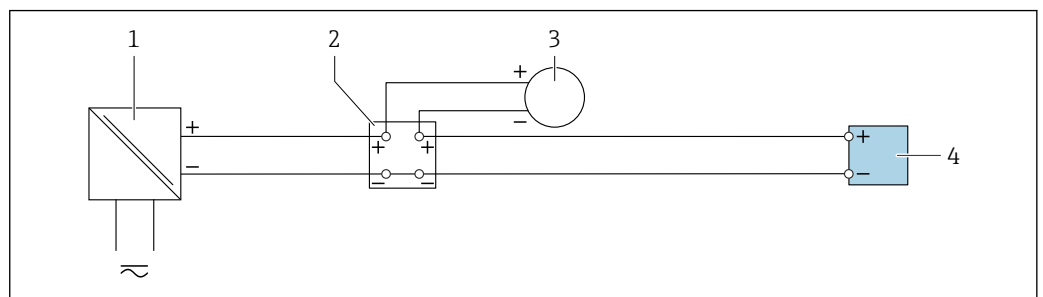
20   Connection example for 4 to 20 mA current input

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

Status input
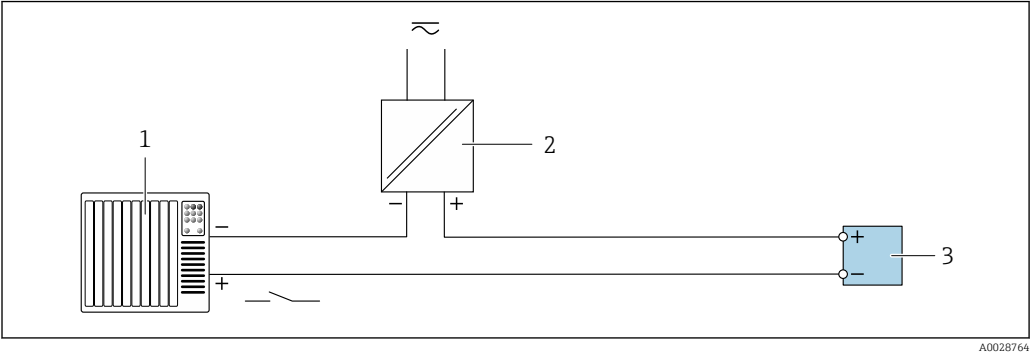
⊞ *21   Connection example for status input*

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

7.6   Ensuring the degree of protection

The measuring device 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").
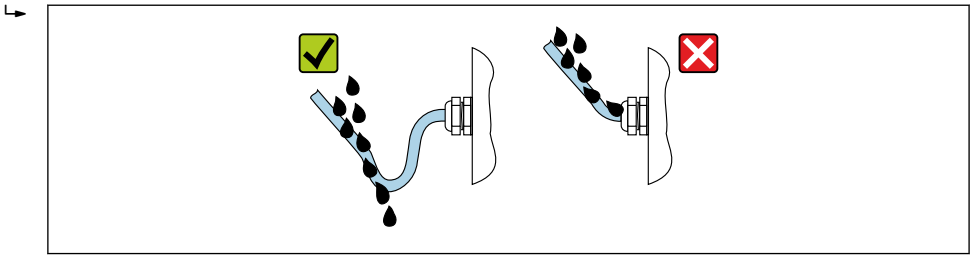
6. Insert dummy plugs (corresponding to the housing degree of protection) into unused cable entries.

7.7   Post-connection check

Are cables or the device undamaged (visual inspection)?	❏
Is the protective earthing established correctly?	
Do the cables used comply with the requirements ?	❏
Do the mounted cables have adequate strain relief?	❏
Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🖹 42?	❏
Is the terminal assignment correct ?	❏

If supply voltage is present, do values appear on the display module?	❏
Are dummy plugs inserted in unused cable entries and have transportation plugs been replaced with dummy plugs?	

8   Operation options

8.1   Overview of operation options

A0034513
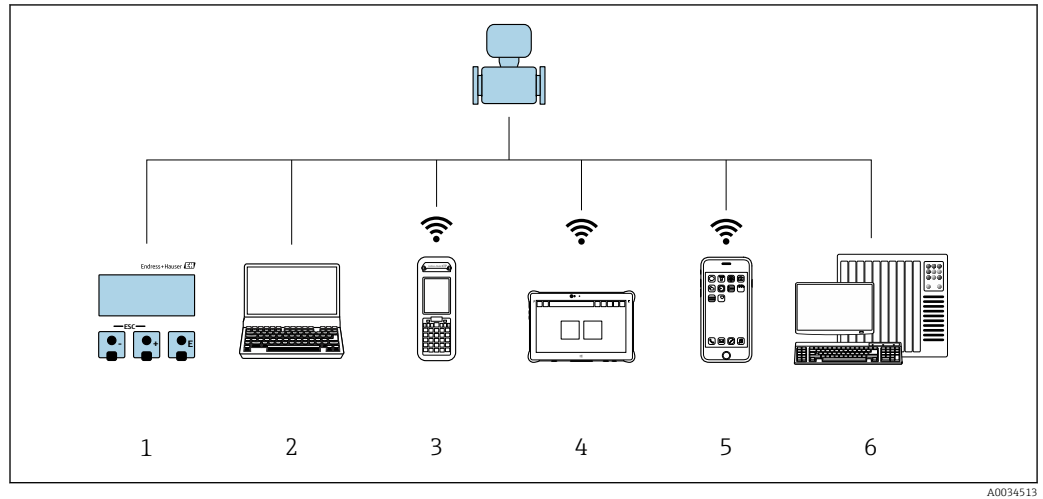
1   Local operation via display module
2   Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
3   Field Xpert SFX350 or SFX370
4   Field Xpert SMT70
5   Mobile handheld terminal
6   Control system (e.g. PLC)

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

For an overview of the operating menu for experts: see the "Description of Device Parameters" document supplied with the device
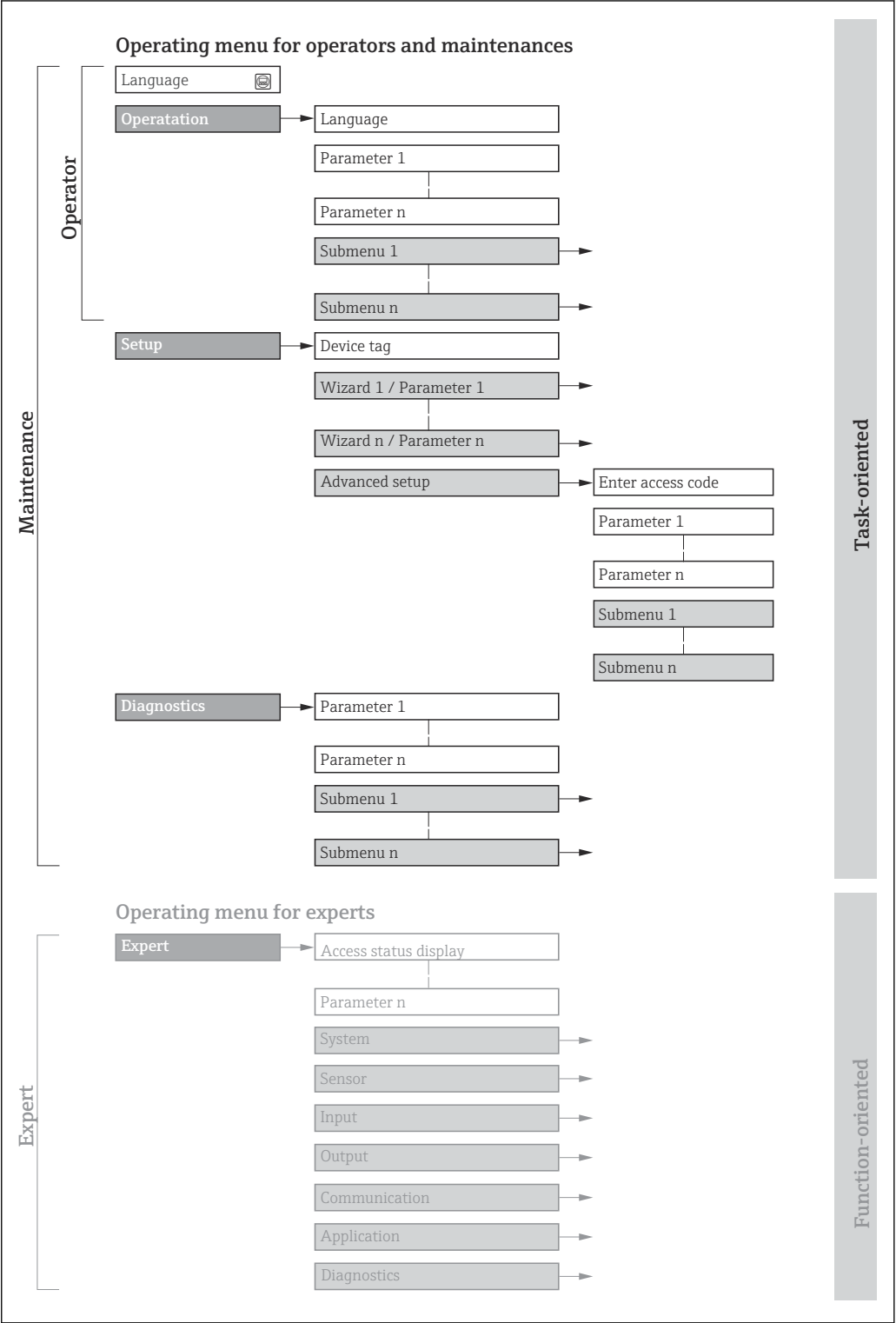
⊠ 22   Schematic structure of the operating menu

8.2.2 Operating philosophy

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

Menu/parameter		User role and tasks	Content/meaning
Language	task-oriented	**Role "Operator", "Maintenance"** Tasks during operation: • Configuration of the operational display • Reading measured values	• Defining the operating language • Defining the Web server operating language • Resetting and controlling totalizers
Operation			• Configuring the operational display (e.g. display format, display contrast) • Resetting and controlling totalizers
Setup		**"Maintenance" role** Commissioning: • Configuration of the measurement • Configuration of the inputs and outputs • Configuration of the communication interface	Wizards for fast commissioning: • Configuration of the system units • Configuration of the communication interface • Definition of the medium • Displaying the I/O configuration • Configuration of the inputs • Configuration of the outputs • Configuration of the operational display • Configuration of the low flow cut off • Configuration of the detection of partially filled and empty pipes Advanced setup • For more customized configuration of the measurement (adaptation to special measuring conditions) • Configuration of totalizers • Configuration of WLAN settings • Administration (define access code, reset measuring device)

Diagnostics		**"Maintenance" role**
		Troubleshooting:
		• Diagnostics and elimination of process and device errors
		• Measured value simulation
			Contains all parameters for error detection and analyzing process and device errors:
			• 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
			  The functionality of the device is checked on demand and the verification results are documented.
			• Simulation
			  Is used to simulate measured values or output values.

Expert	function-oriented	Tasks that require detailed knowledge of the function of the device:
		• Commissioning measurements under difficult conditions
		• Optimal adaptation of the measurement to difficult conditions
		• Detailed configuration of the communication interface
		• Error diagnostics in difficult cases
			Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device:
			• System
			  Contains all higher-level device parameters that do not pertain either to the measurement or to measured value communication.
			• Sensor
			  Configuration of the measurement.
			• 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.
			• 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 the operating menu via the local display

8.3.1 Operational display
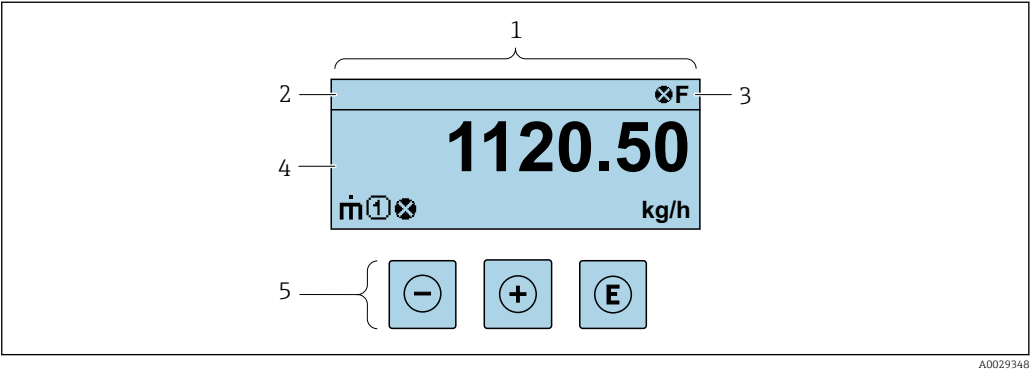
1   Operational display
2   Device tag
3   Status area
4   Display area for measured values (4-line)
5   Operating elements → 🖺 52

Status area

The following symbols appear in the status area of the operational display at the top right:
- Status signals→ 🖺 157
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior→ 🖺 158
  - 🛇: 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 variable	Measurement channel number	Diagnostic behavior
↓	↓	↓

Example

⤻	①	△

Appears only if a diagnostics event is present for this measured variable.

Measured variables

Symbol	Meaning
ṁ	Mass flow
U̇	• Volume flow • Corrected volume flow

(density symbol)	• Density • Reference density
(temperature symbol)	Temperature
Σ	Totalizer (i) The measurement channel number indicates which of the three totalizers is displayed.
(output symbol)	Output (i) The measurement channel number indicates which of the outputs is displayed.
(status input symbol)	Status input

Measurement channel numbers

Symbol	Meaning
[1]...[4]	Measurement channel 1 to 4

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

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols → 🖹 158

(i) The number and display format of the measured values can be configured via the **Format display** parameter (→ 🖹 107).

8.3.2 Navigation view

1 Navigation view
2 Navigation path to current position
3 Status area
4 Display area for navigation
5 Operating elements → 🖹 52

Navigation path

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

	• In the submenu:
	  Display symbol for menu
	• In the wizard:
	  Display symbol for wizard
		Omission symbol for operating menu levels in between	Name of current
			• Submenu
			• Wizard
			• Parameters

	↓	↓	↓
Examples	⟨symbol⟩	/ ../	**Display**
	⟨symbol⟩	/ ../	**Display**

For more information about the icons in the menu, refer to the "Display area" section → 🖺 49

Status area

The following appears in the status area of the navigation view in the top right corner:
• In the submenu
  • The direct access code for the parameter you are navigating to (e.g. 0022-1)
  • If a diagnostic event is present, the diagnostic behavior and status signal
• In the wizard
  If a diagnostic event is present, the diagnostic behavior and status signal

• For information on the diagnostic behavior and status signal → 🖺 157
• For information on the function and entry of the direct access code → 🖺 54

Display area

Menus

Symbol	Meaning
⟨symbol⟩	**Operation** Appears: • In the menu next to the "Operation" selection • At the left in the navigation path in the **Operation** menu
⟨symbol⟩	**Setup** Appears: • In the menu next to the "Setup" selection • At the left in the navigation path in the **Setup** menu
⟨symbol⟩	**Diagnostics** Appears: • In the menu next to the "Diagnostics" selection • At the left in the navigation path in the **Diagnostics** menu
⟨symbol⟩	**Expert** Appears: • In the menu next to the "Expert" selection • At the left in the navigation path in the **Expert** menu

Submenus, wizards, parameters

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

Locking

Symbol	Meaning
🔒	**Parameter locked** When displayed in front of a parameter name, indicates that the parameter is locked. • By a user-specific access code • By the hardware write protection switch

Wizard operation

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

8.3.3   Editing view

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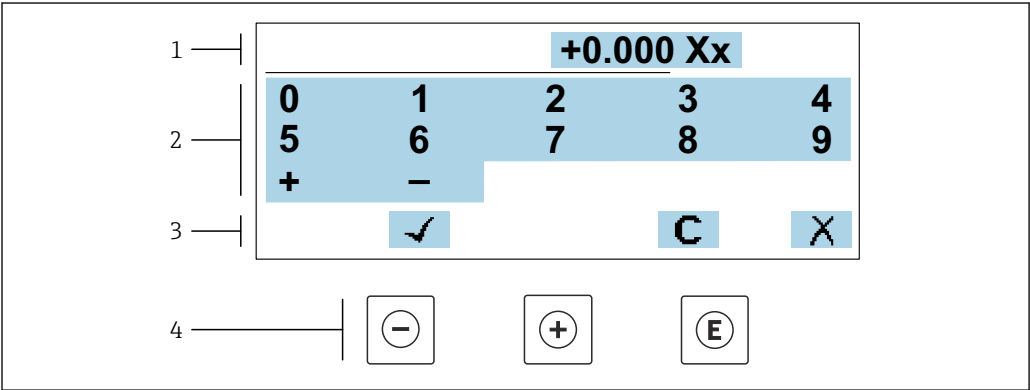
🖼 23   For entering values in parameters (e.g. limit values)

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

Text editor
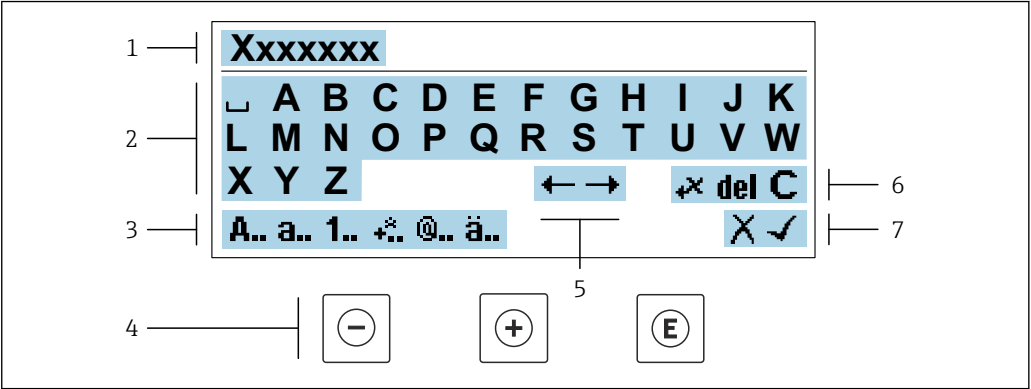
⊡ *24   For entering text in parameters (e.g. tag name)*

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

Using the operating elements in the editing view

Key	Meaning
⊟	**Minus key** Move the entry position to the left.
⊞	**Plus key** Move the entry position to the right.
Ⓔ	**Enter key** • Pressing the key briefly confirms the 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 ° € $ £ ¥ § @ # / \ I ~ & _
ä..	Umlauts and accents

Controlling data entries

Symbol	Meaning
←→	Move entry position
✗	Reject entry
✓	Confirm entry
⟵ˣ	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

Key	Meaning
⊖	**Minus key** *In menu, submenu* Moves the selection bar upwards in a picklist. *With a wizard* Confirms the parameter value and goes to the previous parameter. *For text and numeric editor* Move the entry position to the left.
⊕	**Plus key** *In menu, submenu* Moves the selection bar downwards in a picklist. *With a wizard* Confirms the parameter value and goes to the next parameter. *For text and numeric editor* Move the entry position to the right.

Ⓔ	**Enter key**
	
	For operational display
	Pressing the key briefly opens the operating menu.
	
	In menu, submenu
	• Pressing the key briefly:
	  • 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:
	  If present, opens the help text for the function of the parameter.
	
	With a wizard
	Opens the editing view of the parameter.
	
	For text and numeric editor
	• Pressing the key briefly confirms the selection.
	• Pressing the key for 2 s confirms your entry.

Key	Meaning

⊟+⊞	**Escape key combination (press keys simultaneously)**
	
	In menu, submenu
	• Pressing the key briefly:
	    • Exits the current menu level and takes you to the next level up.
	    • 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").
	
	With a wizard
	Exits the wizard and takes you to the next level up.
	
	For text and numeric editor
	Closes the editing view without applying changes.

⊟+Ⓔ	**Minus/Enter key combination (press and hold down the keys simultaneously)**
	
	• If the keypad lock is enabled:
	    Pressing the key for 3 s disables the keypad lock.
	• If the keypad lock is not enabled:
	    Pressing the key for 3 s opens the context menu including the selection 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.
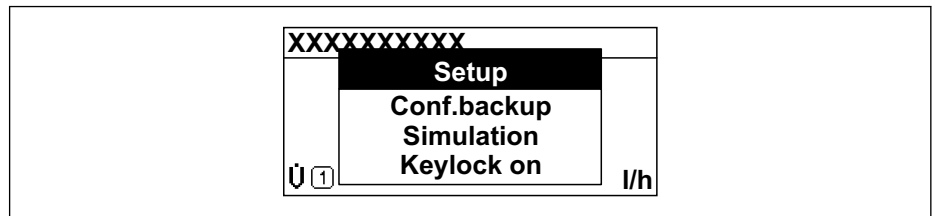
2. Press ⊟ + ⊞ simultaneously.
   ↳ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

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

8.3.6   Navigating and selecting from list

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

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

Example: Setting the number of displayed measured values to "2 values"
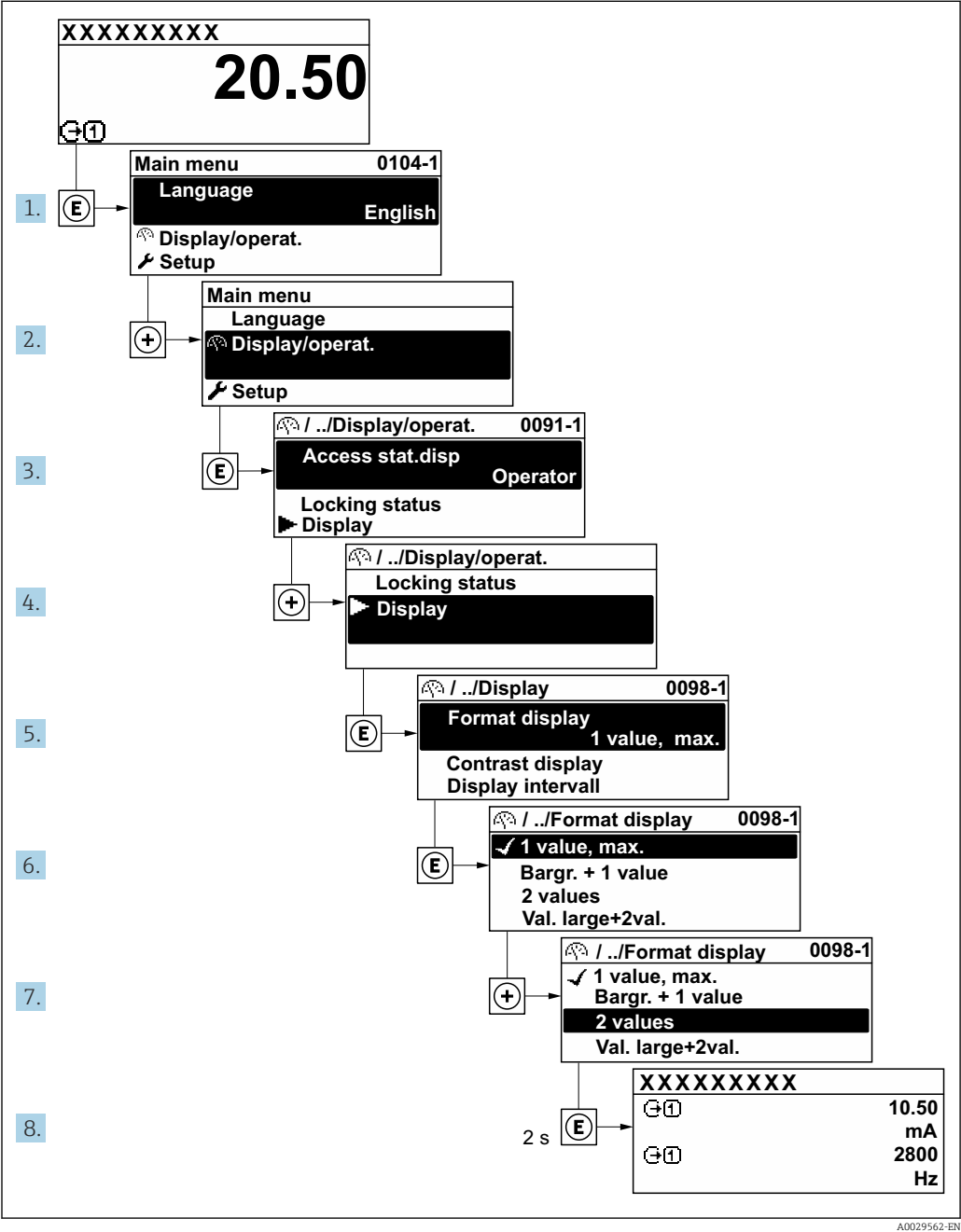
8.3.7   Calling the parameter directly

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.
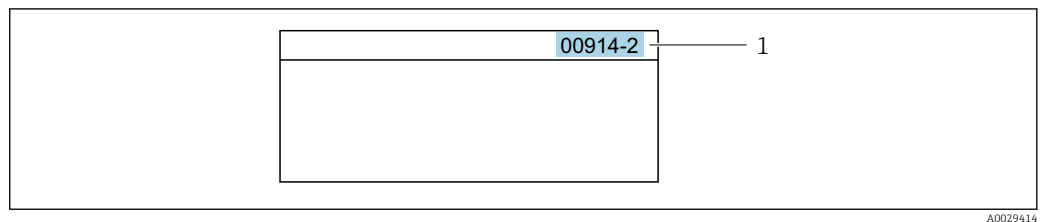
1 Direct access code

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.

   Ent. access code
   Enter access code to disable
   write protec.
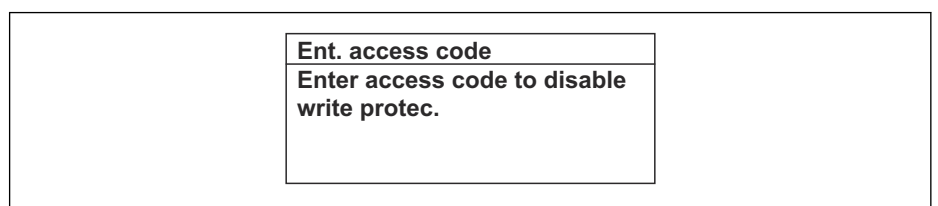
⊠ *25 Example: Help text for parameter "Enter access code"*

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

8.3.9 Changing the parameters

Parameters can be changed via the numeric editor or text editor.
- Numeric editor: Change values in a parameter, e.g. specifications for limit values.
- Text editor: Enter text in a parameter, e.g. tag name.

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

```
                        ┌─────────────────────────────────┐
                        │ Ent. access code                │
                        │ Invalid or out of range input   │
                        │ value                           │
                        │ Min:0                           │
                        │ Max:9999                        │
                        └─────────────────────────────────┘
```

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 → 🖹 134.

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. Refer to the "Write protection via access code" section

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 → 🖹 134.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→ 🖹 113) 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 the operating menu via the Web browser

8.4.1 Function scope

Thanks to the integrated Web server the device can be operated and configured via a Web browser and via the service interface (CDI-RJ45) or via the WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, device status information is also displayed and allows users to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

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

For additional information on the Web server, refer to the Special Documentation for the device → 🖹 216

8.4.2   Requirements

Computer hardware

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

Computer software

Software	Interface	
	CDI-RJ45	**WLAN**

Recommended operating systems	• Microsoft Windows 8 or higher.
	• Mobile operating systems:
	  • iOS
	  • Android
	
	ⓘ Microsoft Windows XP is supported.
	
	ⓘ Microsoft Windows 7 is supported.	

Web browsers supported	• 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 (for adjusting the IP address, subnet mask etc.).	
Proxy server settings of the Web browser	The Web browser setting *Use proxy server for LAN* must be **disabled** .	
JavaScript	JavaScript must be enabled. ⓘ If JavaScript cannot be enabled: Enter http://192.168.1.212/servlet/basic.html in the address bar of the web browser. A fully functional but simplified version of the operating menu structure starts in the Web browser. ⓘ When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) of the Web browser under **Internet options**.	
Network connections	Only the active network connections to the measuring device should be used.	
	Switch off all other network connections such as WLAN.	Switch off all other network connections.

ⓘ In the event of connection problems: → 🖹 154

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 ℹ️ 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: • Transmitter with integrated WLAN antenna • Transmitter with external WLAN antenna
Web server	Web server and WLAN must be enabled; factory setting: ON ℹ️ For information on enabling the Web server → 🔖 63

8.4.3 Establishing a connection

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. The location of the connection socket depends on the measuring device and the communication protocol:
   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 to the computer using a cable → 🔖 65.

3. If a 2nd network card is not used, close all the applications on the notebook.
   ↳ Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.

4. Close any open Internet browsers.

5. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

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

Via WLAN interface

Configuring the Internet protocol of the mobile terminal

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

> **NOTICE**
> **In principle, avoid simultaneous access to the measuring device via the service interface (CDI-RJ45) and the WLAN interface from the same mobile terminal. This could cause a network conflict.**
> ▶ Only activate one service interface (CDI-RJ45 service interface or WLAN interface).
> ▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

Preparing the mobile terminal

▶ Enable WLAN reception on the mobile terminal.

Establishing a connection from the mobile terminal to the measuring device

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promass_300_A802000).

2. If necessary, select the WPA2 encryption method.

3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ LED on display module flashes: it is now possible to operate the measuring device with a web browser, FieldCare or DeviceCare.

🛈 The serial number can be found on the nameplate.

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

Disconnecting

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

Starting the Web browser

1. Start the Web browser on the computer.

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

A0029417

1 Picture of device
2 Device name
3 Device tag (→ 🖹 81)
4 Status signal
5 Current measured values
6 Operating language
7 User role
8 Access code
9 Login
10 Reset access code (→ 🖹 130)

If a login page does not appear, or if the page is incomplete → 🖹 154

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 (default setting); can be changed by customer

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

8.4.5   User interface
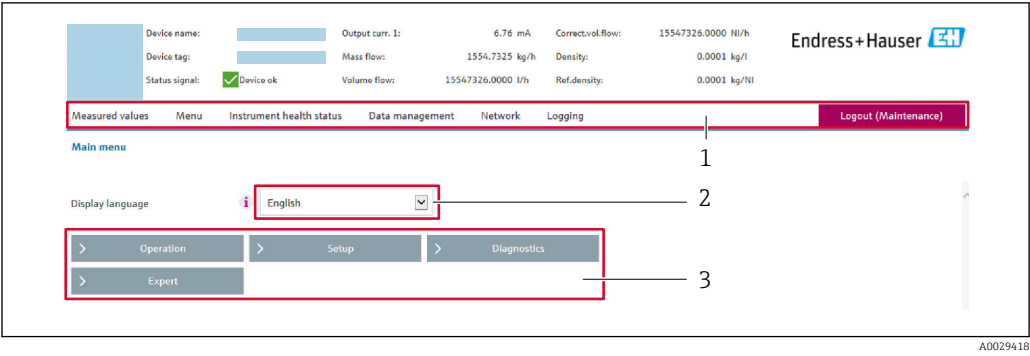
1   Function row
2   Local display language
3   Navigation area

Header

The following information appears in the header:
- Device name
- Device tag
- Device status with status signal → 📖 160
- Current measured values

Function row

Functions	Meaning
Measured values	Displays the measured values of the device
Menu	• Access to the operating menu from the measuring device • The structure of the operating menu is the same as for the local display 📖 For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device
Device status	Displays the diagnostic messages currently pending, listed in order of priority

Data management	Data exchange between PC and measuring device:
	• Device configuration:
	  ▪ 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:
	  ▪ 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)
	• Firmware update - Flashing a firmware version

Network configuration	Configuration and checking of all the parameters required for establishing the connection to the measuring device: • 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

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

Working area

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

8.4.6   Disabling the Web server

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

Navigation
"Expert" menu → Communication → Web server

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Web server functionality	Switch the Web server on and off.	• Off • HTML Off • On	On

Function scope of the "Web server functionality" parameter

Option	Description
Off	• The Web server is completely disabled. • Port 80 is locked.
HTML Off	The HTML version of the Web server is not available.
On	• 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 HART protocol

This communication interface is available in device versions with a HART output.
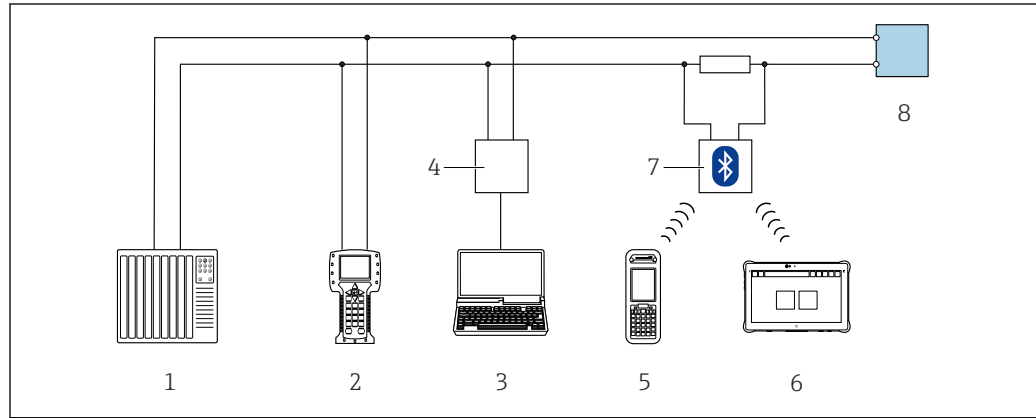
A0028747

🖾 *26   Options for remote operation via HART protocol (active)*

1   Control system (e.g. PLC)
2   Field Communicator 475
3   Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
4   Commubox FXA195 (USB)
5   Field Xpert SFX350 or SFX370
6   Field Xpert SMT70
7   VIATOR Bluetooth modem with connecting cable
8   Transmitter
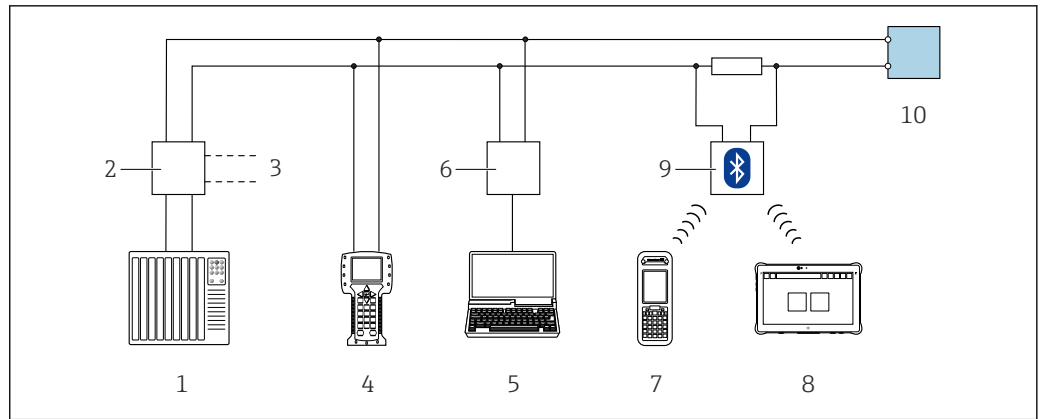
🖾 *27   Options for remote operation via HART protocol (passive)*

1   Control system (e.g. PLC)
2   Transmitter power supply unit, e.g. RN221N (with communication resistor)
3   Connection for Commubox FXA195 and Field Communicator 475
4   Field Communicator 475
5   Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or
computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM
DTM "CDI Communication TCP/IP"
6   Commubox FXA195 (USB)
7   Field Xpert SFX350 or SFX370
8   Field Xpert SMT70
9   VIATOR Bluetooth modem with connecting cable
10   Transmitter

Service interface

Via service interface (CDI-RJ45)

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

ℹ️ An adapter for RJ45 to the M12 plug is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

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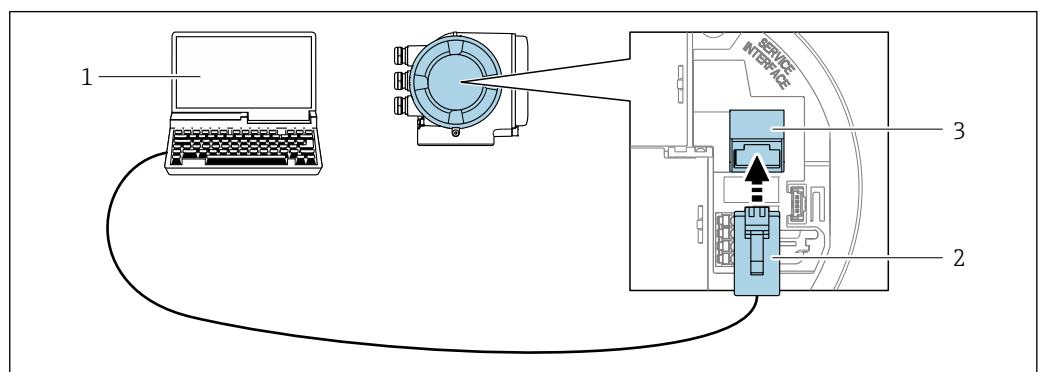
🖾 *28   Connection via service interface (CDI-RJ45)*

1   Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated
Web server or with "FieldCare", "DeviceCare" operating tool 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
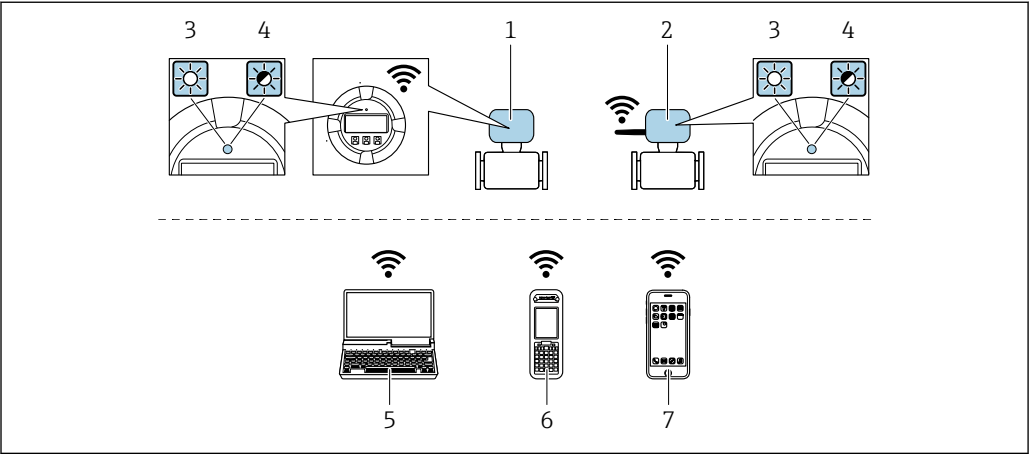
1   Transmitter with integrated WLAN antenna
2   Transmitter with external WLAN antenna
3   LED lit constantly: WLAN reception is enabled on measuring device
4   LED flashing: WLAN connection established between operating unit and measuring device
5   Computer with WLAN interface and Web browser (e.g. 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	• Internal antenna • External antenna (optional) In the event of poor transmission/reception conditions at the place of installation. Only 1 antenna is active at any one time!
Range	• Internal antenna: typically 10 m (32 ft) • External antenna: typically 50 m (164 ft)
Materials (external antenna)	• Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass • Adapter: Stainless steel and nickel-plated brass • Cable: Polyethylene • Plug: Nickel-plated brass • Angle bracket: Stainless steel

Configuring the Internet protocol of the mobile terminal

NOTICE

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

NOTICE

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

▶ Only activate one service interface (CDI-RJ45 service interface or WLAN interface).

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

Preparing the mobile terminal

▶ Enable WLAN reception on the mobile terminal.

Establishing a connection from the mobile terminal to the measuring device

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promass_300_A802000).

2. If necessary, select the WPA2 encryption method.

3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ LED on display module flashes: it is now possible to operate the measuring device with a web browser, FieldCare or DeviceCare.

The serial number can be found on the nameplate.

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

Disconnecting

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

8.5.2   Field Xpert SFX350, SFX370

Function range

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 → 🖹 71

8.5.3   FieldCare

Function scope

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

Access is via:
- HART protocol
- CDI-RJ45 service interface → 🖺 65
- WLAN interface → 🖺 66

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

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

Source for device description files

See information → 🖺 71

Establishing a connection

1. Start FieldCare and launch the project.

2. In the network: Add a device.
   ↳ The **Add device** window opens.

3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.

4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.

5. Select the desired device from the list and press **OK** to confirm.
   ↳ The **CDI Communication TCP/IP (Configuration)** window opens.

6. Enter the device address in the **IP address** field: 192.168.1.212 and press **Enter** to confirm.

7. Establish the online connection to the device.

📖 For additional information, see Operating Instructions BA00027S and BA00059S

User interface
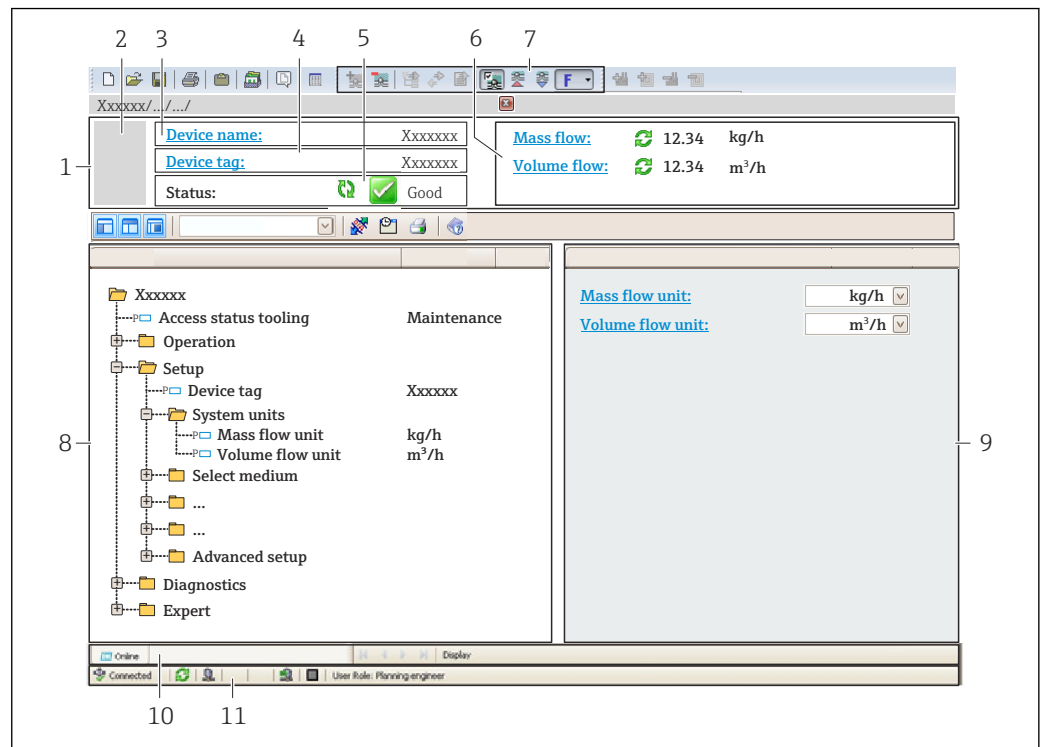
A0021051-EN

1   Header
2   Picture of device
3   Device name
4   Tag name
5   Status area with status signal → 🖺 160
6   Display area for current measured values
7   Edit bar with additional functions such as save/load, event list and document creation
8   Navigation area with operating menu structure
9   Working area
10   Range of action
11   Status area

8.5.4   DeviceCare

Function scope

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.

For details, see Innovation Brochure IN01047S

Source for device description files

See information → 🖺 71

8.5.5   AMS Device Manager

Function scope

Program from Emerson Process Management for operating and configuring measuring devices via HART protocol.

Source for device description files

See data → 🕮 71

8.5.6   SIMATIC PDM

Function scope

SIMATIC PDM is a standardized, manufacturer-independent program from Siemens for the operation, configuration, maintenance and diagnosis of intelligent field devices via HART protocol.

Source for device description files

See information on → 🕮 71

8.5.7   Field Communicator 475

Function scope

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

Source for device description files

See data → 🕮 71

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.06.zz	• On the title page of the Operating Instructions • On the transmitter nameplate • Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	08.2022	---
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x3B	Device type Diagnostics → Device information → Device type
HART protocol revision	7	---
Device revision	7	• On the transmitter nameplate • Device revision Diagnostics → Device information → Device revision

For an overview of the various firmware versions for the device → 🖹 174

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 HART protocol	Sources for obtaining device descriptions
FieldCare	• www.endress.com → Download Area • CD-ROM (contact Endress+Hauser) • DVD (contact Endress+Hauser)
DeviceCare	• www.endress.com → Download Area • CD-ROM (contact Endress+Hauser) • DVD (contact Endress+Hauser)
• Field Xpert SMT70 • Field Xpert SMT77	Use update function of handheld terminal
AMS Device Manager (Emerson Process Management)	www.endress.com → Download Area
SIMATIC PDM (Siemens)	www.endress.com → Download Area
Field Communicator 475 (Emerson Process Management)	Use update function of handheld terminal

9.2   Measured variables via HART protocol

The following measured variables (HART device variables) are assigned to the dynamic variables at the factory:

Dynamic variables	Measured variables (HART device variables)
Primary dynamic variable (PV)	Mass flow
Secondary dynamic variable (SV)	Totalizer 1
Tertiary dynamic variable (TV)	Density
Quaternary dynamic variable (QV)	Temperature

The assignment of the measured variables to the dynamic variables can be modified and assigned as desired via local operation and the operating tool using the following parameters:

- Expert → Communication → HART output → Output → Assign PV
- Expert → Communication → HART output → Output → Assign SV
- Expert → Communication → HART output → Output → Assign TV
- Expert → Communication → HART output → Output → Assign QV

The following measured variables can be assigned to the dynamic variables:

Measured variables for PV (primary dynamic variable)

- Measured variables which are generally available:
  - Mass flow
  - Volume flow
  - Corrected volume flow
  - Density
  - Reference density
  - Temperature
  - Electronics temperature
  - Pressure
  - Raw value mass flow
  - Oscillation frequency 0
  - Oscillation frequency 1
  - Oscillation damping 0
  - Oscillation damping 1
  - Signal asymmetry
  - Exciter current 0
  - Exciter current 1
  - Inhomogeneous medium index
  - Sensor index coil asymmetry
  - Test point 0
  - Test point 1
  - Torsion signal asymmetry
- Additional measured variables with the Heartbeat Verification + Monitoring application package:
  - Carrier pipe temperature
  - Oscillation amplitude
  - Oscillation amplitude 1
  - Frequency fluctuation 0
  - Frequency fluctuation 1
  - Oscillation damping fluctuation 0
  - Oscillation damping fluctuation 1
  - HBSI
- Additional measured variables with the Concentration application package:
  - Concentration
  - Target mass flow
  - Carrier mass flow
  - Target volume flow
  - Carrier volume flow
  - Target corrected volume flow
  - Carrier corrected volume flow
- Additional measured variables with the Viscosity application package:
  - Dynamic viscosity
  - Kinematic viscosity
  - Temp. compensated dynamic viscosity
  - Temp. compensated kinematic viscosity
- With application-specific output
  - Application specific output 0
  - Application specific output 1

Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)
- Measured variables which are always available:
  - Mass flow
  - Volume flow
  - Corrected volume flow
  - Density
  - Reference density
  - Temperature
  - Electronics temperature
  - Oscillation frequency 0
  - Oscillation damping 0
  - Inhomogeneous medium index
  - Suspended bubbles index
  - Sensor index coil asymmetry
  - Test point 0
  - Test point 1
  - Pressure
  - Totalizer 1
  - Totalizer 2
  - Totalizer 3
- Additional measured variables with the Heartbeat Verification + Monitoring application package:
  - Carrier pipe temperature
  - HBSI
- Additional measured variables with the Concentration application package:
  - Concentration
  - Target mass flow
  - Carrier mass flow
  - Target volume flow
  - Carrier volume flow
  - Target corrected volume flow
  - Carrier corrected volume flow
- Additional measured variables with the Viscosity application package:
  - Dynamic viscosity
  - Kinematic viscosity
  - Temp. compensated dynamic viscosity
  - Temp. compensated kinematic viscosity

9.2.1   Device variables

Device variables are permanently assigned. A maximum of eight device variables can be transmitted.

Assignment	Device variables
0	Mass flow
1	Volume flow
2	Corrected volume flow
3	Density
4	Reference density
5	Temperature
6	Totalizer 1
7	Totalizer 2
8	Totalizer 3
9	Dynamic viscosity

Assignment	Device variables
10	Kinematic viscosity
11	Temp. compensated dynamic viscosity
12	Temp. compensated kinematic viscosity
13	Target mass flow [1]
14	Carrier mass flow [1]
15	Concentration [1]

1) Visible depending on the order options or device settings

9.3   Other settings

Burst mode functionality in accordance with HART 7 Specification:

Navigation

"Expert" menu → Communication → HART output → Burst configuration → Burst configuration 1 to n

▶ Burst configuration 1 to n	
Burst mode 1 to n	→ 🖺 76
Burst command 1 to n	→ 🖺 76
Burst variable 0	→ 🖺 77
Burst variable 1	→ 🖺 77
Burst variable 2	→ 🖺 77
Burst variable 3	→ 🖺 77
Burst variable 4	→ 🖺 77
Burst variable 5	→ 🖺 77
Burst variable 6	→ 🖺 77
Burst variable 7	→ 🖺 77
Burst trigger mode	→ 🖺 77
Burst trigger level	→ 🖺 77
Min. update period	→ 🖺 78
Max. update period	→ 🖺 78

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Burst mode 1 to n	Activate the HART burst mode for burst message X.	• Off • On	Off
Burst command 1 to n	Select the HART command that is sent to the HART master.	• Command 1 • Command 2 • Command 3 • Command 9 • Command 33 • Command 48	Command 2

Parameter	Description	Selection / User entry	Factory setting
Burst variable 0	For HART command 9 and 33: select the HART device variable or the process variable.	• Mass flow • Volume flow • Corrected volume flow * • Density • Reference density * • Temperature • Totalizer 1 • Totalizer 2 • Totalizer 3 • Target mass flow * • Carrier mass flow * • Concentration * • Dynamic viscosity * • Kinematic viscosity * • Temp. compensated dynamic viscosity * • Temp. compensated kinematic viscosity * • Totalizer 1 • Totalizer 2 • Totalizer 3 • HBSI * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow * • Sensor index coil asymmetry • Test point 0 • Test point 1 • HART input • Percent of range • Measured current • Primary variable (PV) • Secondary variable (SV) • Tertiary variable (TV) • Quaternary variable (QV) • Not used	Volume flow
Burst variable 1	For HART command 9 and 33: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst variable 2	For HART command 9 and 33: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst variable 3	For HART command 9 and 33: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst variable 4	For HART command 9: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst variable 5	For HART command 9: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst variable 6	For HART command 9: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst variable 7	For HART command 9: select the HART device variable or the process variable.	See the **Burst variable 0** parameter.	Not used
Burst trigger mode	Select the event that triggers burst message X.	• Continuous • Window * • Rising * • Falling * • On change	Continuous
Burst trigger level	Enter the burst trigger value. Together with the option selected in the **Burst trigger mode** parameter the burst trigger value determines the time of burst message X.	Signed floating-point number	–

Parameter	Description	Selection / User entry	Factory setting
Min. update period	Enter the minimum time span between two burst commands of burst message X.	Positive integer	1 000 ms
Max. update period	Enter the maximum time span between two burst commands of burst message X.	Positive integer	2 000 ms

*   Visibility depends on order options or device settings

10   Commissioning

10.1   Function check

Before commissioning the measuring device:

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

- Checklist for "Post-mounting check" → 🖹 30
- Checklist for "Post-connection check" → 🖹 42

10.2   Switching on the measuring device

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

ℹ   If nothing appears on the local display or a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" → 🖹 153.

10.3   Setting the operating language

Factory setting: English or ordered local language
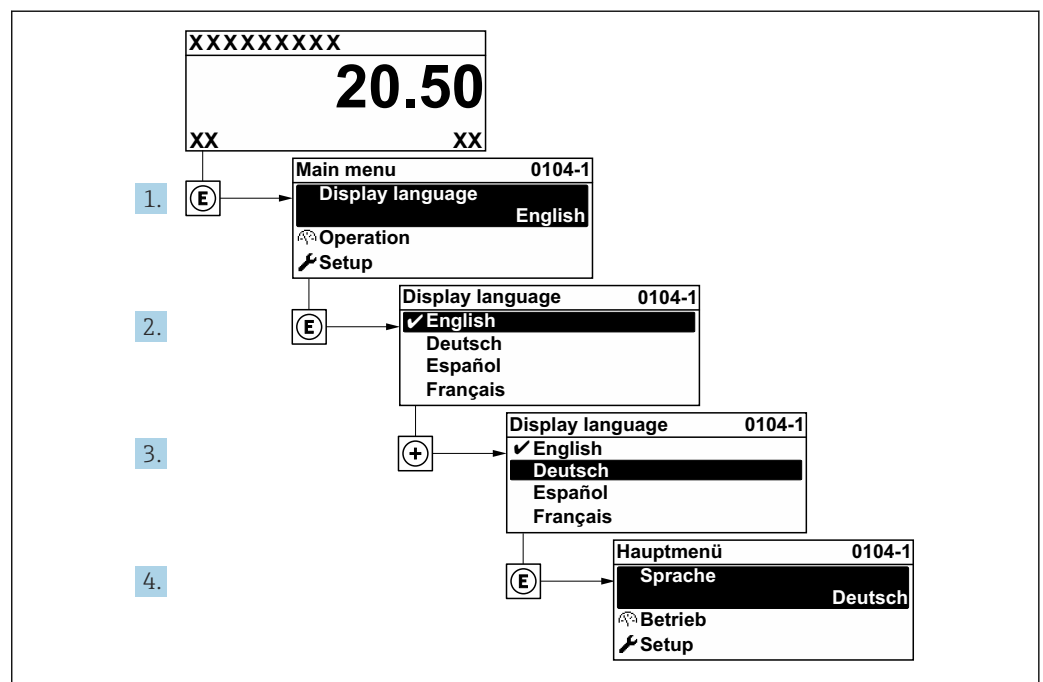
A0029420

🖼 *29   Taking the example of the local display*

10.4   Configuring the measuring device

- The **Setup** menu with its guided wizards contains all the parameters needed for standard operation.
- Navigation to the **Setup** menu
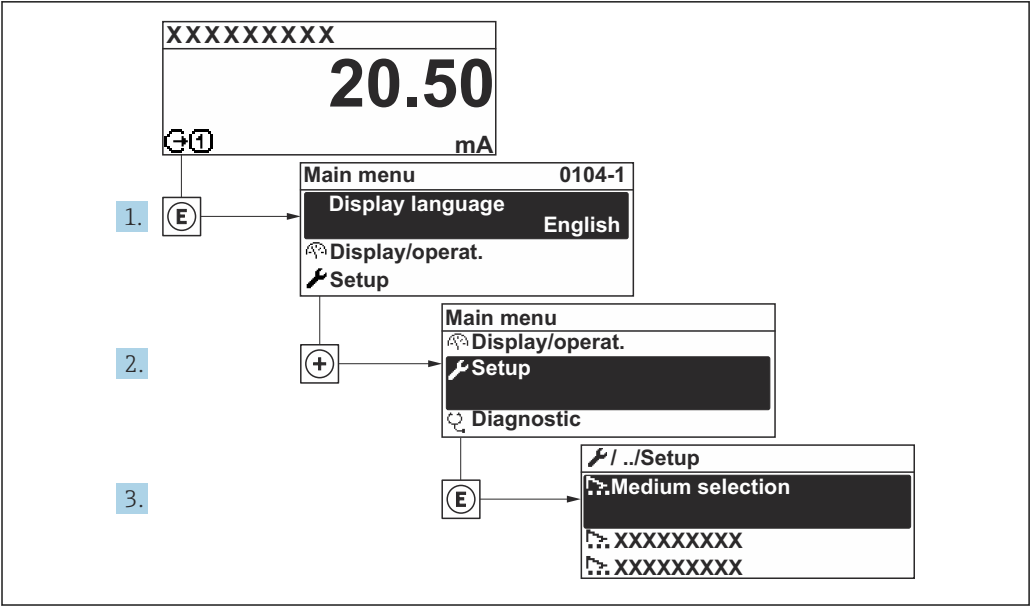
30   Taking the example of the local display

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 Operation Instructions. Instead a description is provided in the Special Documentation for the device (→ "Supplementary documentation" section).

🔧 Setup		
Device tag		→ 🖹 81
► System units		→ 🖹 81
► Medium selection		→ 🖹 84
► I/O configuration		→ 🖹 86
► Current input 1 to n		→ 🖹 87
► Status input 1 to n		→ 🖹 88
► Current output 1 to n		→ 🖹 89
► Pulse/frequency/switch output 1 to n		→ 🖹 94
► Relay output 1 to n		→ 🖹 101
► Double pulse output		→ 🖹 104
► Display		→ 🖹 105
► Low flow cut off		→ 🖹 110

▶ Partially filled pipe detection	→ 🖺 111
▶ Advanced setup	→ 🖺 112

10.4.1 Defining the tag name

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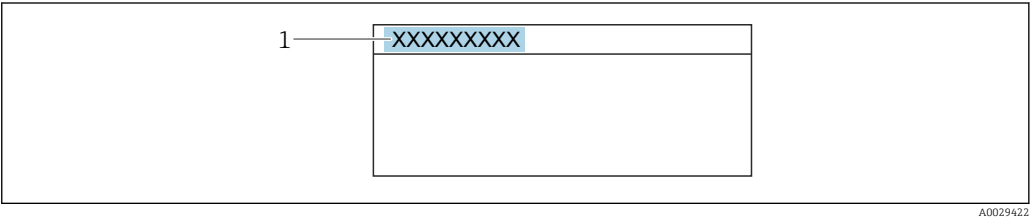
1   Tag name

🖿 *31   Header of the operational display with tag name*

A0029422

ℹ️ Enter the tag name in the "FieldCare" operating tool → 🖺 69

Navigation
"Setup" menu → Device tag

Parameter overview with brief description

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

10.4.2 Setting the system units

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

ℹ️ 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 Operation Instructions. Instead a description is provided in the Special Documentation for the device (→ "Supplementary documentation" section).

Navigation
"Setup" menu → System units

▶ System units		
	Mass flow unit	→ 🖺 82
	Mass unit	→ 🖺 82
	Volume flow unit	→ 🖺 82
	Volume unit	→ 🖺 82

Corrected volume flow unit		→ 🕮 82
Corrected volume unit		→ 🕮 82
Density unit		→ 🕮 82
Reference density unit		→ 🕮 82
Density 2 unit		→ 🕮 83
Temperature unit		→ 🕮 83
Pressure unit		→ 🕮 83

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. *Effect* The selected unit applies for: • Output • Low flow cut off • Simulation process variable	Unit choose list	Country-specific: • kg/h • lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific: • kg • lb
Volume flow unit	Select volume flow unit. *Effect* The selected unit applies for: • Output • Low flow cut off • Simulation process variable	Unit choose list	Depends on country: • l/h • gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: • l (DN > 150 (6"): m^3 option) • gal (us)
Corrected volume flow unit	Select corrected volume flow unit. *Result* The selected unit applies for: **Corrected volume flow** parameter (→ 🕮 139)	Unit choose list	Country-specific: • Nl/h • Sft³/min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: • Nl • Sft³
Density unit	Select density unit. *Effect* The selected unit applies for: • Output • Simulation process variable • Density adjustment (**Expert** menu)	Unit choose list	Country-specific: • kg/l • lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent • kg/Nl • lb/Sft³

Parameter	Description	Selection	Factory setting
Density 2 unit	Select second density unit.	Unit choose list	Depends on country: • kg/l • lb/ft³
Temperature unit	Select temperature unit. *Effect* The selected unit applies for: • **Electronic temperature** parameter (6053) • **Maximum value** parameter (6051) • **Minimum value** parameter (6052) • **External temperature** parameter (6080) • **Maximum value** parameter (6108) • **Minimum value** parameter (6109) • **Carrier pipe temperature** parameter (6027) • **Maximum value** parameter (6029) • **Minimum value** parameter (6030) • **Reference temperature** parameter (1816) • **Temperature** parameter	Unit choose list	Country-specific: • ℃ • ℉
Pressure unit	Select process pressure unit. *Result* The unit is taken from: • **Pressure value** parameter (→ 🖹 86) • **External pressure** parameter (→ 🖹 86) • Pressure value	Unit choose list	Country-specific: • bar a • psi a

10.4.3 Selecting and setting the medium

The **Select medium** wizard submenu contains parameters that must be configured in order to select and set the medium.

Navigation
"Setup" menu → Medium selection

▸ Medium selection	
MFT (Multi-Frequency Technology)	
Select medium type	→ 🕮 85
Select gas type	→ 🕮 85
Reference sound velocity	→ 🕮 85
Reference sound velocity	→ 🕮 85
Temperature coefficient sound velocity	→ 🕮 85
Temperature coefficient sound velocity	→ 🕮 85
Pressure compensation	→ 🕮 85
Pressure value	→ 🕮 86
External pressure	→ 🕮 86

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Select medium type	–	Use this function to select the type of medium: "Gas" or "Liquid". Select the "Other" option in exceptional cases in order to enter the properties of the medium manually (e.g. for highly compressive liquids such as sulfuric acid).	• Liquid • Gas • Other	Liquid
Select gas type	In the **Medium selection** submenu, the **Gas** option is selected.	Select measured gas type.	• Air • Ammonia NH3 • Argon Ar • Sulfur hexafluoride SF6 • Oxygen O2 • Ozone O3 • Nitrogen oxide NOx • Nitrogen N2 • Nitrous oxide N2O • Methane CH4 • Methane CH4 + 10% Hydrogen H2 • Methane CH4 + 20% Hydrogen H2 • Methane CH4 + 30% Hydrogen H2 • Hydrogen H2 • Helium He • Hydrogen chloride HCl • Hydrogen sulfide H2S • Ethylene C2H4 • Carbon dioxide CO2 • Carbon monoxide CO • Chlorine Cl2 • Butane C4H10 • Propane C3H8 • Propylene C3H6 • Ethane C2H6 • Other	Methane CH4
Reference sound velocity	In the **Select gas type** parameter, the **Other** option is selected.	Enter sound velocity of the gas at 0 ℃ (32 ℉).	1 to 99 999.9999 m/s	415.0 m/s
Reference sound velocity	In the **Select medium type** parameter, the **Other** option is selected.	Enter sound velocity of the medium at 0 ℃ (32 ℉).	Signed floating-point number	1 456 m/s
Temperature coefficient sound velocity	In the **Select gas type** parameter, the **Other** option is selected.	Enter the temperature coefficient for the gas sound velocity.	Positive floating point number	0.87 (m/s)/K
Temperature coefficient sound velocity	In the **Select medium type** parameter, the **Other** option is selected.	Enter temperature coefficient for the medium sound velocity.	Signed floating-point number	1.3 (m/s)/K
Pressure compensation	–	Select pressure compensation type.	• Off • Fixed value • External value [*] • Current input 1 [*] • Current input 2 [*]	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Pressure value	In the **Pressure compensation** parameter, the **Fixed value** option is selected.	Enter process pressure to be used for pressure correction.	Positive floating-point number	1.01325 bar
External pressure	In the **Pressure compensation** parameter, the **External value** option or the **Current input 1...n** option is selected.	Shows the external process pressure value.		–

*   Visibility depends on order options or device settings

10.4.4   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	→ 🗎 86
I/O module 1 to n information	→ 🗎 86
I/O module 1 to n type	→ 🗎 86
Apply I/O configuration	→ 🗎 87
I/O alteration code	→ 🗎 87

Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
I/O module 1 to n terminal numbers	Shows the terminal numbers used by the I/O module.	• Not used • 26-27 (I/O 1) • 24-25 (I/O 2) • 22-23 (I/O 3)	–
I/O module 1 to n information	Shows information of the plugged I/O module.	• Not plugged • Invalid • Not configurable • Configurable • HART	–
I/O module 1 to n type	Shows the I/O module type.	• Off • Current output * • Current input * • Status input * • Pulse/frequency/switch output * • Double pulse output * • Relay output *	Off

Parameter	Description	User interface / Selection / User entry	Factory setting
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	• No • Yes	No
I/O alteration code	Enter the code in order to change the I/O configuration.	Positive integer	0

*   Visibility depends on order options or device settings

10.4.5   Configuring the current input

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

Navigation
"Setup" menu → Current input

```
► Current input 1 to n

                    Terminal number                          → 🖺 87

                    Signal mode                              → 🖺 87

                    0/4 mA value                             → 🖺 87

                    20 mA value                              → 🖺 87

                    Current span                             → 🖺 88

                    Failure mode                             → 🖺 88

                    Failure value                            → 🖺 88
```

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	–	Shows the terminal numbers used by the current input module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–
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.	• Passive • Active *	Active
0/4 mA value	–	Enter 4 mA value.	Signed floating-point number	0
20 mA value	–	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	• 4...20 mA (4... 20.5 mA) • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 0...20 mA (0... 20.5 mA)	Country-specific: • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA)
Failure mode	–	Define input behavior in alarm condition.	• Alarm • Last valid value • Defined value	Alarm
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	0

*   Visibility depends on order options or device settings

10.4.6   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	→ 🖹 89
Terminal number	→ 🖹 89
Active level	→ 🖹 89
Terminal number	→ 🖹 89
Response time status input	→ 🖹 89
Terminal number	→ 🖹 89

Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry	Factory setting
Assign status input	Select function for the status input.	• Off • Reset totalizer 1 • Reset totalizer 2 • Reset totalizer 3 • Reset all totalizers • Flow override • Zero adjustment • Reset weighted averages * • Reset weighted averages + totalizer 3 *	Off
Terminal number	Shows the terminal numbers used by the status input module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–
Active level	Define input signal level at which the assigned function is triggered.	• High • Low	High
Response time status input	Define the minimum amount of time the input signal level must be present before the selected function is triggered.	5 to 200 ms	50 ms

* Visibility depends on order options or device settings

10.4.7 Configuring the current output

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

Navigation
"Setup" menu → Current output

▶ Current output 1 to n	
Terminal number	
Signal mode	
Process variable current output	
Current range output	
Lower range value output	
Upper range value output	
Fixed current	
Damping current output	
Failure behavior current output	
Failure current	

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.	• Not used • 26-27 (I/O 1) • 24-25 (I/O 2) • 22-23 (I/O 3)	–
Signal mode	–	Select the signal mode for the current output.	• Active * • Passive *	Active

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Process variable current output	–	Select the process variable for the current output.	• Off [*] • Mass flow • Volume flow • Corrected volume flow [*] • Density • Reference density [*] • Temperature • Target mass flow [*] • Carrier mass flow [*] • Target volume flow [*] • Carrier volume flow [*] • Target corrected volume flow [*] • Carrier corrected volume flow [*] • Concentration [*] • Dynamic viscosity [*] • Kinematic viscosity [*] • Temp. compensated dynamic viscosity [*] • Temp. compensated kinematic viscosity [*] • Application specific output 0 [*] • Application specific output 1 [*] • Inhomogeneous medium index • Suspended bubbles index [*] • Raw value mass flow • Exciter current 0 • Oscillation damping 0 • Oscillation damping fluctuation 0 [*] • Oscillation frequency 0 • Frequency fluctuation 0 [*] • Signal asymmetry • Torsion signal asymmetry [*] • Carrier pipe temperature [*] • Oscillation frequency 1 [*] • Frequency fluctuation 0 [*] • Oscillation amplitude 0 [*] • Oscillation amplitude 1 [*] • Frequency fluctuation 1 [*] • Oscillation damping 1 [*]	Mass flow

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
			• Oscillation damping fluctuation 0 * • Oscillation damping fluctuation 1 * • Exciter current 1 * • HBSI* • Pressure * • Electronics temperature • Sensor index coil asymmetry • Test point 0 • Test point 1	
Current range output	–	Select current range for process value output and upper/lower level for alarm signal.	• 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4...20.5 mA) • 0...20 mA (0...20.5 mA) • Fixed value	Depends on country: • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA)
Lower range value output	One of the following options is selected in the **Current span** parameter (→ 🖺 92): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Enter lower range value for the measured value range.	Signed floating-point number	Depends on country: • 0 kg/h • 0 lb/min
Upper range value output	One of the following options is selected in the **Current span** parameter (→ 🖺 92): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Enter upper range value for the measured value range.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The **Fixed current** option is selected in the **Current span** parameter (→ 🖺 92).	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Damping current output	A process variable is selected in the **Assign current output** parameter (→ 🖺 91) and one of the following options is selected in the **Current span** parameter (→ 🖺 92): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Set reaction time for output signal to fluctuations in the measured value.	0.0 to 999.9 s	1.0 s

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure behavior current output	A process variable is selected in the **Assign current output** parameter (→ 🗎 91) and one of the following options is selected in the **Current span** parameter (→ 🗎 92): • 4...20 mA NE (3.8...20.5 mA) • 4...20 mA US (3.9...20.8 mA) • 4...20 mA (4... 20.5 mA) • 0...20 mA (0... 20.5 mA)	Define output behavior in alarm condition.	• Min. • Max. • Last valid value • Actual value • Fixed value	Max.
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

10.4.8   Configuring the pulse/frequency/switch output

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

Navigation

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

▶ Pulse/frequency/switch output 1 to n		
	Operating mode	→ 🖹 94

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	Pulse

Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output

▶ Pulse/frequency/switch output 1 to n		
	Operating mode	→ 🖹 95
	Terminal number	→ 🖹 95
	Signal mode	→ 🖹 95
	Assign pulse output	→ 🖹 95
	Pulse scaling	→ 🖹 95
	Pulse width	→ 🖹 95
	Failure mode	→ 🖹 95
	Invert output signal	→ 🖹 95

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	• Pulse • Frequency • Switch	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active * • Passive NE	Passive
Assign pulse output	The **Pulse** option is selected in the **Operating mode** parameter.	Select process variable for pulse output.	• Off • Mass flow • Volume flow • Corrected volume flow * • Target mass flow * • Carrier mass flow * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow *	Off
Pulse scaling	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 94) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 95).	Enter quantity for 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 (→ 🖺 94) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 95).	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms
Failure mode	The **Pulse** option is selected in the **Operating mode** parameter (→ 🖺 94) and a process variable is selected in the **Assign pulse output** parameter (→ 🖺 95).	Define output behavior in alarm condition.	• Actual value • No pulses	No pulses
Invert output signal	–	Invert the output signal.	• No • Yes	No

*   Visibility depends on order options or device settings

Configuring the frequency output

Navigation

"Setup" menu → Pulse/frequency/switch output

▶ Pulse/frequency/switch output 1 to n		
Operating mode	→ 🖹 96	
Terminal number	→ 🖹 96	
Signal mode	→ 🖹 96	
Assign frequency output	→ 🖹 97	
Minimum frequency value	→ 🖹 98	
Maximum frequency value	→ 🖹 98	
Measuring value at minimum frequency	→ 🖹 98	
Measuring value at maximum frequency	→ 🖹 98	
Failure mode	→ 🖹 98	
Failure frequency	→ 🖹 98	
Invert output signal	→ 🖹 98	

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.	• Pulse • Frequency • Switch	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active * • Passive NE	Passive

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign frequency output	In the **Operating mode** parameter (→ 🗎 94), the **Frequency** option is selected.	Select process variable for frequency output.	• Off • Mass flow • Volume flow • Corrected volume flow * • Density • Reference density * • Time period signal frequency (TPS) * • Temperature • Pressure • Dynamic viscosity * • Kinematic viscosity * • Temp. compensated dynamic viscosity * • Temp. compensated kinematic viscosity * • Concentration * • Target mass flow * • Carrier mass flow * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow * • Application specific output 0 * • Application specific output 1 * • Inhomogeneous medium index • Suspended bubbles index * • HBSI * • Raw value mass flow • Exciter current 0 • Exciter current 1 * • Oscillation damping 0 • Oscillation damping 1 * • Oscillation damping fluctuation 0 * • Oscillation damping fluctuation 1 * • Oscillation frequency 0 • Oscillation frequency 1 * • Frequency fluctuation 0 * • Frequency fluctuation 1 * • Oscillation amplitude 0 * • Oscillation amplitude 1 *	Off

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
			• Signal asymmetry • Torsion signal asymmetry * • Carrier pipe temperature * • Electronics temperature • Sensor index coil asymmetry • Test point 0 • Test point 1	
Minimum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 94) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 97).	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz
Maximum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 94) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 97).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 94) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 97).	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 (→ 🖹 94) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 97).	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 (→ 🖹 94) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 97).	Define output behavior in alarm condition.	• Actual value • Defined value • 0 Hz	0 Hz
Failure frequency	In the **Operating mode** parameter (→ 🖹 94), the **Frequency** option is selected, in the **Assign frequency output** parameter (→ 🖹 97) 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	0.0 Hz
Invert output signal	–	Invert the output signal.	• No • Yes	No

* Visibility depends on order options or device settings

Configuring the switch output

Navigation

"Setup" menu → Pulse/frequency/switch output

▶ Pulse/frequency/switch output 1 to n		
	Operating mode	→ 🖹 99
	Terminal number	→ 🖹 99
	Signal mode	→ 🖹 99
	Switch output function	→ 🖹 100
	Assign diagnostic behavior	→ 🖹 100
	Assign limit	→ 🖹 100
	Assign flow direction check	→ 🖹 100
	Assign status	→ 🖹 101
	Switch-on value	→ 🖹 101
	Switch-off value	→ 🖹 101
	Switch-on delay	→ 🖹 101
	Switch-off delay	→ 🖹 101
	Failure mode	→ 🖹 101
	Invert output signal	→ 🖹 101

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.	• Pulse • Frequency • Switch	Pulse
Terminal number	–	Shows the terminal numbers used by the PFS output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–
Signal mode	–	Select the signal mode for the PFS output.	• Passive • Active * • Passive NE	Passive

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.	• Off • On • Diagnostic behavior • Limit • Flow direction check • Status	Off
Assign diagnostic behavior	• 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.	• Alarm • Alarm or warning • Warning	Alarm
Assign limit	• In the **Operating mode** parameter, the **Switch** option is selected. • In the **Switch output function** parameter, the **Limit** option is selected.	Select process variable for limit function.	• Mass flow • Volume flow • Corrected volume flow * • Target mass flow * • Carrier mass flow * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow * • Density • Reference density * • Dynamic viscosity * • Concentration * • Kinematic viscosity * • Temp. compensated dynamic viscosity * • Temp. compensated kinematic viscosity * • Temperature • Totalizer 1 • Totalizer 2 • Totalizer 3 • Oscillation damping • Pressure • Application specific output 0 * • Application specific output 1 * • Inhomogeneous medium index • Suspended bubbles index *	Volume flow
Assign flow direction check	• 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.	• Off • Volume flow • Mass flow • Corrected volume flow *	Mass flow

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Assign status	• The **Switch** option is selected in the **Operating mode** parameter. • The **Status** option is selected in the **Switch output function** parameter.	Select device status for switch output.	• Partially filled pipe detection • Low flow cut off	Partially filled pipe detection
Switch-on value	• 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	Country-specific: • 0 kg/h • 0 lb/min
Switch-off value	• 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	Country-specific: • 0 kg/h • 0 lb/min
Switch-on delay	• 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	0.0 s
Switch-off delay	• 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	0.0 s
Failure mode	–	Define output behavior in alarm condition.	• Actual status • Open • Closed	Open
Invert output signal	–	Invert the output signal.	• No • Yes	No

*   Visibility depends on order options or device settings

10.4.9   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                              →  🖹 102

        Relay output function                        →  🖹 102

        Assign flow direction check                  →  🖹 102

        Assign limit                                 →  🖹 103
```

Assign diagnostic behavior	→ 🖹 103	
Assign status	→ 🖹 103	
Switch-off value	→ 🖹 103	
Switch-off delay	→ 🖹 103	
Switch-on value	→ 🖹 103	
Switch-on delay	→ 🖹 104	
Failure mode	→ 🖹 104	

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.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–
Relay output function	–	Select the function for the relay output.	• Closed • Open • Diagnostic behavior • Limit • Flow direction check • Digital Output	Closed
Assign flow direction check	The **Flow direction check** option is selected in the **Relay output function** parameter.	Select process variable for flow direction monitoring.	• Off • Volume flow • Mass flow • Corrected volume flow *	Mass flow

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Assign limit	The **Limit** option is selected in the **Relay output function** parameter.	Select process variable for limit function.	- Mass flow - Volume flow - Corrected volume flow * - Target mass flow * - Carrier mass flow * - Target volume flow * - Carrier volume flow * - Target corrected volume flow * - Carrier corrected volume flow * - Density - Reference density * - Dynamic viscosity * - Concentration * - Kinematic viscosity * - Temp. compensated dynamic viscosity * - Temp. compensated kinematic viscosity * - Temperature - Totalizer 1 - Totalizer 2 - Totalizer 3 - Oscillation damping - Pressure - Application specific output 0 * - Application specific output 1 * - Inhomogeneous medium index - Suspended bubbles index *	Mass flow
Assign diagnostic behavior	In the **Relay output function** parameter, the **Diagnostic behavior** option is selected.	Select diagnostic behavior for switch output.	- Alarm - Alarm or warning - Warning	Alarm
Assign status	In the **Relay output function** parameter, the **Digital Output** option is selected.	Select device status for switch output.	- Partially filled pipe detection - Low flow cut off	Partially filled pipe detection
Switch-off value	In the **Relay output function** parameter, the **Limit** option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: • 0 kg/h • 0 lb/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	0.0 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	Country-specific: • 0 kg/h • 0 lb/min

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
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	0.0 s
Failure mode	–	Define output behavior in alarm condition.	• Actual status • Open • Closed	Open

*   Visibility depends on order options or device settings

10.4.10 Configuring the double pulse output

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

Navigation
"Setup" menu → Double pulse output

Parameter overview with brief description

Parameter	Description	Selection / User interface / User entry	Factory setting
Signal mode	Select the signal mode for the double pulse output.	• Passive • Active * • Passive NE	Passive
Master terminal number	Shows the terminal numbers used by the master of the double pulse output module.	• Not used • 24-25 (I/O 2) • 22-23 (I/O 3)	–

Parameter	Description	Selection / User interface / User entry	Factory setting
Assign pulse output	Select process variable for pulse output.	■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow * ■ Target mass flow * ■ Carrier mass flow * ■ Target volume flow * ■ Carrier volume flow * ■ Target corrected volume flow * ■ Carrier corrected volume flow *	Off
Measuring mode	Select measuring mode for pulse output.	■ Forward flow ■ Forward/Reverse flow ■ Reverse flow ■ Reverse flow compensation	Forward flow
Value per pulse	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	Define time width of the output pulse.	0.5 to 2 000 ms	0.5 ms
Failure mode	Define output behavior in alarm condition.	■ Actual value ■ No pulses	No pulses
Invert output signal	Invert the output signal.	■ No ■ Yes	No

* Visibility depends on order options or device settings

10.4.11 Configuring the local display

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

Navigation
"Setup" menu → Display

► Display	
Format display	→ 🖺 107
Value 1 display	→ 🖺 108
0% bargraph value 1	→ 🖺 109
100% bargraph value 1	→ 🖺 109
Value 2 display	→ 🖺 109
Value 3 display	→ 🖺 109
0% bargraph value 3	→ 🖺 109
100% bargraph value 3	→ 🖺 109

Value 4 display	→ 🗎 109
Value 5 display	→ 🗎 109
Value 6 display	→ 🗎 109
Value 7 display	→ 🗎 109
Value 8 display	→ 🗎 109

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	• 1 value, max. size • 1 bargraph + 1 value • 2 values • 1 value large + 2 values • 4 values	1 value, max. size

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	• Mass flow • Volume flow • Corrected volume flow * • Density • Reference density * • Temperature • Pressure • Dynamic viscosity * • Dynamic viscosity * • Kinematic viscosity * • Temp. compensated dynamic viscosity * • Temp. compensated kinematic viscosity * • Totalizer 1 • Totalizer 2 • Totalizer 3 • Concentration * • Target mass flow * • Carrier mass flow * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow * • Application specific output 0 * • Application specific output 1 * • Inhomogeneous medium index • Suspended bubbles index * • HBSI * • Raw value mass flow • Exciter current 0 • Exciter current 1 * • Oscillation damping 0 • Oscillation damping 1 * • Oscillation damping fluctuation 0 * • Oscillation damping fluctuation 1 * • Oscillation frequency 0 • Oscillation frequency 1 * • Frequency fluctuation 0 * • Frequency fluctuation 1 * • Oscillation amplitude 0 * • Oscillation amplitude 1 *	Mass flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
			• Signal asymmetry • Torsion signal asymmetry * • Carrier pipe temperature * • Electronics temperature • Sensor index coil asymmetry • Test point 0 • Test point 1 • Current output 1 * • Current output 2 * • Current output 3 *	
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 kg/h • 0 lb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None
0% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 kg/h • 0 lb/min
100% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None
Value 5 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None
Value 7 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None
Value 8 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖹 108)	None

*   Visibility depends on order options or device settings

10.4.12 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	→ 🕮 110	
On value low flow cutoff	→ 🕮 110	
Off value low flow cutoff	→ 🕮 110	
Pressure shock suppression	→ 🕮 110	

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	• Off • Mass flow • Volume flow • Corrected volume flow *	Mass flow
On value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 🕮 110).	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 (→ 🕮 110).	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the **Assign process variable** parameter (→ 🕮 110).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

*   Visibility depends on order options or device settings

10.4.13 Configuring partially filled pipe detection

The **Partial filled pipe detection** wizard guides you systematically through all parameters that have to be set for configuring the monitoring of the pipe filling.

Navigation

"Setup" menu → Partially filled pipe detection

| ▶ Partially filled pipe detection	
Assign process variable	→ 🗎 111
Low value partial filled pipe detection	→ 🗎 111
High value partial filled pipe detection	→ 🗎 111
Response time part. filled pipe detect.	→ 🗎 111

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for partially filled pipe detection.	• Off • Density • Calculated reference density	Off
Low value partial filled pipe detection	A process variable is selected in the **Assign process variable** parameter (→ 🗎 111).	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country: • 200 kg/m^3 • 12.5 lb/ft^3
High value partial filled pipe detection	A process variable is selected in the **Assign process variable** parameter (→ 🗎 111).	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Depends on country: • 6000 kg/m^3 • 374.6 lb/ft^3
Response time part. filled pipe detect.	A process variable is selected in the **Assign process variable** parameter (→ 🗎 111).	Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Pipe only partly filled" is triggered in the event of a partially filled or empty measuring pipe.	0 to 100 s	1 s

10.5   Advanced settings

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

Navigation to the "Advanced setup" submenu
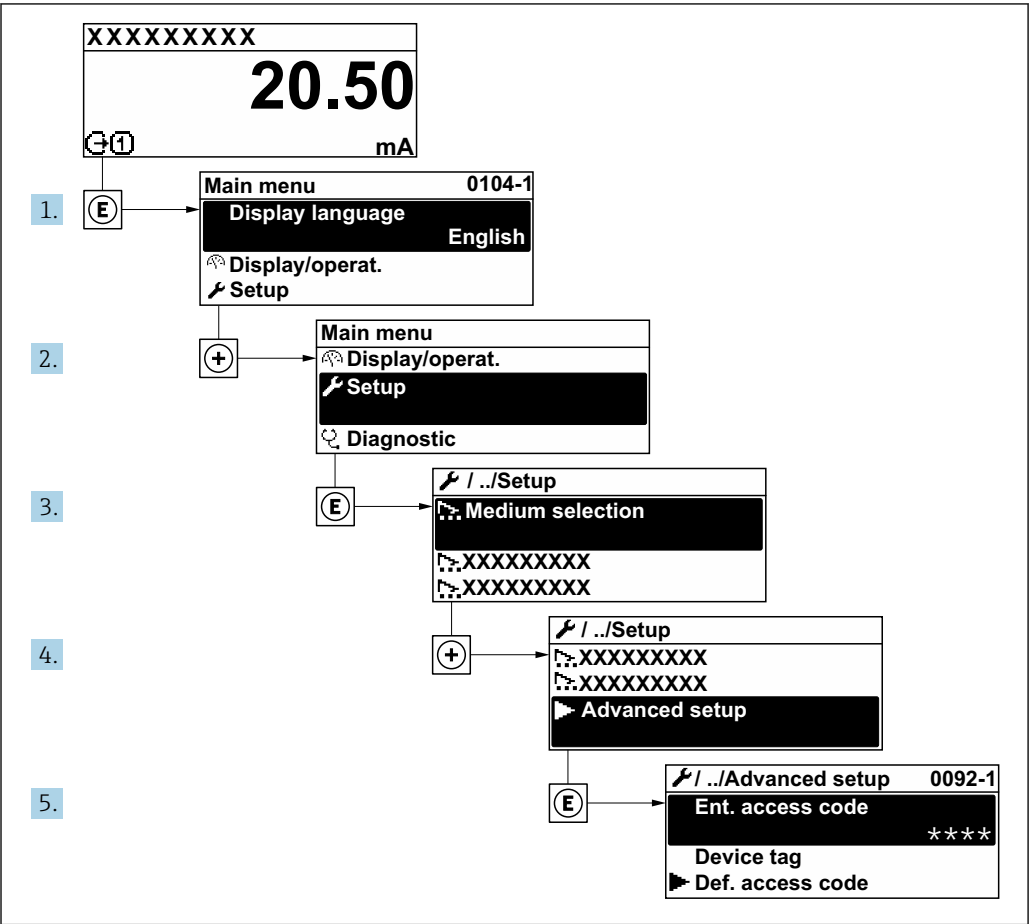
A0032223-EN

The number of submenus and parameters can vary depending on the device version and the available application packages. These submenus and their parameters are explained in the Special Documentation for the device and not in Operating Instructions.

- For detailed information on the parameter descriptions for application packages: Special Documentation for the device → 🗎 216
- For detailed information on the SIL parameter descriptions, see the Functional Safety Manual → 🗎 216

Navigation
"Setup" menu → Advanced setup

▶ Advanced setup	
Enter access code	→ 🗎 113
▶ Calculated values	→ 🗎 113

‣ Sensor adjustment	→ 🖹 114
‣ Totalizer 1 to n	→ 🖹 118
‣ Display	→ 🖹 120
‣ WLAN settings	→ 🖹 126
‣ Configuration backup	→ 🖹 128
‣ Administration	→ 🖹 129

10.5.1　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

10.5.2　Calculated process variables

The **Calculated values** submenu contains parameters for calculating the corrected volume flow.

Navigation
"Setup" menu → Advanced setup → Calculated values

| ‣ Calculated values | |
| ‣ Corrected volume flow calculation | → 🖹 113 |

"Corrected volume flow calculation" submenu

Navigation
"Setup" menu → Advanced setup → Calculated values → Corrected volume flow calculation

‣ Corrected volume flow calculation	
Select reference density (1812)	→ 🖹 114
External reference density (6198)	→ 🖹 114
Fixed reference density (1814)	→ 🖹 114

	Reference temperature (1816)	→ 🖹 114
	Linear expansion coefficient (1817)	→ 🖹 114
	Square expansion coefficient (1818)	→ 🖹 114

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Select reference density	–	Select reference density for calculating the corrected volume flow.	• Fixed reference density • Calculated reference density • Current input 1 * • Current input 2 *	Calculated reference density
External reference density	One of the following options is selected in the **Corrected volume flow calculation** parameter: • Current input 1 * • Current input 2 *	Shows external reference density.	Floating point number with sign	–
Fixed reference density	The **Fixed reference density** option is selected in the **Corrected volume flow calculation** parameter parameter.	Enter fixed value for reference density.	Positive floating-point number	1 kg/Nl
Reference temperature	The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter parameter.	Enter reference temperature for calculating the reference density.	–273.15 to 99 999 ℃	Country-specific: • +20 ℃ • +68 ℉
Linear expansion coefficient	The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter parameter.	Enter linear, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0 1/K
Square expansion coefficient	The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter parameter.	For media with a non-linear expansion pattern: enter the quadratic, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0 $1/K^2$

*   Visibility depends on order options or device settings

10.5.3   Carrying out a sensor adjustment

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

Navigation

"Setup" menu → Advanced setup → Sensor adjustment

► Sensor adjustment		
	Installation direction	→ 🖩 115
	► Zero verification	→ 🖩 115
	► Zero adjustment	→ 🖩 117

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Installation direction	Select sign of flow direction.	• Forward flow • Reverse flow	Forward flow

Zero point verification and zero adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 🖩 194. Therefore, a zero adjustment in the field is generally not required.

Experience shows that zero adjustment is advisable only in special cases:
• To achieve maximum measuring accuracy even with low flow rates.
• Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

To get a representative zero point, ensure that:
• any flow in the device is prevented during the adjustment
• the process conditions (e.g. pressure, temperature) are stable and representative

Zero point verification and zero adjustment cannot be performed if the following process conditions are present:
• Gas pockets
  Ensure that the system has been sufficiently flushed with the medium. Repeat flushing can help to eliminate gas pockets
• Thermal circulation
  In the event of temperature differences (e.g. between the measuring tube inlet and outlet section), induced flow can occur even if the valves are closed due to thermal circulation in the device
• Leaks at the valves
  If the valves are not leak-tight, flow is not sufficiently prevented when determining the zero point

If these conditions cannot be avoided, it is advisable to keep the factory setting for the zero point.

Zero point verification

The zero point can be verified with the **Zero verification** wizard.

Navigation

"Setup" menu → Advanced setup → Sensor adjustment → Zero verification

▸ **Zero verification**		
	Process conditions	→ 🕮 116
	Progress	→ 🕮 116
	Status	→ 🕮 116
	Additional information	→ 🕮 116
	Recommendation:	→ 🕮 116
	Root cause	→ 🕮 116
	Abort cause	→ 🕮 116
	Zero point measured	→ 🕮 117
	Zero point standard deviation	→ 🕮 117

Parameter overview with brief description

Parameter	Description	Selection / User interface	Factory setting
Process conditions	Ensure process conditions as follows.	• Tubes are completely filled • Process operational pressure applied • No-flow conditions (closed valves) • Process and ambient temperatures stable	–
Progress	Shows the progress of the process.	0 to 100 %	–
Status	Shows the status of the process.	• Busy • Failed • Done	–
Additional information	Indicate whether to display additional information.	• Hide • Show	Hide
Recommendation:	Indicates whether an adjustment is recommended. Only recommended if the measured zero point deviates significantly from the current zero point.	• Do not adjust zero point • Adjust zero point	–
Abort cause	Indicates why the wizard was aborted.	• Check process conditions! • A technical issue has occurred	–
Root cause	Shows the diagnostic and remedy.	• Zero point too high. Ensure no-flow. • Zero point is unstable. Ensure no-flow. • Fluctuation high. Avoid 2-phase medium.	–

Parameter	Description	Selection / User interface	Factory setting
Zero point measured	Shows the zero point measured for the adjustment.	Signed floating-point number	–
Zero point standard deviation	Shows the standard deviation of the zero point measured.	Positive floating-point number	–

Zero adjust

The zero point can be adjusted with the **Zero adjustment** wizard.

- A zero point verification should be performed before a zero adjustment.
- The zero point can also be adjusted manually: Expert → Sensor → Calibration

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

‣ Zero adjustment	
Process conditions	→ 🖺 118
Progress	→ 🖺 118
Status	→ 🖺 118
Root cause	→ 🖺 118
Abort cause	→ 🖺 118
Root cause	→ 🖺 118
Reliability of measured zero point	→ 🖺 118
Additional information	→ 🖺 118
Reliability of measured zero point	→ 🖺 118
Zero point measured	→ 🖺 118
Zero point standard deviation	→ 🖺 118
Select action	→ 🖺 118

Parameter overview with brief description

Parameter	Description	Selection / User interface	Factory setting
Process conditions	Ensure process conditions as follows.	• Tubes are completely filled • Process operational pressure applied • No-flow conditions (closed valves) • Process and ambient temperatures stable	–
Progress	Shows the progress of the process.	0 to 100 %	–
Status	Shows the status of the process.	• Busy • Failed • Done	–
Abort cause	Indicates why the wizard was aborted.	• Check process conditions! • A technical issue has occurred	–
Root cause	Shows the diagnostic and remedy.	• Zero point too high. Ensure no-flow. • Zero point is unstable. Ensure no-flow. • Fluctuation high. Avoid 2-phase medium.	–
Reliability of measured zero point	Indicates the reliability of the zero point measured.	• Not done • Good • Uncertain	–
Additional information	Indicate whether to display additional information.	• Hide • Show	Hide
Zero point measured	Shows the zero point measured for the adjustment.	Signed floating-point number	–
Zero point standard deviation	Shows the standard deviation of the zero point measured.	Positive floating-point number	–
Select action	Select the zero point value to apply.	• Keep current zero point • Apply zero point measured • Apply factory zero point *	Keep current zero point

*   Visibility depends on order options or device settings

10.5.4   Configuring the totalizer

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

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

```
► Totalizer 1 to n

        │ Assign process variable │          → 🖹 119

        │ Unit totalizer 1 to n │            → 🖹 119

        │ Totalizer operation mode │         → 🖹 119

        │ Failure mode │                     → 🖹 119
```

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	• Off • Mass flow • Volume flow • Corrected volume flow * • Target mass flow * • Carrier mass flow * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow * • Raw value mass flow	Mass flow
Unit totalizer 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖻 119) of the **Totalizer 1 to n** submenu.	Select the unit for the process variable of the totalizer.	Unit choose list	Depends on country: • kg • lb
Totalizer operation mode	A process variable is selected in the **Assign process variable** parameter (→ 🖻 119) of the **Totalizer 1 to n** submenu.	Select totalizer calculation mode.	• Net • Forward • Reverse	Net
Failure mode	A process variable is selected in the **Assign process variable** parameter (→ 🖻 119) of the **Totalizer 1 to n** submenu.	Select totalizer behavior in the event of a device alarm.	• Hold • Continue • Last valid value + continue	Hold

*   Visibility depends on order options or device settings

10.5.5   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	→ 🖺 122
Value 1 display	→ 🖺 123
0% bargraph value 1	→ 🖺 124
100% bargraph value 1	→ 🖺 124
Decimal places 1	→ 🖺 124
Value 2 display	→ 🖺 124
Decimal places 2	→ 🖺 124
Value 3 display	→ 🖺 124
0% bargraph value 3	→ 🖺 124
100% bargraph value 3	→ 🖺 124
Decimal places 3	→ 🖺 124
Value 4 display	→ 🖺 124
Decimal places 4	→ 🖺 125
Value 5 display	→ 🖺 125
0% bargraph value 5	→ 🖺 125
100% bargraph value 5	→ 🖺 125
Decimal places 5	→ 🖺 125
Value 6 display	→ 🖺 125
Decimal places 6	→ 🖺 125
Value 7 display	→ 🖺 125

0% bargraph value 7	→ 🖹	125
100% bargraph value 7	→ 🖹	125
Decimal places 7	→ 🖹	125
Value 8 display	→ 🖹	125
Decimal places 8	→ 🖹	126
Display language	→ 🖹	126
Display interval	→ 🖹	126
Display damping	→ 🖹	126
Header	→ 🖹	126
Header text	→ 🖹	126
Separator	→ 🖹	126
Backlight	→ 🖹	126

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	• 1 value, max. size • 1 bargraph + 1 value • 2 values • 1 value large + 2 values • 4 values	1 value, max. size

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	• Mass flow • Volume flow • Corrected volume flow * • Density • Reference density * • Temperature • Pressure • Dynamic viscosity * • Dynamic viscosity * • Kinematic viscosity * • Temp. compensated dynamic viscosity * • Temp. compensated kinematic viscosity * • Totalizer 1 • Totalizer 2 • Totalizer 3 • Concentration * • Target mass flow * • Carrier mass flow * • Target volume flow * • Carrier volume flow * • Target corrected volume flow * • Carrier corrected volume flow * • Application specific output 0 * • Application specific output 1 * • Inhomogeneous medium index • Suspended bubbles index * • HBSI * • Raw value mass flow • Exciter current 0 • Exciter current 1 * • Oscillation damping 0 • Oscillation damping 1 * • Oscillation damping fluctuation 0 * • Oscillation damping fluctuation 1 * • Oscillation frequency 0 • Oscillation frequency 1 * • Frequency fluctuation 0 * • Frequency fluctuation 1 * • Oscillation amplitude 0 * • Oscillation amplitude 1 *	Mass flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
			• Signal asymmetry • Torsion signal asymmetry * • Carrier pipe temperature * • Electronics temperature • Sensor index coil asymmetry • Test point 0 • Test point 1 • Current output 1 • Current output 2 * • Current output 3 *	
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 kg/h • 0 lb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the **Value 1 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🗎 108)	None
Decimal places 2	A measured value is specified in the **Value 2 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🗎 108)	None
0% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: • 0 kg/h • 0 lb/min
100% bargraph value 3	A selection was made in the **Value 3 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 3	A measured value is specified in the **Value 3 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🗎 108)	None

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.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 5 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖺 108)	None
0% bargraph value 5	An option was selected in the **Value 5 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Depends on country: • 0 kg/h • 0 lb/min
100% bargraph value 5	An option was selected in the **Value 5 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 5	A measured value is specified in the **Value 5 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 6 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖺 108)	None
Decimal places 6	A measured value is specified in the **Value 6 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 7 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖺 108)	None
0% bargraph value 7	An option was selected in the **Value 7 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Depends on country: • 0 kg/h • 0 lb/min
100% bargraph value 7	An option was selected in the **Value 7 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 7	A measured value is specified in the **Value 7 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Value 8 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the **Value 1 display** parameter (→ 🖺 108)	None

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 8	A measured value is specified in the **Value 8 display** parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxxx • x.xxxxx • x.xxxxxx	x.xx
Display language	A local display is provided.	Set display language.	• 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	5 s
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	• Device tag • Free text	Device tag
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.	• . (point) • , (comma)	. (point)
Backlight	One of the following conditions is met: • 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.	• Disable • Enable	Enable

*   Visibility depends on order options or device settings

10.5.6   WLAN configuration

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

Navigation

"Setup" menu → Advanced setup → WLAN settings

▶ WLAN settings		
	WLAN IP address	→ 🖺 127
	Security type	→ 🖺 127
	WLAN passphrase	→ 🖺 127
	Assign SSID name	→ 🖺 127
	SSID name	→ 🖺 127
	Apply changes	→ 🖺 127

Parameter overview with brief description

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
WLAN IP address	–	Enter IP address of the WLAN interface of the device.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Network security	–	Select the security type of the WLAN network.	• Unsecured • WPA2-PSK • EAP-PEAP with MSCHAPv2 * • EAP-PEAP MSCHAPv2 no server authentic. * • EAP-TLS*	WPA2-PSK
WLAN passphrase	The **WPA2-PSK** option is selected in the **Security type** parameter.	Enter the network key (8 to 32 characters). ℹ 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.	• Device tag • User-defined	User-defined
SSID name	• 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). ℹ 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_Promass_300_A 802000)
Apply changes	–	Use changed WLAN settings.	• Cancel • Ok	Cancel

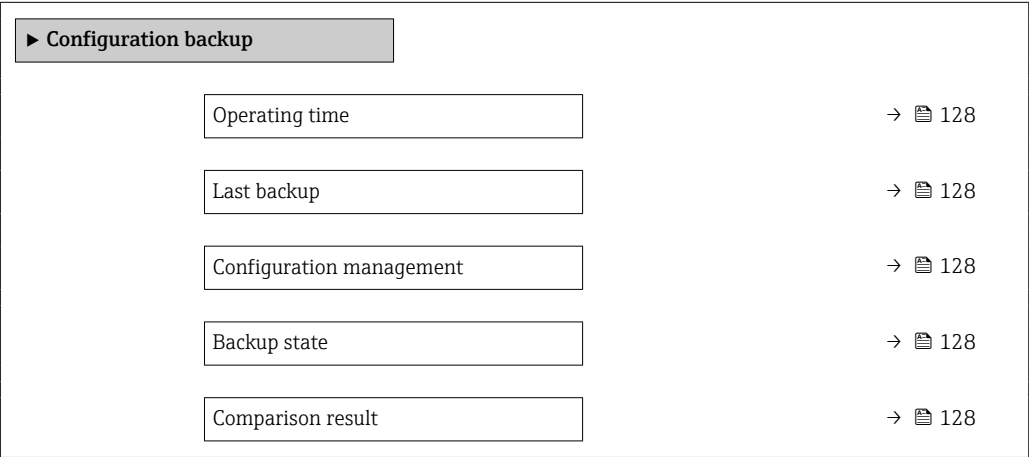*   Visibility depends on order options or device settings

10.5.7 Configuration management

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

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

Navigation
"Setup" menu → Advanced setup → Configuration backup

▶ Configuration backup	
Operating time	→ 🖿 128
Last backup	→ 🖿 128
Configuration management	→ 🖿 128
Backup state	→ 🖿 128
Comparison result	→ 🖿 128

Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	–
Last backup	Shows when the last data backup was saved to HistoROM backup.	Days (d), hours (h), minutes (m) and seconds (s)	–
Configuration management	Select action for managing the device data in the HistoROM backup.	• Cancel • Execute backup • Restore * • Compare * • Clear backup data	Cancel
Backup state	Shows the current status of data saving or restoring.	• None • Backup in progress • Restoring in progress • Delete in progress • Compare in progress • Restoring failed • Backup failed	None
Comparison result	Comparison of current device data with HistoROM backup.	• Settings identical • Settings not identical • No backup available • Backup settings corrupt • Check not done • Dataset incompatible	Check not done

* Visibility depends on order options or device settings

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.

10.5.8 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	→ 🖹 129
▸ Reset access code	→ 🖹 130
Device reset	→ 🖹 130

Using the parameter to define the access code

Complete this wizard to specify an access code for the Maintenance role.

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

▸ Define access code	
Define access code	→ 🖹 130
Confirm access code	→ 🖹 130

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	→ 🖹 130
Reset access code	→ 🖹 130

Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
Operating time	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	–
Reset access code	Reset access code to factory settings. For a reset code, contact your Endress+Hauser service organization. The reset code can only be entered via: • Web browser • DeviceCare, FieldCare (via CDI-RJ45 service interface) • Fieldbus	Character string comprising numbers, letters and special characters	0x00

Using the parameter to reset the device

Navigation

"Setup" menu → Advanced setup → Administration

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	• Cancel • To delivery settings • Restart device • Restore S-DAT backup *	Cancel

*   Visibility depends on order options or device settings

10.6   Simulation

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

Navigation
"Diagnostics" menu → Simulation

‣ Simulation		
Assign simulation process variable	→ 🖺 132	
Process variable value	→ 🖺 132	
Current output 1 to n simulation	→ 🖺 132	
Current output value	→ 🖺 132	
Frequency output 1 to n simulation	→ 🖺 132	
Frequency output 1 to n value	→ 🖺 132	
Pulse output simulation 1 to n	→ 🖺 132	
Pulse value 1 to n	→ 🖺 133	
Switch output simulation 1 to n	→ 🖺 133	
Switch state 1 to n	→ 🖺 133	
Relay output 1 to n simulation	→ 🖺 133	
Switch state 1 to n	→ 🖺 133	
Pulse output simulation	→ 🖺 133	
Pulse value	→ 🖺 133	
Device alarm simulation	→ 🖺 133	
Diagnostic event category	→ 🖺 133	
Diagnostic event simulation	→ 🖺 133	
Current input 1 to n simulation	→ 🖺 133	
Value current input 1 to n	→ 🖺 133	

Status input 1 to n simulation	→ 🖺 133
Input signal level 1 to n	→ 🖺 133

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	• Off • Mass flow • Volume flow • Corrected volume flow [*] • Target mass flow [*] • Carrier mass flow [*] • Target volume flow [*] • Carrier volume flow [*] • Target corrected volume flow [*] • Carrier corrected volume flow [*] • Density • Reference density [*] • Temperature • Dynamic viscosity [*] • Kinematic viscosity [*] • Temp. compensated dynamic viscosity [*] • Temp. compensated kinematic viscosity [*] • Concentration [*] • Time period signal frequency (TPS) [*]	Off
Process variable value	A process variable is selected in the **Assign simulation process variable** parameter (→ 🖺 132).	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Current output 1 to n simulation	–	Switch the simulation of the current output on and off.	• Off • On	Off
Current output value	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	3.59 mA
Frequency output 1 to n simulation	In the **Operating mode** parameter, the **Frequency** option is selected.	Switch the simulation of the frequency output on and off.	• Off • On	Off
Frequency output 1 to n value	In the **Frequency simulation 1 to n** parameter, the **On** option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz	0.0 Hz
Pulse output simulation 1 to n	In the **Operating mode** parameter, the **Pulse** option is selected.	Set and switch off the pulse output simulation. ℹ For **Fixed value** option: **Pulse width** parameter (→ 🖺 95) defines the pulse width of the pulses output.	• Off • Fixed value • Down-counting value	Off

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Pulse value 1 to n	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	0
Switch output simulation 1 to n	In the **Operating mode** parameter, the **Switch** option is selected.	Switch the simulation of the switch output on and off.	• Off • On	Off
Switch state 1 to n	–	Select the status of the status output for the simulation.	• Open • Closed	Open
Relay output 1 to n simulation	–	Switch simulation of the relay output on and off.	• Off • On	Off
Switch state 1 to n	The **On** option is selected in the **Switch output simulation 1 to n** parameter parameter.	Select status of the relay output for the simulation.	• Open • Closed	Open
Pulse output simulation	–	Set and switch off the pulse output simulation. For **Fixed value** option: **Pulse width** parameter defines the pulse width of the pulses output.	• Off • Fixed value • Down-counting value	Off
Pulse value	In the **Pulse output simulation** parameter, the **Down-counting value** option is selected.	Set and switch off the pulse output simulation.	0 to 65 535	0
Device alarm simulation	–	Switch the device alarm on and off.	• Off • On	Off
Diagnostic event category	–	Select a diagnostic event category.	• Sensor • Electronics • Configuration • Process	Process
Diagnostic event simulation	–	Select a diagnostic event to simulate this event.	• Off • Diagnostic event picklist (depends on the category selected)	Off
Current input 1 to n simulation	–	Switch simulation of the current input on and off.	• Off • On	Off
Value current input 1 to n	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	0 mA
Status input 1 to n simulation	–	Switch simulation of the status input on and off.	• Off • On	Off
Input signal level 1 to n	In the **Status input simulation** parameter, the **On** option is selected.	Select the signal level for the simulation of the status input.	• High • Low	High

*   Visibility depends on order options or device settings

10.7   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 → 📖 134
- Protect access to local operation via key locking → 📖 57
- Protect access to measuring device via write protection switch → 📖 135

10.7.1   Write protection via access code

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

Defining the access code via local display

1. Navigate to the **Define access code** parameter (→ 🖺 130).

2. Define a max. 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 (→ 🖺 130) to confirm the code.
   ↳ The 🔒-symbol appears in front of all write-protected parameters.

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

> 🛈 • If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 🖺 56.
> • The user role with which the user is currently logged on via the local display → 🖺 56 is indicated by the **Access status** parameter. Navigation path: Operation → Access status

Parameters which can always be modified via the local display

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

	Parameters for configuring the local display	Parameters for configuring the totalizer
	↓	↓
Language	Format display	Control Totalizer
	Contrast display	Preset value
	Display interval	Reset all totalizers
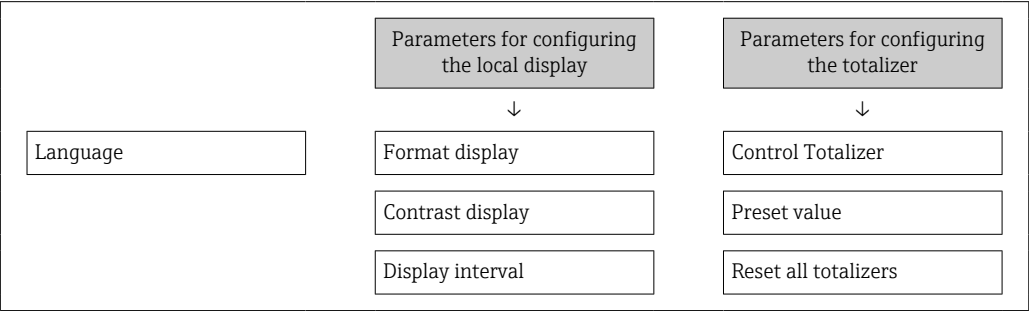
Defining the access code via the Web browser

1. Navigate to the **Define access code** parameter (→ 🖺 130).

2. Define a max. 16-digit numeric code as an access code.

3. Enter the access code again in the **Confirm access code** parameter (→ 🗎 130) to confirm the code.

   ↳ The Web browser switches to the login page.

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

ℹ️ • If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 🗎 56.
   • The user role with which the user is currently logged on via Web browser is indicated by the **Access status** parameter. Navigation path: Operation → Access status

Resetting the access code

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

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

ℹ️ 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 (→ 🗎 130).

   ↳ The access code has been reset to the factory setting **0000**. It can be redefined → 🗎 134.

ℹ️ 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.

10.7.2 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 HART protocol

1.

A0029630
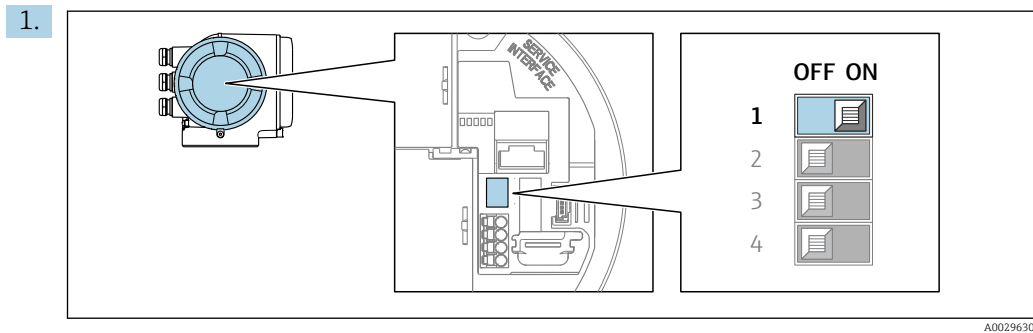
Setting the write protection (WP) switch on the main electronics module to the **ON** position enables hardware write protection.

↳ In the **Locking status** parameter, the **Hardware locked** option is displayed → ≡ 137. 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.

A0029425
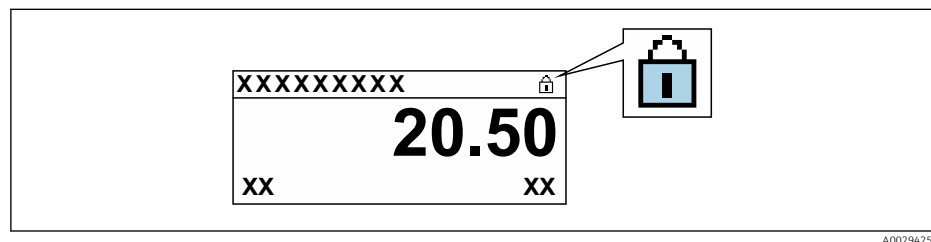
2. Setting the write protection (WP) switch on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.

↳ No option is displayed in the **Locking status** parameter → ≡ 137. On the local display, the ⓐ symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

11 Operation

11.1 Reading 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) → 🖺 135.
SIL locked	The SIL mode is enabled. This locks write access to the parameters (e.g. via local display or operating tool).
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset, etc.). Once the internal processing has been completed, the parameters can be changed once again.

11.2 Adjusting the operating language

🛈 Detailed information:
- To configure the operating language → 🖺 79
    - For information on the operating languages supported by the measuring device → 🖺 205

11.3 Configuring the display

Detailed information:
- On the basic settings for the local display → 🖺 105
- On the advanced settings for the local display → 🖺 120

11.4 Reading measured values

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

Navigation
"Diagnostics" menu → Measured values

► Measured values	
► Measured variables	→ 🖺 138
► Input values	→ 🖺 141
► Output values	→ 🖺 143
► Totalizer	→ 🖺 141

11.4.1 "Measured variables" submenu

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

Navigation

"Diagnostics" menu → Measured values → Measured variables

▶ Measured variables	
Mass flow	→ 🖹 139
Volume flow	→ 🖹 139
Corrected volume flow	→ 🖹 139
Density	→ 🖹 139
Reference density	→ 🖹 139
Temperature	→ 🖹 139
Pressure	→ 🖹 139
Dynamic viscosity	→ 🖹 139
Kinematic viscosity	→ 🖹 139
Temp. compensated dynamic viscosity	→ 🖹 139
Temp. compensated kinematic viscosity	→ 🖹 140
Concentration	→ 🖹 140
Target mass flow	→ 🖹 140
Carrier mass flow	→ 🖹 140
Target corrected volume flow	→ 🖹 140
Carrier corrected volume flow	→ 🖹 140
Target volume flow	→ 🖹 141
Carrier volume flow	→ 🖹 141

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Mass flow	–	Displays the mass flow that is currently measured. *Dependency* The unit is taken from: **Mass flow unit** parameter (→ 🖺 82)	Signed floating-point number
Volume flow	–	Displays the volume flow that is currently calculated. *Dependency* The unit is taken from the **Volume flow unit** parameter (→ 🖺 82).	Signed floating-point number
Corrected volume flow	–	Displays the corrected volume flow that is currently calculated. *Dependency* The unit is taken from: **Corrected volume flow unit** parameter (→ 🖺 82)	Signed floating-point number
Density	–	Shows the density currently measured. *Dependency* The unit is taken from the **Density unit** parameter (→ 🖺 82).	Signed floating-point number
Reference density	–	Displays the reference density that is currently calculated. *Dependency* The unit is taken from: **Reference density unit** parameter (→ 🖺 82)	Signed floating-point number
Temperature	–	Shows the medium temperature currently measured. *Dependency* The unit is taken from: **Temperature unit** parameter (→ 🖺 83)	Signed floating-point number
Pressure	–	Displays either a fixed or external pressure value. *Dependency* The unit is taken from the **Pressure unit** parameter (→ 🖺 83).	Signed floating-point number
Dynamic viscosity	For the following order code: "Application package", option **EG** "Viscosity" ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the dynamic viscosity that is currently calculated. *Dependency* The unit is taken from the **Dynamic viscosity unit** parameter.	Signed floating-point number
Kinematic viscosity	For the following order code: "Application package", option **EG** "Viscosity" ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the kinematic viscosity that is currently calculated. *Dependency* The unit is taken from the **Kinematic viscosity unit** parameter.	Signed floating-point number
Temp. compensated dynamic viscosity	For the following order code: "Application package", option **EG** "Viscosity" ℹ️ The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the temperature compensation that is currently calculated for the viscosity. *Dependency* The unit is taken from the **Dynamic viscosity unit** parameter.	Signed floating-point number

Parameter	Prerequisite	Description	User interface
Temp. compensated kinematic viscosity	For the following order code: "Application package", option **EG** "Viscosity" The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the temperature compensation that is currently calculated for the kinetic viscosity. *Dependency* The unit is taken from the **Kinematic viscosity unit** parameter (0578).	Signed floating-point number
Concentration	For the following order code: Order code for "Application package", option **ED** "Concentration" The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the concentration that is currently calculated. *Dependency* The unit is taken from the **Concentration unit** parameter.	Signed floating-point number
Target mass flow	With the following conditions: Order code for "Application package", option **ED** "Concentration" The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the mass flow that is currently measured for the target medium. *Dependency* The unit is taken from the **Mass flow unit** parameter (→ 🖺 82).	Signed floating-point number
Carrier mass flow	With the following conditions: Order code for "Application package", option **ED** "Concentration" The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the mass flow of the carrier medium that is currently measured. *Dependency* The unit is taken from: **Mass flow unit** parameter (→ 🖺 82)	Signed floating-point number
Target corrected volume flow	With the following conditions: • Order code for "Application package", option **ED** "Concentration" • The **Ethanol in water** option or **%mass / %volume** option is selected in the **Liquid type** parameter. The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the corrected volume flow that is currently measured for the target fluid. *Dependency* The unit is taken from the **Volume flow unit** parameter (→ 🖺 82).	Signed floating-point number
Carrier corrected volume flow	With the following conditions: • Order code for "Application package", option **ED** "Concentration" • In the **Liquid type** parameter, the **Ethanol in water** option or **%mass / %volume** option is selected. The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the corrected volume flow currently measured for the carrier fluid. *Dependency* The unit is taken from the **Volume flow unit** parameter (→ 🖺 82).	Signed floating-point number

Parameter	Prerequisite	Description	User interface
Target volume flow	With the following conditions: • Order code for "Application package", option **ED** "Concentration" • The **Ethanol in water** option or **%mass / %volume** option is selected in the **Liquid type** parameter. • The **%vol** option is selected in the **Concentration unit** parameter. ⓘ The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the volume flow currently measured for the target medium. *Dependency* The unit is taken from the **Volume flow unit** parameter (→ 🖺 82).	Signed floating-point number
Carrier volume flow	With the following conditions: • Order code for "Application package", option **ED** "Concentration" • The **Ethanol in water** option or **%mass / %volume** option is selected in the **Liquid type** parameter. • The **%vol** option is selected in the **Concentration unit** parameter. ⓘ The software options currently enabled are displayed in the **Software option overview** parameter.	Displays the volume flow currently measured for the carrier medium. *Dependency* The unit is taken from the **Volume flow unit** parameter (→ 🖺 82).	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

▶ Totalizer		
	Totalizer value 1 to n	→ 🖺 141
	Totalizer overflow 1 to n	→ 🖺 141

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 (→ 🖺 119) of the **Totalizer 1 to n** submenu.	Displays the current totalizer counter reading.	Signed floating-point number
Totalizer overflow 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🖺 119) 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                                                               │
│                                                                               │
│              ▶ Current input 1 to n                          → ▤ 142          │
│                                                                               │
│              ▶ Status input 1 to n                           → ▤ 142          │
└─────────────────────────────────────────────────────────────────────────────┘
```

Input values of current input

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

Navigation

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

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  ▶ Current input 1 to n                                                       │
│                                                                               │
│              Measured values 1 to n                          → ▤ 142          │
│                                                                               │
│              Measured current 1 to n                         → ▤ 142          │
└─────────────────────────────────────────────────────────────────────────────┘
```

Parameter overview with brief description

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

Input values of status input

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

Navigation

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

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  ▶ Status input 1 to n                                                        │
│                                                                               │
│              Value status input                              → ▤ 142          │
└─────────────────────────────────────────────────────────────────────────────┘
```

Parameter overview with brief description

Parameter	Description	User interface
Value status input	Shows the current input signal level.	• 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	
‣ Current output 1 to n	→ 🖺 143
‣ Pulse/frequency/switch output 1 to n	→ 🖺 143
‣ Relay output 1 to n	→ 🖺 144
‣ Double pulse output	→ 🖺 145

Output values of current output

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

Navigation

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

‣ Current output 1 to n	
Output current	→ 🖺 143
Measured current	→ 🖺 143

Parameter overview with brief description

Parameter	Description	User interface
Output current	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	→ 🖹	144
Pulse output 1 to n	→ 🖹	144
Switch state	→ 🖹	144

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 1 to n	The **Pulse** option is selected in the **Operating mode** parameter parameter.	Displays the pulse frequency currently output.	Positive floating-point number
Switch state	The **Switch** option is selected in the **Operating mode** parameter.	Displays the current switch output status.	• 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 state	→ 🖹	144
Switch cycles	→ 🖹	144
Max. switch cycles number	→ 🖹	144

Parameter overview with brief description

Parameter	Description	User interface
Switch state	Shows the current relay switch status.	• 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

Output values for double pulse output

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

Navigation

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

‣ Double pulse output		
	Pulse output	→ 🗎 145

Parameter overview with brief description

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

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:
- Basic settings using the**Setup** menu (→ 🗎 79)
- Advanced settings using the**Advanced setup** submenu (→ 🗎 112)

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	→ 🗎 146
	Preset value 1 to n	→ 🗎 146
	Totalizer value 1 to n	→ 🗎 146
	Reset all totalizers	→ 🗎 146

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Control Totalizer 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🗎 119) of the **Totalizer 1 to n** submenu.	Control totalizer value.	• Totalize • Reset + hold * • Preset + hold * • Reset + totalize • Preset + totalize * • Hold *	Totalize
Preset value 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🗎 119) of the **Totalizer 1 to n** submenu.	Specify start value for totalizer. *Dependency* ℹ The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 🗎 119).	Signed floating-point number	Country-specific: • 0 kg • 0 lb
Totalizer value 1 to n	A process variable is selected in the **Assign process variable** parameter (→ 🗎 119) of the **Totalizer 1 to n** submenu.	Displays the current totalizer counter reading.	Signed floating-point number	–
Reset all totalizers	–	Reset all totalizers to 0 and start.	• Cancel • Reset + totalize	Cancel

*   Visibility depends on order options or device settings

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 scope of the "Reset all totalizers" parameter

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

11.7 Show data logging

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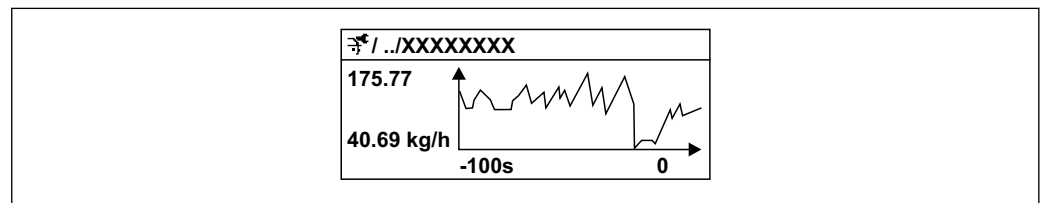
Data logging is also available via:
- Plant Asset Management Tool FieldCare → 🖥 67.
- Web browser

Function scope
- 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

🖼 32 Chart of a measured value trend

- 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	→ 🖥 149
Assign channel 2	→ 🖥 150
Assign channel 3	→ 🖥 150
Assign channel 4	→ 🖥 150
Logging interval	→ 🖥 150
Clear logging data	→ 🖥 150
Data logging	→ 🖥 150
Logging delay	→ 🖥 150
Data logging control	→ 🖥 150

Data logging status	→ 🖹 151
Entire logging duration	→ 🖹 151
▶ 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	Factory setting
Assign channel 1	The **Extended HistoROM** application package is available.	Assign process variable to logging channel.	• Off • Mass flow • Volume flow • Corrected volume flow* • Density • Reference density* • Temperature • Pressure • Dynamic viscosity* • Kinematic viscosity* • Temp. compensated dynamic viscosity* • Temp. compensated kinematic viscosity* • Concentration* • Target mass flow* • Carrier mass flow* • Target volume flow* • Carrier volume flow* • Target corrected volume flow* • Carrier corrected volume flow* • Application specific output 0* • Application specific output 1* • Inhomogeneous medium index • Suspended bubbles index* • HBSI* • Raw value mass flow • Exciter current 0 • Exciter current 1* • Oscillation damping 0 • Oscillation damping 1* • Oscillation damping fluctuation 0* • Oscillation damping fluctuation 1* • Oscillation frequency 0 • Oscillation frequency 1* • Frequency fluctuation 0* • Frequency fluctuation 1* • Oscillation amplitude* • Oscillation amplitude 1*	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
			• Oscillation amplitude 1 [*] • Signal asymmetry • Torsion signal asymmetry [*] • Carrier pipe temperature [*] • Electronics temperature • Sensor index coil asymmetry • Test point 0 • Test point 1 • Current output 1 • Current output 2 [*] • Current output 3 [*]	
Assign channel 2	The **Extended HistoROM** application package is available. [i] The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see the **Assign channel 1** parameter (→ 🖺 149)	Off
Assign channel 3	The **Extended HistoROM** application package is available. [i] The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see the **Assign channel 1** parameter (→ 🖺 149)	Off
Assign channel 4	The **Extended HistoROM** application package is available. [i] The software options currently enabled are displayed in the **Software option overview** parameter.	Assign a process variable to logging channel.	For the picklist, see the **Assign channel 1** parameter (→ 🖺 149)	Off
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 3 600.0 s	1.0 s
Clear logging data	The **Extended HistoROM** application package is available.	Clear the entire logging data.	• Cancel • Clear data	Cancel
Data logging	–	Select the type of data logging.	• Overwriting • Not overwriting	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	0 h
Data logging control	In the **Data logging** parameter, the **Not overwriting** option is selected.	Start and stop measured value logging.	• None • Delete + start • Stop	None

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Data logging status	In the **Data logging** parameter, the **Not overwriting** option is selected.	Displays the measured value logging status.	• Done • Delay active • Active • Stopped	Done
Entire logging duration	In the **Data logging** parameter, the **Not overwriting** option is selected.	Displays the total logging duration.	Positive floating-point number	0 s

*   Visibility depends on order options or device settings

11.8   Gas Fraction Handler

The Gas Fraction Handler improves measurement stability and repeatability in the event of two-phase media and provides valuable diagnostic information for the process.

The function continuously checks for the presence of gas bubbles in liquids or droplets in gases, as this second phase influences the output values for flow and density.

In the case of two-phase media, the Gas Fraction Handler stabilizes the output values and enables better readability for operators and easier interpretation by the distributed control system. The level of smoothing is adjusted according to the severity of the disturbances introduced by the second phase. In the case of single-phase media, the Gas Fraction Handler does not have any influence on the output values.

Possible options in the Gas Fraction Handler parameter:
• Off: Disables the Gas Fraction Handler. When a second phase is present, large fluctuations in the values output for flow and density will occur.
• Moderate: Use for applications with low levels or intermittent levels of second phase.
• Powerful: Use for applications with very significant levels of second phase.

The Gas Fraction Handler is cumulative to any fixed damping constants applied to flow and density that are set elsewhere in the instrument parameterization.

For detailed information on the parameter descriptions of the Gas Fraction Handler, see the Special Documentation for the device → 🖺 216

11.8.1   "Measurement mode" submenu

Navigation
"Expert" menu → Sensor → Measurement mode

► Measurement mode	
Gas Fraction Handler (6377)	→ 🖺 151

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Gas Fraction Handler	Activates the Gas Fraction Handler function for two phase media.	• Off • Moderate • Powerful	Moderate

11.8.2 "Medium index" submenu

Navigation

"Expert" menu → Application → Medium index

▶ Medium index		
	Inhomogeneous medium index (6368)	→ 🖺 152
	Cut off inhomogeneous wet gas (6375)	→ 🖺 152
	Cut off inhomogeneous liquid (6374)	→ 🖺 152
	Suspended bubbles index (6376)	→ 🖺 152
	Cut off suspended bubbles (6370)	→ 🖺 152

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / User entry	Factory setting
Inhomogeneous medium index	–	Shows the degree of inhomogeneity of the medium.	Signed floating-point number	–
Cut off inhomogeneous wet gas	–	Enter cut off value for wet gas applications. Below this value the 'Inhomogeneous medium index' is set to 0.	Positive floating-point number	0.25
Cut off inhomogeneous liquid	–	Enter cut off value for liquid applications. Below this value the 'Inhomogeneous medium index' is set to 0.	Positive floating-point number	0.05
Suspended bubbles index	The diagnostic index is only available for Promass Q.	Shows the relative amount of suspended bubbles in the medium.	Signed floating-point number	–
Cut off suspended bubbles	The parameter is only available for Promass Q.	Enter the cut off value for suspended bubbles. Below this value the 'Index for suspended bubbles' is set to 0.	Positive floating-point number	0.05

12   Diagnostics and troubleshooting

12.1   General troubleshooting

For local display

Error	Possible causes	Remedy
Local display dark and no output signals	Supply voltage does not match that specified on the nameplate.	Apply the correct supply voltage → 🖺 34.
Local display dark and no output signals	The polarity of the supply voltage is wrong.	Correct the polarity.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly. Terminals are not plugged into the main electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective. Main electronics module is defective.	Order spare part → 🖺 177.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	• Set the display brighter by simultaneously pressing ⊞ + 🗉. • Set the display darker by simultaneously pressing ⊟ + 🗉.
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 🖺 177.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures → 🖺 163
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press 2 s ⊟ + ⊞ ("home position"). 2. Press 🗉. 3. Set the desired language in the **Display language** parameter (→ 🖺 126).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	• Check the cable and the connector between the main electronics module and display module. • Order spare part → 🖺 177.

For output signals

Error	Possible causes	Remedial action
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖺 177.
Signal output outside the valid current range (< 3.6 mA or > 22 mA)	Main electronics module is defective. I/O electronics module is defective.	Order spare part → 🖺 177.

| Error	Possible causes	Remedial action
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Parametrization errors	Check parameterization and correct it.
Device measures incorrectly.	Configuration error or device is operated outside the application.	1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".

For access

Error	Possible causes	Remedy
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the main electronics module to the **OFF** position → 🖿 135.
No write access to parameters	Current user role has limited access authorization	1. Check user role → 🖿 56. 2. Enter correct customer-specific access code → 🖿 56.
No connection via HART protocol	Missing or incorrectly installed communication resistor.	Install the communication resistor (250 Ω) correctly. Observe the maximum load → 🖿 186.
No connection via HART protocol	Commubox • Connected incorrectly • Configured incorrectly • Drivers not installed correctly • USB interface on computer configured incorrectly	Observe the documentation for the Commubox. 📖 FXA195 HART: Document "Technical Information" TI00404F
No connection to Web server	Web server disabled	Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary→ 🖿 63.
	Incorrect settings for the Ethernet interface of the computer	1. Check the properties of the Internet protocol (TCP/IP) → 🖿 59→ 🖿 59. 2. Check the network settings with the IT manager.
No connection to Web server	Incorrect IP address	Check the IP address: 192.168.1.212 → 🖿 59→ 🖿 59
No connection to Web server	Incorrect WLAN access data	• Check WLAN network status. • Log on to the device again using WLAN access data. • Check that WLAN is enabled on the measuring device and operating device → 🖿 59.
	WLAN communication disabled	–
Not connecting to Web server, FieldCare or DeviceCare	No WLAN network available	• Check if WLAN reception is present: LED on display module is lit blue • Check if WLAN connection is enabled: LED on display module flashes blue • Switch on instrument function.
Network connection not present or unstable	WLAN network is weak.	• Operating device is outside of reception range: Check network status on operating device. • To improve network performance, use an external WLAN antenna.
	Parallel WLAN and Ethernet communication	• Check network settings. • Temporarily enable only the WLAN as an interface.
Web browser frozen and operation no longer possible	Data transfer active	Wait until data transfer or current action is finished.

Error	Possible causes	Remedy
	Connection lost	1. Check cable connection and power supply. 2. Refresh the Web browser and restart if necessary.
Content of Web browser incomplete or difficult to read	Not using optimum version of Web server.	1. Use the correct Web browser version → 🖺 58. 2. Clear the Web browser cache and restart the Web browser.
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No or incomplete display of contents in the Web browser	• JavaScript not enabled • JavaScript cannot be enabled	1. Enable JavaScript. 2. Enter http://XXX.XXX.X.X.XX/servlet/basic.html as the IP address.
Operation with FieldCare or DeviceCare not possible via CDI-RJ45 service interface (port 8000)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.
Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.

12.2   Diagnostic information via light emitting diodes

12.2.1   Transmitter

Different LEDs in the transmitter provide information on the device status.
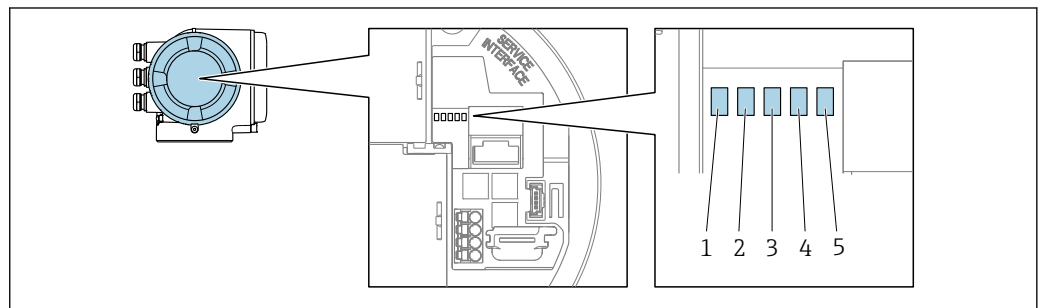
A0029629

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

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is ok.
2	Device status (normal operation)	Off	Firmware error
		Green	Device status is ok.
		Flashing green	Device is not configured.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.

LED		Color	Meaning
		Flashing red/green	The device restarts.
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	Off	Communication not active.
		White	Communication active.
5	Service interface (CDI)	Off	Not connected or no connection established.
		Yellow	Connected and connection established.
		Flashing yellow	Service interface active.

## 12.3	Diagnostic information on local display

### 12.3.1	Diagnostic message

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

Operational display in alarm condition	Diagnostic message

*1	Status signal*
*2	Diagnostic behavior*
*3	Diagnostic behavior with diagnostic code*
*4	Short text*
*5	Operating elements*
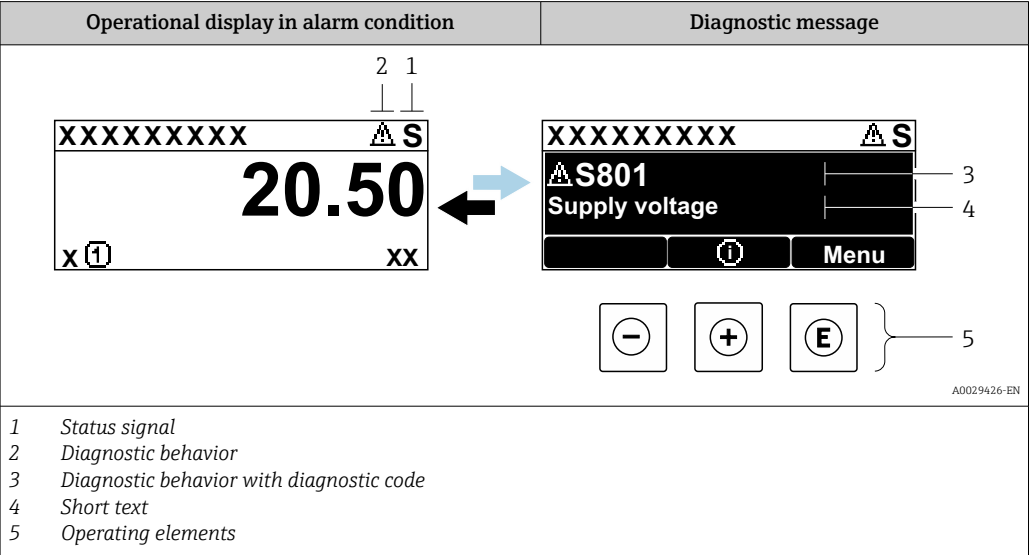
If two or more diagnostic events are pending simultaneously, only the message of the diagnostic event with the highest priority is shown.

Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
- Via parameter → 🖺 168
- Via submenus → 🖺 169

Status signals

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

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

Symbol	Meaning
F	**Failure** 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 operated: • Outside its technical specification limits (e.g. outside the process temperature range) • Outside of the configuration carried out by the user (e.g. maximum flow in parameter **20 mA value**)
M	**Maintenance required** Maintenance is required. The measured value remains valid.

Diagnostic behavior

Symbol	Meaning
	Alarm
	• Measurement is interrupted.
	• Signal outputs and totalizers assume the defined alarm condition.
	• A diagnostic message is generated.
	Warning
	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.

	Diagnostic information		
	Diagnostic code		
Diagnostic behavior	Status signal	Diagnostic number	Short text
	↓	↓	↓
Example	A0013962	S A0013958	441	Curr.output 1
		NAMUR NE 107	3-digit number	

Operating elements

Key	Meaning
⊞	**Plus key**
	In a menu, submenu
	Opens the message about remedy information.
Ⓔ	**Enter key**
	In a menu, submenu
	Opens the operating menu.
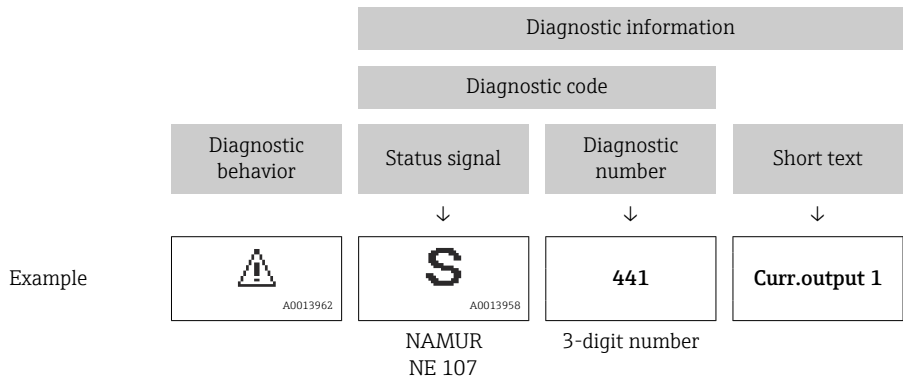
12.3.2   Calling up remedial measures
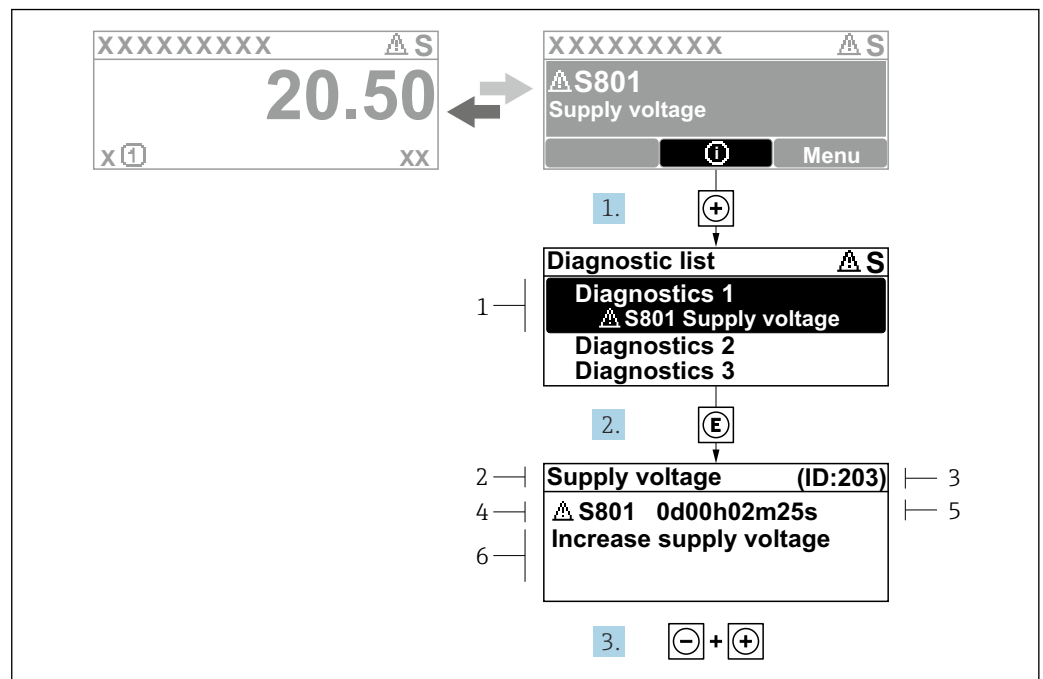
🖼 33   Message for remedial measures

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 ⊞ (ⓘ symbol).
    ↳ The **Diagnostic list** submenu opens.

2. Select the desired diagnostic event with ⊞ or ⊟ and press Ⓔ .
    ↳ The message about the remedial measures opens.

3. Press ⊟ + ⊞ 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 Ⓔ.
    ↳ The message for the remedial measures for the selected diagnostic event opens.

2. Press ⊟ + ⊞ 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.
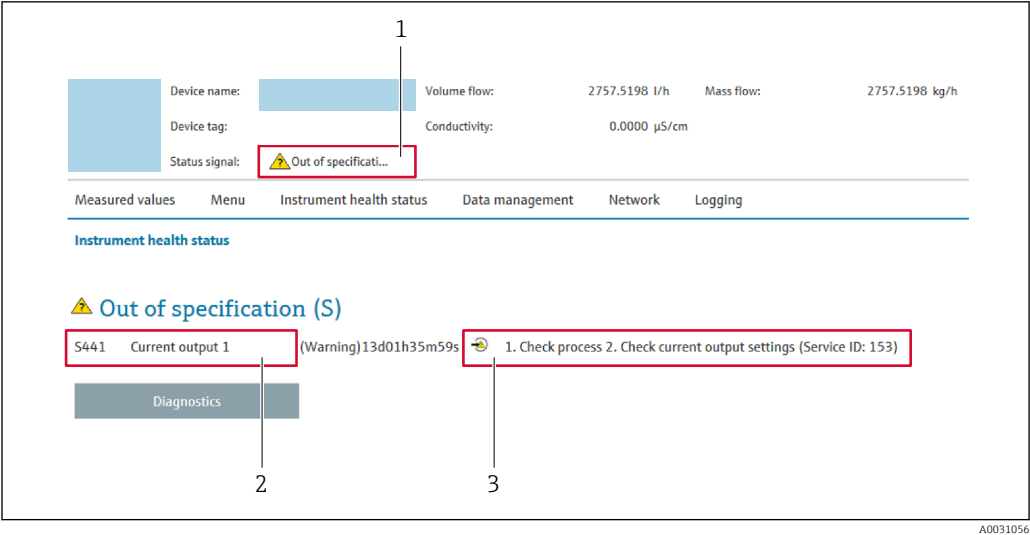
1   Status area with status signal
2   Diagnostic information
3   Remedial measures with service ID

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
  • Via parameter → 🖺 168
  • Via submenu → 🖺 169

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 the service mode (during a simulation, for example).
⚠?	**Out of specification** The device is being operated: • Outside its technical specification limits (e.g. outside the process temperature range) • Outside of the configuration carried out by the user (e.g. maximum flow in parameter **20 mA value**)
◇	**Maintenance required** Maintenance is required. The measured value is still valid.

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

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.

A0021799-EN
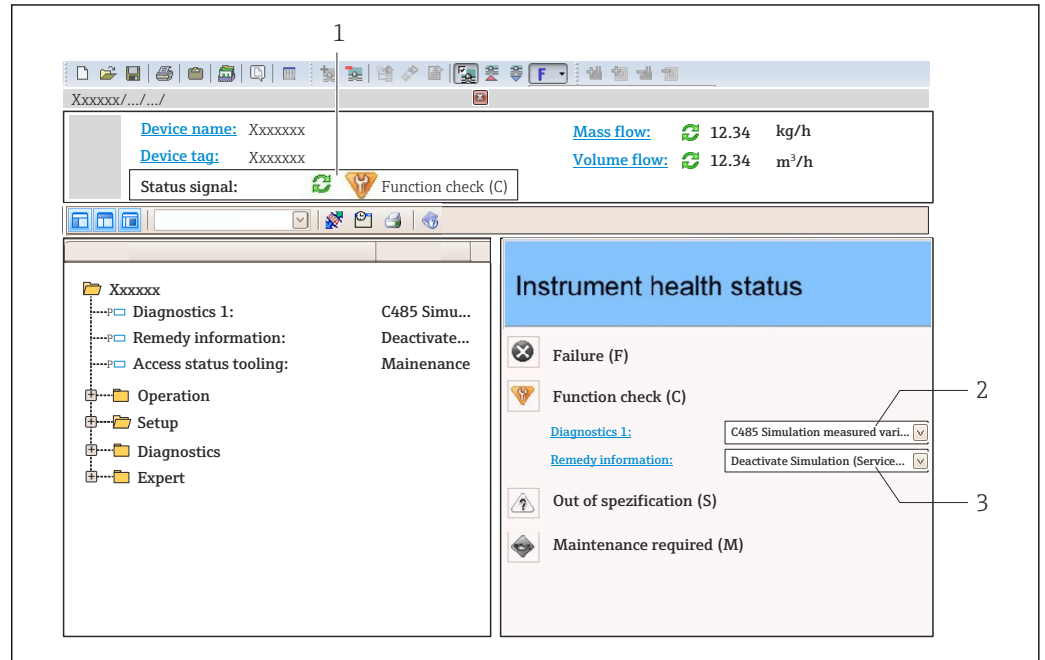
1   Status area with status signal → 🗎 157
2   Diagnostics information → 🗎 158
3   Remedial measures with service ID

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter → 🗎 168
- Via submenu → 🗎 169

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.
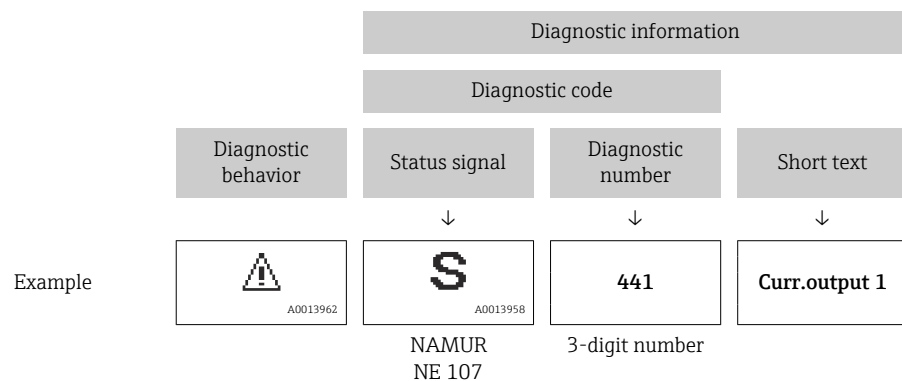
12.5.2 Calling up remedy information

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
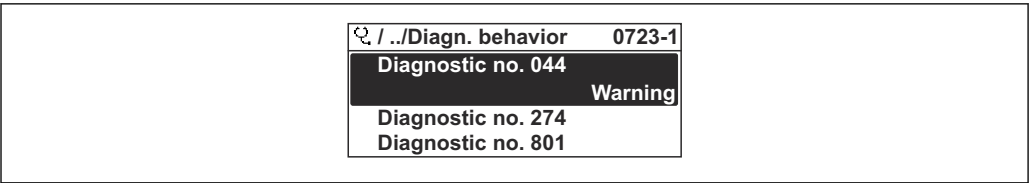
⊞ 34   Taking the example of the local display

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 displayed only in the **Event logbook** submenu (**Event list** submenu) and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.6.2 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 HART 7 Specification (Condensed Status), in accordance with NAMUR NE107.

Symbol	Meaning
F A0013956	**Failure** A device error is present. The measured value is no longer valid.
C A0013959	**Function check** The device is in service mode (e.g. during a simulation).
S A0013958	**Out of specification** The device is being operated: • Outside its technical specification limits (e.g. outside the process temperature range) • Outside of the configuration carried out by the user (e.g. maximum flow in parameter **20 mA value**)
M A0013957	**Maintenance required** Maintenance is required. The measured value is still valid.
N A0023076	Has no effect on the condensed status.

12.7   Overview of diagnostic information

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

In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Change the diagnostic information → 🗎 162

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of sensor				
002	Sensor unknown	1. Check if the correct sensor is mounted 2. Check if the 2-D matrix code on the sensor is undamaged	F	Alarm
022	Temperature sensor defective	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	F	Alarm
046	Sensor limit exceeded	1. Check process conditions 2. Check sensor	S	Warning [1]
062	Sensor connection faulty	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	F	Alarm
063	Exciter current faulty	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	F	Alarm
082	Data storage inconsistent	Check module connections	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
083	Memory content inconsistent	1. Restart device 2. Restore S-DAT data 3. Replace S-DAT	F	Alarm
119	Sensor initialization active	Sensor initialization in progress, please wait	C	Warning
140	Sensor signal asymmetrical	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	S	Alarm [1]
141	Zero adjustment failed	1. Check process conditions 2. Repeat commissioning procedure 3. Check sensor	F	Alarm
142	Sensor index coil asymmetry too high	Check sensor	S	Warning [1]
144	Measurement error too high	1. Check process conditions 2. Check or change sensor	F	Alarm [1]
Diagnostic of electronic				
201	Electronics faulty	1. Restart device 2. Replace electronics	F	Alarm
242	Firmware incompatible	1. Check firmware version 2. Flash or replace electronic module	F	Alarm
252	Module incompatible	1. Check electronic modules 2. Check if correct modules are available (e.g. NEx, Ex) 3. Replace electronic modules	F	Alarm
262	Module connection interrupted	1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics 2. Check or replace ISEM or main electronics	F	Alarm
270	Main electronics defective	1. Restart device 2. Replace main electronic module	F	Alarm
271	Main electronics faulty	1. Restart device 2. Replace main electronic module	F	Alarm
272	Main electronics faulty	Restart device	F	Alarm
273	Main electronics defective	1. Pay attention to display emergency operation 2. Replace main electronics	F	Alarm
275	I/O module defective	Change I/O module	F	Alarm
276	I/O module faulty	1. Restart device 2. Change I/O module	F	Alarm
283	Memory content inconsistent	Restart device	F	Alarm
302	Device verification active	Device verification active, please wait.	C	Warning [1]
303	I/O 1 to n configuration changed	1. Apply I/O module configuration (parameter 'Apply I/O configuration') 2. Afterwards reload device description and check wiring	M	Warning
304	Device verification failed	1. Check verification report 2. Repeat commissioning procedure 3. Check sensor	F	Alarm [1]

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
311	Sensor electronics (ISEM) faulty	Maintenance required! Do not reset device	M	Warning
330	Flash file invalid	1. Update firmware of device 2. Restart device	M	Warning
331	Firmware update failed	1. Update firmware of device 2. Restart device	F	Warning
332	Writing in HistoROM backup failed	1. Replace user interface board 2. Ex d/XP: replace transmitter	F	Alarm
361	I/O module 1 to n faulty	1. Restart device 2. Check electronic modules 3. Change I/O module or main electronics	F	Alarm
369	Matrix code scanner defective	Replace matrix code scanner	F	Alarm
371	Temperature sensor defective	Contact service	M	Warning
372	Sensor electronics (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	F	Alarm
373	Sensor electronics (ISEM) faulty	Transfer data or reset device	F	Alarm
374	Sensor electronics (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	S	Warning [1]
375	I/O- 1 to n communication failed	1. Restart device 2. Check if failure recurs 3. Replace module rack inclusive electronic modules	F	Alarm
378	Supply voltage ISEM faulty	1. If available: Check connection cable between sensor and transmitter 2. Replace main electronic module 3. Replace sensor electronic module (ISEM)	F	Alarm
382	Data storage	1. Insert T-DAT 2. Replace T-DAT	F	Alarm
383	Memory content	Reset device	F	Alarm
387	HistoROM data faulty	Contact service organization	F	Alarm
Diagnostic of configuration				
410	Data transfer failed	1. Retry data transfer 2. Check connection	F	Alarm
412	Processing download	Download active, please wait	C	Warning
431	Trim 1 to n required	Carry out trim	C	Warning
437	Configuration incompatible	1. Update firmware 2. Execute factory reset	F	Alarm
438	Dataset different	1. Check data set file 2. Check device parameterization 3. Download new device parameterization	M	Warning
441	Current output 1 to n faulty	1. Check process 2. Check current output settings	S	Warning [1]

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
442	Frequency output faulty	1. Check process 2. Check frequency output settings	S	Warning [1]
443	Pulse output 1 to n faulty	1. Check process 2. Check pulse output settings	S	Warning [1]
444	Current input 1 to n faulty	1. Check process 2. Check current input settings	S	Warning [1]
453	Flow override active	Deactivate flow override	C	Warning
484	Failure mode simulation active	Deactivate simulation	C	Alarm
485	Process variable simulation active	Deactivate simulation	C	Warning
486	Current input simulation active	Deactivate simulation	C	Warning
491	Current output 1 to n simulation active	Deactivate simulation	C	Warning
492	Frequency output simulation active	Deactivate simulation frequency output	C	Warning
493	Pulse output simulation active	Deactivate simulation pulse output	C	Warning
494	Switch output simulation active	Deactivate simulation switch output	C	Warning
495	Diagnostic event simulation active	Deactivate simulation	C	Warning
496	Status input simulation active	Deactivate simulation status input	C	Warning
502	CT activation/ deactivation failed	Follow the sequence of the custody transfer activation/deactivation: First authorized user login, then set the DIP switch on the main electonic module	C	Warning
520	I/O 1 to n hardware configuration invalid	1. Check I/O hardware configuration 2. Replace wrong I/O module 3. Plug the module of double pulse output on correct slot	F	Alarm
528	Concentration calculation not possible	Out of valid range of the selected calculation algorithm 1. Check concentration settings 2. Check measured values, e.g. density or temperature	S	Alarm
529	Concentration calculation not accurate	Out of valid range of the selected calculation algorithm 1. Check concentration settings 2. Check measured values, e.g. density or temperature	S	Warning
537	Configuration	1. Check IP addresses in network 2. Change IP address	F	Warning
540	Custody transfer mode failed	1. Power off device and toggle DIP switch 2. Deactivate custody transfer mode 3. Reactivate custody transfer mode 4. Check electronic components	F	Alarm
543	Double pulse output	1. Check process 2. Check pulse output settings	S	Warning [1]

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
593	Double pulse output simulation	Deactivate simulation pulse output	C	Warning
594	Relay output simulation	Deactivate simulation switch output	C	Warning
599	Custody transfer logbook full	1. Deactivate custody transfer mode 2. Clear custody transfer logbook (all 30 entries) 3. Activate custody transfer mode	F	Warning [1]
Diagnostic of process				
803	Loop current 1 faulty	1. Check wiring 2. Change I/O module	F	Alarm
830	Ambient temperature too high	Reduce ambient temp. around the sensor housing	S	Warning [1]
831	Ambient temperature too low	Increase ambient temp. around the sensor housing	S	Warning [1]
832	Electronics temperature too high	Reduce ambient temperature	S	Warning [1]
833	Electronics temperature too low	Increase ambient temperature	S	Warning [1]
834	Process temperature too high	Reduce process temperature	S	Warning [1]
835	Process temperature too low	Increase process temperature	S	Warning [1]
842	Process value below limit	1. Decrease process value 2. Check application 3. Check sensor	S	Warning [1]
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning [1]
882	Input signal faulty	1. Check input signal parameterization 2. Check external device 3. Check process conditions	F	Alarm
910	Tubes not oscillating	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Check sensor	F	Alarm
912	Medium inhomogeneous	1. Check process cond. 2. Increase system pressure	S	Warning [1]
913	Medium unsuitable	1. Check process conditions 2. Check electronic modules or sensor	S	Warning [1]
915	Viscosity ouf of specification	1. Avoid 2-phase flow 2. Increase system pressure 3. Verify viscosity and density are within range 4. Check process conditions	S	Warning [1]
941	API/ASTM temperature out of specificat.	1. Check process temperature with selected API/ASTM commodity group 2. Check API/ASTM-related parameters	S	Warning [1]
942	API/ASTM density out of specification	1. Check process density with selected API/ASTM commodity group 2. Check API/ASTM-related parameters	S	Warning [1]

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
943	API pressure out of specification	1. Check process pressure with selected API commodity group 2. Check API related parameters	S	Warning [1]
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning [1]
948	Oscillation damping too high	Check process conditions	S	Warning [1]
984	Condensation risk	1. Decrease ambient temperature 2. Increase medium temperature	S	Warning [1]

1)   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 → 🖹 159
- Via web browser → 🖹 160
- Via "FieldCare" operating tool → 🖹 162
- Via "DeviceCare" operating tool → 🖹 162

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 🖹 169

Navigation
"Diagnostics" menu

⟳ Diagnostics	
Actual diagnostics	→ 🖹 169
Previous diagnostics	→ 🖹 169
Operating time from restart	→ 🖹 169
Operating time	→ 🖹 169

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information. ℹ️ 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 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
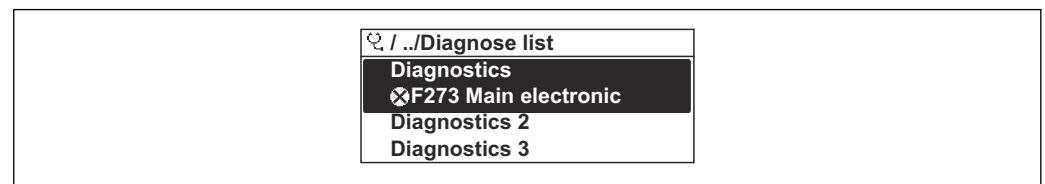
📊 *35   Taking the example of the local display*

ℹ️ To call up the measures to rectify a diagnostic event:
- Via local display → 🕮 159
- Via web browser → 🕮 160
- Via "FieldCare" operating tool → 🕮 162
- Via "DeviceCare" operating tool → 🕮 162

12.10   Event logbook

12.10.1 Reading out the event logbook

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

Navigation path
Diagnostics menu → **Event logbook** submenu → Event list
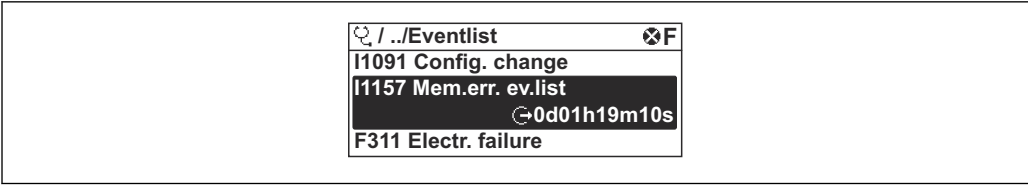
⊞ 36   Taking the example of the local display

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

The event history includes entries for:
- Diagnostic events → 🖺 163
- Information events → 🖺 170

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:
- Diagnostic event
  - ⊕: Occurrence of the event
  - ⊖: End of the event
- Information event
  ⊕: Occurrence of the event

> ℹ️ To call up the measures to rectify a diagnostic event:
> - Via local display → 🖺 159
> - Via web browser → 🖺 160
> - Via "FieldCare" operating tool → 🖺 162
> - Via "DeviceCare" operating tool → 🖺 162

> ℹ️ For filtering the displayed event messages → 🖺 170

12.10.2 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)

12.10.3 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

Info number	Info name
I1092	HistoROM backup deleted
I1111	Density adjust failure
I11280	ZeroPT verified and adjustm. recommended
I11281	ZeroPT verif. and adjust. not recommend.
I1137	Electronics changed
I1151	History reset
I1155	Reset electronics temperature
I1156	Memory error trend
I1157	Memory error event list
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1256	Display: access status changed
I1264	Safety sequence aborted
I1278	I/O module restarted
I1335	Firmware changed
I1361	Web server: login failed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1444	Device verification passed
I1445	Device verification failed
I1447	Record application reference data
I1448	Application reference data recorded
I1449	Recording application ref. data failed
I1450	Monitoring off
I1451	Monitoring on
I1457	Measurement error verification failed
I1459	I/O module verification failed
I1460	HBSI verification failed
I1461	Sensor verification failed
I1462	Sensor electronic module verific. failed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1517	Custody transfer active
I1518	Custody transfer inactive
I1554	Safety sequence started
I1555	Safety sequence confirmed
I1556	Safety mode off
I1618	I/O module 2 replaced
I1619	I/O module 3 replaced
I1621	I/O module 4 replaced

Info number	Info name
I1622	Calibration changed
I1624	All totalizers reset
I1625	Write protection activated
I1626	Write protection deactivated
I1627	Web server: login successful
I1628	Display: login successful
I1629	CDI: login successful
I1631	Web server access changed
I1632	Display: login failed
I1633	CDI: login failed
I1634	Reset to factory settings
I1635	Reset to delivery settings
I1639	Max. switch cycles number reached
I1643	Custody transfer logbook cleared
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated
I1651	Custody transfer parameter changed
I1712	New flash file received
I1725	Sensor electronic module (ISEM) changed
I1726	Configuration backup failed

12.11   Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter (→ 🖺 130).

12.11.1 Function scope of "Device reset" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
Restore S-DAT backup	Restores the data that is saved on the S-DAT. Additional information: This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed. ℹ This option is displayed only in an alarm condition.

12.12   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	→ 🗎 173	
Serial number	→ 🗎 173	
Firmware version	→ 🗎 173	
Device name	→ 🗎 173	
Manufacturer	→ 🗎 173	
Order code	→ 🗎 174	
Extended order code 1	→ 🗎 174	
Extended order code 2	→ 🗎 174	
Extended order code 3	→ 🗎 174	
ENP version	→ 🗎 174	
Device revision	→ 🗎 174	
Device ID	→ 🗎 174	
Device type	→ 🗎 174	
Manufacturer ID	→ 🗎 174	

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Device tag	Shows name of measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Promass
Serial number	Shows the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	–
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	–
Device name	Shows the name of the transmitter. 🛈 The name can be found on the nameplate of the transmitter.	Promass 300/500	–
Manufacturer	Displays the manufacturer.	Character string comprising numbers, letters and special characters	Endress+Hauser

Parameter	Description	User interface	Factory setting
Order code	Shows the device order code. ⓘ The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	–
Extended order code 1	Shows the 1st part of the extended order code. ⓘ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 2	Shows the 2nd part of the extended order code. ⓘ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 3	Shows the 3rd part of the extended order code. ⓘ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00
Device revision	Shows the device revision with which the device is registered with the HART Communication Foundation.	2-digit hexadecimal number	7
Device ID	Shows the device ID for identifying the device in a HART network.	6-digit hexadecimal number	–
Device type	Shows the device type with which the measuring device is registered with the HART Communication Foundation.	2-digit hexadecimal number	0x3B (for Promass 300/500)
Manufacturer ID	Shows the device's manufacturer ID registered with the HART Communication Foundation.	2-digit hexadecimal number	0x11 (for Endress+Hauser)

12.13 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
08.2022	01.06.zz	Option **60**	• New gas type: methane with hydrogen • Eight display values on local display • Zero point verification and zero adjustment wizard • New density unit: °API • New diagnostic parameters • Additional languages for Heartbeat Technology Reports	Operating Instructions	BA01487D/06/EN/05.22
09.2019	01.05.zz	Option **66**	• Gas Fraction Handler Adaptive Filter, Gas Entrainment Index • Application-specific Input module • Upgrading of the Petroleum application package	Operating Instructions	BA01487D/06/EN/03.19

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation

10.2017	01.01.zz	Option **71**	• Petroleum new
			• Concentration update
			• Viscosity update
			• OPC-UA with Security new
			• Local display - enhanced performance and data entry via text editor
			• Optimized keypad lock for local display
			• Improvements and enhancements with regard to custody transfer measurement
			• Web server feature update
			  • Support for trend data function
			  • Heartbeat function enhanced to include detailed results (page 3/4 of the report)
			  • Device configuration as PDF (parameter log, similar to FDT print)
			• Network capability of Ethernet (service) interface
			• Comprehensive Heartbeat feature update
			• Local display - support for WLAN infrastructure mode
			• Implementation of reset code
				Operating Instructions	BA01487D/06/EN/02.17

08.2016	01.00.zz	Option **78**	Original firmware	Operating Instructions	BA01487D/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, see the "Device history and compatibility" section → 🗎 175

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. 8I3B
      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

12.14   Device history and compatibility

The device model is documented in the order code on the nameplate of the device (e.g. 8F3BXX-XXX....XXXA1-XXXXXX).

Device model	Release	Change compared with earlier model	Compatibility with earlier model
A2	09.2019	I/O module with enhanced performance and functionality: see device firmware 01.05.zz → 🗎 174	No
A1	08.2016	–	–

13 Maintenance

13.1 Maintenance tasks

No special maintenance work is required.

13.1.1 Exterior cleaning

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

13.1.2 Interior cleaning

Observe the following points for CIP and SIP cleaning:
• Use only cleaning agents to which the process-wetted materials are adequately resistant.
• Observe the maximum permitted medium temperature for the measuring device → 🕮 200.

Observe the following point for cleaning with pigs:
Observe the inside diameter of the measuring tube and process connection.

13.2 Measuring and test equipment

Endress+Hauser offers a wide variety of measuring and test equipment, such as W@M or device tests.

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

List of some of the measuring and testing equipment: → 🕮 179→ 🕮 181

13.3 Endress+Hauser services

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

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

14   Repair

14.1   General information

14.1.1   Repair and conversion concept

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

14.1.2   Notes for repair and conversion

For repair and modification of a measuring device, observe the following notes:
▸ Use only original Endress+Hauser spare parts.
▸ Carry out the repair according to the Installation Instructions.
▸ Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
▸ Document every repair and each conversion and enter them into the *W@M* life cycle management database and Netilion Analytics.

14.2   Spare parts

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 (→ 🖹 173) in the **Device information** submenu.

14.3   Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

14.4   Return

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

1. Refer to the web page for information:
   http://www.endress.com/support/return-material
   ↳ Select the region.

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

14.5   Disposal

⌧

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to 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	Transmitter for replacement or storage. Use the order code to define the following specifications: • Approvals • Output • Input • Display/operation • Housing • Software Order code: 8X3BXX Installation Instructions EA01200D

Remote display and operating module DKX001	• 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:
	   • 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
	
	 Mounting bracket for DKX001
	 • If ordered directly: order code for "Accessory enclosed", option RA "Mounting bracket, pipe 1/2'"
	 • If ordered subsequently: order number: 71340960
	
	 Connecting cable (replacement cable)
	 Via the separate product structure: DKX002
	
	 Further information on display and operating module DKX001→ 🖺 206.
	
	 Special Documentation SD01763D

External WLAN antenna	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". • The external WLAN antenna is not suitable for use in hygienic applications. • Additional information regarding the WLAN interface → 🖺 66. Order number: 71351317 Installation Instructions EA01238D
Weather protection cover	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight. Order number: 71343505 Installation Instructions EA01160D

15.1.2   For the sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.
	If using oil as a heating medium, please consult with Endress+Hauser.
	Use the order code with the product root DK8003.
	Special Documentation SD02158D

15.2   Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. Technical Information TI00404F
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. • Technical Information TI00429F • Operating Instructions BA00371F
Fieldgate FXA42	Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices • Technical Information TI01297S • Operating Instructions BA01778S • Product page: www.endress.com/fxa42
Field Xpert SMT50	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in 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. • Technical Information TI01342S • Operating Instructions BA01709S • 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. • 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. • Technical Information TI01418S • Operating Instructions BA01923S • Product page: www.endress.com/smt77

15.3 Service-specific accessories

Accessory	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Choice of measuring devices with industrial requirements • Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. • Graphic illustration of the calculation results • Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: • Via the Internet: https://portal.endress.com/webapp/applicator • As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, see: www.endress.com/lifecyclemanagement
FieldCare	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. 📖 Operating Instructions BA00027S and BA00059S
DeviceCare	Tool for connecting and configuring Endress+Hauser field devices. 📖 Innovation brochure IN01047S

15.4 System components

Accessories	Description

Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.
	
	   📖 • Technical Information TI00133R
	       • Operating Instructions BA00247R

Cerabar M	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.
	
	   📖 • Technical Information TI00426P and TI00436P
	       • Operating Instructions BA00200P and BA00382P

Cerabar S	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.
	
	   📖 • Technical Information TI00383P
	       • Operating Instructions BA00271P

iTEMP	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. 📖 "Fields of Activity" document FA00006T

16   Technical data

16.1   Application

The measuring device is only suitable for the flow measurement of liquids and gases.

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	Mass flow measurement based on the Coriolis measuring principle

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.
	Information on the structure of the device → 🖹 14

16.3 Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature
- Viscosity

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

DN		Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	⅜	0 to 2 000	0 to 73.50
15	½	0 to 6 500	0 to 238.9
15 FB	½ FB	0 to 18 000	0 to 661.5
25	1	0 to 18 000	0 to 661.5
25 FB	1 FB	0 to 45 000	0 to 1 654
40	1½	0 to 45 000	0 to 1 654
40 FB	1½ FB	0 to 70 000	0 to 2 573
50	2	0 to 70 000	0 to 2 573
50 FB	2 FB	0 to 180 000	0 to 6 615
80	3	0 to 180 000	0 to 6 615

FB = Full bore

Measuring range for gases

The full scale value depends on the density and the sound velocity of the gas used and can be calculated with the formula below:

The full scale value depends on the density and the sound velocity of the gas used. The full scale value can be calculated with the following formulas:

- $\dot{m}_{max(G)} = \text{minimum}\,(\dot{m}_{max(F)} \cdot \rho_G : x\,)$
- $\dot{m}_{max(G)} = \text{minimum}\,(\rho_G \cdot (c_G/2) \cdot d_i^2 \cdot (\pi/4) \cdot 3600 \cdot n)$

$\dot{m}_{max(G)}$	Maximum full scale value for gas [kg/h]
$\dot{m}_{max(F)}$	Maximum full scale value for liquid [kg/h]
$\dot{m}_{max(G)} < \dot{m}_{max(F)}$	$\dot{m}_{max(G)}$ can never be greater than $\dot{m}_{max(F)}$
ρ_G	Gas density in [kg/m³] at operating conditions
x	Limitation constant for max. gas flow [kg/m³]
c_G	Sound velocity (gas) [m/s]
d_i	Measuring tube internal diameter [m]
π	Pi
n = 1	Number of measuring tubes

DN		x
[mm]	[in]	[kg/m³]
8	³⁄₈	60
15	½	80
15 FB	½ FB	90
25	1	90
25 FB	1 FB	90
40	1½	90
40 FB	1½ FB	90
50	2	90
50 FB	2 FB	110
80	3	110
FB = Full bore		

If calculating the full scale value using the two formulas:

1. Calculate the full scale value with both formulas.

2. The smaller value is the value that must be used.

Recommended measuring range

Flow limit → 🖹 201

| Operable flow range | Over 1000 : 1.

Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly. |

| Input signal | **External measured values**

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

Various pressure and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 🖹 181

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

HART protocol

The measured values are written from the automation system to the measuring device via the HART protocol. The pressure transmitter must support the following protocol-specific functions:
• HART protocol
• Burst mode

Current input

The measured values are written from the automation system to the measuring device via the current input → 🖹 185. |

Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	• 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	• Pressure • Temperature • Density

Status input

Maximum input values	• DC −3 to 30 V • If status input is active (ON): R_i >3 kΩ
Response time	Configurable: 5 to 200 ms
Input signal level	• Low signal: DC −3 to +5 V • High signal: DC 12 to 30 V
Assignable functions	• Off • Reset the individual totalizers separately • Reset all totalizers • Flow override

16.4   Output

Output signal | **Current output 4 to 20 mA HART**

Order code	"Output; input 1" (20): Option BA: current output 4 to 20 mA HART
Signal mode	Can be set to: • Active • Passive
Current range	Can be set to: • 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
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	250 to 700 Ω
Resolution	0.38 µA
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	• Mass flow • Volume flow • Corrected volume flow • Density • Reference density • Temperature • Electronics temperature • Oscillation frequency 0 • Oscillation damping 0 • Signal asymmetry • Exciter current 0 The range of options increases if the measuring device has one or more application packages.

Current output 4 to 20 mA HART Ex i

Order code	"Output; input 1" (20) choose from: • Option CA: current output 4 to 20 mA HART Ex i passive • Option CC: current output 4 to 20 mA HART Ex i active
Signal mode	Depends on the selected order version.
Current range	Can be set to: • 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
Open-circuit voltage	DC 21.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	• 250 to 400 Ω (active) • 250 to 700 Ω (passive)
Resolution	0.38 µA

Damping	Configurable: 0 to 999.9 s
Assignable measured variables	• Mass flow • Volume flow • Corrected volume flow • Density • Reference density • Temperature • Electronics temperature • Oscillation frequency 0 • Oscillation damping 0 • Signal asymmetry • Exciter current 0 ℹ The range of options increases if the measuring device has one or more application packages.

Current output 4 to 20 mA

Order code	"Output; input 2" (21), "Output; input 3" (022): Option B: current output 4 to 20 mA
Signal mode	Can be set to: • Active • Passive
Current span	Can be set to: • 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	• Mass flow • Volume flow • Corrected volume flow • Density • Reference density • Temperature • Electronics temperature • Oscillation frequency 0 • Oscillation damping 0 • Signal asymmetry • Exciter current 0 ℹ The range of options increases if the measuring device has one or more application packages.

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 span	Can be set to: • 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	• Mass flow • Volume flow • Corrected volume flow • Density • Reference density • Temperature • Electronics temperature • Oscillation frequency 0 • Oscillation damping 0 • Signal asymmetry • Exciter current 0 The range of options increases if the measuring device has one or more application packages.

Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector Can be set to: • 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	• Mass flow • Volume 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	• Mass flow • Volume flow • Corrected volume flow • Density • Reference density • Temperature • Electronics temperature • Oscillation frequency 0 • Oscillation damping 0 • Signal asymmetry • Exciter current 0 The range of options increases if the measuring device has one or more application packages.
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	• Off
	• On
	• Diagnostic behavior
	• Limit value
	  • Mass flow
	  • Volume flow
	  • Corrected volume flow
	  • Density
	  • Reference density
	  • Temperature
	  • Totalizer 1-3
	• Flow direction monitoring
	• Status
	  • Partially filled pipe detection
	  • Low flow cut off
	
	The range of options increases if the measuring device has one or more application packages.

Double pulse output

Function	Double pulse
Version	Open collector Can be set to: • Active • Passive • Passive NAMUR
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
Output frequency	Configurable: 0 to 1000 Hz
Damping	Configurable: 0 to 999 s

Pulse/pause ratio	1:1
Assignable measured variables	• Mass flow • Volume flow • Corrected volume flow • Density • Reference density • Temperature ⓘ The range of options increases if the measuring device has one or more application packages.

Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: • NO (normally open), factory setting • NC (normally closed)
Maximum switching capacity (passive)	• DC 30 V, 0.1 A • AC 30 V, 0.5 A

Assignable functions	• Off
	• On
	• Diagnostic behavior
	• Limit value
	  • Mass flow
	  • Volume flow
	  • Corrected volume flow
	  • Density
	  • Reference density
	  • Temperature
	  • Totalizer 1-3
	• Flow direction monitoring
	• Status
	  • Partially filled pipe detection
	  • Low flow cut off
	
	ⓘ The range of options increases if the measuring device has one or more application packages.

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:

Current output 0/4 to 20 mA

4 to 20 mA

Failure mode	Choose from:
	• 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
	• Freely definable value between: 3.59 to 22.5 mA
	• Actual value
	• Last valid value

0 to 20 mA

Failure mode	Choose from:
	• Maximum alarm: 22 mA
	• Freely definable value between: 0 to 20.5 mA

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from:
	• Actual value
	• No pulses
Frequency output	
Failure mode	Choose from:
	• Actual value
	• 0 Hz
	• Defined value (f $_{max}$ 2 to 12 500 Hz)
Switch output	
Failure mode	Choose from:
	• Current status
	• Open
	• Closed

Relay output

Failure mode	Choose from:
	• Current status
	• Open
	• Closed

Local display

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

ℹ️ Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
  HART protocol
- 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: • Supply voltage active • Data transmission active • Device alarm/error has occurred ⓘ Diagnostic information via light emitting diodes → 🖹 155

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	0x11
	Device type ID	0x3B
	HART protocol revision	7
	Device description files (DTM, DD)	Information and files under: www.endress.com
	HART load	Min. 250 Ω
	System integration	Information on system integration → 🖹 72. • Measured variables via HART protocol • Burst Mode functionality

16.5   Power supply

Terminal assignment	→ 🖹 34

Supply voltage			
	Order code for "Power supply"	**Terminal voltage**	**Frequency range**
	Option **D**	DC 24 V	±20%	–
	Option **E**	AC 100 to 240 V	−15 to +10%	50/60 Hz

Order code for "Power supply"	Terminal voltage		Frequency range
Option **I**	DC 24 V	±20%	–
	AC 100 to 240 V	−15 to +10%	50/60 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**

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

Power supply failure	- Totalizers stop at the last value measured.

- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memoryor 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.
- 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   → 🖹 34

Potential equalization   → 🖹 37

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

Cable specification   → 🖹 31

Overvoltage protection

Mains voltage fluctuations	→ 🖹 192
Overvoltage category	Overvoltage category II
Short-term, temporary overvoltage	Up to 1200 V between cable and ground, for max. 5 s
Long-term, temporary overvoltage	Up to 500 V between cable and ground

16.6   Performance characteristics

Reference operating conditions	• Error limits based on ISO 11631

• Error limits based on ISO 11631
• Water with +15 to +45 ℃ (+59 to +113 ℉) at 2 to 6 bar (29 to 87 psi)
• Specifications as per calibration protocol
• Accuracy based on accredited calibration rigs that are traced to ISO 17025.

ℹ To obtain measured errors, use the *Applicator* sizing tool → 🖺 181

Maximum measured error	o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

Base accuracy

ℹ Design fundamentals → 🖺 197

Mass flow and volume flow (liquids)

±0.10 % o.r.

Mass flow (gases)

±0.50 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration [1]	Wide-range Density specification [2] [3]
[g/cm³]	[g/cm³]	[g/cm³]
±0.0005	±0.02	±0.004

1)   Valid over the entire temperature and density range
2)   Valid range for special density calibration: 0 to 2 g/cm³, +10 to +80 ℃ (+50 to +176 ℉)
3)   order code for "Application package", option EE "Special density"

Temperature

±0.5 ℃ ± 0.005 · T ℃ (±0.9 ℉ ± 0.003 · (T − 32) ℉)

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	⅜	0.150	0.0055
15	½	0.488	0.0179
15 FB	½ FB	1.350	0.0496
25	1	1.350	0.0496
25 FB	1 FB	3.375	0.124
40	1½	3.375	0.124
40 FB	1 ½ FB	5.25	0.193
50	2	5.25	0.193
50 FB	2 FB	13.5	0.496
80	3	13.5	0.496
FB = Full bore			

Flow values

Flow values as turndown parameters depending on the nominal diameter.

SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
8	2 000	200	100	40	20	4
15	6 500	650	325	130	65	13
15 FB	18 000	1 800	900	360	180	36
25	18 000	1 800	900	360	180	36
25 FB	45 000	4 500	2 250	900	450	90
40	45 000	4 500	2 250	900	450	90
40 FB	70 000	7 000	3 500	1 400	700	140
50	70 000	7 000	3 500	1 400	700	140
50 FB	180 000	18 000	9 000	3 600	1 800	360
80	180 000	18 000	9 000	3 600	1 800	360
FB = Full bore						

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
⅜	73.50	7.350	3.675	1.470	0.735	0.147
½	238.9	23.89	11.95	4.778	2.389	0.478
½ FB	661.5	66.15	33.08	13.23	6.615	1.323
1	661.5	66.15	33.08	13.23	6.615	1.323
1 FB	1 654	165.4	82.70	33.08	16.54	3.308
1½	1 654	165.4	82.70	33.08	16.54	3.308
1½ FB	2 573	257.3	128.7	51.46	25.73	5.146
2	2 573	257.3	128.7	51.46	25.73	5.146
2 FB	6 615	661.5	330.8	132.3	66.15	13.23
3	6 615	661.5	330.8	132.3	66.15	13.23
FB = Full bore						

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; 1 g/cm³ = 1 kg/l; T = medium temperature

                                 Base repeatability

                                 ℹ️ Design fundamentals → 🖹 197

                                 Mass flow and volume flow (liquids)
                                 ±0.05 % o.r.

                                 Mass flow (gases)
                                 ±0.25 % o.r.

                                 Density (liquids)
                                 ±0.00025 g/cm³

                                 Temperature
                                 ±0.25 °C ± 0.0025 · T °C (±0.45 °F ± 0.0015 · (T−32) °F)

Response time   The response time depends on the configuration (damping).

Influence of ambient   **Current output**
temperature

Temperature coefficient	Max. 1 μA/°C

                                 Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

Influence of medium   **Mass flow and volume flow**
temperature
                                 o.f.s. = of full scale value

                                 If there is a difference between the temperature during zero adjustment and the process
                                 temperature, the additional measured error of the sensors is typically ±0.0002 %o.f.s./°C
                                 (±0.0001 % o.f.s./°F).

                                 The influence is reduced when the zero adjustment is performed at process temperature.

                                 Density
                                 If there is a difference between the density calibration temperature and the process
                                 temperature, the measured error of the sensors is typically
                                 ±0.0001 g/cm³/°C (±0.00005 g/cm³/°F). Field density adjustment is possible.

                                 Wide-range density specification (special density calibration)
                                 If the process temperature is outside the valid range (→ 🖹 194) the measured error is
                                 ±0.0001 g/cm³ /°C (±0.00005 g/cm³ /°F)
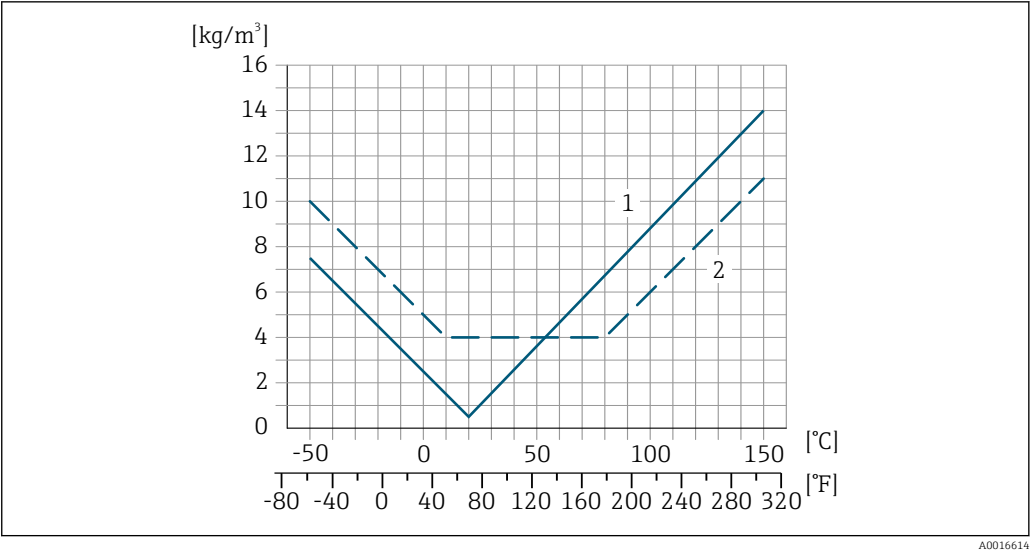
1   Field density adjustment, for example at +20 ℃ (+68 ℉)
2   Special density calibration

Temperature

$\pm 0.005 \cdot T\ ℃\ (\pm\ 0.005 \cdot (T - 32)\ ℉)$

Influence of medium pressure	The tables below show the effect that a difference in pressure between the calibration pressure and the process pressure has on the accuracy in the case of the mass flow and density.

o.r. = of reading

It is possible to compensate for the effect by:
- Reading in the current pressure measured value via the current input or a digital input.
- Specifying a fixed value for the pressure in the device parameters.

Operating Instructions .

DN		[% o.r./bar]	[% o.r./psi]
[mm]	**[in]**		
8	⅜	no influence	no influence
15	½	no influence	no influence
15 FB	½ FB	+0.003	+0.0002
25	1	+0.003	+0.0002
25 FB	1 FB	no influence	no influence
40	1½	no influence	no influence
40 FB	1½ FB	no influence	no influence
50	2	no influence	no influence
50 FB	2 FB	no influence	no influence
80	3	no influence	no influence
FB = Full bore			

Design fundamentals	o.r. = of reading, o.f.s. = of full scale value

BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.

MeasValue = measured value; ZeroPoint = zero point stability

Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \dfrac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ A0021332	$\pm$ BaseAccu A0021339
$< \dfrac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ A0021333	$\pm \dfrac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021334

Calculation of the maximum repeatability as a function of the flow rate

Flow rate	Maximum repeatability in % o.r.
$\geq \dfrac{\frac{1}{2} \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021335	$\pm$ BaseRepeat A0021340
$< \dfrac{\frac{1}{2} \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021336	$\pm \frac{1}{2} \cdot \dfrac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021337

Example of maximum measured error

A0030296
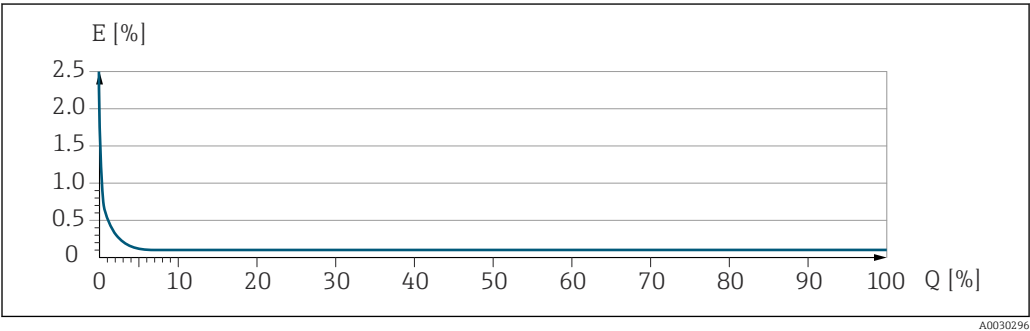
E   Maximum measured error in % o.r. (example)
Q   Flow rate in % of maximum full scale value

16.7   Installation

Installation conditions   → 🕮 21

16.8   Environment

Ambient temperature
range

→ 🕮 23

Temperature tables

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

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

Storage temperature	−50 to +80 °C (−58 to +176 °F)

Climate class	DIN EN 60068-2-38 (test Z/AD)

Relative humidity	The device is suitable for use in outdoor and indoor areas with a relative humidity of 4 to 95%.

Operating height	According to EN 61010-1 • ≤ 2 000 m (6 562 ft) • > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

Degree of protection

Transmitter

- 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

Order code for "Sensor options", option CM "IP69

External WLAN antenna

IP67

Vibration- and shock-resistance

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

- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 2 000 Hz, 1 g peak

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

- 10 to 200 Hz, 0.003 g^2/Hz
- 200 to 2 000 Hz, 0.001 g^2/Hz
- Total: 1.54 g rms

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

6 ms 30 g

Rough handling shocks, according to IEC 60068-2-31

Interior cleaning

- Cleaning in place (CIP)
- Sterilization in place (SIP)
- Cleaning with pigs

Options
Oil- and grease-free version for wetted parts, without declaration
Order code for "Service", option HA

Mechanical load

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

| Electromagnetic compatibility (EMC) | As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21) |

📖 Details are provided in the Declaration of Conformity.

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

16.9 Process

| Medium temperature range | −50 to +150 °C (−58 to +302 °F) |

Dependency of ambient temperature on medium temperature
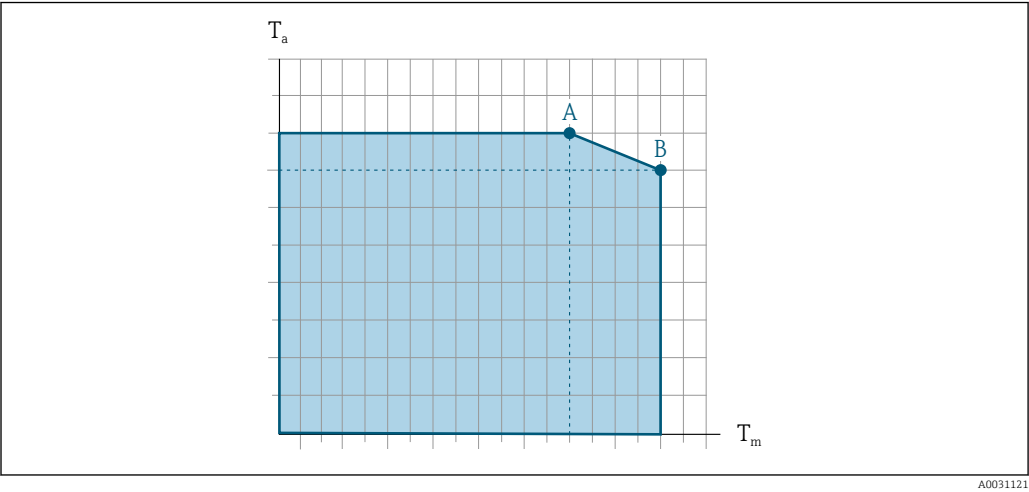
37   Exemplary representation, values in the table below.

T_a *Ambient temperature*
T_m *Medium temperature*
A   *Maximum permitted medium temperature T_m at $T_{a\ max}$ = 60 °C (140 °F); higher medium temperatures T_m require a reduction in the ambient temperature T_a*
B   *Maximum permitted ambient temperature T_a for the maximum specified medium temperature T_m of the sensor*

ℹ️ Values for devices that are used in the hazardous area:
Separate Ex documentation (XA) for the device → 📄 215.

Not insulated				Insulated			
A		B		A		B	
T_a	T_m	T_a	T_m	T_a	T_m	T_a	T_m
60 °C (140 °F)	150 °C (302 °F)	–	–	60 °C (140 °F)	120 °C (248 °F)	55 °C (131 °F)	150 °C (302 °F)

| Density | 0 to 5000 kg/m³ (0 to 312 lb/cf) |

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

| Sensor housing | The sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside. |

> If a measuring tube fails (e.g. due to process characteristics like corrosive or abrasive fluids), the fluid will initially be contained by the sensor housing.

If the sensor is to be purged with gas (gas detection), it should be equipped with purge connections.

> Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge.

Maximum pressure: 5 bar (72.5 psi)

Burst pressure of the sensor housing

The following sensor housing burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (not opened/as delivered).

If a device fitted with purge connections (order code for "Sensor option", option CH "Purge connection") is connected to the purge system, the maximum pressure is determined by the purge system itself or by the device, depending on which component has the lower pressure classification.

The sensor housing burst pressure refers to a typical internal pressure which is reached prior to mechanical failure of the sensor housing and which was determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option LN "Sensor housing burst pressure, type test").

DN		Sensor housing burst pressure	
[mm]	**[in]**	**[bar]**	**[psi]**
8	⅜	220	3 190
15	½	220	3 190
15 FB	½ FB	235	3 408
25	1	235	3 408
25 FB	1 FB	220	3 190
40	1½	220	3 190
40 FB	1 ½ FB	235	3 408
50	2	235	3 408
50 FB	2 FB	460	6 670
80	3	460	6 670
FB = Full bore			

> For information on the dimensions: see the "Mechanical construction" section of the "Technical Information" document

| Flow limit | Select the nominal diameter by optimizing between the required flow range and permissible pressure loss. |

> For an overview of the full scale values for the measuring range, see the "Measuring range" section → 🗎 183

• The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
• In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
• A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
• For gas measurement the following rules apply:
  • The flow velocity in the measuring tubes should not exceed half the sound velocity (0.5 Mach).
  • The maximum mass flow depends on the density of the gas: formula → 🖺 183

ℹ️ To calculate the flow limit, use the *Applicator* sizing tool → 🖺 181

| Pressure loss | ℹ️ To calculate the pressure loss, use the *Applicator* sizing tool → 🖺 181 |

| System pressure | → 🖺 23 |

16.10 Mechanical construction

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

| Weight | All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges. 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)
• Cast transmitter version, stainless
  (Order code for "Housing", option L "Cast, stainless"): +6 kg (+13 lbs)
• Transmitter version for hygienic area
  (Order code for "Housing", option B "Stainless, hygienic"): +0.2 kg (+0.44 lbs)

Weight in SI units

DN [mm]	Weight [kg]
8	11
15	13
15 FB	19
25	20
25 FB	39
40	40
40 FB	65
50	67
50 FB	118
80	122
FB = Full bore	

Weight in US units

DN [in]	Weight [lbs]
3/8	24
½	29
½ FB	42
1	44
1 FB	86
1½	88
1½ FB	143
2	148
2 FB	260
3	269
FB = Full bore	

Materials

Transmitter housing

Order code for "Housing":
- Option **A** "Aluminum, coated": aluminum, AlSi10Mg, coated
- Option **B** "Stainless, hygienic": stainless steel, 1.4404 (316L)
- Option **L** "Cast, stainless": cast, stainless steel, 1.4409 (CF3M) similar to 316L

Window material

Order code for "Housing":
- Option **A** "Aluminum, coated": glass
- Option **B** "Stainless, hygienic": polycarbonate
- Option **L** "Cast, stainless": glass

Seals

Order code for "Housing":
Option **B** "Stainless, hygienic": EPDM and silicone

Cable entries/cable glands

A0020640
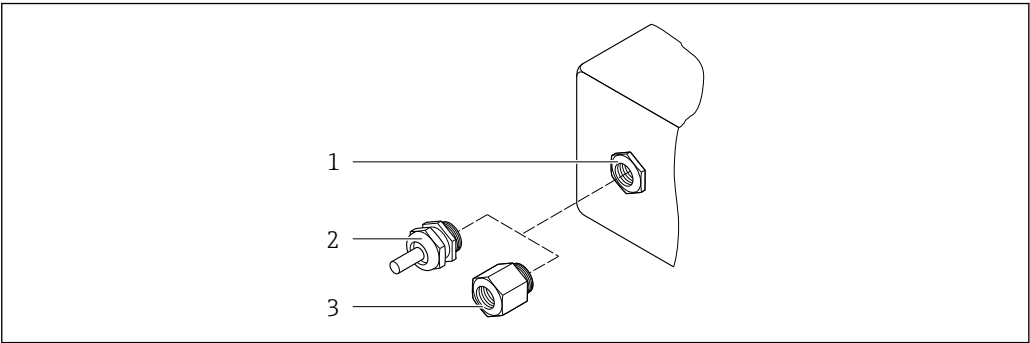
🖻 *38   Possible cable entries/cable glands*

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

Order code for "Housing", option A "Aluminum, coated"

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

Cable entry/cable gland	Material
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"	

Order code for "Housing", option L "Cast, stainless"

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

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Stainless steel, 1.4404 (316L)
Adapter for cable entry with female thread G ½"	
Adapter for cable entry with female thread NPT ½"	

Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301 (304)

Measuring tubes

Grade 9 titanium

Process connections

- Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5/ according to JIS:
  - Stainless steel 1.4301 (304)
  - Wetted parts: Grade 2 titanium
- All other process connections:
  Grade 2 titanium

Available process connections→ 🖺 205

Seals

Welded process connections without internal seals

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

External WLAN antenna

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

Process connections	- Fixed flange connections:
	  - EN 1092-1 (DIN 2501) flange
	  - EN 1092-1 (DIN 2512N) flange
	  - ASME B16.5 flange
	  - JIS B2220 flange
	  - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
	- Clamp connections:
	  Tri-Clamp (OD tubes), DIN 11866 series C
	- Eccentric clamp connection:
	  Eccen. Tri-Clamp, DIN 11866 series C
	- Thread:
	  - DIN 11851 thread, DIN 11866 series A
	  - SMS 1145 thread
	  - ISO 2853 thread, ISO 2037
	  - DIN 11864-1 Form A thread, DIN 11866 series A
	
	Process connection materials → 🖺 204

Surface roughness	All data refer to parts in contact with the medium. The following surface roughness categories can be ordered. - Not polished - Ra_{max} = 0.76 µm (30 µin) - Ra_{max} = 0.38 µm (15 µin)

16.11 Operability

Languages	Can be operated in the following languages:
	- Via local operation
	  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, 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

Local operation	**Via display module** Equipment: - 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 → 🖺 66
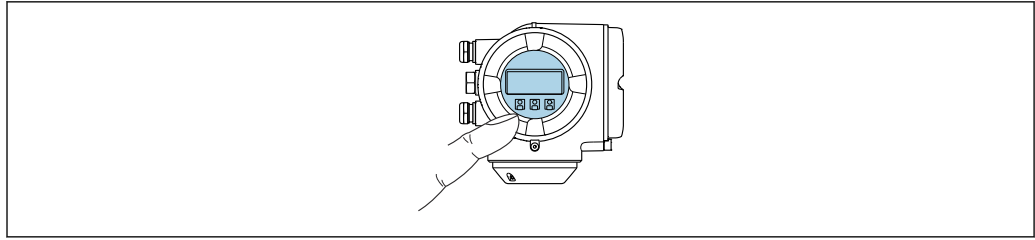
39   Operation with touch control

Display elements

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

Operating elements

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

Via remote display and operating module DKX001

The remote display and operating module DKX001 is available as an optional extra → 🖹 179.

- The remote display and operating module DKX001 is only available for the following housing versions, order code for "Housing":
  - Option A "Aluminum, coated"
  - Option L "Cast, stainless"
- The measuring device is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring device. Display or operation at the transmitter is not possible in this case.
- If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring device display module. Only one display or operation unit may be connected to the transmitter at any one time.

40   Operation via remote display and operating module DKX001

Display and operating elements

The display and operating elements correspond to those of the display module → 🖹 205.

Housing material

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

Transmitter housing		Remote display and operating module
Order code for "Housing"	Material	Material
Option **A** "Aluminum, coated"	AlSi10Mg, coated	AlSi10Mg, coated
Option **L** "Cast, stainless"	Cast stainless steel, 1.4409 (CF3M) similar to 316L	1.4409 (CF3M)

Cable entry

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

Connecting cable

→ 🖹 32

Dimensions

📖 Information about dimensions:

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

Remote operation	→ 🖹 64
Service interface	→ 🖹 65
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	• CDI-RJ45 service interface • WLAN interface	Special Documentation for the device → 🖹 216
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	• CDI-RJ45 service interface • WLAN interface • Fieldbus protocol	→ 🖹 181
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	• CDI-RJ45 service interface • WLAN interface • Fieldbus protocol	→ 🖹 181

Supported operating tools	Operating unit	Interface	Additional information
Field Xpert	SMT70/77/50	• All fieldbus protocols • WLAN interface • Bluetooth • CDI-RJ45 service interface	Operating Instructions BA01202S Device description files: Use update function of handheld terminal
SmartBlue app	Smart phone or tablet with iOs or Android	WLAN	→ 🖻 181

ℹ️ 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
- Process Device Manager (PDM) from Siemens → www.siemens.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 → Downloads

Web server

Thanks to the integrated Web server the device can be operated and configured via a Web browser and via the service interface (CDI-RJ45) or via the WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, device status information is also displayed and allows users to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

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

Supported functions
Data exchange between the operating unit (such as a notebook for example) and the measuring device:
- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package → 🖻 213)

📖 Web server special documentation → 🖻 216

	HistoROM backup	T-DAT	S-DAT
Available data	• Event logbook such as diagnostic events for example • Parameter data record backup • Device firmware package	• Measured value logging ("Extended HistoROM" order option) • Current parameter data record (used by firmware at run time) • Maximum indicators (min/max values) • Totalizer values	• Sensor data: nominal diameter etc. • Serial number • Calibration data • Device configuration (e.g. SW options, fixed I/O or multi I/O)
Storage location	Fixed on the user interface board in the connection compartment	Attachable to the user interface board in the connection compartment	In the sensor plug in the transmitter neck part

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:

Data backup

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

Manual
Additional parameter data record (complete parameter settings) in the integrated device memory HistoROM backup for:
- Data backup function
  Backup and subsequent restoration of a device configuration in the device memory HistoROM backup
- Data comparison function
  Comparison of the current device configuration with the device configuration saved in the device memory HistoROM backup

Data 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)

Event list

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

Data logging

Manual
If the **Extended HistoROM** application package (order option) is enabled:
- Record up to 1 000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

16.12   Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:

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

2. Open the product page.

3. Select **Configuration**.

CE mark	The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.
	Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
UKCA marking	The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.
	Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com
RCM mark	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".
Ex approval	The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

Hygienic compatibility	• 3-A approval
	  • Only measuring devices with the order code for "Additional approval", option LP "3A" have 3-A approval.
	  • 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.
	    A remote display module must be installed in accordance with the 3-A Standard.
	  • Accessories (e.g. heating jacket, 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-tested
	  Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.
	  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
	• Food Contact Materials Regulation (EC) 1935/2004

Pharmaceutical compatibility	• FDA 21 CFR 177
	• USP <87>
	• USP <88> Class VI 121 °C
	• TSE/BSE Certificate of Suitability
	• cGMP
	  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.

Functional safety	The measuring device can be used for flow monitoring systems (min., max., range) up to SIL 2 (single-channel architecture; order code for "Additional approval", option LA) and SIL 3 (multi-channel architecture with homogeneous redundancy) and is independently evaluated and certified in accordance with IEC 61508. The following types of monitoring in safety equipment are possible: • Mass flow • Volume flow • Density Functional Safety Manual with information on the SIL device → 🗎 215
HART certification	**HART interface** The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications: • Certified according to HART 7 • The device can also be operated with certified devices of other manufacturers (interoperability)

Pressure Equipment Directive	• With the marking: a) PED/G1/x (x = category) or b) UK/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or b) Schedule 2 of Statutory Instruments 2016 No. 1105. • Devices not bearing this marking (without PED or UKCA) are designed and manufactured according to sound engineering practice. They meet the requirements of a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105. The scope of application is indicated a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.
Radio approval	The measuring device has radio approval. For detailed information on the radio approval, see the Special Documentation → 🗎 216
Additional certification	**CRN approval** Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device. **Tests and certificates** • EN10204-3.1 material certificate, wetted parts and sensor housing • Pressure test, internal process, inspection certificate • Compliance with requirements derived from cGMP, Declaration • EN10204-2.1 confirmation of compliance with the order and EN10204-2.2 test report
Other standards and guidelines	• EN 60529 Degrees of protection provided by enclosures (IP code) • IEC/EN 60068-2-6 Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal). • IEC/EN 60068-2-31 Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices. • EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements • IEC/EN 61326-2-3 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). • 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 80 The application of the pressure equipment directive to process control devices

- 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
- NAMUR NE 132
  Coriolis mass meter
- 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.

Detailed information on the application packages:
Special Documentation for the device → 🗎 215

Diagnostic functionality	Order code for "Application package", option EA "Extended HistoROM"

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

Event log:
Memory volume is extended from 20 message entries (standard version) to up to 100 entries.

Data logging (line recorder):
- 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.

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

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

Heartbeat Verification
Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state 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.

Heartbeat Monitoring

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

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

Concentration measurement	Order code for "Application package", option ED "Concentration"

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:
- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.).
- Common or user-defined units (°Brix, °Plato, % mass, % volume, mol/l etc.) for standard applications.
- Concentration calculation from user-defined tables.

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

Viscosity	Order code for "Application package", option EG "Viscosity"

In-line and real-time viscosity measurement

Promass I with the "Viscosity" application package also measures the real-time viscosity of the fluid directly in the process, in addition to measuring the mass flow/volume flow/temperature and density.

The following viscosity measurements are performed on liquids:
- Dynamic viscosity
- Kinematic viscosity
- Temperature-compensated viscosity (kinematic and dynamic) in relation to the reference temperature

Viscosity measurement can be used for Newtonian and non-Newtonian applications and supplies accurate measured data irrespective of the flow, even under difficult conditions.

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

Special density	Order code for "Application package", option EE "Special density"

Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.

The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.

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

OPC-UA Server	Order code for "Application package", option EL "OPC-UA Server"

The application package provides an integrated OPC-UA server for comprehensive device services for IoT and SCADA applications.

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

16.14   Accessories

Overview of accessories available for order → 🖺 179

16.15   Supplementary documentation

ℹ For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter serial number from 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 Promass I	KA01284D

Brief Operating Instructions for transmitter

Measuring device	Documentation code
Proline 300	KA01309D

Technical Information

Measuring device	Documentation code
Promass I 300	TI01274D

Description of Device Parameters

Measuring device	Documentation code							
	HART	FOUNDATION Fieldbus	PROFIBUS PA	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET	PROFINET with Ethernet-APL
Promass 300	GP01057D	GP01094D	GP01058D	GP01134D	GP01059D	GP01114D	GP01115D	GP01168D

Supplementary device-dependent documentation   **Safety instructions**

Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
ATEX/IECEx Ex d/Ex de	XA01405D
ATEX/IECEx Ex ec	XA01439D

Contents	Documentation code
cCSAus XP	XA01373D
cCSAus Ex d/ Ex de	XA01372D
cCSAus Ex nA	XA01507D
INMETRO Ex d/Ex de	XA01468D
INMETRO Ex ec	XA01470D
NEPSI Ex d/Ex de	XA01469D
NEPSI Ex nA	XA01471D
EAC Ex d/Ex de	XA01656D
EAC Ex nA	XA01657D
JPN Ex d	XA01778D

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

Functional Safety Manual

Contents	Documentation code
Proline Promass 300	SD01727D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Remote display and operating module DKX001	SD01763D
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Web server	SD01662D
OPC-UA Server	SD02039D
Heartbeat Technology	SD01642D
Concentration measurement	SD01644D
Viscosity measurement Promass I	SD01646D

Installation Instructions

Contents	Comment
Installation instructions for spare part sets and accessories	• Access the overview of all the available spare part sets via *Device Viewer* → 🕮 177 • Accessories available for order with Installation Instructions → 🕮 179

Index

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People for Process Automation

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