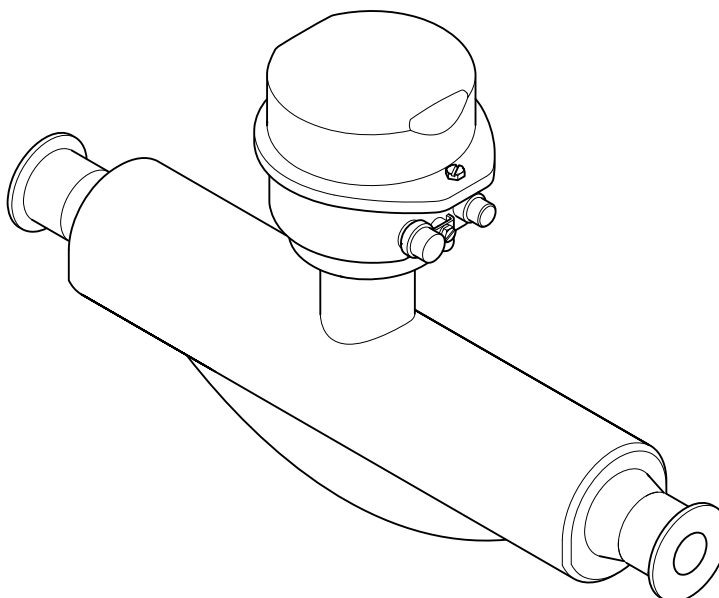


# Operating Instructions

## Proline Promass E 100

Coriolis flowmeter  
PROFINET



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

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# 1 About this document

## 1.1 Document function

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

## 1.2 Symbols

### 1.2.1 Safety symbols

#### **DANGER**

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

#### **WARNING**

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






#### **CAUTION**

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



#### **NOTICE**

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









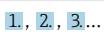



### 1.2.2 Electrical symbols

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





### 1.2.3 Tool symbols

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


### 1.2.4 Symbols for certain types of information

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


### 1.2.5 Symbols in graphics

| Symbol  | Meaning                        |
|---|--------------------------------|
| 1, 2, 3, ...  | Item numbers                   |
|  | Series of steps                |
| A, B, C, ...  | Views                          |
| A-A, B-B, C-C, ...  | Sections                       |
|  | Hazardous area                 |
|  | Safe area (non-hazardous area) |
|  | Flow direction                 |

## 1.3 Documentation

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

The following document types are available in the Downloads area of the Endress+Hauser website ([www.endress.com/downloads](http://www.endress.com/downloads)), depending on the device version:

| Document type  | Purpose and content of the document   |
|--|---|
| Technical Information (TI)                           | <b>Planning aid for your device</b><br>The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.  |
| Brief Operating Instructions (KA)                    | <b>Guide that takes you quickly to the 1st measured value</b><br>The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.  |
| Operating Instructions (BA)                          | <b>Your reference document</b><br>The Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.                     |
| Description of Device Parameters (GP)                | <b>Reference for your parameters</b><br>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. These are an integral part of the Operating Instructions.<br> The nameplate indicates which Safety Instructions (XA) apply to the device. |
| Supplementary device-dependent documentation (SD/FY) | Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is a constituent part of the device documentation.  |

## 1.4 Registered trademarks

### PROFINET®

Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

### 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 instrument described in this manual is intended only for the flow measurement of liquids and gases.

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

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

To ensure that the measuring instrument remains in proper condition during the operating time:

- ▶ Only use the measuring instrument in full compliance with the data on the nameplate and the general conditions listed in the manual and supplementary documentation.
- ▶ Using the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- ▶ Use the measuring instrument only for media against which the materials in contact with the process are sufficiently resistant.
- ▶ Keep within the specified pressure and temperature range.
- ▶ Keep within the specified ambient temperature range.
- ▶ Protect the measuring instrument permanently against corrosion from environmental influences.

#### Incorrect use

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

#### **WARNING**

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

- ▶ Verify the compatibility of the process fluid with the sensor material.
- ▶ Ensure the resistance of all wetted materials during 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**

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

- ▶ Mount suitable touch protection.

**⚠ WARNING**

**Danger of housing breaking due to measuring tube breakage!**

If a measuring tube ruptures, the pressure inside the sensor housing will rise according to the operating process pressure.

- ▶ Use a rupture disk.

**⚠ WARNING**

**Danger from medium escaping!**

For device versions with a rupture disk: medium escaping under pressure can cause injury or material damage.

- ▶ Take precautions to prevent injury and material damage if the rupture disk is actuated.

## 2.3 Workplace safety

For work on and with the device:

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

## 2.4 Operational safety

Damage to the device!

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

**Modifications to the device**

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

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

**Repair**

To ensure continued operational safety and reliability:

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

## 2.5 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU declaration of conformity. The manufacturer confirms this by affixing the CE mark.

## **2.6 IT security**

The manufacturer 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.

### 3 Product description

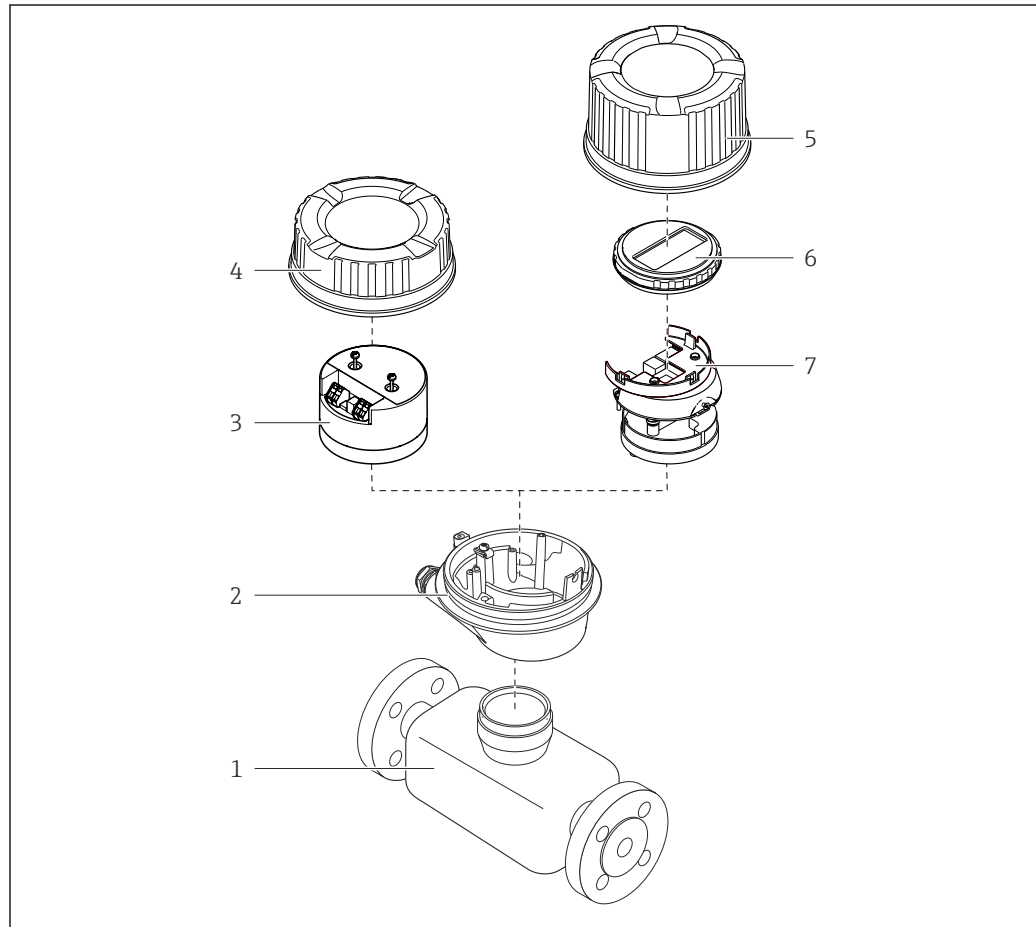
The device consists of a transmitter and a sensor.

The device is available as a compact version:


The transmitter and sensor form a mechanical unit.

#### 3.1 Product design

##### 3.1.1 Device version with PROFINET communication protocol



A0023153

 1 Important components of a measuring device

- 1 Sensor
- 2 Transmitter housing
- 3 Main electronics module
- 4 Transmitter housing cover
- 5 Transmitter housing cover (version for optional local display)
- 6 Local display (optional)
- 7 Main electronics module (with bracket for optional local display)

## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

On receipt of the delivery:

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



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

### 4.2 Product identification

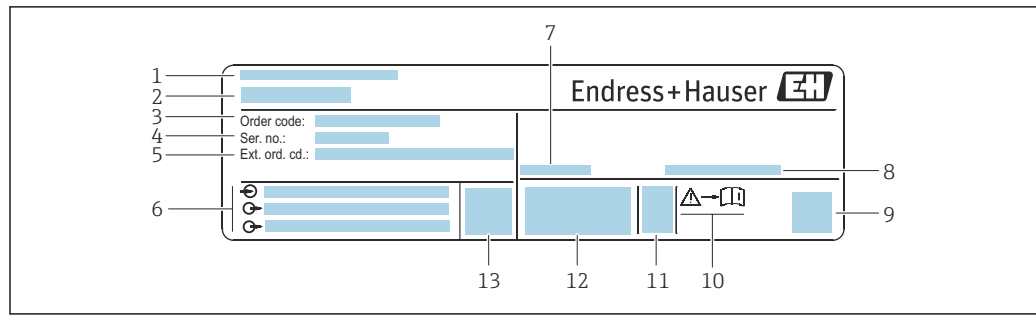
The device can be identified in the following ways:

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


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


- The "Additional standard device documentation" and "Supplementary device-dependent documentation" sections
- The *Device Viewer*: Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://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

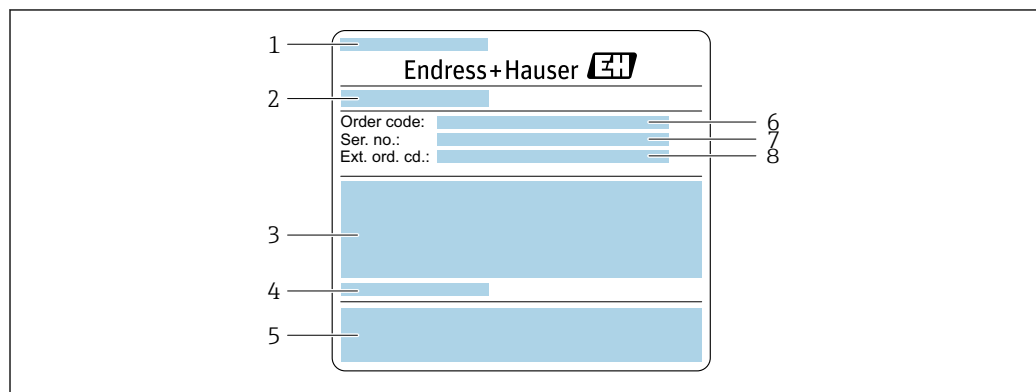


A0030222


 2 Example of a transmitter nameplate

- 1 Manufacturer address/certificate holder
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number
- 5 Extended order code
- 6 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 7 Permitted ambient temperature ( $T_a$ )
- 8 Degree of protection
- 9 2-D matrix code
- 10 Document number of safety-related supplementary documentation →  156
- 11 Date of manufacture: year-month
- 12 CE mark, RCM-Tick mark
- 13 Firmware version (FW)

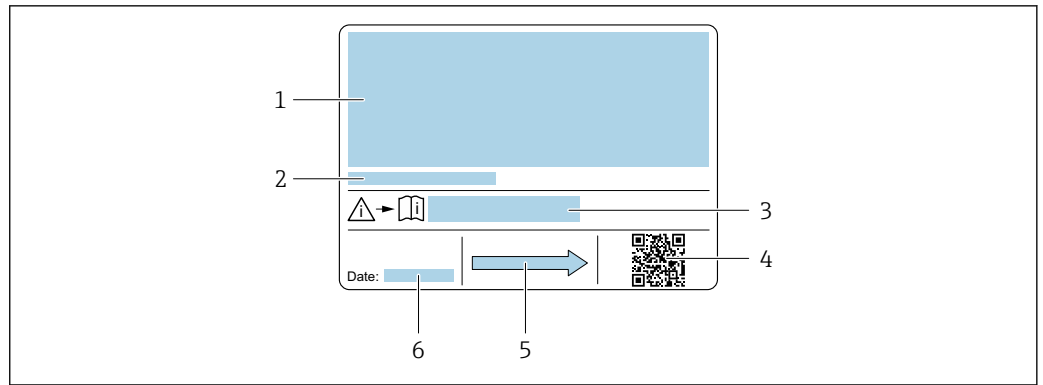
### 4.2.2 Sensor nameplate



A0029206

 3 Example of a sensor nameplate, part 1

- 1 Name of sensor
- 2 Manufacturer/certificate holder
- 3 Nominal diameter of the sensor; flange nominal diameter/nominal pressure; sensor test pressure; medium temperature range; material of measuring tube and manifold
- 4 Sensor-specific information
- 5 CE mark, RCM symbol
- 6 Order code
- 7 Serial number (Ser. no.)
- 8 Extended order code (Ext. ord. cd.)



A0029207

4 Example of a sensor nameplate, part 2

- 1 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 2 Permitted ambient temperature ( $T_a$ )
- 3 Document number of safety-related supplementary documentation
- 4 2-D matrix code
- 5 Flow direction
- 6 Manufacturing date: year-month



#### Order code

The measuring device is reordered using the order code.

##### Extended order code

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

### 4.2.3 Symbols on the device

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

## 5 Storage and transport

### 5.1 Storage conditions

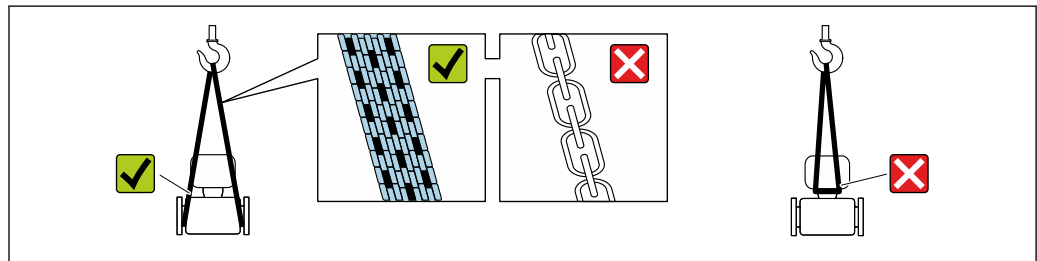
Observe the following notes for storage:

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

Storage temperature → 📄 143

### 5.2 Transporting the product

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



A0029252

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

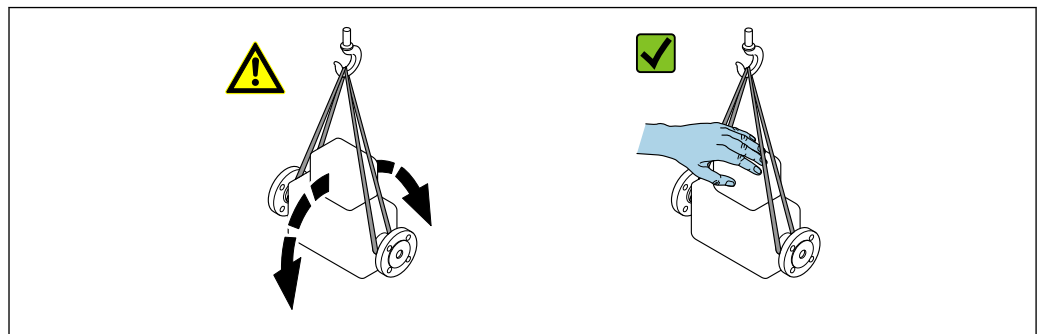
#### 5.2.1 Measuring devices without lifting lugs

##### **⚠ WARNING**

**Center of gravity of the measuring device is higher than the suspension points of the webbing slings.**

Risk of injury if the measuring device slips.

- ▶ Secure the measuring device against slipping or turning.
- ▶ Observe the weight specified on the packaging (stick-on label).



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:

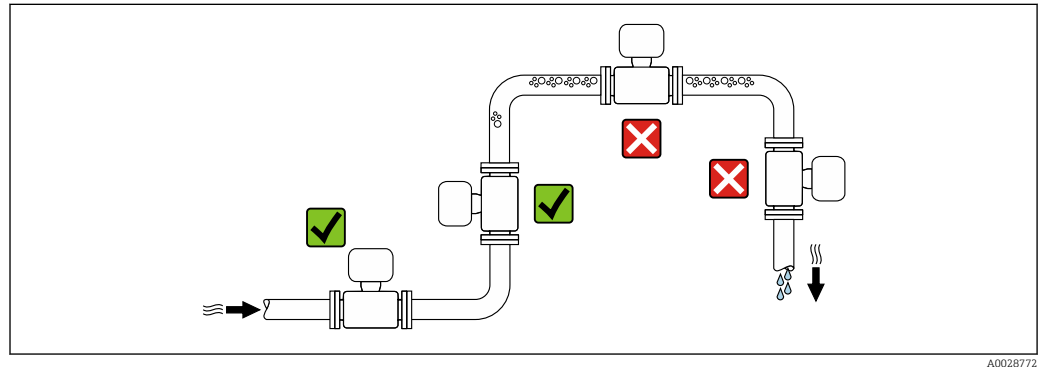
- Outer packaging of device
  - Stretch wrap made of polymer in accordance with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wood crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62/EC, recyclability confirmed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

## 6 Installation

### 6.1 Installation requirements

#### 6.1.1 Installation position

##### Mounting location



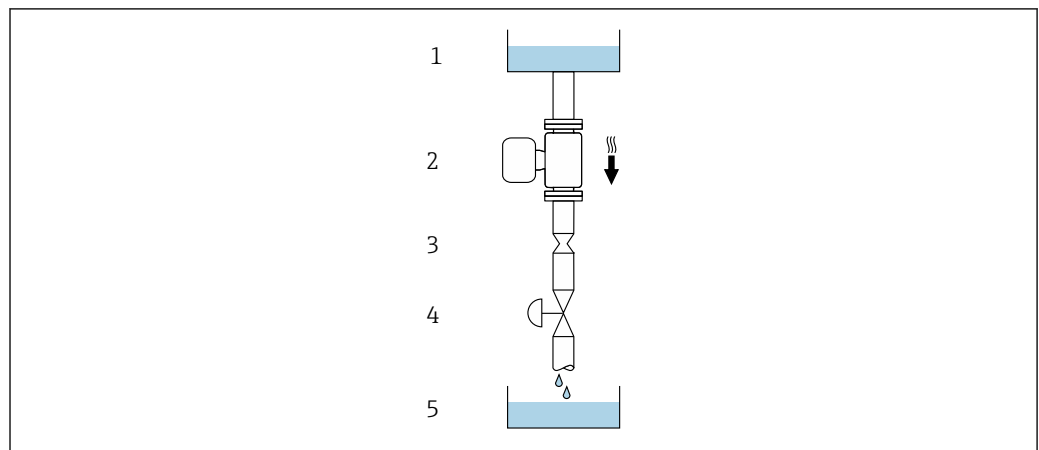
A0028772

To avoid measurement errors caused by gas bubble formation in the measuring tube, avoid the following installation locations in the pipe:


- 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.



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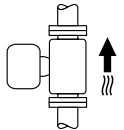
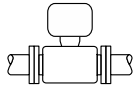
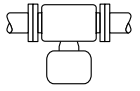

 5 Installation in a down pipe (e.g. for batching applications)

- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Filling container

| DN/NPS |       | Ø orifice plate, pipe restriction |      |
|--------|-------|-----------------------------------|------|
| [mm]   | [in]  | [mm]                              | [in] |
| 8      | 3⁄8   | 6                                 | 0.24 |
| 15     | 1⁄2   | 10                                | 0.40 |
| 25     | 1     | 14                                | 0.55 |
| 40     | 1 1⁄2 | 22                                | 0.87 |
| 50     | 2     | 28                                | 1.10 |
| 80     | 3     | 50                                | 1.97 |

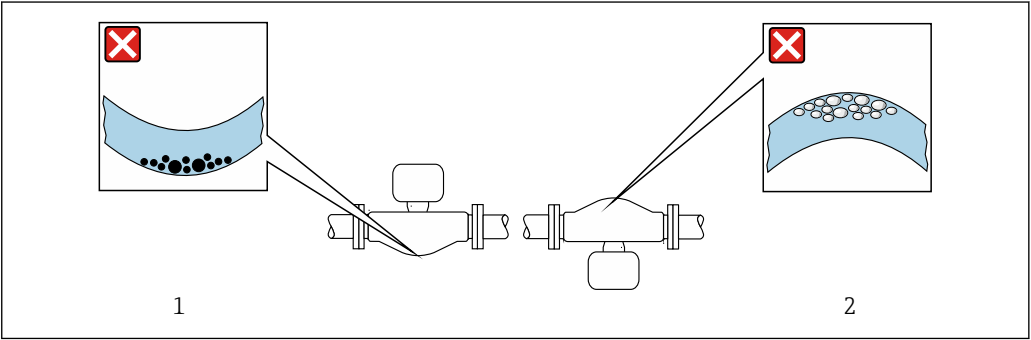
Orientation

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                          | <br>A0015591   | ✓✓ <sup>1)</sup>                          |
| B           | Horizontal orientation, transmitter at top    | <br>A0015589  | ✓✓ <sup>2)</sup><br>Exception:<br>→ 6, 19 |
| C           | Horizontal orientation, transmitter at bottom | <br>A0015590 | ✓✓ <sup>3)</sup><br>Exception:<br>→ 6, 19 |
| D           | Horizontal orientation, transmitter at side   | <br>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.

If a sensor is installed horizontally with a curved measuring tube, match the position of the sensor to the medium properties.

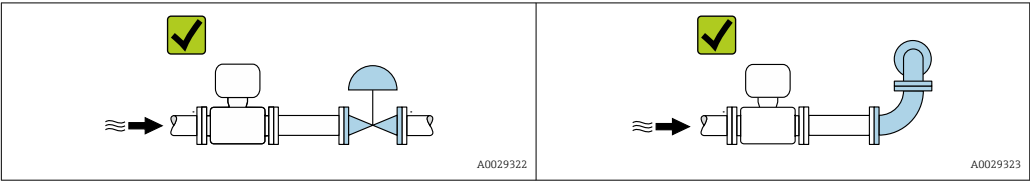


6 Orientation of sensor with curved measuring tube


- 1 Avoid this orientation for media with entrained solids: Risk of solids accumulating
- 2 Avoid this orientation for outgassing media: Risk of gas accumulating

**Inlet and outlet runs**

No special precautions need to be taken for fittings that create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 20.



*Installation dimensions*

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

**6.1.2 Environmental and process requirements**

**Ambient temperature range**

|                      |  |
|----------------------|--|
| Measuring instrument | <ul style="list-style-type: none"><li>▪ -40 to +60 °C (-40 to +140 °F)</li><li>▪ Order code for "Test, certificate", option JM: -50 to +60 °C (-58 to +140 °F)</li></ul> |
|----------------------|--|

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

**Static pressure**

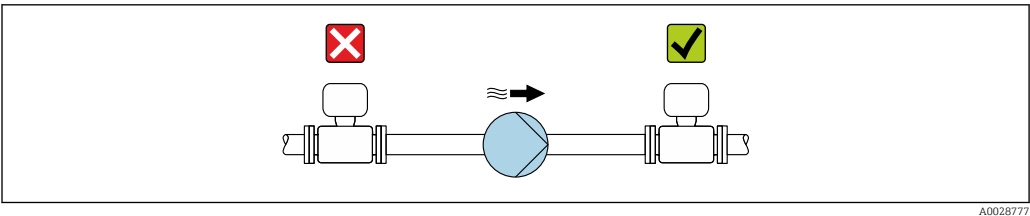
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

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 static 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)

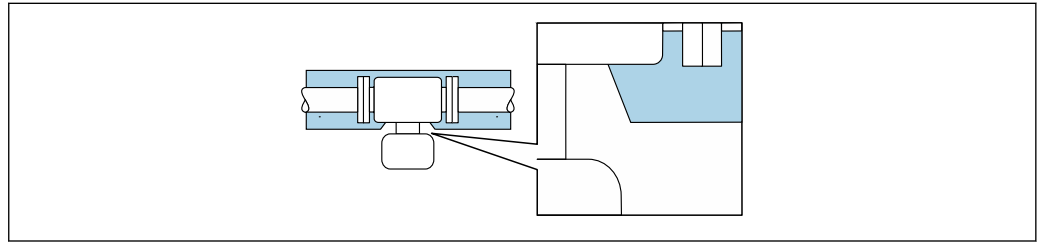


**Thermal insulation**


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.

**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 °C (176 °F)
- ▶ Thermal insulation with exposed extension neck: We recommend that you do not insulate the extension neck in order to ensure optimum dissipation of heat.



A0034391

 7 Thermal insulation with exposed extension 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 °C (176 °F).
- ▶ 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.
- ▶ Consider the behavior of the process diagnostics "830 Ambient temperature too high" and "832 Electronics temperature too high" if overheating cannot be avoided by a suitable system design.

*Heating options*

If a medium 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 <sup>1)</sup>
- 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 installation instructions

#### Drainability

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

#### Hygienic compatibility

**i** When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 152

#### Rupture disk

Process-related information: → 145.

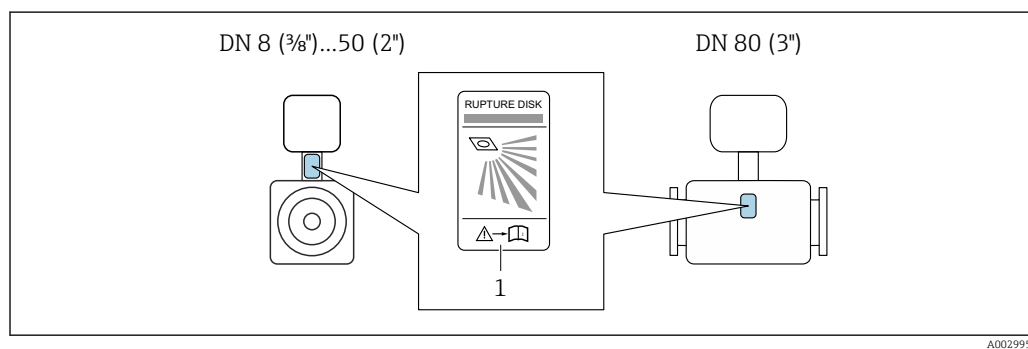
#### **WARNING**

##### **Danger from medium escaping!**

Medium escaping under pressure can cause injury or material damage.

- ▶ Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- ▶ Observe the information on the rupture disk sticker.
- ▶ Make sure that the function and operation of the rupture disk is not impeded through the installation of the device.
- ▶ Do not use a heating jacket.
- ▶ Do not remove or damage the rupture disk.
- ▶ After the rupture disk is actuated, do not operate the measuring instrument any more.

The position of the rupture disk is indicated on a sticker applied over it. If the rupture disk is triggered, the sticker is destroyed. The disk can therefore be visually monitored.



1 Rupture disk label

#### Zero point verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 139. 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 measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity media).
- For gas applications with low pressure.

**i** To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stress during operation.

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

Verification and 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.

## 6.2 Installing the 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 instrument

1. Remove all remaining transport packaging.
2. Remove any protective covers or protective caps present from the sensor.
3. If present, remove transport protection of the rupture disk.
4. Remove stick-on label on the electronics compartment cover.

### 6.2.3 Installing the measuring instrument

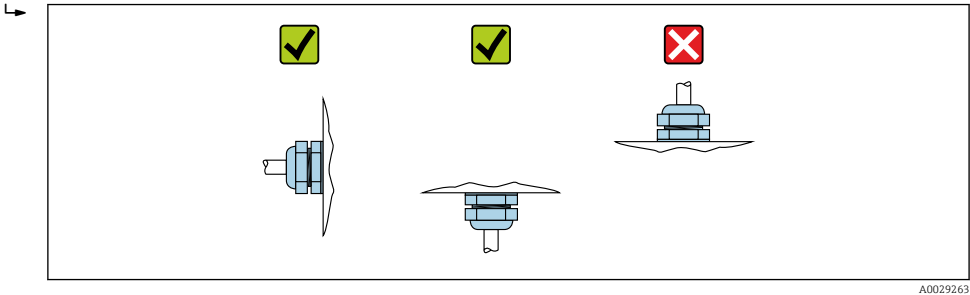
#### **WARNING**

**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 and sealing surfaces 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 instrument or turn the transmitter housing so that the cable entries do not point upwards.



6.3 Post-installation check

|   |                          |
|---|--------------------------|
| Is the device undamaged (visual inspection)?  | <input type="checkbox"/> |
| Does the measuring instrument correspond to the measuring point specifications?<br>For example: <ul style="list-style-type: none"><li>▪ Process temperature → 144</li><li>▪ Pressure (refer to the "Pressure-temperature ratings" section of the "Technical Information" document).</li><li>▪ Ambient temperature → 143</li><li>▪ Measuring range</li></ul> | <input type="checkbox"/> |
| Has the correct orientation for the sensor been selected → 19? <ul style="list-style-type: none"><li>▪ According to sensor type</li><li>▪ According to medium temperature</li><li>▪ According to medium properties (outgassing, with entrained solids)</li></ul>  | <input type="checkbox"/> |
| Does the arrow on the sensor match the direction of flow of the medium? → 19?   | <input type="checkbox"/> |
| Is the tag name and labeling correct (visual inspection)?   | <input type="checkbox"/> |
| Is the device sufficiently protected from precipitation and direct sunlight?  | <input type="checkbox"/> |
| Are the securing screw and securing clamp tightened securely?   | <input type="checkbox"/> |



## 7 Electrical connection

### WARNING

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

- ▶ Set up a disconnecting device (switch or power-circuit breaker) to easily disconnect the device from the supply voltage.
- ▶ In addition to the device fuse, include an overcurrent protection unit with max. 16 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 (on aluminum housing): Allen screw 3 mm
- For securing screw (for stainless steel housing): open-ended wrench 8 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule

#### 7.2.2 Requirements for connection cable

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

##### Permitted temperature range

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

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

Standard installation cable is sufficient.

##### Signal cable

*Pulse/frequency/switch output*

Standard installation cable is sufficient.

##### PROFINET

Only PROFINET cables.



See <https://www.profibus.com> "PROFINET Planning guideline".

##### Cable diameter

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

7.2.3 Terminal assignment

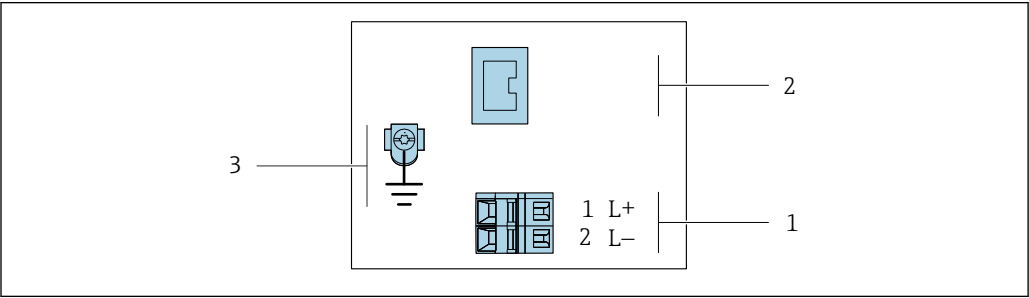
Transmitter

PROFINET connection version

Order code for "Output", option R

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

| Order code for "Housing"   | Connection methods available |                     | Possible options for order code "Electrical connection"   |
|--|------------------------------|---------------------|---|
|  | Output                       | Power supply        |   |
| Options A, B   | Device plug<br>→ 27          | Terminals           | <ul style="list-style-type: none"><li>Option L: plug M12x1 + thread NPT ½"</li><li>Option N: plug M12x1 + coupling M20</li><li>Option P: plug M12x1 + thread G ½"</li><li>Option U: plug M12x1 + thread M20</li></ul> |
| Options A, B, C  | Device plug<br>→ 27          | Device plug<br>→ 27 | Option Q: 2 x plug M12x1  |
| Order code for "Housing": <ul style="list-style-type: none"><li>Option A: compact, coated aluminum</li><li>Option B: compact, hygienic, stainless</li><li>Option C: ultra-compact, hygienic, stainless</li></ul> |                              |                     |   |



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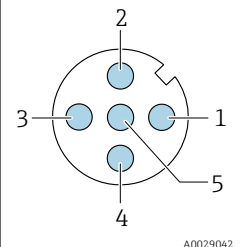
8 PROFINET terminal assignment

- 1 Power supply: DC 24 V
- 2 PROFINET
- 3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

| Order code for<br>"Output"                     | Terminal number |        |                   |
|--|-----------------|--------|-------------------|
|  | Power supply    |        | Output            |
|  | 2 (L-)          | 1 (L+) | Device plug M12x1 |
| Option R                                       | DC 24 V         |        | PROFINET          |
| Order code for "Output":<br>Option R: PROFINET |                 |        |                   |

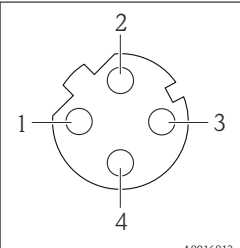
### 7.2.4 Pin assignment, device plug

#### Supply voltage

|  | Pin    | Assignment |                                   |
|---|--------|------------|-----------------------------------|
|   | 1      | L+         | DC 24 V                           |
|   | 2      |            | Not used                          |
|   | 3      |            | Not used                          |
|   | 4      | L-         | DC 24 V                           |
|   | 5      |            | Grounding/shielding <sup>1)</sup> |
|   | Coding |            | Plug/socket                       |
|   | A      |            | Plug                              |

- 1) Connection for protective ground and/or shielding from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

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

|  | Pin    | Assignment |             |
|--|--------|------------|-------------|
|  | 1      | +          | TD +        |
|  | 2      | +          | RD +        |
|  | 3      | -          | TD -        |
|  | 4      | -          | RD -        |
|  | Coding |            | Plug/socket |
|  | D      |            | Socket      |

### 7.2.5 Preparing the 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 instrument is supplied without cable glands:  
Provide suitable cable gland for corresponding connecting cable.
3. If the measuring instrument is supplied with cable glands:  
Observe requirements for connecting cables → 25.

## 7.3 Connecting the device

#### NOTICE

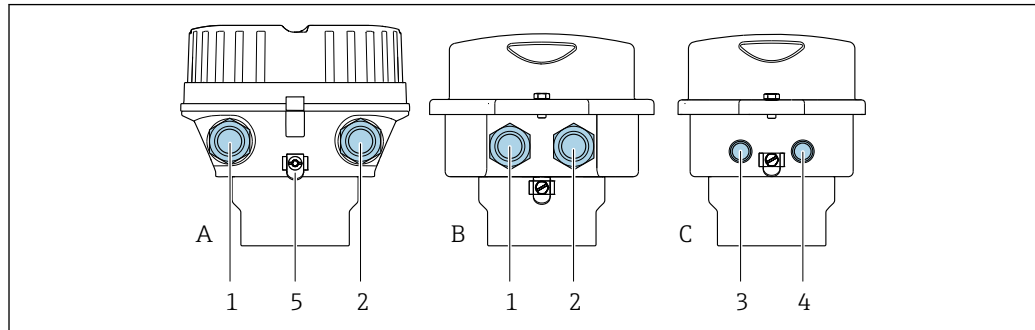
##### An incorrect connection compromises electrical safety!

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

### 7.3.1 Connecting the transmitter

The connection of the transmitter depends on the following order codes:

- Housing version: compact or ultra-compact
- Connection version: device plug or terminals



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#### 9 Housing versions and connection versions

A Housing version: compact, coated, aluminum

B Housing version: compact, hygienic, stainless

C Housing version: ultra-compact, hygienic, stainless

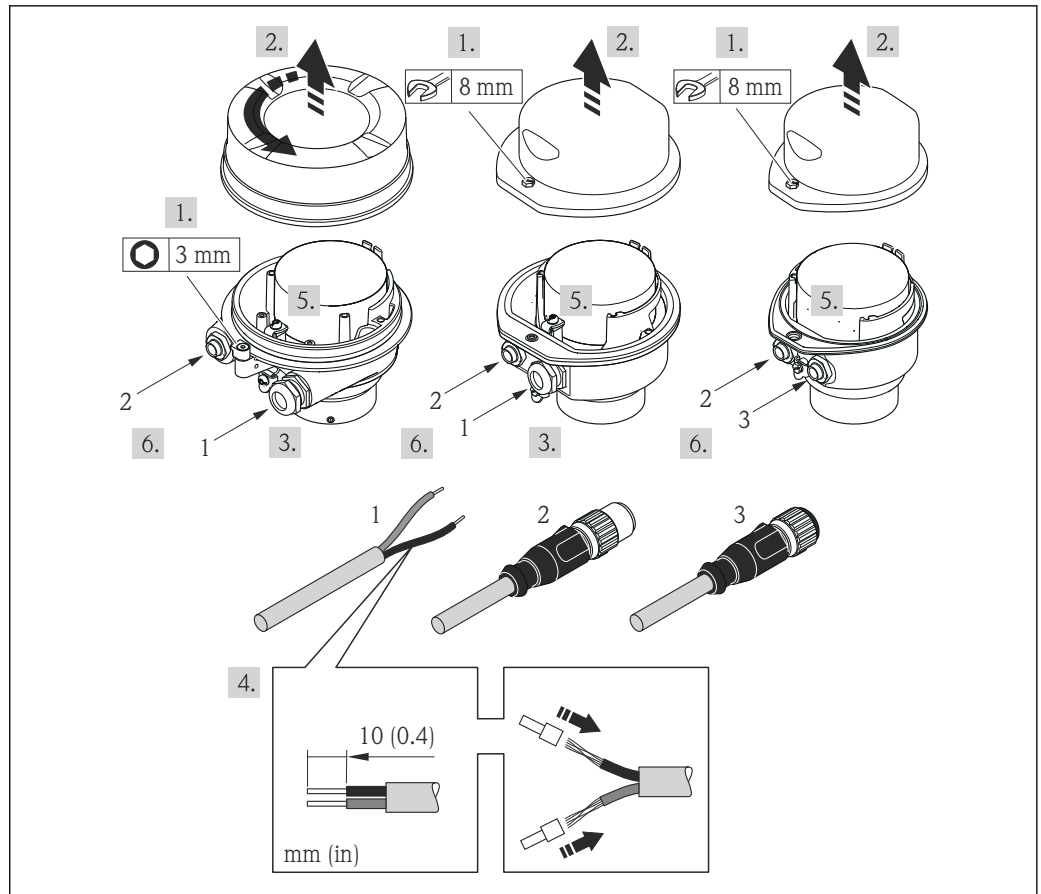
1 Cable entry or device plug for signal transmission

2 Cable entry or device plug for supply voltage

3 Device plug for signal transmission

4 Device plug for supply voltage

5 Ground terminal. Cable lugs, pipe clips or ground disks are recommended for optimization of the grounding/shielding.



A0017844

#### 10 Device versions with connection examples

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

For device version with device plug: follow step 6 only.

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
3. Strip the cable and cable ends. In the case of stranded cables, also fit wire end ferrules.
4. Connect the cable in accordance with the terminal assignment or the device plug pin assignment .
5. Depending on the device version, tighten the cable glands or insert the device plug and tighten .
6. **NOTICE**

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

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

Reassemble the transmitter in the reverse order.

## 7.4 Potential equalization

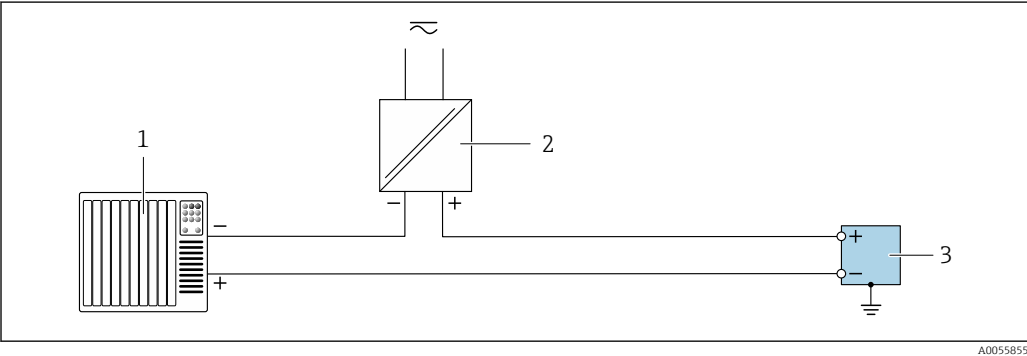
### 7.4.1 Requirements


- 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 electric potential
  - Use a ground cable with a minimum cross-section of 6 mm<sup>2</sup> (10 AWG) and a cable lug for potential equalization connections

## 7.5 Special connection instructions

### 7.5.1 Connection examples

Pulse output/frequency output/switch output



 11 Connection example for pulse output/frequency output/switch output (passive)

1 Automation system with pulse input/frequency input/switch input (e.g. PLC)  
2 Power supply  
3 Transmitter with pulse output/frequency output/switch output (passive)

### PROFINET

 See <https://www.profibus.com> "PROFINET Planning guideline".

## 7.6 Hardware settings

### 7.6.1 Setting the device name

A measuring point can be quickly identified within a plant on the basis of the tag name. The tag name is equivalent to the device name (name of station of the PROFINET specification). The factory-assigned device name can be changed using the DIP switches or the automation system.

Example of device name (factory setting): EH-Promass100-XXXXX

|         |                             |
|---------|-----------------------------|
| EH      | Endress+Hauser              |
| Promass | Instrument family           |
| 100     | Transmitter                 |
| XXXXX   | Serial number of the device |

The device name currently used is displayed in Setup → Name of station .

### Setting the device name using the DIP switches

The last part of the device name can be set using DIP switches 1-8. The address range is between 1 and 254 (factory setting: serial number of the device )

#### Overview of the DIP switches

| DIP switches | Bit | Description                           |
|--------------|-----|---------------------------------------|
| 1            | 1   | Configurable part of the device name  |
| 2            | 2   |                                       |
| 3            | 4   |                                       |
| 4            | 8   |                                       |
| 5            | 16  |                                       |
| 6            | 32  |                                       |
| 7            | 64  |                                       |
| 8            | 128 |                                       |
| 9            | –   | Enable hardware write protection      |
| 10           | –   | Default IP address: use 192.168.1.212 |

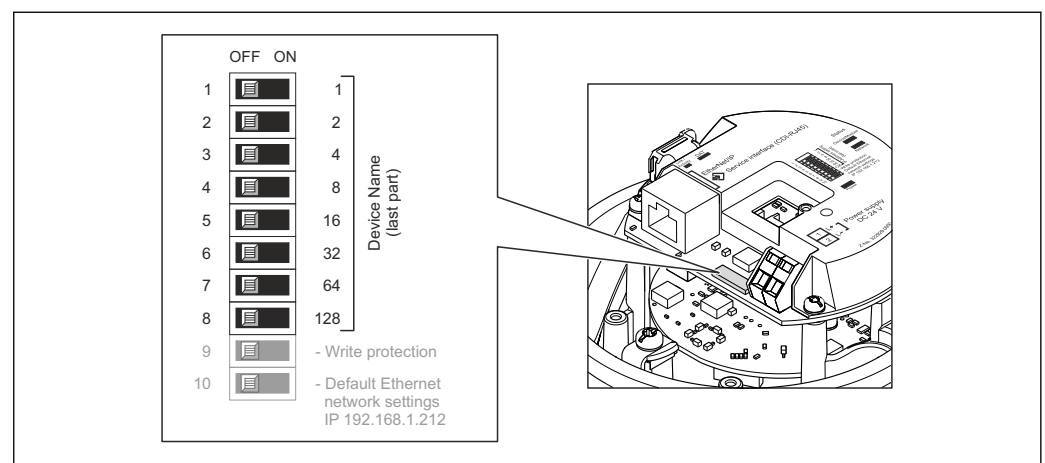
*Example: set the device name EH-PROMASS100-065*

| DIP switches | ON/OFF | Bit |
|--------------|--------|-----|
| 1            | ON     | 1   |
| 2...6        | OFF    | –   |
| 7            | ON     | 64  |
| 8            | OFF    | –   |



#### Setting the device name

Risk of electric shock when opening the transmitter housing.

- Disconnect the device from the power supply before opening the transmitter housing.




1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.

2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary  
→  150.
  3. Set the desired device name using the corresponding DIP switches on the I/O electronics module.
  4. Reverse the removal procedure to reassemble the transmitter.
  5. Reconnect the device to the power supply. The configured device address is used once the device is restarted.
-  If the device is reset via the PROFINET interface, it is not possible to reset the device name to the factory setting. The value 0 is used instead of the device name.

### Setting the device name via the automation system

DIP switches 1-8 must all be set to **OFF** (factory setting) or all be set to **ON** to be able to set the device name via the automation system.

The complete device name (name of station) can be changed individually via the automation system.

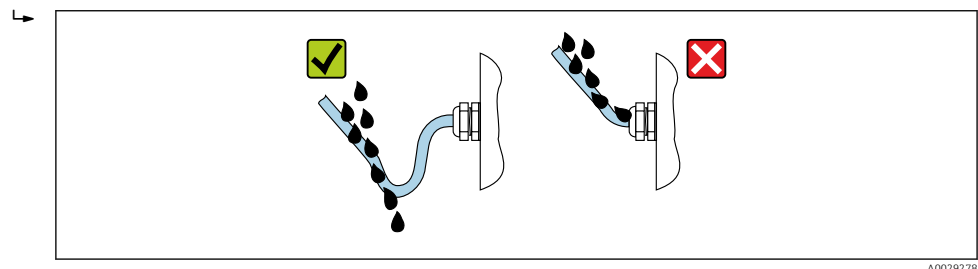
-  ■ The serial number used as part of the device name in the factory setting is not saved. It is not possible to reset the device name to the factory setting with the serial number. The value 0 is used instead of the serial number.
- When assigning the device name via the automation system, enter the device name in lower-case letters.

## 7.7 Ensuring the degree of protection

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

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

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










A0029278

6. The supplied cable glands and plastic dummy plugs used for the threaded cable entries do not ensure degree of protection IP66/67, Type 4X enclosure. To achieve this degree of protection, cable glands and plastic dummy plugs that are not used must be replaced by threaded dummy plugs with the degree of protection IP66/67, Type 4X enclosure.

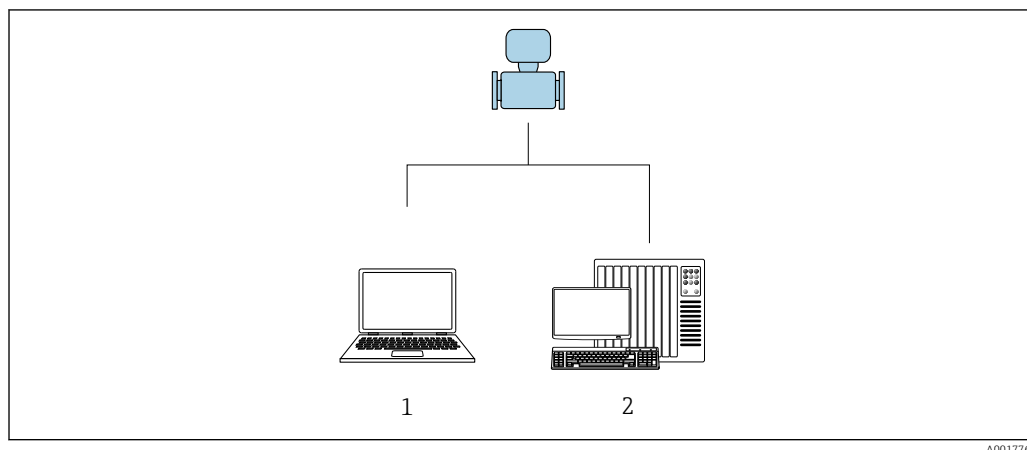


## 7.8 Post-connection check

|   |                          |
|---|--------------------------|
| Are the device and cable undamaged (visual inspection)?   | <input type="checkbox"/> |
| Do the cables used meet the requirements →  25?  | <input type="checkbox"/> |
| Are the mounted cables strain-relieved and fixed securely in place?   | <input type="checkbox"/> |
| Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" →  32?  | <input type="checkbox"/> |
| Depending on the device version:<br>Are all the device plugs firmly tightened →  28?   | <input type="checkbox"/> |
| Does the supply voltage match the specifications on the transmitter nameplate →  138?  | <input type="checkbox"/> |
| Is the terminal assignment →  26 or the device plug pin assignment →  27 correct? | <input type="checkbox"/> |
| If supply voltage is present:<br>Is the power LED on the electronics module of the transmitter lit green →  12?  | <input type="checkbox"/> |
| Depending on the device version:<br><ul style="list-style-type: none"> <li>■ Have the fixing screws been tightened with the correct tightening torque?</li> <li>■ Is the securing clamp securely tightened?</li> </ul>                              | <input type="checkbox"/> |

## 8 Operation options

### 8.1 Overview of operation options





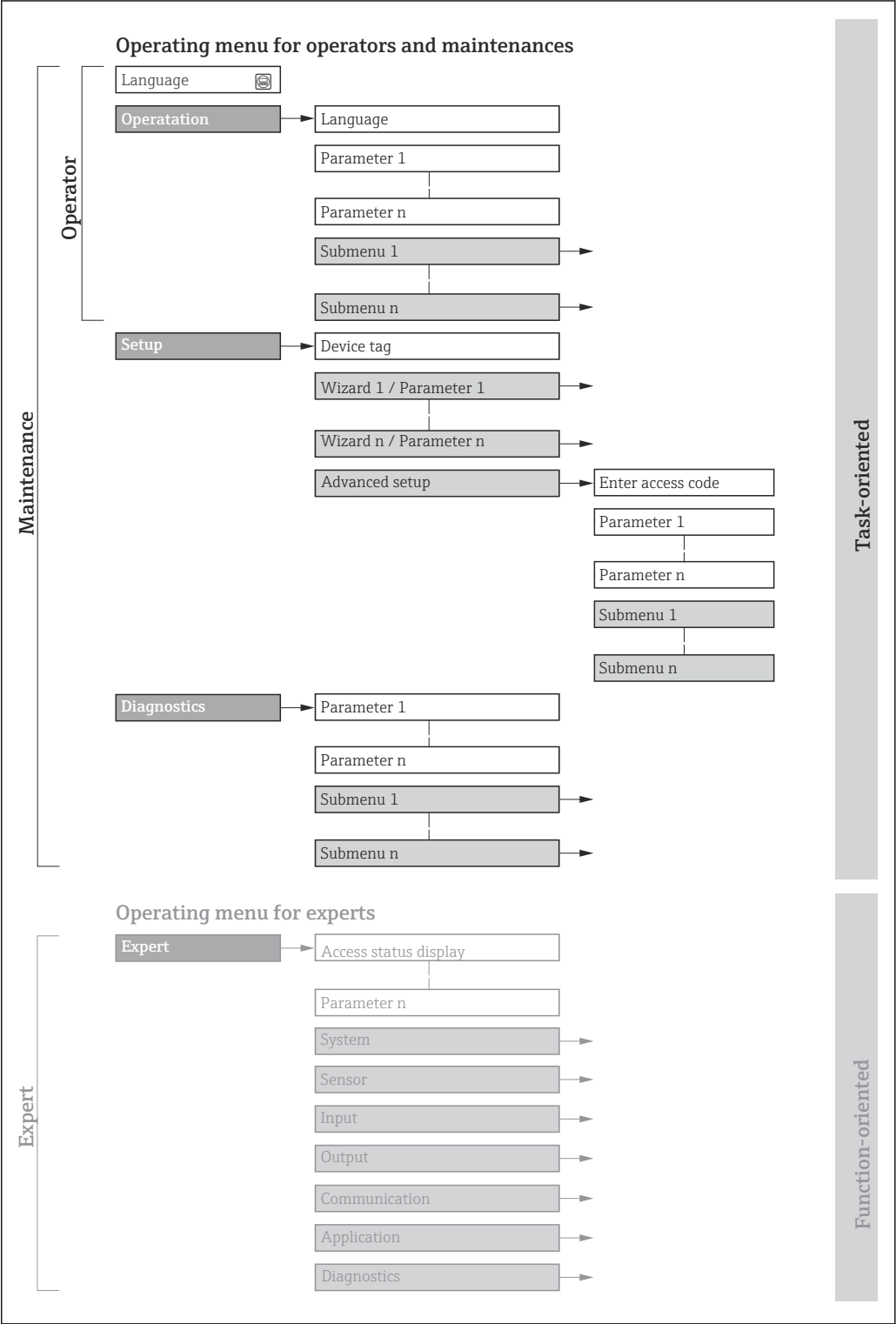
A0017760


- 1 Computer with web browser or with "FieldCare" operating tool
- 2 Automation system, e.g. Siemens S7-300 or S7-1500 with Step7 or TIA portal and latest GSD file.

## 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 →  156



 12 Schematic structure of the operating menu

A0018237-EN

## 8.2.2 Operating philosophy

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

| Menu/parameter |                   | User role and tasks  | Content/meaning   |
|----------------|-------------------|--|---|
| Language       | Task-oriented     | <b>Role "Operator", "Maintenance"</b><br>Tasks during operation: <ul style="list-style-type: none"> <li>■ Configuring the operational display</li> <li>■ Reading measured values</li> </ul>  | Defining the operating language   |
| Operation      |                   |  | <ul style="list-style-type: none"> <li>■ Defining the operating language</li> <li>■ Defining the web server operating language</li> <li>■ Resetting and controlling totalizers</li> <li>■ Configuring the operational display (e.g. display format, display contrast)</li> <li>■ Resetting and controlling totalizers</li> </ul>  |
| Setup          |                   | <b>"Maintenance" role</b><br>Commissioning:<br>Configuring the measurement   | Submenus for fast commissioning: <ul style="list-style-type: none"> <li>■ Configuring the system units</li> <li>■ Defining the medium</li> <li>■ Configuring the operational display</li> <li>■ Configuring the low flow cut off</li> <li>■ Configuring the detection of partially filled and empty pipes</li> </ul> Advanced setup <ul style="list-style-type: none"> <li>■ For more customized configuration of the measurement (adaptation to special measuring conditions)</li> <li>■ Configuring totalizers</li> <li>■ Administration (define access code, reset measuring instrument)</li> </ul>  |
| Diagnostics    |                   | <b>"Maintenance" role</b><br>Troubleshooting: <ul style="list-style-type: none"> <li>■ Diagnostics and elimination of process and device errors</li> <li>■ Measured value simulation</li> </ul>  | Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> <li>■ Diagnostic list<br/>Contains up to 5 currently pending diagnostic messages.</li> <li>■ Event logbook<br/>Contains event messages that have occurred.</li> <li>■ Device information<br/>Contains information for identifying the device.</li> <li>■ Measured values<br/>Contains all current measured values.</li> <li>■ Heartbeat Technology<br/>The functionality of the device is checked on demand and the verification results are documented.</li> <li>■ Simulation<br/>Used to simulate measured values or output values.</li> <li>■ Testpoints</li> </ul>  |
| Expert         | Function-oriented | Tasks that require detailed knowledge of the function of the device: <ul style="list-style-type: none"> <li>■ Commissioning measurements under difficult conditions</li> <li>■ Optimal adaptation of the measurement to difficult conditions</li> <li>■ Detailed configuration of the communication interface</li> <li>■ Error diagnostics in difficult cases</li> </ul> | Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device: <ul style="list-style-type: none"> <li>■ System<br/>Contains all higher-level device parameters that do not affect measurement or measured value communication.</li> <li>■ Sensor<br/>Configuring the measurement.</li> <li>■ Communication<br/>Configuring the digital communication interface and the web server.</li> <li>■ Application<br/>Configuring the functions that go beyond the actual measurement (e.g. totalizer).</li> <li>■ Diagnostics<br/>Error detection and analysis of process and device errors and for device simulation and the Heartbeat Technology menu.</li> </ul> |

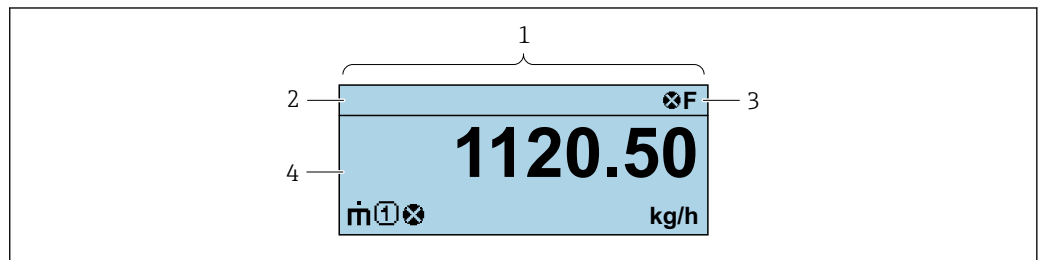
## 8.3 Displaying the measured values via the local display (optionally available)

### 8.3.1 Operational display



The local display is optionally available:

Order code for "Display; operation", option B "4-line, illuminated; via communication".



A0037831

- 1 Operational display
- 2 Tag name
- 3 Status area
- 4 Display area for measured values (4-line)

#### Status area

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

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


#### Display area

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

##### Measured variables

| Symbol    | Meaning   |
|-----------|---|
| $\dot{m}$ | Mass flow   |
| $\dot{V}$ | <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul>  |
| $\rho$    | <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Reference density</li> </ul>          |
| $\theta$  | Temperature   |
| $\Sigma$  | Totalizer<br>The measurement channel number indicates which of the three totalizers is displayed. |

*Measurement channel numbers*

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

*Diagnostic behavior*

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



The number and display format of the measured values can only be configured via the control system or Web server.

**8.3.2 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 from unauthorized access.

**Defining access authorization for user roles**

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

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

*Access authorization to parameters: "Maintenance" user role*

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

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

*Access authorization to parameters: "Operator" user role*

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

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



The user role with which the user is currently logged on is indicated by the .  
Navigation path:

**8.4 Access to the operating menu via the web browser****8.4.1 Function range**

The integrated web server can be used to operate and configure the device via a web browser service interface (CDI-RJ45). In addition to the measured values, status information on the device is displayed and can be used to monitor device health.

Furthermore the device data can be managed and the network parameters can be configured.



For additional information on the web server, see the Special Documentation for the device.

## 8.4.2 Prerequisites

### Computer hardware

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

### Computer software

| Software                      | Interface  |      |
|-------------------------------|--|------|
|                               | CDI-RJ45   | WLAN |
| Recommended operating systems | <ul style="list-style-type: none"> <li>▪ Microsoft Windows 8 or higher.</li> <li>▪ Mobile operating systems: <ul style="list-style-type: none"> <li>▪ iOS</li> <li>▪ Android</li> </ul> </li> </ul> <div style="margin-top: 5px;">  Microsoft Windows XP is supported. </div> <div style="margin-top: 5px;">  Microsoft Windows 7 is supported. </div> |      |
| Web browsers supported        | <ul style="list-style-type: none"> <li>▪ Microsoft Internet Explorer 8 or higher</li> <li>▪ Microsoft Edge</li> <li>▪ Mozilla Firefox</li> <li>▪ Google Chrome</li> <li>▪ Safari</li> </ul>  |      |



### Computer settings

|  |  |
|--|--|
| User rights                              | Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (for adjusting the IP address, subnet mask etc.).   |
| Proxy server settings of the Web browser | The web browser setting <i>Use a Proxy Server for Your LAN</i> must be <b>deselected</b> .   |
| JavaScript                               | <p>JavaScript must be enabled.</p> <div style="margin-top: 5px;">  If JavaScript cannot be enabled:<br/> Enter <code>http://XXX.XXX.X.X.XX/servlet/basic.html</code> in the address bar of the web browser, e.g. <code>http://192.168.1.212/servlet/basic.html</code>. A fully functional but simplified version of the operating menu structure starts in the web browser. </div> |
| Network connections                      | <p>Only the active network connections to the measuring device should be used.</p> <p>Switch off all other network connections.</p>  |




In the event of connection problems: → 90

*Measuring device: Via CDI-RJ45 service interface*

| Device           | CDI-RJ45 service interface   |
|------------------|--|
| Measuring device | The measuring device has an RJ45 interface.  |
| Web server       | Web server must be enabled; factory setting: ON<br> For information on enabling the Web server →  43 |


**8.4.3 Connecting the device****Via service interface (CDI-RJ45)***Preparing the measuring device**Configuring the Internet protocol of the computer*

The IP address can be assigned to the measuring device in a variety of ways:

- Dynamic Configuration Protocol (DCP), factory setting:  
The IP address is automatically assigned to the measuring device by the automation system (e.g. Siemens S7).
- Hardware addressing:  
The IP address is set via DIP switches .
- Software addressing:  
The IP address is entered via the **IP address** parameter (→  62) .
- DIP switch for "Default IP address":  
To establish the network connection via the service interface (CDI-RJ45): the fixed IP address 192.168.1.212 is used .

The device works with the Dynamic Configuration Protocol (DCP) ex-works, i.e. the IP address of the measuring device is automatically assigned by the automation system (e.g. Siemens S7).

To establish a network connection via the service interface (CDI-RJ45): set the "Default IP address" DIP switch to **ON**. The measuring device then has the fixed IP address: 192.168.1.212. The fixed IP address 192.168.1.212 can now be used to establish the connection to the network.

1. Via DIP switch 2, activate the default IP address 192.168.1.212: .
2. Switch on the measuring device.
3. Connect the computer to the RJ45 plug via the standard Ethernet cable →  151.
4. 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.
5. Close any open Internet browsers.
6. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

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

**Starting the web browser**

1. Start the web browser on the computer.



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

The screenshot shows the login interface of the Endress+Hauser web browser. It includes fields for device information, a language selector, and a login section with an access code field and a 'Login' button. A 'Reset access code' button is located at the bottom of the login section.

A0053670

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

If a login page does not appear, or if the page is incomplete → 90

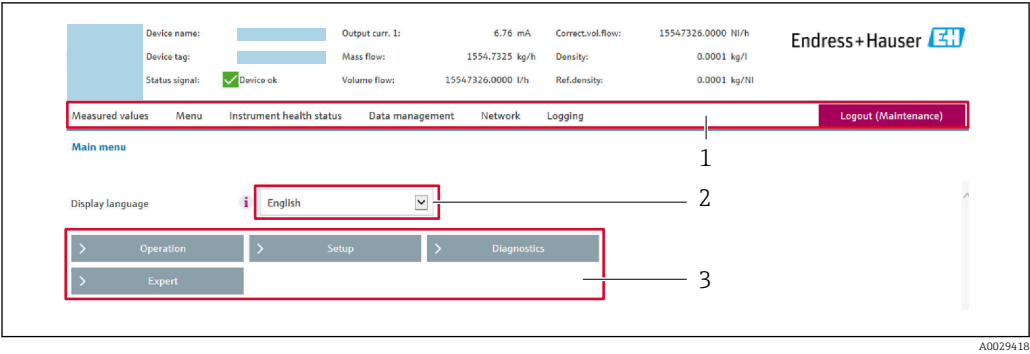
#### 8.4.4 Logging on

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

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

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

8.4.5 User interface




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

Header

The following information appears in the header:

- Device name
- Device tag
- Device status with status signal → 93
- Current measured values

Function row

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

Navigation area

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

### Working area

Depending on the selected function and the related submenus, various actions can be performed in this area:

- Configuring parameters
- Reading measured values
- Calling up help text
- Starting an upload/download

## 8.4.6 Disabling the Web server

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

### Navigation

"Expert" menu → Communication → Web server

### Parameter overview with brief description

| Parameter                | Description                       | Selection   |
|--------------------------|-----------------------------------|---|
| Web server functionality | Switch the Web server on and off. | <ul style="list-style-type: none"> <li>■ Off</li> <li>■ HTML Off</li> <li>■ On</li> </ul> |

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


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


### Enabling the Web server


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

- Via 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) →  40.

 If communication with the web server was established via the default IP address 192.168.1.212, DIP switch no. 10 must be reset (from **ON** → **OFF**). Afterwards, the IP address of the device is active again for network communication.

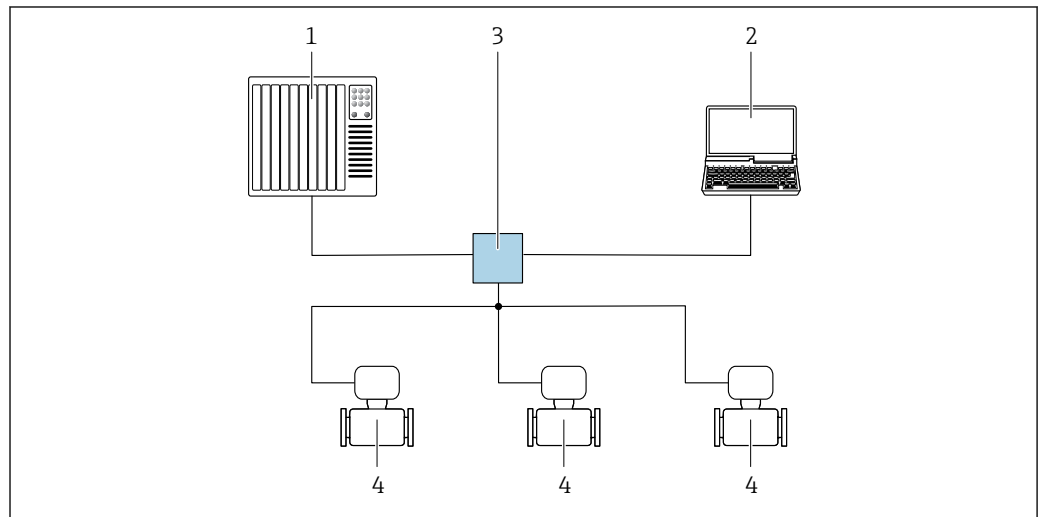
## 8.5 Access to the operating menu via the operating tool

### 8.5.1 Connecting the operating tool

#### Via PROFINET network

This communication interface is available in device versions with PROFINET.

##### Star topology



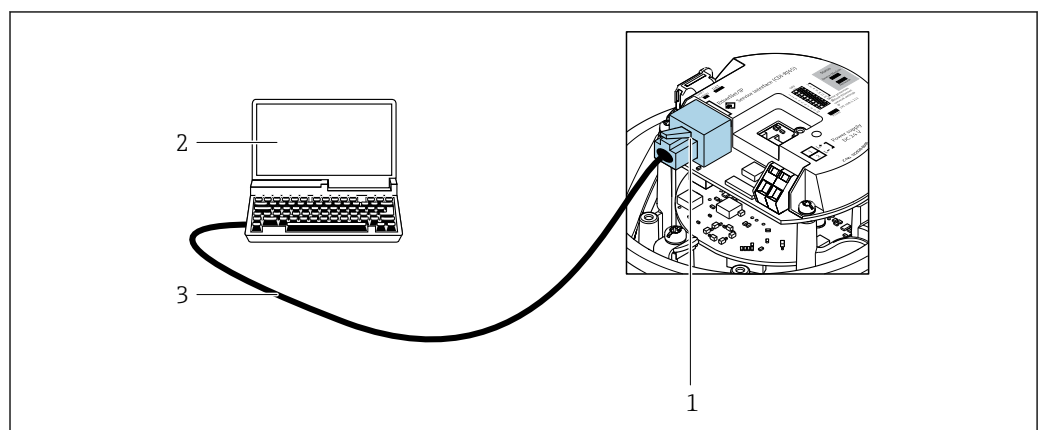
A0026545

13 Options for remote operation via PROFINET network: star topology

- 1 Automation system, e.g. Simatic S7 (Siemens)
- 2 Computer with web browser for accessing integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet switch, e.g. Scalance X204 (Siemens)
- 4 Measuring instrument

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

##### PROFINET



A0016940

14 Connection for order code for "Output", option R: PROFINET

- 1 Service interface (CDI-RJ45) and PROFINET interface of the measuring instrument with access to the integrated web server
- 2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet connecting cable with RJ45 plug

## 8.5.2 FieldCare

### Function range

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

Access is via:  
CDI-RJ45 service interface


Typical functions:

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



- Operating Instructions BA00027S
- Operating Instructions BA00059S



Source for device description files →  46

## 8.5.3 DeviceCare

### Function range


Tool for connecting and configuring Endress+Hauser field devices.

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



Innovation brochure IN01047S



Source for device description files →  46

## 9 System integration

### 9.1 Overview of device description files

#### 9.1.1 Current version data for the device

|                                  |             |   |
|----------------------------------|-------------|---|
| Firmware version                 | 01.00.zz    | <ul style="list-style-type: none"> <li>■ On the title page of the manual</li> <li>■ On the transmitter nameplate</li> <li>■ Firmware version<br/>Diagnostics → Device information → Firmware version</li> </ul> |
| Release date of firmware version | 12.2015     | –   |
| Manufacturer ID                  | 0x11        | Manufacturer ID<br>Diagnostics → Device information → Manufacturer ID   |
| Device ID                        | 0x844A      | Device ID<br>Expert → Communication → PROFINET configuration → PROFINET information → Device ID   |
| Device type code                 | Promass 100 | Device Type<br>Expert → Communication → PROFINET configuration → PROFINET information → Device Type   |
| Device revision                  | 1           | Device revision<br>Expert → Communication → PROFINET configuration → PROFINET information → Device revision   |
| PROFINET version                 | 2.3.x       | –   |



For an overview of the various firmware versions for the device

#### 9.1.2 Operating tools

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

| Operating tool via Service interface (CDI-RJ45) | Sources for obtaining device descriptions  |
|---|--|
| FieldCare                                       | <ul style="list-style-type: none"> <li>■ <a href="http://www.endress.com">www.endress.com</a> → Downloads area</li> <li>■ USB stick (contact Endress+Hauser)</li> <li>■ E-mail → Downloads area</li> </ul> |
| DeviceCare                                      | <ul style="list-style-type: none"> <li>■ <a href="http://www.endress.com">www.endress.com</a> → Downloads area</li> <li>■ E-mail → Downloads area</li> </ul>   |

## 9.2 Device master file (GSD)

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

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

The device master file (GSD) is in XML format, and the file is created in the GSDML description markup language.

With the PA Profile 4.02 device master file (GSD) it is possible to exchange field devices made by different manufacturers without having to reconfigure.

Two different device master files (GSD) can be used: Manufacturer-specific GSD and PA Profile GSD.

### 9.2.1 File name of the manufacturer-specific device master file (GSD)

Example of the name of a device master file:

GSDML-V2.3.x-EH-PROMASS 100-yyyymmdd.xml








|                 |  |
|-----------------|--|
| <b>GSDML</b>    | Description language                           |
| <b>V2.3.x</b>   | Version of the PROFINET specification          |
| <b>EH</b>       | Endress+Hauser                                 |
| <b>PROMASS</b>  | Instrument family                              |
| <b>100</b>      | Transmitter                                    |
| <b>yyyymmdd</b> | Date of issue (yyyy: year, mm: month, dd: day) |
| <b>.xml</b>     | File name extension (XML file)                 |

### 9.2.2 File name of the PA Profile device master file (GSD)


## 9.3 Cyclic data transmission

### 9.3.1 Overview of the modules

The following tables shows which modules are available to the measuring device for cyclic data exchange. Cyclic data exchange is performed with an automation system.

| Measuring device   |            | Direction<br>Data flow | Control system |
|--|------------|------------------------|----------------|
| Modules  | Slot       |                        |                |
| Analog Input module →  48           | 1 to 14    | →                      | PROFINET       |
| Digital Input module →  49          | 1 to 14    | →                      |                |
| Diagnose Input module →  50         | 1 to 14    | →                      |                |
| Analog Output module →  53          | 18, 19, 20 | ←                      |                |
| Digital Output module →  54         | 21, 22     | ←                      |                |
| Totalizer 1 to 3 →  51              | 15 to 17   | ←<br>→                 |                |
| Heartbeat Verification module →  55 | 23         | ←<br>→                 |                |

### 9.3.2 Description of the modules

 The data structure is described from the perspective of the automation system:

- Input data: Are sent from the measuring device to the automation system.
- Output data: Are sent from the automation system to the measuring device.

#### Analog Input module

Transmit input variables from the measuring device to the automation system.

Analog Input modules cyclically transmit the selected input variables, along with the status, from the measuring device to the automation system. The input variable is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains status information pertaining to the input variable.

*Selection: input variable*

| Slot    | Input variables   |
|---------|---|
| 1 to 14 | <ul style="list-style-type: none"> <li>▪ Mass flow</li> <li>▪ Volume flow</li> <li>▪ Corrected volume flow</li> <li>▪ Target mass flow <sup>1)</sup></li> <li>▪ Carrier mass flow</li> <li>▪ Density</li> <li>▪ Reference density</li> <li>▪ Concentration</li> <li>▪ Temperature</li> <li>▪ Electronic temperature</li> <li>▪ Oscillation frequency</li> <li>▪ Oscillation amplitude</li> <li>▪ Frequency fluctuation</li> <li>▪ Oscillation damping</li> <li>▪ Tube damping fluctuation</li> <li>▪ Signal asymmetry</li> <li>▪ Exciter current</li> </ul> |

1) Only available with the Concentration application package



*Data structure**Input data of Analog Input*

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

1) Status coding → 56

**Application-specific Input module**

Transmit compensation values from the measuring device to the automation system.

The Application-specific Input module cyclically transmits compensation values, including the status, from the measuring device to the automation system. The compensation value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the compensation value.

*Assigned compensation values*

The configuration is performed via: Expert → Application → Application specific calculations → Process variables

| Slot | Compensation value                |
|------|-----------------------------------|
| 31   | Application-specific Input module |
| 32   | Application-specific Input module |

*Data structure**Input data of Application-specific Input module*

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

1) Status coding

*Failsafe mode*

A failsafe mode can be defined for using the compensation values.

If the status is GOOD or UNCERTAIN, the compensation values transmitted by the automation system are used. If the status is BAD, the failsafe mode is activated for the use of the compensation values.

Parameters are available per compensation value to define the failsafe mode: Expert → Application → Application specific calculations → Process variables

*Fail safe type parameter*

- **Fail safe value** option: The value defined in the Fail safe value parameter is used.
- **Fallback value** option: The last valid value is used.
- **Off** option: Failsafe mode is disabled.

*Fail safe value parameter*

Use this parameter to enter the compensation value which is used if the Fail safe value option is selected in the Fail safe type parameter.

**Digital Input module**

Transmit digital input values from the measuring device to the automation system.

Digital input values are used by the measuring device to transmit the state of device functions to the automation system.

Digital Input modules cyclically transmit discrete input values, including the status, from the measuring device to the automation system. The discrete input value is depicted in the first byte. The second byte contains standardized status information pertaining to the input value.


*Selection: device function*

| Slot    | Device function      | Status (meaning)   |
|---------|----------------------|--|
| 1 to 14 | Empty pipe detection | <ul style="list-style-type: none"> <li>■ 0 (device function not active)</li> <li>■ 1 (device function active)</li> </ul> |
|         | Low flow cut off     |  |

*Data structure*

*Input data of Digital Input*


| Byte 1        | Byte 2               |
|---------------|----------------------|
| Digital Input | Status <sup>1)</sup> |

1) Status coding →  56


### Diagnose Input module



Transmit discrete input values (diagnostic information) from the measuring device to the automation system.

Diagnostic information is used by the measuring device to transmit the device status to the automation system.

Diagnose Input modules transmit discrete input values from the measuring device to the automation system. The first two bytes contain the information regarding the diagnostic information number (→  98). The third byte provides the status.

*Selection: device function*

| Slot    | Device function   | Status (meaning)  |
|---------|-------------------|---|
| 1 to 14 | Last diagnostics  | Diagnostic information number (→  98) and status |
|         | Current diagnosis |   |

 Information about pending diagnostic information →  119.

*Data structure*

*Input data of Diagnose Input*

| Byte 1                        | Byte 2 | Byte 3 | Byte 4  |
|-------------------------------|--------|--------|---------|
| Diagnostic information number |        | Status | Value 0 |

*Status*

| Coding (hex) | Status  |
|--------------|---|
| 0x00         | No device error is present.   |
| 0x01         | Failure (F):<br>A device error is present. The measured value is no longer valid. |

| Coding (hex) | Status   |
|--------------|--|
| 0x02         | Function check (C):<br>The device is in service mode (e.g. during a simulation).   |
| 0x04         | Maintenance required (M):<br>Maintenance is required. The measured value is still valid.   |
| 0x08         | Out of specification (S):<br>The device is being operated outside its technical specification limits (e.g. process temperature range). |

### Totalizer module

The Totalizer module consists of the Totalizer Value, Totalizer Control and Totalizer Mode submodules.

#### Totalizer Value submodule

Transmit transmitter value from the device to the automation system.

Totalizer modules cyclically transmit a selected totalizer value, along with the status, from the measuring device to the automation system via the Totalizer Value submodule. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains status information pertaining to the totalizer value.

#### Selection: input variable

| Slot    | Sub-slot | Input variable   |
|---------|----------|--|
| 15...17 | 1        | <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow <sup>1)</sup></li> <li>■ Carrier mass flow <sup>1)</sup></li> </ul> |

1) Only available with the Concentration application package

#### Data structure of input data (Totalizer Value submodule)

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

1) Status coding → 56

#### Totalizer Control module

Transmit totalizer value from the measuring device to the automation system.

#### Selection: input variable

#### Data structure

#### Totalizer Control input data

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

1) Status coding

*Selection: output variable*

Transmit the control value from the automation system to the measuring device.

| Slot     | Sub-slot | Value | Input variable |
|----------|----------|-------|----------------|
| 70 to 71 | 1        | 1     | Reset to "0"   |
|          |          | 2     | Preset value   |
|          |          | 3     | Stop           |
|          |          | 4     | Totalize       |

*Data structure**Totalizer Control output data*

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

*Totalizer Control submodule*

Control the totalizer via the automation system.

*Selection: control totalizer*

| Slot    | Sub-slot | Value | Control totalizer |
|---------|----------|-------|-------------------|
| 15...17 | 2        | 0     | Totalize          |
|         |          | 1     | Reset + hold      |
|         |          | 2     | Preset + hold     |
|         |          | 3     | Reset + totalize  |
|         |          | 4     | Preset + totalize |
|         |          | 5     | Hold              |

*Data structure of output data (Totalizer Control submodule)*

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

*Totalizer Mode submodule*

Configure the totalizer via the automation system.

*Selection: totalizer configuration*

| Slot    | Sub-slot | Value | Control totalizer         |
|---------|----------|-------|---------------------------|
| 15...17 | 3        | 0     | Balancing                 |
|         |          | 1     | Balance the positive flow |
|         |          | 2     | Balance the negative flow |

*Data structure of output data (Totalizer Mode submodule)*

| Byte 1                 |
|------------------------|
| Configuration variable |

### Analog Output module

Transmit compensation values from the automation system to the measuring device.

Analog Output modules cyclically transmit compensation values, along with the status and the associated unit, from the automation system to the measuring device. The compensation value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the compensation value. The unit is transmitted in the sixth and seventh byte.

#### Assigned compensation values



The configuration is performed via: Expert → Sensor → External compensation

| Slot | Compensation value  |
|------|---|
| 18   | External pressure   |
| 19   | External temperature  |
| 20   | External reference density                                  |
| 29   | External value for % S&W (sediment and water) <sup>1)</sup> |
| 30   | External value for % Water cut <sup>1)</sup>                |

1) Only available with the Petroleum application package.

#### Available units

| Pressure  |       | Temperature |      | Density   |                     | Percent   |      |
|-----------|-------|-------------|------|-----------|---------------------|-----------|------|
| Unit code | Unit  | Unit code   | Unit | Unit code | Unit                | Unit code | Unit |
| 1610      | Pa a  | 1001        | °C   | 32840     | kg/Nm <sup>3</sup>  | 1342      | %    |
| 1616      | kPa a | 1002        | °F   | 32841     | kg/Nl               |           |      |
| 1614      | MPa a | 1000        | K    | 32842     | g/Scm <sub>3</sub>  |           |      |
| 1137      | bar   | 1003        | °R   | 32843     | kg/Scm <sub>3</sub> |           |      |
| 1611      | Pa g  |             |      | 32844     | lb/Sft <sub>3</sub> |           |      |
| 1617      | kPa g |             |      |           |                     |           |      |
| 1615      | MPa g |             |      |           |                     |           |      |
| 32797     | bar g |             |      |           |                     |           |      |
| 1142      | psi a |             |      |           |                     |           |      |
| 1143      | psi g |             |      |           |                     |           |      |

#### Data structure

##### Output data of Analog Output

| Byte 1   | Byte 2 | Byte 3 | Byte 4 | Byte 5               | Byte 6    | Byte 7 |
|--|--------|--------|--------|----------------------|-----------|--------|
| Measured value: floating point number (IEEE 754) |        |        |        | Status <sup>1)</sup> | Unit code |        |

1) Status coding → 56

#### Failsafe mode

A failsafe mode can be defined for using the compensation values.

If the status is GOOD or UNCERTAIN, the compensation values transmitted by the automation system are used. If the status is BAD, the failsafe mode is activated for the use of the compensation values.

Parameters are available per compensation value to define the failsafe mode: Expert  
→ Sensor → External compensation

#### *Fail safe type parameter*

- Fail safe value option: The value defined in the Fail safe value parameter is used.
- Fallback value option: The last valid value is used.
- Off option: The failsafe mode is disabled.

#### *Fail safe value parameter*

Use this parameter to enter the compensation value which is used if the Fail safe value option is selected in the Fail safe type parameter.

### **Digital Output module**

Transmit digital output values from the automation system to the measuring device.

Digital output values are used by the automation system to enable and disable device functions.

Digital output values cyclically transmit discrete output values, including the status, from the automation system to the measuring device. The discrete output value is transmitted in the first byte. The second byte contains status information pertaining to the output value.

#### *Assigned device functions*

| Slot     | Device function | Status (meaning)  |
|----------|-----------------|---|
| 21       | Flow override   | <ul style="list-style-type: none"> <li>■ 0 (disable device function)</li> <li>■ 1 (enable device function)</li> </ul> |
| 22       | Zero adjust     |   |
| 24 to 26 | Relay output    | Relay output value: <ul style="list-style-type: none"> <li>■ 0</li> <li>■ 1</li> </ul>                                |

#### *Data structure*

##### *Output data of Digital Output*

| Byte 1         | Byte 2                  |
|----------------|-------------------------|
| Digital Output | Status <sup>1) 2)</sup> |

1) Status coding → 56

2) If the status is BAD, the control variable is not adopted.

### **Heartbeat Verification module**

Receive discrete output values from the automation system and transmit discrete input values from the measuring instrument to the automation system.

The Heartbeat Verification module receives discrete output data from the automation system and transmits discrete input data from the measuring instrument to the automation system.

The discrete output value is provided by the automation system to start a Heartbeat Verification. The discrete input value is depicted in the first byte. The second byte contains status information pertaining to the input value.

The discrete input value is used by the measuring instrument to send the status of the Heartbeat Verification device functions to the automation system. The module cyclically transmits the discrete input value, along with the status, to the automation system. The

discrete input value is depicted in the first byte. The second byte contains status information pertaining to the input value.



Only available with the Heartbeat Verification application package.

#### Assigned device functions

| Slot | Device function                         | Bit   | Verification status                    |
|------|---|---|--|
| 23   | Verification status<br>(input data)     | 0   | Verification has not been performed    |
|      |   | 1   | The device has failed the verification |
|      |   | 2   | Currently performing verification      |
|      |   | 3   | Verification finished                  |
|      | Verification result<br>(input data)     | <b>Bit</b>  | <b>Verification result</b>             |
|      |   | 4   | The device has failed the verification |
|      |   | 5   | Verification performed successfully    |
|      |   | 6   | Verification has not been performed    |
|      |   | 7   | –                                      |
|      | Start the verification<br>(output data) | <b>Verification control</b>                         |  |
|      |   | A status change from 0 to 1 starts the verification |  |

#### Data structure

##### Output data of Heartbeat Verification module

| Byte 1          |
|-----------------|
| Discrete Output |

##### Input data of Heartbeat Verification module

| Byte 1         | Byte 2               |
|----------------|----------------------|
| Discrete Input | Status <sup>1)</sup> |

1) Status coding → 56

#### Concentration module



Only available with the Concentration Measurement application package.

#### Assigned device functions

| Slot | Input variables              |
|------|------------------------------|
| 28   | Selection of the liquid type |

#### Data structure

##### Concentration output data

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

| Liquid type                 | Enum code |
|-----------------------------|-----------|
| Off                         | 0         |
| Sucrose in water            | 5         |
| Glucose in water            | 2         |
| Fructose in water           | 1         |
| Invert sugar in water       | 6         |
| Corn syrup HFCS42           | 15        |
| Corn syrup HFCS55           | 16        |
| Corn syrup HFCS90           | 17        |
| Original wort               | 18        |
| Ethanol in water            | 11        |
| Methanol in water           | 12        |
| Hydrogen peroxide in water  | 4         |
| Hydrochloric acid           | 24        |
| Sulfuric acid               | 25        |
| Nitric acid                 | 7         |
| Phosphoric acid             | 8         |
| Sodium hydroxide            | 10        |
| Potassium hydroxide         | 9         |
| Ammonium nitrate in water   | 13        |
| Iron(III) chloride in water | 14        |
| % mass / % volume           | 19        |
| User Profile Coef Set No. 1 | 21        |
| User Profile Coef Set No. 2 | 22        |
| User Profile Coef Set No. 3 | 23        |

### 9.3.3 Status coding

| Status                           | Coding (hex) | Meaning   |
|----------------------------------|--------------|---|
| BAD - Maintenance alarm          | 0x24         | A measured value is not available because a device error has occurred.  |
| BAD - Process related            | 0x28         | A measured value is not available because the process conditions are not within the device's technical specification limits.  |
| BAD - Function check             | 0x3C         | A function check is active (e.g. cleaning or calibration)   |
| UNCERTAIN - Initial value        | 0x4F         | A predefined value is output until a correct measured value is available again or corrective measures have been performed that change this status.  |
| UNCERTAIN - Maintenance demanded | 0x68         | Signs of wear and tear have been detected on the measuring instrument. Short-term maintenance is necessary to ensure that the measuring instrument remains ready for use.<br>The measured value might be invalid. The use of the measured value depends on the application. |
| UNCERTAIN - Process related      | 0x78         | The process conditions are not within the device's technical specification limits. This could have a negative impact on the quality and accuracy of the measured value.<br>The use of the measured value depends on the application.  |



| Status                      | Coding (hex) | Meaning   |
|-----------------------------|--------------|---|
| GOOD - OK                   | 0x80         | No error has been diagnosed.  |
| GOOD - Maintenance demanded | 0xA8         | The measured value is valid.<br>It is strongly recommended to service the device in the near future.  |
| GOOD - Function check       | 0xBC         | The measured value is valid.<br>The measuring instrument is performing an internal function check. The function check does not have any noticeable effect on the process. |

### 9.3.4 Factory setting

The slots are already assigned in the automation system for initial commissioning.

#### Assigned slots

| Slot    | Factory setting       |
|---------|-----------------------|
| 1       | Mass flow             |
| 2       | Volume flow           |
| 3       | Corrected volume flow |
| 4       | Density               |
| 5       | Reference density     |
| 6       | Temperature           |
| 7 to 14 | –                     |
| 15      | Totalizer 1           |
| 16      | Totalizer 2           |
| 17      | Totalizer 3           |

### 9.3.5 Startup configuration



If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used. The following configurations are taken from the automation system.

|                             |  |
|-----------------------------|--|
| Startup configuration (NSU) | <ul style="list-style-type: none"> <li>■ Management: <ul style="list-style-type: none"> <li>■ Software revision</li> <li>■ Write protection</li> <li>■ Web server functionality</li> </ul> </li> <li>■ System units: <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Mass</li> <li>■ Volume flow</li> <li>■ Volume</li> <li>■ Corrected volume flow</li> <li>■ Corrected volume</li> <li>■ Density</li> <li>■ Reference density</li> <li>■ Temperature</li> <li>■ Pressure</li> </ul> </li> <li>■ Concentration application package: <ul style="list-style-type: none"> <li>■ Coefficients A0 to A4</li> <li>■ Coefficients B1 to B3</li> <li>■ Medium type</li> </ul> </li> <li>■ Sensor adjustment</li> <li>■ Process parameter: <ul style="list-style-type: none"> <li>■ Damping (flow, density, temperature)</li> <li>■ Flow override</li> </ul> </li> <li>■ Low flow cut off: <ul style="list-style-type: none"> <li>■ Assign process variable</li> <li>■ Switch-on/switch-off point</li> <li>■ Pressure shock suppression</li> </ul> </li> <li>■ Empty pipe detection: <ul style="list-style-type: none"> <li>■ Assign process variable</li> <li>■ Limits</li> <li>■ Response time</li> <li>■ Max. damping</li> </ul> </li> <li>■ Corrected volume flow calculation: <ul style="list-style-type: none"> <li>■ External reference density</li> <li>■ Fixed reference density</li> <li>■ Reference temperature</li> <li>■ Linear expansion coefficient</li> <li>■ Square expansion coefficient</li> </ul> </li> <li>■ Measuring mode: <ul style="list-style-type: none"> <li>■ Medium</li> <li>■ Gas type</li> <li>■ Reference sound velocity</li> <li>■ Temperature coefficient sound velocity</li> </ul> </li> <li>■ External compensation: <ul style="list-style-type: none"> <li>■ Pressure compensation</li> <li>■ Pressure value</li> <li>■ External pressure</li> </ul> </li> <li>■ Alarm delay</li> <li>■ Diagnostic settings</li> <li>■ Diagnostic behavior for diverse diagnostic information</li> <li>■ Petroleum application package: <ul style="list-style-type: none"> <li>■ Petroleum mode</li> <li>■ Water density unit</li> <li>■ Water reference density unit</li> <li>■ Oil density unit</li> <li>■ Oil sample density</li> <li>■ Oil sample temperature</li> <li>■ Oil sample pressure</li> <li>■ Water sample density</li> <li>■ Water sample temperature</li> <li>■ API commodity group</li> <li>■ API table selection</li> <li>■ Thermal expansion coefficient</li> </ul> </li> </ul> |
|-----------------------------|--|

## 10 Commissioning

### 10.1 Post-installation and post-connection check

Before commissioning the device:

- Make sure that the post-installation and post-connection checks have been performed successfully.
- Checklist for "Post-installation" check →  24
- Checklist for "Post-connection" check →  33

### 10.2 Identifying the device in the PROFINET network

A device can be quickly identified within a plant using the PROFINET flash function. If the PROFINET flash function is activated in the automation system, the LED indicating the network status flashes and the red backlight of the onsite display is switched on.

### 10.3 Startup parameterization

By activating the startup parameterization function (NSU: Normal Startup Unit), the configuration of the most important measuring device parameters is taken from the automation system.

 Configurations taken from the automation system .

### 10.4 Connecting via FieldCare

- For connecting FieldCare
- For connecting via FieldCare
- For user interface of FieldCare

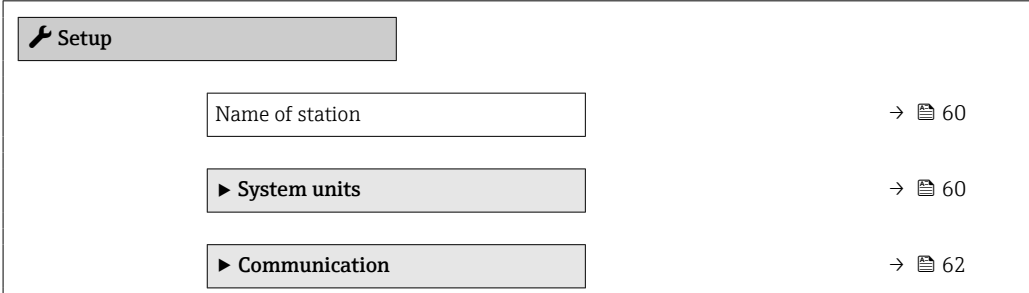
### 10.5 Setting the operating language




Factory setting: English or ordered local language

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

### 10.6 Configuring the device

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



| ⚙ Setup         |  |
|-----------------|--|
| Name of station | →  60 |
| ► System units  | →  60 |
| ► Communication | →  62 |

|                                   |      |
|-----------------------------------|------|
| ► Medium selection                | → 64 |
| ► Low flow cut off                | → 66 |
| ► Partially filled pipe detection |      |
| ► Advanced setup                  | → 68 |

10.6.1 Defining the tag name

A measuring point can be quickly identified within a plant on the basis of the tag name. The tag name is equivalent to the device name (name of station) of the PROFINET specification (data length: 255 bytes)

The device name can be changed via DIP switches or the automation system → 30.

The device name currently used is displayed in the **Name of station** parameter.

Navigation


"Setup" menu → PROFINET device name

Parameter overview with brief description

| Parameter       | Description                  | User interface                                  | Factory setting                           |
|-----------------|------------------------------|---|---|
| Name of station | Name of the measuring point. | Max. 32 characters such as letters and numbers. | EH-PROMASS100 serial number of the device |

10.6.2 Setting the system units

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

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

Navigation



"Setup" menu → Advanced setup → System units

|                            |      |
|----------------------------|------|
| ► System units             |      |
| Mass flow unit             | → 61 |
| Mass unit                  | → 61 |
| Volume flow unit           | → 61 |
| Volume unit                | → 61 |
| Corrected volume flow unit | → 61 |
| Corrected volume unit      | → 61 |

|                        |      |
|------------------------|------|
| Density unit           | → 61 |
| Reference density unit | → 61 |
| Temperature unit       | → 62 |
| Pressure unit          | → 62 |

### Parameter overview with brief description

| Parameter                  | Description  | Selection        | Factory setting  |
|----------------------------|--|------------------|--|
| Mass flow unit             | Select mass flow unit.<br><i>Effect</i><br>The selected unit applies to:<br><ul style="list-style-type: none"> <li>Output</li> <li>Low flow cut off</li> <li>Simulation process variable</li> </ul>                      | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>kg/h</li> <li>lb/min</li> </ul>  |
| Mass unit                  | Select mass unit.  | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>kg</li> <li>lb</li> </ul>  |
| Volume flow unit           | Select volume flow unit.<br><i>Effect</i><br>The selected unit applies to:<br><ul style="list-style-type: none"> <li>Output</li> <li>Low flow cut off</li> <li>Simulation process variable</li> </ul>                    | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>l/h</li> <li>gal/min (us)</li> </ul>   |
| Volume unit                | Select volume unit.  | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>l (DN &gt; 150 (6"): <b>m<sup>3</sup></b> option)</li> <li>gal (us)</li> </ul> |
| Corrected volume flow unit | Select corrected volume flow unit.<br><i>Effect</i><br>The selected unit applies to:<br><b>Corrected volume flow</b> parameter<br>(→ 80)   | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>NI/h</li> <li>Sft<sup>3</sup>/min</li> </ul>                                   |
| Corrected volume unit      | Select corrected volume unit.  | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>NI</li> <li>Sft<sup>3</sup></li> </ul>   |
| Reference density unit     | Select reference density unit.   | Unit choose list | Country-specific<br><ul style="list-style-type: none"> <li>kg/NI</li> <li>lb/Sft<sup>3</sup></li> </ul>                                    |
| Density unit               | Select density unit.<br><i>Effect</i><br>The selected unit applies to:<br><ul style="list-style-type: none"> <li>Output</li> <li>Simulation process variable</li> <li>Density adjustment (<b>Expert</b> menu)</li> </ul> | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>kg/l</li> <li>lb/ft<sup>3</sup></li> </ul>                                     |
| Density 2 unit             | Select second density unit.  | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>kg/l</li> <li>lb/ft<sup>3</sup></li> </ul>                                     |

| Parameter        | Description   | Selection        | Factory setting   |
|------------------|---|------------------|---|
| Temperature unit | Select temperature unit.<br><i>Effect</i><br>The selected unit applies to:<br><ul style="list-style-type: none"> <li>▪ <b>Electronic temperature</b> parameter (6053)</li> <li>▪ <b>Maximum value</b> parameter (6051)</li> <li>▪ <b>Minimum value</b> parameter (6052)</li> <li>▪ <b>External temperature</b> parameter (6080)</li> <li>▪ <b>Maximum value</b> parameter (6108)</li> <li>▪ <b>Minimum value</b> parameter (6109)</li> <li>▪ <b>Maximum value</b> parameter (6029)</li> <li>▪ <b>Minimum value</b> parameter (6030)</li> <li>▪ <b>Reference temperature</b> parameter (1816)</li> <li>▪ <b>Temperature</b> parameter</li> </ul> | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>▪ °C</li> <li>▪ °F</li> </ul>       |
| Pressure unit    | Select process pressure unit.<br><i>Effect</i><br>The unit is taken from:<br><ul style="list-style-type: none"> <li>▪ <b>Pressure value</b> parameter (→  65)</li> <li>▪ <b>External pressure</b> parameter (→  65)</li> <li>▪ Pressure value</li> </ul>  | Unit choose list | Country-specific:<br><ul style="list-style-type: none"> <li>▪ bar a</li> <li>▪ psi a</li> </ul> |


### 10.6.3 Displaying the communication interface


The **Communication** submenu shows all the current parameter settings for selecting and configuring the communication interface.


#### Navigation


"Setup" menu → Communication

► Communication


MAC address (7214) →  62

IP address (7209) →  62

Subnet mask (7211) →  63

Default gateway (7210) →  63

#### Parameter overview with brief description

| Parameter   | Description   | User interface  | Factory setting   |
|-------------|---|---|---|
| MAC address | Displays the MAC address of the measuring instrument.<br> MAC = Media Access Control | Unique 12-digit character string comprising letters and numbers, e.g.:<br>00:07:05:10:01:5F | Each measuring instrument is given an individual address. |
| IP address  | IP address of the Web server integrated in the measuring instrument.<br>If the DHCP client and write access are switched off, the IP address can also be entered.       | 4 octet: 0 to 255 (in the particular octet)   | –   |

| Parameter       | Description   | User interface                              | Factory setting |
|-----------------|---|---|-----------------|
| Subnet mask     | Displays the subnet mask.<br>If the DHCP client and write access are switched off, the Subnet mask can also be entered.         | 4 octet: 0 to 255 (in the particular octet) | –               |
| Default gateway | Displays the default gateway.<br>If the DHCP client and write access are switched off, the Default gateway can also be entered. | 4 octet: 0 to 255 (in the particular octet) | –               |

### 10.6.4 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                     |      |
|--|------|
| Select medium                          | → 64 |
| Select gas type                        | → 64 |
| Reference sound velocity               | → 65 |
| Temperature coefficient sound velocity | → 65 |
| Pressure compensation                  | → 65 |
| Pressure value                         | → 65 |
| External pressure                      | → 65 |

#### Parameter overview with brief description

| Parameter       | Prerequisite   | Description  | Selection / User entry   |
|-----------------|--|--|--|
| Select medium   | –  | 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). | <ul style="list-style-type: none"> <li>■ Liquid</li> <li>■ Gas</li> </ul>  |
| Select gas type | In the <b>Medium selection</b> submenu, the <b>Gas</b> option is selected. | Select measured gas type.  | <ul style="list-style-type: none"> <li>■ Air</li> <li>■ Ammonia NH<sub>3</sub></li> <li>■ Argon Ar</li> <li>■ Sulfur hexafluoride SF<sub>6</sub></li> <li>■ Oxygen O<sub>2</sub></li> <li>■ Ozone O<sub>3</sub></li> <li>■ Nitrogen oxide NO<sub>x</sub></li> <li>■ Nitrogen N<sub>2</sub></li> <li>■ Nitrous oxide N<sub>2</sub>O</li> <li>■ Methane CH<sub>4</sub></li> <li>■ Hydrogen H<sub>2</sub></li> <li>■ Helium He</li> <li>■ Hydrogen chloride HCl</li> <li>■ Hydrogen sulfide H<sub>2</sub>S</li> <li>■ Ethylene C<sub>2</sub>H<sub>4</sub></li> <li>■ Carbon dioxide CO<sub>2</sub></li> <li>■ Carbon monoxide CO</li> <li>■ Chlorine Cl<sub>2</sub></li> <li>■ Butane C<sub>4</sub>H<sub>10</sub></li> <li>■ Propane C<sub>3</sub>H<sub>8</sub></li> <li>■ Propylene C<sub>3</sub>H<sub>6</sub></li> <li>■ Ethane C<sub>2</sub>H<sub>6</sub></li> <li>■ Others</li> </ul> |



| Parameter                              | Prerequisite   | Description  | Selection / User entry   |
|--|--|--|--|
| Reference sound velocity               | In the <b>Select gas type</b> parameter, the <b>Others</b> option is selected.   | Enter sound velocity of gas at 0 °C (32 °F).               | 1 to 99 999.9999 m/s   |
| Temperature coefficient sound velocity | In the <b>Select gas type</b> parameter, the <b>Others</b> option is selected.   | Enter temperature coefficient for the gas sound velocity.  | Positive floating-point number   |
| Pressure compensation                  | –  | Select pressure compensation type.                         | <ul style="list-style-type: none"> <li>■ Off</li> <li>■ Fixed value</li> <li>■ External value</li> </ul> |
| Pressure value                         | In the <b>Pressure compensation</b> parameter, the <b>Fixed value</b> option or the <b>Current input 1...n</b> option is selected. | Enter process pressure to be used for pressure correction. | Positive floating-point number   |
| External pressure                      | In the <b>Pressure compensation</b> parameter, the <b>External value</b> option is selected.                                       | Shows the external, fixed process pressure value.          |  |

10.6.5    Configuring the low flow cut off

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

Navigation

"Setup" menu → Low flow cut off

► Low flow cut off

Assign process variable

On value low flow cutoff

Off value low flow cutoff

Pressure shock suppression

→ 66

→ 66

→ 66

→ 66

Parameter overview with brief description

| Parameter                  | Prerequisite   | Description  | Selection / User entry  | Factory setting                         |
|----------------------------|--|--|---|---|
| Assign process variable    | –  | Select process variable for low flow cut off.                                  | <div>■ Off</div> <div>■ Mass flow</div> <div>■ Volume flow</div> <div>■ Corrected volume flow</div> | –                                       |
| On value low flow cutoff   | A process variable is selected in the <b>Assign process variable</b> parameter (→ 66). | 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 <b>Assign process variable</b> parameter (→ 66). | Enter off value for low flow cut off.  | 0 to 100.0 %  | –                                       |
| Pressure shock suppression | A process variable is selected in the <b>Assign process variable</b> parameter (→ 66). | Enter time frame for signal suppression (= active pressure shock suppression). | 0 to 100 s  | –                                       |

### 10.6.6 Partially filled pipe detection

The **Partially filled pipe detection** submenu contains parameters that have to be set for configuring empty pipe detection.

#### Navigation

"Setup" menu → Partially filled pipe detection


|  |      |
|--|------|
| ► Partially filled pipe detection        |      |
| Assign process variable                  | → 67 |
| Low value partial filled pipe detection  | → 67 |
| High value partial filled pipe detection | → 67 |
| Response time part. filled pipe detect.  | → 67 |

#### Parameter overview with brief description

| Parameter                                | Prerequisite   | Description  | Selection / User entry  | Factory setting   |
|--|--|--|---|---|
| Assign process variable                  | –  | Select process variable for partially filled pipe detection.   | <ul style="list-style-type: none"> <li>■ Off</li> <li>■ Density</li> <li>■ Reference density</li> </ul> | Density   |
| Low value partial filled pipe detection  | A process variable is selected in the <b>Assign process variable</b> parameter (→ 67). | Enter lower limit value for deactivating partialy filled pipe detection.   | Signed floating-point number  | Depends on country: <ul style="list-style-type: none"> <li>■ 200 kg/m<sup>3</sup></li> <li>■ 12.5 lb/ft<sup>3</sup></li> </ul>    |
| High value partial filled pipe detection | A process variable is selected in the <b>Assign process variable</b> parameter (→ 67). | Enter upper limit value for deactivating partialy filled pipe detection.   | Signed floating-point number  | Depends on country: <ul style="list-style-type: none"> <li>■ 6 000 kg/m<sup>3</sup></li> <li>■ 374.6 lb/ft<sup>3</sup></li> </ul> |
| Response time part. filled pipe detect.  | A process variable is selected in the <b>Assign process variable</b> parameter (→ 67). | 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  | –   |

## 10.7 Advanced settings

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

 The number of submenus can vary depending on the device version, e.g. viscosity is available only with the Promass I.

### Navigation

"Setup" menu → Advanced setup

▶ Advanced setup

Enter access code

→ 68

▶ Calculated values

→ 68

▶ Sensor adjustment

→ 70

▶ Totalizer 1 to n

→ 71

▶ Display

▶ Viscosity

▶ Concentration

▶ Heartbeat setup

▶ Administration

→ 72

### 10.7.1 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 |

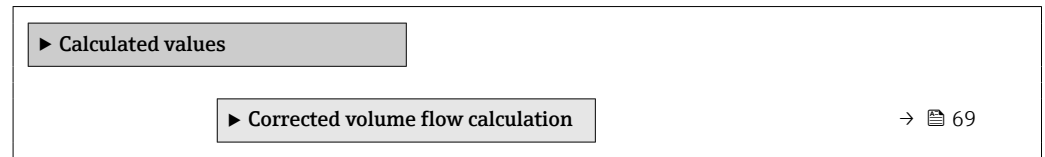
### 10.7.2 Calculated process variables

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

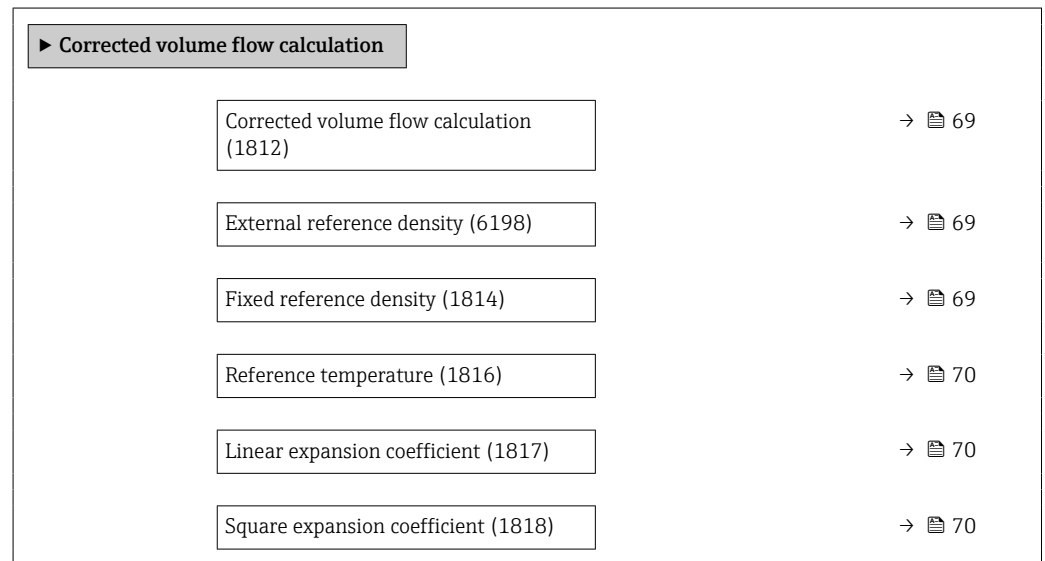
 The **Calculated values** submenu is **not** available if one of the following options was selected in the **Petroleum mode** parameter in the "Application package", option **EJ "Petroleum"**: **API referenced correction** option, **Net oil & water cut** option or **ASTM D4311** option

**Navigation**

"Setup" menu → Advanced setup → Calculated values

**"Corrected volume flow calculation" submenu****Navigation**

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

**Parameter overview with brief description**

| Parameter                         | Prerequisite   | Description   | Selection / User interface / User entry  | Factory setting |
|-----------------------------------|--|---|--|-----------------|
| Corrected volume flow calculation | –  | Select reference density for calculating the corrected volume flow. | <ul style="list-style-type: none"> <li>■ Fixed reference density</li> <li>■ Calculated reference density</li> <li>■ Reference density by API table 53</li> <li>■ External reference density</li> </ul> | –               |
| External reference density        | In the <b>Corrected volume flow calculation</b> parameter, the <b>External reference density</b> option is selected. | Shows external reference density.                                   | Floating point number with sign  | –               |
| Fixed reference density           | The <b>Fixed reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter.     | Enter fixed value for reference density.                            | Positive floating-point number   | –               |

| Parameter                    | Prerequisite  | Description  | Selection / User interface / User entry | Factory setting                           |
|------------------------------|---|--|---|---|
| Reference temperature        | The <b>Calculated reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter parameter. | Enter reference temperature for calculating the reference density.   | -273.15 to 99 999 °C                    | Country-specific:<br>■ +20 °C<br>■ +68 °F |
| Linear expansion coefficient | The <b>Calculated reference density</b> option is selected in the <b>Corrected volume flow calculation</b> parameter parameter. | Enter linear, medium-specific expansion coefficient for calculating the reference density.   | Signed floating-point number            | –   |
| Square expansion coefficient | The <b>Calculated reference density</b> option is selected in the <b>Corrected volume flow calculation</b> 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            | –   |

### 10.7.3 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

→ 70

► Density adjustment

► Zero verification

► Zero adjustment

#### Parameter overview with brief description


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

#### Zero verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 139. 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 measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity media).
- For gas applications with low pressure.

 To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stress during operation.

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 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.

### Navigation


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

▶ Zero point adjustment

Zero point adjustment control

→  71

Progress

→  71

### Parameter overview with brief description

| Parameter                     | Description                        | Selection / User interface   | Factory setting |
|-------------------------------|------------------------------------|--|-----------------|
| Zero point adjustment control | Start zero point adjustment.       | <ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Busy</li> <li>■ Zero point adjust failure</li> <li>■ Start</li> </ul> | –               |
| Progress                      | Shows the progress of the process. | 0 to 100 %   | –               |

## 10.7.4 Configuring the totalizer

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

**Navigation**

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

|                           |   |      |
|---------------------------|---|------|
| ► <b>Totalizer 1 to n</b> |   |      |
| Assign process variable   | → | 📄 72 |
| Unit totalizer            | → | 📄 72 |
| Totalizer operation mode  | → | 📄 72 |
| Failure mode              | → | 📄 72 |

**Parameter overview with brief description**

| Parameter                | Prerequisite  | Description   | Selection  | Factory setting  |
|--------------------------|---|---|--|--|
| Assign process variable  | –   | Select process variable for totalizer.                        | <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>                                      | –  |
| Unit totalizer           | One of the following options is selected in the <b>Assign process variable</b> parameter: <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul>  | Select the unit for the process variable of the totalizer.    | Unit choose list   | Country-specific: <ul style="list-style-type: none"> <li>■ kg</li> <li>■ lb</li> </ul> |
| Totalizer operation mode | In the <b>Assign process variable</b> parameter, one of the following options is selected: <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul> | Select totalizer calculation mode.                            | <ul style="list-style-type: none"> <li>■ Net flow total</li> <li>■ Forward flow total</li> <li>■ Reverse flow total</li> <li>■ Last valid value</li> </ul> | –  |
| Failure mode             | In the <b>Assign process variable</b> parameter, one of the following options is selected: <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul> | Define the totalizer behavior in the event of a device alarm. | <ul style="list-style-type: none"> <li>■ Stop</li> <li>■ Actual value</li> <li>■ Last valid value</li> </ul>   | –  |

\* Visibility depends on order options or device settings

**10.7.5 Using parameters for device administration**

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



Navigation

"Setup" menu → Advanced setup → Administration

► Administration

Define access code

→ 73

Device reset

→ 73

Parameter overview with brief description

| Parameter          | Description   | User entry / Selection   |
|--------------------|---|--|
| Define access code | Define release code for write access to parameters.                               | 0 to 9999  |
| Device reset       | Reset the device configuration - either entirely or in part - to a defined state. | <ul style="list-style-type: none"><li>■ Cancel</li><li>■ To delivery settings</li><li>■ Restart device</li><li>■ Delete powerfail storage</li><li>■ Delete T-DAT</li><li>■ Delete factory data</li></ul> |

10.8 Simulation

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

Navigation

"Diagnostics" menu → Simulation

► Simulation

Assign simulation process variable

→ 74

Process variable value

→ 74


Simulation device alarm

→ 74

Diagnostic event simulation

→ 74




### Parameter overview with brief description

| Parameter                          | Prerequisite  | Description   | Selection / User entry  |
|------------------------------------|---|---|---|
| Assign simulation process variable | –   | Select a process variable for the simulation process that is activated. | <ul style="list-style-type: none"> <li>■ Off</li> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Density</li> <li>■ Reference density</li> <li>■ Temperature *</li> <li>■ Concentration *</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul> |
| Process variable value             | A process variable is selected in the <b>Assign simulation process variable</b> parameter (→  74). | Enter the simulation value for the selected process variable.           | Depends on the process variable selected  |
| Simulation device alarm            | –   | Switch the device alarm on and off.                                     | <ul style="list-style-type: none"> <li>■ Off</li> <li>■ On</li> </ul>   |
| Diagnostic event category          | –   | Select a diagnostic event category.                                     | <ul style="list-style-type: none"> <li>■ Sensor</li> <li>■ Electronics</li> <li>■ Configuration</li> <li>■ Process</li> </ul>   |
| Diagnostic event simulation        | –   | Select a diagnostic event to simulate this event.                       | <ul style="list-style-type: none"> <li>■ Off</li> <li>■ Diagnostic event picklist (depends on the category selected)</li> </ul>   |

\* Visibility depends on order options or device settings

## 10.9 Protecting settings from unauthorized access

The following options exist for protecting the configuration of the measuring device from unintentional modification after commissioning:

- Write protection via access code for Web browser →  74
- Write protection via write protection switch →  75
- Write protection via startup parameterization →  59

### 10.9.1 Write protection via access code


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

#### Navigation


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

▶ Administration

Define access code



→  73

Device reset

→  73

#### Defining the access code via the web browser

1. Navigate to the **Define access code** parameter.
2. Define a 16-digit (max.) numeric code as the access code.

3. Enter the access code again in the to confirm.
  - ↳ The web browser switches to the login page.
- 
  - Disabling parameter write protection via access code .
  - If the access code is lost: Resetting the access code .
  - The **Access status tooling** parameter shows which user role the user is currently logged in with.
    - Navigation path: Operation → Access status tooling
    - User roles and their access rights →  38

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


### 10.9.2 Write protection via write protection switch

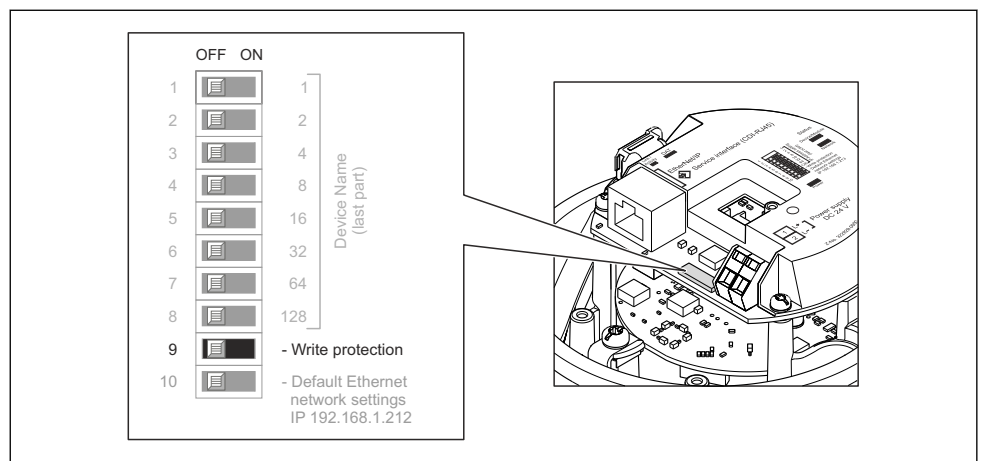
The write protection switch makes it possible to block write access to the entire operating menu with the exception of the following parameters:

- External pressure
- External temperature
- Reference density
- All parameters for configuring the totalizer

The parameter values are now read only and cannot be edited any more:

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

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary  
→  150.
- 3.



A0028081

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

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

4. Reverse the removal procedure to reassemble the transmitter.

### 10.9.3 Write protection via startup parameterization

Software write protection can be enabled via startup parameterization. If software write protection is enabled, device configuration can only be performed via the PROFINET controller. In this case, write access is **no longer** possible via:

- Acyclic PROFINET communication
- Service interface
- Web server



Startup parameterization settings .

# 11 Operation

## 11.1 Reading the device locking status

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

**Navigation**

"Operation" menu → Locking status

*Function scope of "Locking status" parameter*

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

## 11.2 Adjusting the operating language



Detailed information:

- To configure the operating language → 59
- For information on the operating languages supported by the measuring device → 151

## 11.3 Configuring the display

Detailed information:

On the advanced settings for the local display

## 11.4 Reading off measured values

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

**Navigation**

"Diagnostics" menu → Measured values























|                     |       |
|---------------------|-------|
| ► Measured values   |       |
| ► Process variables | →  77 |
| ► Totalizer         | →  87 |























### 11.4.1 "Measured variables" submenu

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





Navigation

"Diagnostics" menu → Measured values → Measured variables








| ► Measured variables          |   |  |
|-------------------------------|---|--|
| Mass flow                     | → |  80   |
| Volume flow                   | → |  80   |
| Corrected volume flow         | → |  80   |
| Density                       | → |  80   |
| Reference density             | → |  80   |
| Temperature                   | → |  80   |
| Pressure                      | → |  80   |
| Concentration                 | → |  80   |
| Target mass flow              | → |  81 |
| Carrier mass flow             | → |  81 |
| Target corrected volume flow  | → |  81 |
| Carrier corrected volume flow | → |  81 |
| Target volume flow            | → |  81 |
| Carrier volume flow           | → |  81 |
| CTL                           | → |  81 |
| CPL                           | → |  81 |
| CTPL                          | → |  81 |
| S&W volume flow               | → |  82 |
| S&W correction value          | → |  82 |
| Reference density alternative | → |  82 |
| GSV flow                      | → |  82 |
| GSV flow alternative          | → |  82 |




|                              |  |
|------------------------------|--|
| NSV flow                     | →  83   |
| NSV flow alternative         | →  83   |
| Oil CTL                      | →  83   |
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| Oil CTPL                     | →  83   |
| Water CTL                    | →  84   |
| CTL alternative              | →  84   |
| CPL alternative              | →  84   |
| CTPL alternative             | →  84   |
| Oil reference density        | →  84   |
| Water reference density      | →  85   |
| Oil density                  | →  85 |
| Water density                | →  85 |
| Water cut                    | →  85 |
| Oil volume flow              | →  85 |
| Oil corrected volume flow    | →  86 |
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| Water corrected volume flow  | →  86 |
| Water mass flow              | →  86 |
| Weighted density average     | →  87 |
| Weighted temperature average | →  87 |






## Parameter overview with brief description






| Parameter             | Prerequisite   | Description   | User interface               | Factory setting |
|-----------------------|--|---|------------------------------|-----------------|
| Mass flow             | –  | Displays the mass flow that is currently measured.<br><i>Dependency</i><br>The unit is taken from: <b>Mass flow unit</b> parameter (→  61)                           | Signed floating-point number | –               |
| Volume flow           | –  | Displays the volume flow that is currently calculated.<br><i>Dependency</i><br>The unit is taken from the <b>Volume flow unit</b> parameter (→  61).                 | Signed floating-point number | –               |
| Corrected volume flow | –  | Displays the corrected volume flow that is currently calculated.<br><i>Dependency</i><br>The unit is taken from: <b>Corrected volume flow unit</b> parameter (→  61) | Signed floating-point number | –               |
| Density               | –  | Shows the density currently measured.<br><i>Dependency</i><br>The unit is taken from the <b>Density unit</b> parameter (→  61).                                    | Signed floating-point number | –               |
| Reference density     | –  | Displays the reference density that is currently calculated.<br><i>Dependency</i><br>The unit is taken from: <b>Reference density unit</b> parameter (→  61)       | Signed floating-point number | –               |
| Temperature           | –  | Shows the medium temperature currently measured.<br><i>Dependency</i><br>The unit is taken from: <b>Temperature unit</b> parameter (→  62)                         | Signed floating-point number | –               |
| Pressure value        | –  | Displays either a fixed or external pressure value.<br><i>Dependency</i><br>The unit is taken from the <b>Pressure unit</b> parameter (→  62).                     | Signed floating-point number | –               |
| Concentration         | For the following order code: Order code for "Application package", option <b>ED</b> "Concentration"<br> The software options currently enabled are displayed in the <b>Software option overview</b> parameter. | Displays the concentration that is currently calculated.<br><i>Dependency</i><br>The unit is taken from the <b>Concentration unit</b> parameter.  | Signed floating-point number | –               |













| Parameter                     | Prerequisite   | Description   | User interface                 | Factory setting |
|-------------------------------|--|---|--------------------------------|-----------------|
| Target mass flow              | <p>With the following conditions:<br/>Order code for "Application package", option <b>ED</b> "Concentration"</p> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | <p>Displays the mass flow that is currently measured for the target medium.</p> <p><i>Dependency</i><br/>The unit is taken from: <b>Mass flow unit</b> parameter (→  61)</p> | Signed floating-point number   | –               |
| Carrier mass flow             | <p>With the following conditions:<br/>Order code for "Application package", option <b>ED</b> "Concentration"</p> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | <p>Displays the mass flow of the carrier medium that is currently measured.</p> <p><i>Dependency</i><br/>The unit is taken from: <b>Mass flow unit</b> parameter (→  61)</p> | Signed floating-point number   | –               |
| Target corrected volume flow  | –  |   | Signed floating-point number   | –               |
| Carrier corrected volume flow | –  |   | Signed floating-point number   | –               |
| Target volume flow            | –  |   | Signed floating-point number   | –               |
| Carrier volume flow           | –  |   | Signed floating-point number   | –               |
| CTL                           | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>API referenced correction</b> option is selected in <b>Petroleum mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the calibration factor which represents the effect of temperature on the fluid. This is used to convert the measured volume flow and the measured density to values at reference temperature.  | Positive floating-point number | –               |
| CPL                           | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>API referenced correction</b> option is selected in <b>Petroleum mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the calibration factor which represents the effect of pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at reference pressure.  | Positive floating-point number | –               |
| CTPL                          | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>API referenced correction</b> option is selected in <b>Petroleum mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the combined calibration factor which represents the effect of temperature and pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at reference temperature and reference pressure.           | Positive floating-point number | –               |



| Parameter                     | Prerequisite   | Description   | User interface                 | Factory setting |
|-------------------------------|--|---|--------------------------------|-----------------|
| S&W volume flow               | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>API referenced correction</b> option is selected in <b>Petroleum mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>                                   | <p>Displays the S&amp;W volume flow which is calculated from the measured total volume flow minus the net volume flow.</p> <p><i>Dependency</i><br/>The unit is taken from:<br/><b>Volume flow unit</b> parameter</p>                           | Signed floating-point number   | –               |
| S&W correction value          | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>External value</b> option or <b>Current input 1...n</b> option is selected in the <b>S&amp;W input mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | <p>Shows the correction value for sediment and water.</p>   | Positive floating-point number | –               |
| Reference density alternative | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>                            | <p>Displays the fluid density at the alternative reference temperature.</p> <p><i>Dependency</i><br/>The unit is taken from:<br/><b>Reference density unit</b> parameter</p>  | Signed floating-point number   | –               |
| GSV flow                      | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>API referenced correction</b> option is selected in <b>Petroleum mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>                                 | <p>Displays the measured total volume flow, corrected to the reference temperature and the reference pressure.</p> <p><i>Dependency</i><br/>The unit is taken from:<br/><b>Corrected volume flow unit</b> parameter</p>                         | Signed floating-point number   | –               |
| GSV flow alternative          | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>                            | <p>Displays the measured total volume flow, corrected to the alternative reference temperature and the alternative reference pressure.</p> <p><i>Dependency</i><br/>The unit is taken from:<br/><b>Corrected volume flow unit</b> parameter</p> | Signed floating-point number   | –               |

| Parameter            | Prerequisite  | Description   | User interface                 | Factory setting |
|----------------------|---|---|--------------------------------|-----------------|
| NSV flow             | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ The <b>API referenced correction</b> option is selected in <b>Petroleum mode</b> parameter.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>      | <p>Displays the net volume flow which is calculated from the measured total volume flow minus the value for sediment &amp; water and minus the shrinkage.</p> <p><i>Dependency</i><br/>The unit is taken from: <b>Corrected volume flow unit</b> parameter</p>        | Signed floating-point number   | –               |
| NSV flow alternative | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | <p>Displays the net volume flow which is calculated from the measured alternative total volume minus the value for sediment &amp; water and minus the shrinkage.</p> <p><i>Dependency</i><br/>The unit is taken from: <b>Corrected volume flow unit</b> parameter</p> | Signed floating-point number   | –               |
| Oil CTL              | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the correction factor which represents the effect of temperature on the oil. This is used to convert the measured oil volume flow and the measured oil density to values at reference temperature.   | Positive floating-point number | –               |
| Oil CPL              | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the correction factor which represents the effect of pressure on the oil. This is used to convert the measured oil volume flow and the measured oil density to values at reference pressure.   | Positive floating-point number | –               |
| Oil CTPL             | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option EJ "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the combined correction factor which represents the effect of temperature and pressure on the oil. This is used to convert the measured oil volume flow and the measured oil density to values at reference temperature and reference pressure.              | Positive floating-point number | –               |

| Parameter             | Prerequisite   | Description  | User interface                 | Factory setting |
|-----------------------|--|--|--------------------------------|-----------------|
| Water CTL             | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>     | Displays the correction factor which represents the effect of temperature on the water. This is used to convert the measured water volume flow and the measured water density to values at reference temperature.  | Positive floating-point number | –               |
| CTL alternative       | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | Displays the correction factor which represents the effect of temperature on the fluid. This is used to convert the measured volume flow and the measured density to values at the alternative reference temperature.  | Positive floating-point number | –               |
| CPL alternative       | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the correction factor which represents the effect of pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at the alternative reference pressure.  | Positive floating-point number | –               |
| CTPL alternative      | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the combined correction factor which represents the effect of temperature and pressure on the fluid. This is used to convert the measured volume flow and the measured density to values at the alternative reference temperature and the alternative reference pressure. | Positive floating-point number | –               |
| Oil reference density | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   |  | Signed floating-point number   | –               |

| Parameter               | Prerequisite   | Description   | User interface               | Factory setting |
|-------------------------|--|---|------------------------------|-----------------|
| Water reference density | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ "Petroleum"</b></li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>     |   | Signed floating-point number | –               |
| Oil density             | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ "Petroleum"</b></li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>     | Displays the density of the oil currently measured.   | Signed floating-point number | –               |
| Water density           | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ "Petroleum"</b></li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | Displays the density of the water currently measured.   | Signed floating-point number | –               |
| Water cut               | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ "Petroleum"</b></li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>API referenced correction</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | Displays the percentage water volume flow in relation to the total volume flow of the fluid.  | 0 to 100 %                   | –               |
| Oil volume flow         | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ "Petroleum"</b></li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | <p>Displays the currently calculated volume flow of the oil.</p> <p>Dependency:</p> <ul style="list-style-type: none"> <li>▪ Based on the value displayed in the <b>Water cut</b> parameter</li> <li>▪ The unit is taken from: <b>Volume flow unit</b> parameter</li> </ul> | Signed floating-point number | –               |

| Parameter                   | Prerequisite   | Description   | User interface               | Factory setting |
|-----------------------------|--|---|------------------------------|-----------------|
| Oil corrected volume flow   | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | <p>Displays the currently calculated volume flow of the oil, calculated to values at reference temperature and reference pressure.</p> <p>Dependency:</p> <ul style="list-style-type: none"> <li>▪ Based on the value displayed in the <b>Water cut</b> parameter</li> <li>▪ The unit is taken from: <b>Corrected volume flow unit</b> parameter</li> </ul>   | Signed floating-point number | –               |
| Oil mass flow               | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p>   | <p>Displays the currently calculated mass flow of the oil.</p> <p>Dependency:</p> <ul style="list-style-type: none"> <li>▪ Based on the value displayed in the <b>Water cut</b> parameter</li> <li>▪ The unit is taken from: <b>Mass flow unit</b> parameter</li> </ul>   | Signed floating-point number | –               |
| Water volume flow           | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | <p>Displays the currently calculated volume flow of the water.</p> <p>Dependency:</p> <ul style="list-style-type: none"> <li>▪ Based on the value displayed in the <b>Water cut</b> parameter</li> <li>▪ The unit is taken from: <b>Volume flow unit</b> parameter</li> </ul>   | Signed floating-point number | –               |
| Water corrected volume flow | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | <p>Displays the currently calculated volume flow of the water, calculated to values at reference temperature and reference pressure.</p> <p>Dependency:</p> <ul style="list-style-type: none"> <li>▪ Based on the value displayed in the <b>Water cut</b> parameter</li> <li>▪ The unit is taken from: <b>Corrected volume flow unit</b> parameter</li> </ul> | Signed floating-point number | –               |
| Water mass flow             | <p>For the following order code:</p> <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ In the <b>Petroleum mode</b> parameter, the <b>Net oil &amp; water cut</b> option is selected.</li> </ul> <p> The software options currently enabled are displayed in the <b>Software option overview</b> parameter.</p> | <p>Displays the currently calculated mass flow of the water.</p> <p>Dependency:</p> <ul style="list-style-type: none"> <li>▪ Based on the value displayed in the <b>Water cut</b> parameter</li> <li>▪ The unit is taken from: <b>Mass flow unit</b> parameter</li> </ul>   | Signed floating-point number | –               |



| Parameter                    | Prerequisite   | Description  | User interface               | Factory setting |
|------------------------------|--|--|------------------------------|-----------------|
| Weighted density average     | For the following order code: <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ "Application package", option <b>EM</b> "Petroleum + Locking function"</li> </ul>  The software options currently enabled are displayed in the <b>Software option overview</b> parameter. | Displays the weighted average for the density since the last time the density averages were reset.<br><br>Dependency: <ul style="list-style-type: none"> <li>▪ The unit is taken from: <b>Density unit</b> parameter</li> <li>▪ The value is reset to NaN (Not a Number) via the <b>Reset weighted averages</b> parameter</li> </ul>             | Signed floating-point number | –               |
| Weighted temperature average | For the following order code: <ul style="list-style-type: none"> <li>▪ "Application package", option <b>EJ</b> "Petroleum"</li> <li>▪ "Application package", option <b>EM</b> "Petroleum + Locking function"</li> </ul>  The software options currently enabled are displayed in the <b>Software option overview</b> parameter. | Displays the weighted average for the temperature since the last time the temperature averages were reset.<br><br>Dependency: <ul style="list-style-type: none"> <li>▪ The unit is taken from: <b>Temperature unit</b> parameter</li> <li>▪ The value is reset to NaN (Not a Number) via the <b>Reset weighted averages</b> parameter</li> </ul> | 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

|                           |  |
|---------------------------|--|
| ► <b>Totalizer</b>        |  |
| Totalizer value 1 to n    | →  88 |
| Totalizer overflow 1 to n | →  88 |

Parameter overview with brief description

| Parameter                 | Prerequisite  | Description                                   | User interface               |
|---------------------------|---|---|------------------------------|
| Totalizer value 1 to n    | One of the following options is selected in the <b>Assign process variable</b> parameter of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"><li>■ Volume flow</li><li>■ Mass flow</li><li>■ Corrected volume flow</li><li>■ Target mass flow *</li><li>■ Carrier mass flow *</li></ul> | Displays the current totalizer counter value. | Signed floating-point number |
| Totalizer overflow 1 to n | One of the following options is selected in the <b>Assign process variable</b> parameter of the <b>Totalizer 1 to n</b> submenu: <ul style="list-style-type: none"><li>■ Volume flow</li><li>■ Mass flow</li><li>■ Corrected volume flow</li><li>■ Target mass flow *</li><li>■ Carrier mass flow *</li></ul> | Displays the current totalizer overflow.      | Integer with sign            |

\* Visibility depends on order options or device settings

11.5 Adapting the measuring device to the process conditions

- The following are available for this purpose:
- Basic settings using the **Setup** menu (→ 59)
  - Advanced settings using the **Advanced setup** submenu (→ 68)

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

→ 89

Preset value 1 to n


→ 89

Reset all totalizers

→ 89



### Parameter overview with brief description

| Parameter                | Prerequisite   | Description   | Selection / User entry   | Factory setting  |
|--------------------------|--|---|--|--|
| Control Totalizer 1 to n | A process variable is selected in the <b>Assign process variable</b> parameter of the <b>Totalizer 1 to n</b> submenu. | Control totalizer value.  | <ul style="list-style-type: none"> <li>■ Totalize</li> <li>■ Reset + hold</li> <li>■ Preset + hold</li> <li>■ Reset + totalize</li> <li>■ Preset + totalize</li> <li>■ Hold</li> </ul> | –  |
| Preset value 1 to n      | A process variable is selected in the <b>Assign process variable</b> parameter of the <b>Totalizer 1 to n</b> submenu. | Specify start value for totalizer.<br><i>Dependency</i><br> The unit of the selected process variable is defined in the <b>Unit totalizer</b> parameter for the totalizer. | Signed floating-point number   | Depends on country: <ul style="list-style-type: none"> <li>■ 0 kg</li> <li>■ 0 lb</li> </ul> |
| Reset all totalizers     | –  | Reset all totalizers to 0 and start.  | <ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Reset + totalize</li> </ul>   | –  |

#### 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 <sup>1)</sup>     | The totaling process is stopped and the totalizer is set to its defined start value from the <b>Preset value</b> parameter. |
| Reset + totalize                | The totalizer is reset to 0 and the totaling process is restarted.  |
| Preset + totalize <sup>1)</sup> | The totalizer is set to the defined start value in the <b>Preset value</b> parameter and the totaling process is restarted. |

1) Visible depending on the order options or device settings

#### 11.6.2 Function range of "Reset all totalizers" parameter

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

## 12 Diagnostics and troubleshooting

### 12.1 General troubleshooting

#### For local display

| Fault   | Possible causes  | Remedial action  |
|---|--|--|
| Local display is dark, but signal output is within the valid range        | The cable of the display module is not plugged in correctly.                 | Insert the plug correctly into the main electronics module and display module.   |
| Local display dark and no output signals                                  | Supply voltage does not match the voltage specified on the nameplate.        | Apply the correct supply voltage → 28.   |
| Local display dark and no output signals                                  | Supply voltage has incorrect polarity.                                       | Reverse polarity of supply voltage.  |
| Local display dark and no output signals                                  | No contact between connecting cables and terminals.                          | Check the electrical contact between the cable and terminals and correct if necessary.   |
| Local display dark and no output signals                                  | Terminals are not plugged into the I/O electronics module correctly.         | Check terminals.   |
| Local display dark and no output signals                                  | I/O electronics module is defective.   | Order spare part → 126.  |
| Local display cannot be read, but signal output is within the valid range | Display is set too bright or too dark.                                       | <ul style="list-style-type: none"> <li>Set the display brighter by simultaneously pressing  + .</li> <li>Set the display darker by simultaneously pressing  + .</li> </ul>   |
| Local display is dark, but signal output is within the valid range        | Display module is defective.   | Order spare part → 126.  |
| Backlighting of local display is red                                      | Diagnostic event with "Alarm" diagnostic behavior has occurred.              | Take remedial actions → 98   |
| Message on local display:<br>"Communication Error"<br>"Check Electronics" | Communication between the display module and the electronics is interrupted. | <ul style="list-style-type: none"> <li>Check the cable and the connector between the main electronics module and display module.</li> <li>Order spare part → 126.</li> </ul> |

#### For output signals

| Fault   | Possible causes   | Remedial action   |
|---|---|---|
| Green power LED on the main electronics module of the transmitter is dark | Supply voltage does not match the voltage specified on the nameplate. | Apply the correct supply voltage → 28.  |
| Device is measuring incorrectly.  | Configuration error or device is operated outside the application.    | <ol style="list-style-type: none"> <li>Check and correct parameter configuration.</li> <li>Observe limit values specified in the "Technical Data".</li> </ol> |

#### For access

| Fault   | Possible causes   | Remedial action   |
|---|---|---|
| Write access to parameters is not possible.   | Hardware write protection is enabled.                       | Set the write protection switch on the main electronics module to the <b>OFF</b> position → 75.   |
| Connection via PROFINET is not possible.      | PROFINET bus cable is connected incorrectly.                | Check the terminal assignment → 26.   |
| Connection via PROFINET is not possible.      | Device plug is connected incorrectly.                       | Check the pin assignment of the device plugs .  |
| Connection to the web server is not possible. | Web server is disabled.                                     | Use the "FieldCare" or "DeviceCare" operating tool to check if the web server of the device is enabled and enable if necessary → 43.                                |
|   | The Ethernet interface on the PC is incorrectly configured. | <ul style="list-style-type: none"> <li>Check the properties of the Internet protocol (TCP/IP) .</li> <li>Check the network settings with the IT manager.</li> </ul> |

| Fault  | Possible causes   | Remedial action   |
|--|---|---|
| Connection to the web server is not possible.  | <ul style="list-style-type: none"> <li>The IP address on the PC is incorrectly configured.</li> <li>IP address is not known.</li> </ul> | <ul style="list-style-type: none"> <li>If addressing via hardware: open the transmitter and check the configured IP address (last octet).</li> <li>Check the IP address of the device with the IT specialist.</li> <li>If the IP address is not known, set DIP switch no. 10 to ON, restart the device and enter the factory IP address 192.168.1.212.</li> </ul> |
|  | The web browser setting "Use a proxy server for LAN" is enabled on the PC.  | Disable the use of the proxy server in the LAN settings.  |
|  | Apart from the active network connection to the measuring instrument, other network connections are also being used.                    | <ul style="list-style-type: none"> <li>Make sure that no other network connections are established by the computer and close other programs with network access to the computer.</li> <li>If using a docking station for notebooks, make sure that a network connection to another network is not active.</li> </ul>  |
| Web browser is frozen and operation no longer possible   | Data transfer is active.  | Wait until data transfer or current action is finished.   |
|  | Connection lost   | <ul style="list-style-type: none"> <li>Check cable connection and power supply.</li> <li>Refresh the web browser and restart if necessary.</li> </ul>   |
| Display of web browser content is difficult to read or incomplete.   | Web browser version used is not optimal.  | <ul style="list-style-type: none"> <li>Use correct web browser version → 39.</li> <li>Empty the web browser cache.</li> <li>Restart the web browser.</li> </ul>   |
|  | Unsuitable view settings.   | Change the font size/display ratio of the web browser.  |
| Incomplete or no display of content in the web browser   | <ul style="list-style-type: none"> <li>JavaScript is not enabled</li> <li>JavaScript cannot be enabled.</li> </ul>                      | <ul style="list-style-type: none"> <li>Enable JavaScript.</li> <li>Enter <code>http://XXX.XXX.X.XX/servlet/basic.html</code> as the IP address.</li> </ul>  |
| Operation with FieldCare or DeviceCare via service interface CDI-RJ45 (port 8000) is not possible.                           | Firewall of the PC or network is blocking communication.  | Depending on the settings of the firewall used on the PC or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.  |
| Flashing the firmware with FieldCare or DeviceCare via service interface CDI-RJ45 (port 8000 or TFTP ports) is not possible. | Firewall of the PC or network is blocking communication.  | Depending on the settings of the firewall used on the PC or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.  |

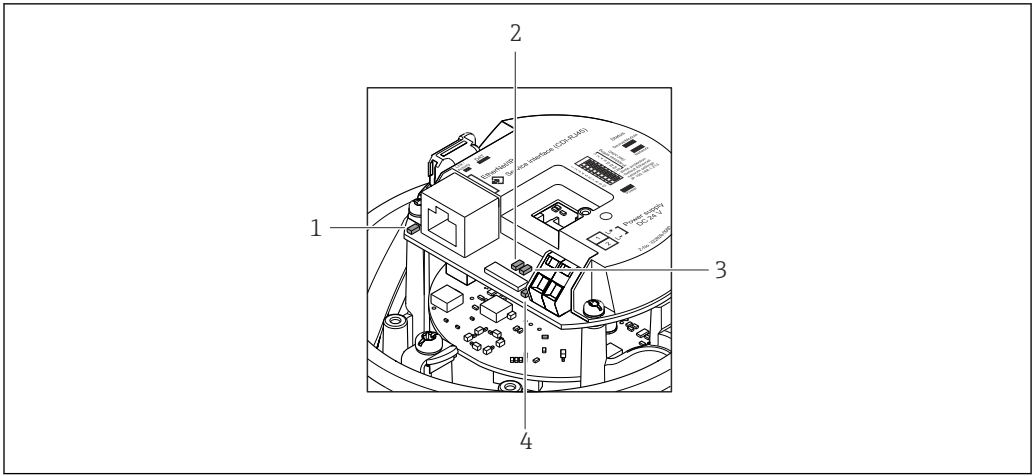
### For system integration

| Error  | Possible causes  | Remedy   |
|--|--|--|
| The PROFINET device name is not displayed correctly and contains coding. | A device name containing one or more underscores has been specified via the automation system. | Specify a correct device name (without underscores) via the automation system. |

## 12.2 Diagnostic information via LEDs

### 12.2.1 Transmitter

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



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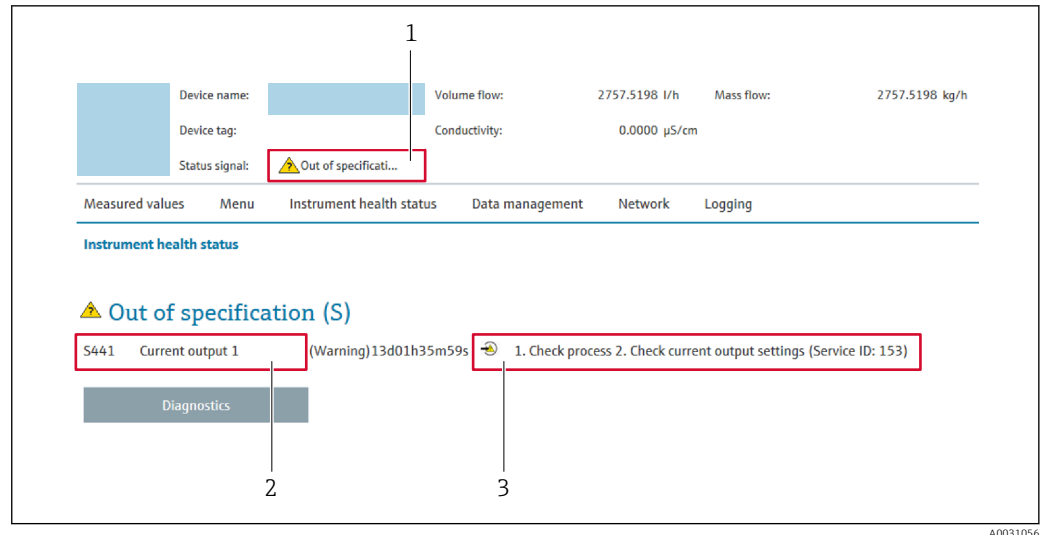
- 1    *Link/Activity*
- 2    *Network status*
- 3    *Device status*
- 4    *Supply voltage*

| LED            | Color           | Meaning   |
|----------------|-----------------|---|
| Supply voltage | OFF             | Supply voltage is off or too low  |
|                | Green           | Supply voltage is ok  |
| Device status  | Green           | Device status is ok   |
|                | Flashing red    | A device error of diagnostic behavior "Warning" has occurred  |
|                | Red             | A device error of diagnostic behavior "Alarm" has occurred  |
| Network status | Green           | Device performing cyclic data exchange  |
|                | Flashing green  | Following request from automation system:<br>Flash frequency: 1 Hz (flash functionality: 500 ms on, 500 ms off)<br>The device does not have an IP address, no cyclic data exchange<br>Flash frequency: 3 Hz |
|                | Red             | IP address is available but no connection to the automation system  |
|                | Flashing red    | Cyclic connection was established but connection was dropped<br>Flash frequency: 3 Hz   |
| Link/Activity  | Orange          | Link available but no activity  |
|                | Flashing orange | Activity present  |

### 12.3    Diagnostic information in the web browser

#### 12.3.1    Diagnostic options

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



- 1 Status area with status signal
- 2 Diagnostic information → 93
- 3 Remedial measures with service ID

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

- Via parameter → 119
- Via submenu → 120

### Status signals

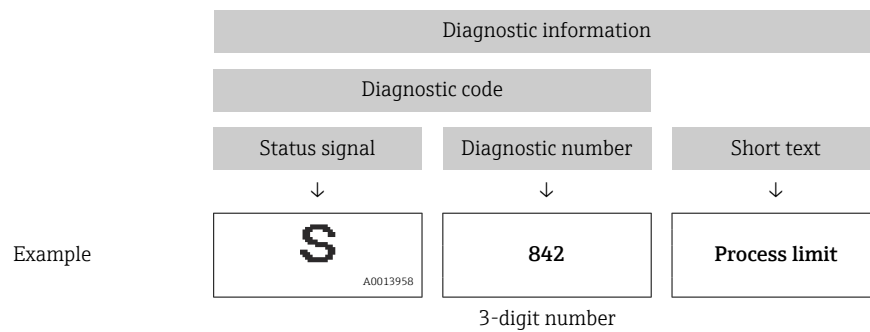
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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

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

### Diagnostic information

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



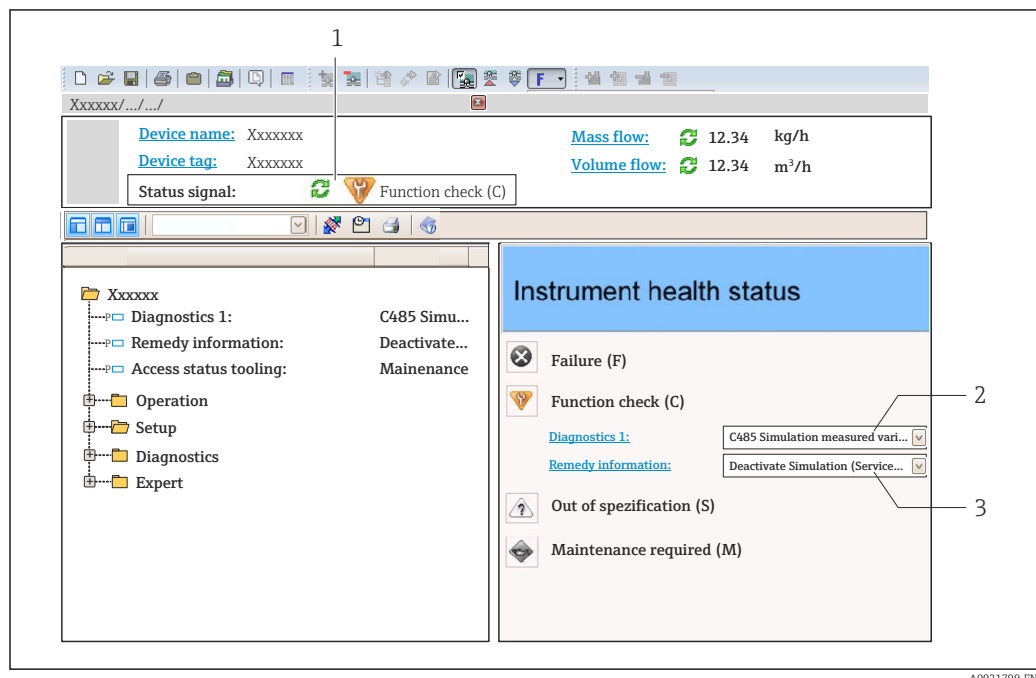
### 12.3.2 Calling up remedial actions

Remedial actions are provided for each diagnostic event to ensure that problems can be rectified quickly. These actions are displayed along with the diagnostic event and the related diagnostic information.

## 12.4 Diagnostic information in FieldCare or DeviceCare

### 12.4.1 Diagnostic options

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



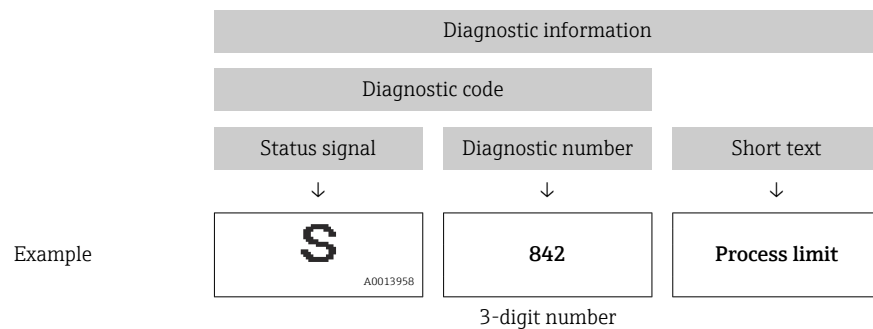
- 1 Status area with status signal
- 2 Diagnostic information → 93
- 3 Remedial actions with service ID

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

- Via parameter → 119
- Via submenu → 120

### Diagnostic information

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



### 12.4.2 Calling up remedy information

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

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

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

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

## 12.5 Adapting the diagnostic information

### 12.5.1 Adapting the diagnostic behavior

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

Expert → System → Diagnostic handling → Diagnostic behavior

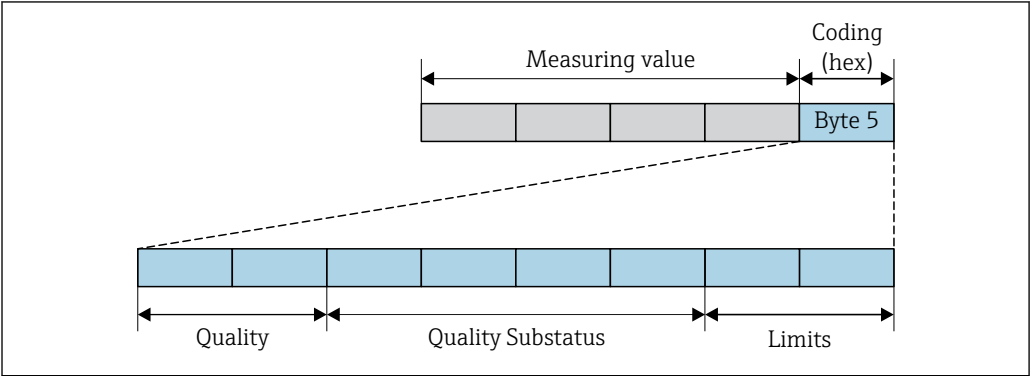
#### Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

| Diagnostic behavior | Description   |
|---------------------|---|
| Alarm               | The device stops measurement. The totalizers assume the defined alarm condition. A diagnostic message is generated.   |
| Warning             | The device continues to measure. Measured value output via PROFINET and totalizers are not affected. A diagnostic message is generated.   |
| Logbook entry only  | The device continues to measure. The diagnostic message is only displayed in the <b>Event logbook</b> submenu ( <b>Event list</b> submenu) and is not displayed in alternating sequence with the operational display. |
| Off                 | The diagnostic event is ignored, and no diagnostic message is generated or entered.   |

Displaying the measured value status

If modules with input data (e.g. Analog Input module, Discrete Input module, Totalizer module, Heartbeat module) are configured for cyclic data transmission, the measured value status is coded as per PROFINET PA Profile 4 Specification and transmitted along with the measured value to the PROFINET Controller via the status byte. The status byte is split into three segments: Quality, Quality Substatus and Limits.



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15 Structure of the status byte

The contents of the status byte depends on the configured failure mode in the individual function block. Depending on which failure mode has been configured, status information in accordance with PROFINET PA Profile Specification 4 is transmitted to the the PROFINET controller via the status byte status information. The two bits for the limits always have the value 0.

Supported status information

| Status                           | Coding (hex) |
|----------------------------------|--------------|
| BAD - Maintenance alarm          | 0x24         |
| BAD - Process related            | 0x28         |
| BAD - Function check             | 0x3C         |
| UNCERTAIN - Initial value        | 0x4F         |
| UNCERTAIN - Maintenance demanded | 0x68         |
| UNCERTAIN - Process related      | 0x78         |
| GOOD - OK                        | 0x80         |
| GOOD - Maintenance demanded      | 0xA8         |
| GOOD - Function check            | 0xBC         |

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

When the diagnostic behavior is assigned, this also changes the measured value status and device status for the diagnostic information. The measured value status and device status depend on the choice of diagnostic behavior and on the group in which the diagnostic information is located.



The diagnostic information is grouped as follows:

- Diagnostic information pertaining to the sensor: diagnostic number 000 to 199  
→ 97
- Diagnostic information pertaining to the electronics: diagnostic number 200 to 399  
→ 97
- Diagnostic information pertaining to the configuration: diagnostic number 400 to 599  
→ 98
- Diagnostic information pertaining to the process: diagnostic number 800 to 999  
→ 98

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

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

| Diagnostic behavior<br>(configurable) | Measured value status (fixed assignment) |                      |              |                  | Device diagnosis<br>(fixed assignment) |
|---------------------------------------|--|----------------------|--------------|------------------|--|
|                                       | Quality                                  | Quality Substatus    | Coding (hex) | Category (NE107) |  |
| Alarm                                 | BAD                                      | Maintenance alarm    | 0x24         | F (Failure)      | Maintenance alarm                      |
| Warning                               | GOOD                                     | Maintenance demanded | 0xA8         | M (Maintenance)  | Maintenance demanded                   |
| Logbook entry only                    | GOOD                                     | ok                   | 0x80         | –                | –                                      |
| Off                                   |  |                      |              |                  |  |

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

*Diagnostic number 200 to 301, 303 to 399*

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

*Diagnostic information 302*

| Diagnostic behavior<br>(configurable) | Measured value status (fixed assignment) |                                |              |                  | Device diagnostics<br>(fixed assignment) |
|---------------------------------------|--|--------------------------------|--------------|------------------|--|
|                                       | Quality                                  | Quality Substatus              | Coding (hex) | Category (NE107) |  |
| Alarm                                 | BAD                                      | Function check, local override | 0x24         | C                | Function check                           |
| Warning                               | GOOD                                     | Function check                 | 0xBC to 0xBF | –                | –  |

Diagnostic information 302 (device verification active) is output during internal or external Heartbeat verification.

- Signal status: Function check
- Choice of diagnostic behavior: alarm or warning (factory setting)

When the Heartbeat Verification is started, data logging is interrupted, the last valid measured value is output and the totalizer counter is stopped.




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

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

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

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

## 12.6 Overview of diagnostic information

-  The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.
- All of the measured variables affected in the entire Promass instrument family are always listed under "Measured variables affected". The measured variables available for the device in question depend on the device version. When assigning the measured variables to the device functions, for example to the individual outputs, all of the measured variables available for the device version in question are available for selection.
-  In the case of some items of diagnostic information, the diagnostic behavior can be changed. Adapting the diagnostic information →  95

### 12.6.1 Diagnostic of sensor

| Diagnostic information |                          |                   | Remedy instructions                                  | Influenced measured variables  |
|------------------------|--------------------------|-------------------|--|--|
| No.                    | Short text               |                   |  |  |
| 022                    | Sensor temperature       |                   | 1. Change main electronic module<br>2. Change sensor | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |  |  |
|                        | Quality                  | Bad               |  |  |
|                        | Quality substatus        | Maintenance alarm |  |  |
|                        | Coding (hex)             | 0x24 to 0x27      |  |  |
|                        | Status signal            | F                 |  |  |
|                        | Diagnostic behavior      | Alarm             |  |  |

| Diagnostic information |   |              | Remedy instructions                             | Influenced measured variables   |
|------------------------|---|--------------|---|---|
| No.                    | Short text  |              |   |   |
| 046                    | Sensor limit exceeded                                     |              | 1. Inspect sensor<br>2. Check process condition | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |   |   |
|                        | Quality   | Good         |   |   |
|                        | Quality substatus   | Ok           |   |   |
|                        | Coding (hex)  | 0x80 to 0x83 |   |   |
|                        | Status signal   | S            |   |   |
|                        | Diagnostic behavior                                       | Warning      |   |   |

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

| Diagnostic information |                          |                   | Remedy instructions                                  | Influenced measured variables  |
|------------------------|--------------------------|-------------------|--|--|
| No.                    | Short text               |                   |  |  |
| 062                    | Sensor connection        |                   | 1. Change main electronic module<br>2. Change sensor | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |  |  |
|                        | Quality                  | Bad               |  |  |
|                        | Quality substatus        | Maintenance alarm |  |  |
|                        | Coding (hex)             | 0x24 to 0x27      |  |  |
|                        | Status signal            | F                 |  |  |
|                        | Diagnostic behavior      | Alarm             |  |  |

| Diagnostic information |                          |                   | Remedy instructions                               | Influenced measured variables   |
|------------------------|--------------------------|-------------------|---|---|
| No.                    | Short text               |                   |   |   |
| 082                    | Data storage             |                   | 1. Check module connections<br>2. Contact service | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |   |   |
|                        | Quality                  | Bad               |   |   |
|                        | Quality substatus        | Maintenance alarm |   |   |
|                        | Coding (hex)             | 0x24 to 0x27      |   |   |
|                        | Status signal            | F                 |   |   |
|                        | Diagnostic behavior      | Alarm             |   |   |

| Diagnostic information |                          |                   | Remedy instructions                     | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---|--|
| No.                    | Short text               |                   |   |  |
| 083                    | Memory content           |                   | 1. Restart device<br>2. Contact service | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |   |  |
|                        | Quality                  | Bad               |   |  |
|                        | Quality substatus        | Maintenance alarm |   |  |
|                        | Coding (hex)             | 0x24 to 0x27      |   |  |
|                        | Status signal            | F                 |   |  |
|                        | Diagnostic behavior      | Alarm             |   |  |

| Diagnostic information |   |              | Remedy instructions                                     | Influenced measured variables   |
|------------------------|---|--------------|---|---|
| No.                    | Short text  |              |   |   |
| 140                    | Sensor signal   |              | 1. Check or change main electronics<br>2. Change sensor | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |   |   |
|                        | Quality   | Good         |   |   |
|                        | Quality substatus   | Ok           |   |   |
|                        | Coding (hex)  | 0x80 to 0x83 |   |   |
|                        | Status signal   | S            |   |   |
|                        | Diagnostic behavior                                       | Alarm        |   |   |

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

| Diagnostic information |  | Remedy instructions                                      | Influenced measured variables   |
|------------------------|--|--|---|
| No.                    | Short text   |  |   |
| 144                    | Measuring error too high   | 1. Check or change sensor<br>2. Check process conditions | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> </ul> |
|                        | <b>Measured variable status [from the factory] <sup>1)</sup></b> |  |   |
|                        | Quality  |  |   |
|                        | Quality substatus  |  |   |
|                        | Coding (hex)   |  |   |
|                        | Status signal  |  |   |
|                        | Diagnostic behavior  |  |   |

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

| Diagnostic information |                                 | Remedy instructions | Influenced measured variables  |
|------------------------|---------------------------------|---------------------|--|
| No.                    | Short text                      |                     |  |
| 190                    | Special event 1                 | Contact service     | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                     |  |
|                        | Quality                         |                     |  |
|                        | Quality substatus               |                     |  |
|                        | Coding (hex)                    |                     |  |
|                        | Status signal                   |                     |  |
|                        | Diagnostic behavior             |                     |  |

| Diagnostic information |                                 | Remedy instructions | Influenced measured variables  |
|------------------------|---------------------------------|---------------------|--|
| No.                    | Short text                      |                     |  |
| 191                    | Special event 5                 | Contact service     | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                     |  |
|                        | Quality                         |                     |  |
|                        | Quality substatus               |                     |  |
|                        | Coding (hex)                    |                     |  |
|                        | Status signal                   |                     |  |
|                        | Diagnostic behavior             |                     |  |

| Diagnostic information |   |              | Remedy instructions | Influenced measured variables  |
|------------------------|---|--------------|---------------------|--|
| No.                    | Short text  |              |                     |  |
| 192                    | Special event 9   |              | Contact service     | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                     |  |
|                        | Quality   | Good         |                     |  |
|                        | Quality substatus   | Ok           |                     |  |
|                        | Coding (hex)  | 0x80 to 0x83 |                     |  |
|                        | Status signal   | F            |                     |  |
|                        | Diagnostic behavior                                       | Alarm        |                     |  |

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

## 12.6.2 Diagnostic of electronic

| Diagnostic information |                          |                   | Remedy instructions                     | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---|--|
| No.                    | Short text               |                   |   |  |
| 201                    | Device failure           |                   | 1. Restart device<br>2. Contact service | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |   |  |
|                        | Quality                  | Bad               |   |  |
|                        | Quality substatus        | Maintenance alarm |   |  |
|                        | Coding (hex)             | 0x24 to 0x27      |   |  |
|                        | Status signal            | F                 |   |  |
|                        | Diagnostic behavior      | Alarm             |   |  |

| Diagnostic information |                          |                   | Remedy instructions   | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---|--|
| No.                    | Short text               |                   |   |  |
| 242                    | Software incompatible    |                   | 1. Check software<br>2. Flash or change main electronics module | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |   |  |
|                        | Quality                  | Bad               |   |  |
|                        | Quality substatus        | Maintenance alarm |   |  |
|                        | Coding (hex)             | 0x24 to 0x27      |   |  |
|                        | Status signal            | F                 |   |  |
|                        | Diagnostic behavior      | Alarm             |   |  |

| Diagnostic information |  | Remedy instructions   | Influenced measured variables  |
|------------------------|--|---|--|
| No.                    | Short text   |   |  |
| 252                    | Modules incompatible   | 1. Check electronic modules<br>2. Change electronic modules | <ul style="list-style-type: none"> <li>■ Carrier mass flow</li> <li>■ Concentration</li> <li>■ Density</li> <li>■ Dynamic viscosity</li> <li>■ Kinematic viscosity</li> <li>■ Mass flow</li> <li>■ Reference density</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow</li> <li>■ Temp. compensated dynamic viscosity</li> <li>■ Temp. compensated kinematic viscosity</li> <li>■ Temperature</li> <li>■ Status</li> <li>■ Volume flow</li> </ul> |
|                        | <b>Measured variable status [from the factory] <sup>1)</sup></b> |   |  |
|                        | Quality  |   |  |
|                        | Quality substatus  |   |  |
|                        | Coding (hex)   |   |  |
|                        | Status signal  |   |  |
|                        | Diagnostic behavior  |   |  |

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

| Diagnostic information |                                 | Remedy instructions                                       | Influenced measured variables  |
|------------------------|---------------------------------|---|--|
| No.                    | Short text                      |   |  |
| 262                    | Module connection               | 1. Check module connections<br>2. Change main electronics | <ul style="list-style-type: none"> <li>■ Carrier mass flow</li> <li>■ Concentration</li> <li>■ Density</li> <li>■ Dynamic viscosity</li> <li>■ Kinematic viscosity</li> <li>■ Mass flow</li> <li>■ Sensor integrity</li> <li>■ Reference density</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow</li> <li>■ Temp. compensated dynamic viscosity</li> <li>■ Temp. compensated kinematic viscosity</li> <li>■ Temperature</li> <li>■ Status</li> <li>■ Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |   |  |
|                        | Quality                         |   |  |
|                        | Quality substatus               |   |  |
|                        | Coding (hex)                    |   |  |
|                        | Status signal                   |   |  |
|                        | Diagnostic behavior             |   |  |

| Diagnostic information |                                 | Remedy instructions           | Influenced measured variables  |
|------------------------|---------------------------------|-------------------------------|--|
| No.                    | Short text                      |                               |  |
| 270                    | Main electronic failure         | Change main electronic module | <ul style="list-style-type: none"> <li>■ Carrier mass flow</li> <li>■ Concentration</li> <li>■ Density</li> <li>■ Dynamic viscosity</li> <li>■ Kinematic viscosity</li> <li>■ Mass flow</li> <li>■ Sensor integrity</li> <li>■ Reference density</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow</li> <li>■ Temp. compensated dynamic viscosity</li> <li>■ Temp. compensated kinematic viscosity</li> <li>■ Temperature</li> <li>■ Status</li> <li>■ Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                               |  |
|                        | Quality                         |                               |  |
|                        | Quality substatus               |                               |  |
|                        | Coding (hex)                    |                               |  |
|                        | Status signal                   |                               |  |
|                        | Diagnostic behavior             |                               |  |

| Diagnostic information |                                 | Remedy instructions                                   | Influenced measured variables  |
|------------------------|---------------------------------|---|--|
| No.                    | Short text                      |   |  |
| 271                    | Main electronic failure         | 1. Restart device<br>2. Change main electronic module | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |   |  |
|                        | Quality                         |   |  |
|                        | Quality substatus               |   |  |
|                        | Coding (hex)                    |   |  |
|                        | Status signal                   |   |  |
|                        | Diagnostic behavior             |   |  |

| Diagnostic information |                                 | Remedy instructions                     | Influenced measured variables  |
|------------------------|---------------------------------|---|--|
| No.                    | Short text                      |   |  |
| 272                    | Main electronic failure         | 1. Restart device<br>2. Contact service | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |   |  |
|                        | Quality                         |   |  |
|                        | Quality substatus               |   |  |
|                        | Coding (hex)                    |   |  |
|                        | Status signal                   |   |  |
|                        | Diagnostic behavior             |   |  |

| Diagnostic information |                                 | Remedy instructions | Influenced measured variables  |
|------------------------|---------------------------------|---------------------|--|
| No.                    | Short text                      |                     |  |
| 273                    | Main electronic failure         | Change electronic   | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                     |  |
|                        | Quality                         |                     |  |
|                        | Quality substatus               |                     |  |
|                        | Coding (hex)                    |                     |  |
|                        | Status signal                   |                     |  |
|                        | Diagnostic behavior             |                     |  |



| Diagnostic information |   |              | Remedy instructions | Influenced measured variables  |
|------------------------|---|--------------|---------------------|--|
| No.                    | Short text  |              |                     |  |
| 274                    | Main electronic failure                                   |              | Change electronic   | <div><div>■</div>Mass flow</div> <div><div>■</div>Sensor integrity</div> <div><div>■</div>Corrected volume flow</div> <div><div>■</div>Volume flow</div> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                     |  |
|                        | Quality   | Good         |                     |  |
|                        | Quality substatus   | Ok           |                     |  |
|                        | Coding (hex)  | 0x80 to 0x83 |                     |  |
|                        | Status signal   | S            |                     |  |
|                        | Diagnostic behavior                                       | Warning      |                     |  |

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

| Diagnostic information |                          |                   | Remedy instructions                   | Influenced measured variables   |
|------------------------|--------------------------|-------------------|---------------------------------------|---|
| No.                    | Short text               |                   |                                       |   |
| 283                    | Memory content           |                   | 1. Reset device<br>2. Contact service | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |                                       |   |
|                        | Quality                  | Bad               |                                       |   |
|                        | Quality substatus        | Maintenance alarm |                                       |   |
|                        | Coding (hex)             | 0x24 to 0x27      |                                       |   |
|                        | Status signal            | F                 |                                       |   |
|                        | Diagnostic behavior      | Alarm             |                                       |   |

| Diagnostic information |                          |                   | Remedy instructions                   | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---------------------------------------|--|
| No.                    | Short text               |                   |                                       |  |
| 311                    | Electronic failure       |                   | 1. Reset device<br>2. Contact service | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |                                       |  |
|                        | Quality                  | Bad               |                                       |  |
|                        | Quality substatus        | Maintenance alarm |                                       |  |
|                        | Coding (hex)             | 0x24 to 0x27      |                                       |  |
|                        | Status signal            | F                 |                                       |  |
|                        | Diagnostic behavior      | Alarm             |                                       |  |

| Diagnostic information |                                 | Remedy instructions                          | Influenced measured variables  |
|------------------------|---------------------------------|--|--|
| No.                    | Short text                      |  |  |
| 311                    | Electronic failure              | 1. Do not reset device<br>2. Contact service | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |  |  |
|                        | Quality                         |  |  |
|                        | Quality substatus               |  |  |
|                        | Coding (hex)                    |  |  |
|                        | Status signal                   |  |  |
|                        | Diagnostic behavior             |  |  |
|                        |                                 |  |  |

| Diagnostic information |                                 | Remedy instructions                          | Influenced measured variables  |
|------------------------|---------------------------------|--|--|
| No.                    | Short text                      |  |  |
| 382                    | Data storage                    | 1. Insert DAT module<br>2. Change DAT module | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |  |  |
|                        | Quality                         |  |  |
|                        | Quality substatus               |  |  |
|                        | Coding (hex)                    |  |  |
|                        | Status signal                   |  |  |
|                        | Diagnostic behavior             |  |  |
|                        |                                 |  |  |

| Diagnostic information |                                 | Remedy instructions   | Influenced measured variables  |
|------------------------|---------------------------------|---|--|
| No.                    | Short text                      |   |  |
| 383                    | Memory content                  | 1. Restart device<br>2. Check or change DAT module 3. Contact service | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |   |  |
|                        | Quality                         |   |  |
|                        | Quality substatus               |   |  |
|                        | Coding (hex)                    |   |  |
|                        | Status signal                   |   |  |
|                        | Diagnostic behavior             |   |  |
|                        |                                 |   |  |

| Diagnostic information |                                 | Remedy instructions | Influenced measured variables  |
|------------------------|---------------------------------|---------------------|--|
| No.                    | Short text                      |                     |  |
| 390                    | Special event 2                 | Contact service     | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                     |  |
|                        | Quality                         |                     |  |
|                        | Quality substatus               |                     |  |
|                        | Coding (hex)                    |                     |  |
|                        | Status signal                   |                     |  |
|                        | Diagnostic behavior             |                     |  |

| Diagnostic information |                                 | Remedy instructions | Influenced measured variables  |
|------------------------|---------------------------------|---------------------|--|
| No.                    | Short text                      |                     |  |
| 391                    | Special event 6                 | Contact service     | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                     |  |
|                        | Quality                         |                     |  |
|                        | Quality substatus               |                     |  |
|                        | Coding (hex)                    |                     |  |
|                        | Status signal                   |                     |  |
|                        | Diagnostic behavior             |                     |  |

| Diagnostic information |  | Remedy instructions | Influenced measured variables  |
|------------------------|--|---------------------|--|
| No.                    | Short text   |                     |  |
| 392                    | Special event 10   | Contact service     | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Status</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status [from the factory] <sup>1)</sup></b> |                     |  |
|                        | Quality  |                     |  |
|                        | Quality substatus  |                     |  |
|                        | Coding (hex)   |                     |  |
|                        | Status signal  |                     |  |
|                        | Diagnostic behavior  |                     |  |

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

### 12.6.3 Diagnostic of configuration

| Diagnostic information |                          |                   | Remedy instructions                           | Influenced measured variables   |
|------------------------|--------------------------|-------------------|---|---|
| No.                    | Short text               |                   |   |   |
| 410                    | Data transfer            |                   | 1. Check connection<br>2. Retry data transfer | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |   |   |
|                        | Quality                  | Bad               |   |   |
|                        | Quality substatus        | Maintenance alarm |   |   |
|                        | Coding (hex)             | 0x24 to 0x27      |   |   |
|                        | Status signal            | F                 |   |   |
|                        | Diagnostic behavior      | Alarm             |   |   |

| Diagnostic information |                          |               | Remedy instructions          | Influenced measured variables   |
|------------------------|--------------------------|---------------|------------------------------|---|
| No.                    | Short text               |               |                              |   |
| 412                    | Processing download      |               | Download active, please wait | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |               |                              |   |
|                        | Quality                  | Uncertain     |                              |   |
|                        | Quality substatus        | Initial value |                              |   |
|                        | Coding (hex)             | 0x4C to 0x4F  |                              |   |
|                        | Status signal            | C             |                              |   |
|                        | Diagnostic behavior      | Warning       |                              |   |

| Diagnostic information |                            |                   | Remedy instructions                     | Influenced measured variables   |
|------------------------|----------------------------|-------------------|---|---|
| No.                    | Short text                 |                   |   |   |
| 437                    | Configuration incompatible |                   | 1. Restart device<br>2. Contact service | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status   |                   |   |   |
|                        | Quality                    | Bad               |   |   |
|                        | Quality substatus          | Maintenance alarm |   |   |
|                        | Coding (hex)               | 0x24 to 0x27      |   |   |
|                        | Status signal              | F                 |   |   |
|                        | Diagnostic behavior        | Alarm             |   |   |

| Diagnostic information |                          |                      | Remedy instructions  | Influenced measured variables   |
|------------------------|--------------------------|----------------------|--|---|
| No.                    | Short text               |                      |  |   |
| 438                    | Dataset                  |                      | 1. Check data set file<br>2. Check device configuration<br>3. Up- and download new configuration | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                      |  |   |
|                        | Quality                  | Uncertain            |  |   |
|                        | Quality substatus        | Maintenance demanded |  |   |
|                        | Coding (hex)             | 0x68 to 0x6B         |  |   |
|                        | Status signal            | M                    |  |   |
|                        | Diagnostic behavior      | Warning              |  |   |

| Diagnostic information |                          |                | Remedy instructions      | Influenced measured variables   |
|------------------------|--------------------------|----------------|--------------------------|---|
| No.                    | Short text               |                |                          |   |
| 453                    | Flow override            |                | Deactivate flow override | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                |                          |   |
|                        | Quality                  | Good           |                          |   |
|                        | Quality substatus        | Function check |                          |   |
|                        | Coding (hex)             | 0xBC to 0xBF   |                          |   |
|                        | Status signal            | C              |                          |   |
|                        | Diagnostic behavior      | Warning        |                          |   |

| Diagnostic information |                          |                | Remedy instructions   | Influenced measured variables  |
|------------------------|--------------------------|----------------|-----------------------|--|
| No.                    | Short text               |                |                       |  |
| 484                    | Simulation Failure Mode  |                | Deactivate simulation | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                |                       |  |
|                        | Quality                  | Bad            |                       |  |
|                        | Quality substatus        | Function check |                       |  |
|                        | Coding (hex)             | 0x3C to 0x3F   |                       |  |
|                        | Status signal            | C              |                       |  |
|                        | Diagnostic behavior      | Alarm          |                       |  |

| Diagnostic information |                                 | Remedy instructions   | Influenced measured variables  |
|------------------------|---------------------------------|-----------------------|--|
| No.                    | Short text                      |                       |  |
| 485                    | Simulation measured variable    | Deactivate simulation | <ul style="list-style-type: none"> <li>Carrier mass flow</li> <li>Concentration</li> <li>Density</li> <li>Dynamic viscosity</li> <li>Kinematic viscosity</li> <li>Mass flow</li> <li>Sensor integrity</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Target mass flow</li> <li>Temp. compensated dynamic viscosity</li> <li>Temp. compensated kinematic viscosity</li> <li>Temperature</li> <li>Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |                       |  |
|                        | Quality                         |                       |  |
|                        | Quality substatus               |                       |  |
|                        | Coding (hex)                    |                       |  |
|                        | Status signal                   |                       |  |
|                        | Diagnostic behavior             |                       |  |

| Diagnostic information |                                 | Remedy instructions   | Influenced measured variables |
|------------------------|---------------------------------|-----------------------|-------------------------------|
| No.                    | Short text                      |                       |                               |
| 495                    | Diagnostic event simulation     | Deactivate simulation | –                             |
|                        | <b>Measured variable status</b> |                       |                               |
|                        | Quality                         |                       |                               |
|                        | Quality substatus               |                       |                               |
|                        | Coding (hex)                    |                       |                               |
|                        | Status signal                   |                       |                               |
|                        | Diagnostic behavior             |                       |                               |

| Diagnostic information |                                 | Remedy instructions                                      | Influenced measured variables |
|------------------------|---------------------------------|--|-------------------------------|
| No.                    | Short text                      |  |                               |
| 537                    | Configuration                   | 1. Check IP addresses in network<br>2. Change IP address | –                             |
|                        | <b>Measured variable status</b> |  |                               |
|                        | Quality                         |  |                               |
|                        | Quality substatus               |  |                               |
|                        | Coding (hex)                    |  |                               |
|                        | Status signal                   |  |                               |
|                        | Diagnostic behavior             |  |                               |

| Diagnostic information |                          |                   | Remedy instructions | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---------------------|--|
| No.                    | Short text               |                   |                     |  |
| 590                    | Special event 3          |                   | Contact service     | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |                     |  |
|                        | Quality                  | Bad               |                     |  |
|                        | Quality substatus        | Maintenance alarm |                     |  |
|                        | Coding (hex)             | 0x24 to 0x27      |                     |  |
|                        | Status signal            | F                 |                     |  |
|                        | Diagnostic behavior      | Alarm             |                     |  |

| Diagnostic information |                          |                   | Remedy instructions | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---------------------|--|
| No.                    | Short text               |                   |                     |  |
| 591                    | Special event 7          |                   | Contact service     | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |                     |  |
|                        | Quality                  | Bad               |                     |  |
|                        | Quality substatus        | Maintenance alarm |                     |  |
|                        | Coding (hex)             | 0x24 to 0x27      |                     |  |
|                        | Status signal            | F                 |                     |  |
|                        | Diagnostic behavior      | Alarm             |                     |  |

| Diagnostic information |   | Remedy instructions | Influenced measured variables  |
|------------------------|---|---------------------|--|
| No.                    | Short text  |                     |  |
| 592                    | Special event 11  |                     | Contact service <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |                     |  |
|                        | Quality   | Good                |  |
|                        | Quality substatus   | Ok                  |  |
|                        | Coding (hex)  | 0x80 to 0x83        |  |
|                        | Status signal   | F                   |  |
|                        | Diagnostic behavior                                       | Alarm               |  |

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

### 12.6.4 Diagnostic of process

| Diagnostic information |                          |              | Remedy instructions  | Influenced measured variables  |
|------------------------|--------------------------|--------------|--|--|
| No.                    | Short text               |              |  |  |
| 825                    | Operating temperature    |              | 1. Check ambient temperature<br>2. Check process temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |              |  |  |
|                        | Quality                  | Good         |  |  |
|                        | Quality substatus        | Ok           |  |  |
|                        | Coding (hex)             | 0x80 to 0x83 |  |  |
|                        | Status signal            | S            |  |  |
|                        | Diagnostic behavior      | Warning      |  |  |

| Diagnostic information |                          |                 | Remedy instructions  | Influenced measured variables  |
|------------------------|--------------------------|-----------------|--|--|
| No.                    | Short text               |                 |  |  |
| 825                    | Operating temperature    |                 | 1. Check ambient temperature<br>2. Check process temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                 |  |  |
|                        | Quality                  | Uncertain       |  |  |
|                        | Quality substatus        | Process related |  |  |
|                        | Coding (hex)             | 0x78 to 0x7B    |  |  |
|                        | Status signal            | S               |  |  |
|                        | Diagnostic behavior      | Warning         |  |  |

| Diagnostic information |                          |                 | Remedy instructions  | Influenced measured variables   |
|------------------------|--------------------------|-----------------|--|---|
| No.                    | Short text               |                 |  |   |
| 825                    | Operating temperature    |                 | 1. Check ambient temperature<br>2. Check process temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                 |  |   |
|                        | Quality                  | Bad             |  |   |
|                        | Quality substatus        | Process related |  |   |
|                        | Coding (hex)             | 0x28 to 0x2B    |  |   |
|                        | Status signal            | F               |  |   |
|                        | Diagnostic behavior      | Alarm           |  |   |



| Diagnostic information |                             |                 | Remedy instructions                            | Influenced measured variables   |
|------------------------|-----------------------------|-----------------|--|---|
| No.                    | Short text                  |                 |  |   |
| 830                    | Sensor temperature too high |                 | Reduce ambient temp. around the sensor housing | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status    |                 |  |   |
|                        | Quality                     | Uncertain       |  |   |
|                        | Quality substatus           | Process related |  |   |
|                        | Coding (hex)                | 0x78 to 0x7B    |  |   |
|                        | Status signal               | S               |  |   |
|                        | Diagnostic behavior         | Warning         |  |   |

| Diagnostic information |                            |                 | Remedy instructions                              | Influenced measured variables   |
|------------------------|----------------------------|-----------------|--|---|
| No.                    | Short text                 |                 |  |   |
| 831                    | Sensor temperature too low |                 | Increase ambient temp. around the sensor housing | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status   |                 |  |   |
|                        | Quality                    | Uncertain       |  |   |
|                        | Quality substatus          | Process related |  |   |
|                        | Coding (hex)               | 0x78 to 0x7B    |  |   |
|                        | Status signal              | S               |  |   |
|                        | Diagnostic behavior        | Warning         |  |   |

| Diagnostic information |   |              | Remedy instructions        | Influenced measured variables   |
|------------------------|---|--------------|----------------------------|---|
| No.                    | Short text  |              |                            |   |
| 832                    | Electronic temperature too high                           |              | Reduce ambient temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                            |   |
|                        | Quality   | Good         |                            |   |
|                        | Quality substatus   | Ok           |                            |   |
|                        | Coding (hex)  | 0x80 to 0x83 |                            |   |
|                        | Status signal   | S            |                            |   |
|                        | Diagnostic behavior                                       | Warning      |                            |   |

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

| Diagnostic information |   |              | Remedy instructions          | Influenced measured variables   |
|------------------------|---|--------------|------------------------------|---|
| No.                    | Short text  |              |                              |   |
| 833                    | Electronic temperature too low                            |              | Increase ambient temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                              |   |
|                        | Quality   | Good         |                              |   |
|                        | Quality substatus   | Ok           |                              |   |
|                        | Coding (hex)  | 0x80 to 0x83 |                              |   |
|                        | Status signal   | S            |                              |   |
|                        | Diagnostic behavior                                       | Warning      |                              |   |

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

| Diagnostic information |   |              | Remedy instructions        | Influenced measured variables   |
|------------------------|---|--------------|----------------------------|---|
| No.                    | Short text  |              |                            |   |
| 834                    | Process temperature too high                              |              | Reduce process temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                            |   |
|                        | Quality   | Good         |                            |   |
|                        | Quality substatus   | Ok           |                            |   |
|                        | Coding (hex)  | 0x80 to 0x83 |                            |   |
|                        | Status signal   | S            |                            |   |
|                        | Diagnostic behavior                                       | Warning      |                            |   |

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

| Diagnostic information |   |              | Remedy instructions          | Influenced measured variables   |
|------------------------|---|--------------|------------------------------|---|
| No.                    | Short text  |              |                              |   |
| 835                    | Process temperature too low                               |              | Increase process temperature | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                              |   |
|                        | Quality   | Good         |                              |   |
|                        | Quality substatus   | Ok           |                              |   |
|                        | Coding (hex)  | 0x80 to 0x83 |                              |   |
|                        | Status signal   | S            |                              |   |
|                        | Diagnostic behavior                                       | Warning      |                              |   |

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

| Diagnostic information |                          |              | Remedy instructions   | Influenced measured variables  |
|------------------------|--------------------------|--------------|---|--|
| No.                    | Short text               |              |   |  |
| 842                    | Process limit            |              | Low flow cut off active!<br>1. Check low flow cut off configuration | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |              |   |  |
|                        | Quality                  | Good         |   |  |
|                        | Quality substatus        | Ok           |   |  |
|                        | Coding (hex)             | 0x80 to 0x83 |   |  |
|                        | Status signal            | S            |   |  |
|                        | Diagnostic behavior      | Warning      |   |  |

| Diagnostic information |                          |              | Remedy instructions      | Influenced measured variables   |
|------------------------|--------------------------|--------------|--------------------------|---|
| No.                    | Short text               |              |                          |   |
| 843                    | Process limit            |              | Check process conditions | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |              |                          |   |
|                        | Quality                  | Good         |                          |   |
|                        | Quality substatus        | Ok           |                          |   |
|                        | Coding (hex)             | 0x80 to 0x83 |                          |   |
|                        | Status signal            | S            |                          |   |
|                        | Diagnostic behavior      | Warning      |                          |   |

| Diagnostic information |                          |                 | Remedy instructions                                       | Influenced measured variables   |
|------------------------|--------------------------|-----------------|---|---|
| No.                    | Short text               |                 |   |   |
| 862                    | Partly filled pipe       |                 | 1. Check for gas in process<br>2. Adjust detection limits | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                 |   |   |
|                        | Quality                  | Uncertain       |   |   |
|                        | Quality substatus        | Process related |   |   |
|                        | Coding (hex)             | 0x78 to 0x7B    |   |   |
|                        | Status signal            | S               |   |   |
|                        | Diagnostic behavior      | Warning         |   |   |

| Diagnostic information |                                 | Remedy instructions  | Influenced measured variables   |
|------------------------|---------------------------------|--|---|
| No.                    | Short text                      |  |   |
| 882                    | Input signal                    | 1. Check input configuration<br>2. Check external device or process conditions | <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Mass flow</li> <li>■ Reference density</li> <li>■ Corrected volume flow</li> <li>■ Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |  |   |
|                        | Quality                         |  |   |
|                        | Quality substatus               |  |   |
|                        | Coding (hex)                    |  |   |
|                        | Status signal                   |  |   |
|                        | Diagnostic behavior             |  |   |

| Diagnostic information |                                 | Remedy instructions                      | Influenced measured variables  |
|------------------------|---------------------------------|--|--|
| No.                    | Short text                      |  |  |
| 910                    | Tubes not oscillating           | 1. Check electronic<br>2. Inspect sensor | <ul style="list-style-type: none"> <li>■ Carrier mass flow</li> <li>■ Concentration</li> <li>■ Density</li> <li>■ Mass flow</li> <li>■ Sensor integrity</li> <li>■ Reference density</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul> |
|                        | <b>Measured variable status</b> |  |  |
|                        | Quality                         |  |  |
|                        | Quality substatus               |  |  |
|                        | Coding (hex)                    |  |  |
|                        | Status signal                   |  |  |
|                        | Diagnostic behavior             |  |  |

| Diagnostic information |  | Remedy instructions                                   | Influenced measured variables  |
|------------------------|--|---|--|
| No.                    | Short text   |   |  |
| 912                    | Medium inhomogeneous   | 1. Check process cond.<br>2. Increase system pressure | <ul style="list-style-type: none"> <li>■ Carrier mass flow</li> <li>■ Concentration</li> <li>■ Density</li> <li>■ Dynamic viscosity</li> <li>■ Kinematic viscosity</li> <li>■ Mass flow</li> <li>■ Sensor integrity</li> <li>■ Reference density</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow</li> <li>■ Temp. compensated dynamic viscosity</li> <li>■ Temp. compensated kinematic viscosity</li> <li>■ Temperature</li> <li>■ Volume flow</li> </ul> |
|                        | <b>Measured variable status [from the factory] <sup>1)</sup></b> |   |  |
|                        | Quality  |   |  |
|                        | Quality substatus  |   |  |
|                        | Coding (hex)   |   |  |
|                        | Status signal  |   |  |
|                        | Diagnostic behavior  |   |  |

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

| Diagnostic information |   |              | Remedy instructions                                   | Influenced measured variables   |
|------------------------|---|--------------|---|---|
| No.                    | Short text  |              |   |   |
| 912                    | Inhomogeneous   |              | 1. Check process cond.<br>2. Increase system pressure | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |   |   |
|                        | Quality   | Good         |   |   |
|                        | Quality substatus   | Ok           |   |   |
|                        | Coding (hex)  | 0x80 to 0x83 |   |   |
|                        | Status signal   | S            |   |   |
|                        | Diagnostic behavior                                       | Warning      |   |   |

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

| Diagnostic information |   |              | Remedy instructions  | Influenced measured variables   |
|------------------------|---|--------------|--|---|
| No.                    | Short text  |              |  |   |
| 913                    | Medium unsuitable   |              | 1. Check process conditions<br>2. Check electronic modules or sensor | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |  |   |
|                        | Quality   | Good         |  |   |
|                        | Quality substatus   | Ok           |  |   |
|                        | Coding (hex)  | 0x80 to 0x83 |  |   |
|                        | Status signal   | S            |  |   |
|                        | Diagnostic behavior                                       | Warning      |  |   |

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

| Diagnostic information |   |              | Remedy instructions                               | Influenced measured variables   |
|------------------------|---|--------------|---|---|
| No.                    | Short text  |              |   |   |
| 944                    | Monitoring failed   |              | Check process conditions for Heartbeat Monitoring | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temperature</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |   |   |
|                        | Quality   | Good         |   |   |
|                        | Quality substatus   | Ok           |   |   |
|                        | Coding (hex)  | 0x80 to 0x83 |   |   |
|                        | Status signal   | S            |   |   |
|                        | Diagnostic behavior                                       | Warning      |   |   |

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

| Diagnostic information |   |              | Remedy instructions      | Influenced measured variables  |
|------------------------|---|--------------|--------------------------|--|
| No.                    | Short text  |              |                          |  |
| 948                    | Tube damping too high                                     |              | Check process conditions | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                          |  |
|                        | Quality   | Good         |                          |  |
|                        | Quality substatus   | Ok           |                          |  |
|                        | Coding (hex)  | 0x80 to 0x83 |                          |  |
|                        | Status signal   | S            |                          |  |
|                        | Diagnostic behavior                                       | Warning      |                          |  |

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

| Diagnostic information |                          |                   | Remedy instructions | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---------------------|--|
| No.                    | Short text               |                   |                     |  |
| 990                    | Special event 4          |                   | Contact service     | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |                     |  |
|                        | Quality                  | Bad               |                     |  |
|                        | Quality substatus        | Maintenance alarm |                     |  |
|                        | Coding (hex)             | 0x24 to 0x27      |                     |  |
|                        | Status signal            | F                 |                     |  |
|                        | Diagnostic behavior      | Alarm             |                     |  |

| Diagnostic information |                          |                   | Remedy instructions | Influenced measured variables  |
|------------------------|--------------------------|-------------------|---------------------|--|
| No.                    | Short text               |                   |                     |  |
| 991                    | Special event 8          |                   | Contact service     | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status |                   |                     |  |
|                        | Quality                  | Bad               |                     |  |
|                        | Quality substatus        | Maintenance alarm |                     |  |
|                        | Coding (hex)             | 0x24 to 0x27      |                     |  |
|                        | Status signal            | F                 |                     |  |
|                        | Diagnostic behavior      | Alarm             |                     |  |




| Diagnostic information |   |              | Remedy instructions | Influenced measured variables  |
|------------------------|---|--------------|---------------------|--|
| No.                    | Short text  |              |                     |  |
| 992                    | Special event 12  |              | Contact service     | <ul style="list-style-type: none"><li>▪ Carrier mass flow</li><li>▪ Concentration</li><li>▪ Density</li><li>▪ Dynamic viscosity</li><li>▪ Kinematic viscosity</li><li>▪ Mass flow</li><li>▪ Sensor integrity</li><li>▪ Reference density</li><li>▪ Corrected volume flow</li><li>▪ Target mass flow</li><li>▪ Temp. compensated dynamic viscosity</li><li>▪ Temp. compensated kinematic viscosity</li><li>▪ Temperature</li><li>▪ Status</li><li>▪ Volume flow</li></ul> |
|                        | Measured variable status [from the factory] <sup>1)</sup> |              |                     |  |
|                        | Quality   | Good         |                     |  |
|                        | Quality substatus   | Ok           |                     |  |
|                        | Coding (hex)  | 0x80 to 0x83 |                     |  |
|                        | Status signal   | F            |                     |  |
|                        | Diagnostic behavior                                       | Alarm        |                     |  |



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

## 12.7 Pending diagnostic events

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






 Accessing the remedial action for a diagnostic event:

- Via web browser →  94
- Via "FieldCare" operating tool →  94
- Via "DeviceCare" operating tool →  94


 Other pending diagnostic events can be displayed in the **Diagnostic list** submenu →  120.

### Navigation

"Diagnostics" menu

|  |  |   |
|--|--|---|
|  <b>Diagnostics</b> |  |   |
| Actual diagnostics   |  | →  120 |
| Previous diagnostics   |  | →  120 |
| Operating time from restart  |  | →  120 |
| Operating time   |  | →  120 |

**Parameter overview with brief description**

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

## 12.8 Diagnostic list




Up to 5 currently pending diagnostic events are 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



Accessing the remedial action for a diagnostic event:

- Via web browser →  94
- Via "FieldCare" operating tool →  94
- Via "DeviceCare" operating tool →  94

## 12.9 Event logbook



### 12.9.1 Reading out the event logbook

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

**Navigation path**

**Diagnostics** menu → **Event logbook** submenu → Event logbook

The event history includes entries for:

- Diagnostic events →  98
- Information events →  121



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

- Diagnostic event
  - ☞: Occurrence of the event
  - ⌚: End of the event
- Information event
  - ☞: Occurrence of the event



Accessing the remedial action for a diagnostic event:

- Via web browser → 94
- Via "FieldCare" operating tool → 94
- Via "DeviceCare" operating tool → 94



Filtering the displayed event messages → 121

### 12.9.2 Filtering the event logbook

Using the **Filter options** parameter you can define which category of event message is displayed in the **Events list** submenu.

#### Navigation path

Diagnostics → Event logbook → Filter options

#### Filter categories

- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)


### 12.9.3 Overview of information events

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


| Info number | Info name                        |
|-------------|----------------------------------|
| I1000       | ----- (Device ok)                |
| I1089       | Power on                         |
| I1090       | Configuration reset              |
| I1091       | Configuration changed            |
| I1111       | Density adjust failure           |
| I1137       | Electronic changed               |
| I1151       | History reset                    |
| I1155       | Reset electronic temperature     |
| I1157       | Memory error event list          |
| I1185       | Display backup done              |
| I1186       | Restore via display done         |
| I1187       | Settings downloaded with display |
| I1188       | Display data cleared             |
| I1189       | Backup compared                  |
| I1209       | Density adjustment ok            |
| I1221       | Zero point adjust failure        |
| I1222       | Zero point adjustment ok         |

| Info number | Info name                              |
|-------------|--|
| I1256       | Display: access status changed         |
| 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             |
| I1446       | Device verification active             |
| I1447       | Record application reference data      |
| I1448       | Application reference data recorded    |
| I1449       | Recording application ref. data failed |
| I1450       | Monitoring off                         |
| I1451       | Monitoring on                          |
| I1457       | Measured error verification failed     |
| I1459       | I/O module verification failed         |
| I1460       | Sensor integrity verification failed   |
| I1461       | Sensor verification failed             |
| I1462       | Sensor electronic module verif. failed |
| I1512       | Download started                       |
| I1513       | Download finished                      |
| I1514       | Upload started                         |
| I1515       | Upload finished                        |
| I1627       | Web server login successful            |
| I1631       | Web server access changed              |
| I1649       | Hardware write protection activated    |
| I1650       | Hardware write protection deactivated  |

## 12.10 Resetting the device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter (→  73).

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

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

### 12.11 Device information

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

**Navigation**

"Diagnostics" menu → Device information

► Device information

Device tag

Serial number

Firmware version

Device name

Order code

Extended order code 1

Extended order code 2

Extended order code 3

ENP version

→ ⓘ 123

→ ⓘ 123

→ ⓘ 123

→ ⓘ 123

→ ⓘ 123




→ ⓘ 124




→ ⓘ 124

→ ⓘ 124

→ ⓘ 124




**Parameter overview with brief description**

| Parameter        | Description   | User interface  | Factory setting     |
|------------------|---|---|---------------------|
| Device tag       | Shows name of measuring point.  | Max. 32 characters such as lower-case letters or numbers.                             | eh-promass100-xxxxx |
| 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.<br> The name can be found on the nameplate of the transmitter.                                      | Character string comprising numbers, letters and special characters                   | –                   |
| Device name      | Shows the name of the transmitter.<br> The name can be found on the nameplate of the transmitter.                                      | Max. 32 characters such as lower-case letters or numbers.                             | eh-promass100-xxxxx |
| Order code       | Shows the device order code.<br> The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field. | Character string composed of letters, numbers and certain punctuation marks (e.g. /). | –                   |

| Parameter             | Description  | User interface   | Factory setting |
|-----------------------|--|------------------|-----------------|
| Extended order code 1 | Shows the 1st part of the extended order code.<br> The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | –               |
| Extended order code 2 | Shows the 2nd part of the extended order code.<br> The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | –               |
| Extended order code 3 | Shows the 3rd part of the extended order code.<br> The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | –               |
| ENP version           | Shows the version of the electronic nameplate (ENP).   | Character string | –               |

## 12.12 Firmware history

| Release date | Firmware version | Order code for "Firmware version" | Firmware Changes  | Documentation type     | Documentation |
|--------------|------------------|-----------------------------------|-------------------|------------------------|---------------|
| 12.2015      | 01.00.zz         | Option 68                         | Original firmware | Operating instructions |               |

-  It is possible to flash the firmware to the current version or an existing previous version via the service interface.
-  For the compatibility of the firmware version with the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.
-  The manufacturer's information is available:
- In the Download Area of the Endress+Hauser Web site: [www.endress.com](http://www.endress.com) → Downloads
  - Specify the following details:
    - Product root, e.g. 8E1B  
The product root is the first part of the order code: see the nameplate on the device.
    - Text search: Manufacturer's information
    - Media type: Documentation – Technical Documentation

## 13 Maintenance

### 13.1 Maintenance work

No special maintenance work is required.

#### 13.1.1 Cleaning

##### Cleaning of surfaces not in contact with the medium

1. Recommendation: Use a lint-free cloth that is either dry or slightly dampened using water.
2. Do not use sharp objects or aggressive cleaning agents that could damage surfaces (e.g. displays, housing) and seals.
3. Do not use high-pressure steam.
4. Ensure compliance with the protection class of the device.

##### NOTICE

##### Cleaning agents can damage the surfaces!

Incorrect cleaning agents can damage the surfaces!

- Do not use cleaning agents containing concentrated mineral acids, alkalis or organic solvents e.g. benzyl alcohol, methylene chloride, xylene, concentrated glycerol cleaners or acetone.

##### Cleaning of surfaces in contact with the medium

Note the following for cleaning and sterilization in place (CIP/SIP):


- Use only cleaning agents to which the materials in contact with the medium are sufficiently resistant.
- Observe the permitted maximum medium temperature.

### 13.2 Measuring and test equipment

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



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

List of some of the measuring and testing equipment: →  129

### 13.3 Maintenance services

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



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

## 14 Repair

### 14.1 General notes

#### 14.1.1 Repair and conversion concept

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

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

#### 14.1.2 Notes for repair and conversion

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

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

### 14.2 Spare parts

*Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)):

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



Measuring device serial number:

- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→ 123) in the **Device information** submenu.

### 14.3 Repair services

Endress+Hauser offers a wide range of services.



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

### 14.4 Return

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

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

## 14.5 Disposal



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

### 14.5.1 Removing the measuring instrument

1. Switch off the device.

#### **WARNING**

##### **Danger to persons from process conditions!**

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

2. Carry out the installation and connection steps from the "Installing the device" and "Connecting the device" sections in reverse order. Observe the safety instructions.

### 14.5.2 Disposing of the measuring instrument

#### **WARNING**

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

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

Observe the following notes during disposal:



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

## 15 Accessories




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

### 15.1 Device-specific accessories



#### 15.1.1 For the sensor

| Accessories    | Description  |
|----------------|--|
| Heating jacket | <p>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.</p> <p> If using oil as a heating medium, please consult with Endress+Hauser.</p> <p>Heating jackets cannot be used with sensors fitted with a rupture disk.</p> <ul style="list-style-type: none"> <li>▪ If ordered together with the measuring device:<br/>Order code for "Accessory enclosed" <ul style="list-style-type: none"> <li>▪ Option RB "Heating jacket, G 1/2" female thread"</li> <li>▪ Option RC "Heating jacket, G 3/4" female thread"</li> <li>▪ Option RD "Heating jacket, NPT 1/2" female thread"</li> <li>▪ Option RE "Heating jacket, NPT 3/4" female thread"</li> </ul> </li> <li>▪ If ordered subsequently:<br/>Use the order code with the product root DK8003.</li> </ul> <p> Special Documentation SD02151D</p> |



### 15.2 Communication-specific accessories

| Accessories       | Description  |
|-------------------|--|
| Commubox FXA291   | <p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> Technical Information TI00405C</p>   |
| Fieldgate FXA42   | <p>Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments</p> <p> <ul style="list-style-type: none"> <li>▪ Technical Information TI01297S</li> <li>▪ Operating Instructions BA01778S</li> <li>▪ Product page: <a href="http://www.endress.com/fxa42">www.endress.com/fxa42</a></li> </ul> </p>  |
| Field Xpert SMT50 | <p>The Field Xpert SMT50 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.</p> <p>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.</p> <p> <ul style="list-style-type: none"> <li>▪ Technical Information TI01555S</li> <li>▪ Operating Instructions BA02053S</li> <li>▪ Product page: <a href="http://www.endress.com/smt50">www.endress.com/smt50</a></li> </ul> </p> |





|                   |  |
|-------------------|--|
| Field Xpert SMT70 | <p>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.</p> <p>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.</p> <ul style="list-style-type: none"> <li> ■ Technical Information TI01342S</li> <li>■ Operating Instructions BA01709S</li> <li>■ Product page: <a href="http://www.endress.com/smt70">www.endress.com/smt70</a></li> </ul> |
| Field Xpert SMT77 | <p>The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.</p> <ul style="list-style-type: none"> <li> ■ Technical Information TI01418S</li> <li>■ Operating Instructions BA01923S</li> <li>■ Product page: <a href="http://www.endress.com/smt77">www.endress.com/smt77</a></li> </ul>   |

### 15.3 Service-specific accessories

| Accessory  | Description  |
|------------|--|
| Applicator | <p>Software for selecting and sizing Endress+Hauser measuring instruments:</p> <ul style="list-style-type: none"> <li>■ Choice of measuring instruments for industrial requirements</li> <li>■ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy.</li> <li>■ Graphic display of the calculation results</li> <li>■ Determining the partial order code. Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.</li> </ul> <p>Applicator is available:<br/>Via the Internet: <a href="https://portal.endress.com/webapp/applicator">https://portal.endress.com/webapp/applicator</a></p> |
| Netilion   | <p>IIoT ecosystem: Unlock knowledge</p> <p>With the Netilion IIoT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration.</p> <p>Based on decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem that enables you to gain useful insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.</p> <p><a href="http://www.netilion.endress.com">www.netilion.endress.com</a></p>   |
| FieldCare  | <p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.</p> <ul style="list-style-type: none"> <li> Operating Instructions BA00027S and BA00059S</li> </ul>  |
| DeviceCare | <p>Tool to connect and configure Endress+Hauser field devices.</p> <ul style="list-style-type: none"> <li> ■ Technical Information: TI01134S</li> <li>■ Innovation brochure: IN01047S</li> </ul>  |

## 15.4 System components

| Accessories                      | Description  |
|----------------------------------|--|
| Memograph M graphic data manager | <p>The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.</p> <p> <ul style="list-style-type: none"> <li>■ Technical Information TI00133R</li> <li>■ Operating Instructions BA00247R</li> </ul> </p> |
| iTEMP                            | <p>The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.</p> <p> "Fields of Activity" document FA00006T</p>  |

# 16      Technical data


## 16.1    Application

The measuring device is intended only for the flow measurement of liquids 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    | <p>The device consists of a transmitter and a sensor.</p> <p>The device is available as a compact version:<br/>The transmitter and sensor form a mechanical unit.</p> <p>For information on the structure of the measuring instrument →  12</p> |

## 16.3 Input

### Measured variable

#### Direct measured variables

- Mass flow
- Density
- Temperature

#### 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    | $\frac{3}{8}$  | 0 to 2 000   | 0 to 73.50 |
| 15   | $\frac{1}{2}$  | 0 to 6 500   | 0 to 238.9 |
| 25   | 1              | 0 to 18 000  | 0 to 661.5 |
| 40   | $1\frac{1}{2}$ | 0 to 45 000  | 0 to 1 654 |
| 50   | 2              | 0 to 70 000  | 0 to 2 573 |
| 80   | 3              | 0 to 180 000   | 0 to 6 615 |

#### Measuring range for gases

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

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

|   |   |
|---|---|
| $\dot{m}_{\max(G)}$                     | 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 $\dot{m}_{\max(F)}$ |
| $\rho_G$                                | Gas density in [kg/m <sup>3</sup> ] at operating conditions       |
| $x$                                     | Limitation constant for max. gas flow [kg/m <sup>3</sup> ]        |
| $c_G$                                   | Speed of sound (gas) [m/s]  |
| $d_i$                                   | Measuring tube internal diameter [m]                              |
| $\pi$                                   | Pi  |
| $n = 2$                                 | Number of measuring tubes   |



| DN   |               | x                    |
|------|---------------|----------------------|
| [mm] | [in]          | [kg/m <sup>3</sup> ] |
| 8    | $\frac{3}{8}$ | 85                   |
| 15   | $\frac{1}{2}$ | 110                  |
| 25   | 1             | 125                  |

| DN   |      | x       |
|------|------|---------|
| [mm] | [in] | [kg/m³] |
| 40   | 1½   | 125     |
| 50   | 2    | 125     |
| 80   | 3    | 155     |



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 →  146

|                     |  |
|---------------------|--|
| Operable flow range | Over 1000 : 1.<br><br>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 | <p><b>External measured values</b></p> <p>To increase the measurement 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 instrument:</p> <ul style="list-style-type: none"> <li>■ Operating pressure to increase measurement accuracy (Endress+Hauser recommends the use of a pressure measuring instrument for absolute pressure, e.g. Cerabar M or Cerabar S)</li> <li>■ Medium temperature to increase measurement accuracy (e.g. iTEMP)</li> <li>■ Reference density for calculating the corrected volume flow for gases</li> </ul> <p> Various pressure transmitters and temperature measuring instruments can be ordered from Endress+Hauser: see "Accessories" section →  130</p> <p>It is recommended to read in external measured values to calculate the following measured variables:</p> <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul> <p><i>Digital communication</i></p> <p>The measured values are written by the automation system via PROFINET.</p> |
|--------------|--|

## 16.4 Output

|                    |  |                    |  |
|--------------------|--|--------------------|--|
| Output signal      | <p><b>PROFINET</b></p> <table> <tr> <td>Standards</td><td>In accordance with IEEE 802.3</td></tr> </table>   | Standards          | In accordance with IEEE 802.3  |
| Standards          | In accordance with IEEE 802.3  |                    |  |
| Signal on alarm    | <p>Depending on the interface, failure information is displayed as follows.</p> <p><b>PROFINET</b></p> <table> <tr> <td>Device diagnostics</td><td>According to "Application Layer protocol for decentralized periphery", Version 2.3</td></tr> </table> | Device diagnostics | According to "Application Layer protocol for decentralized periphery", Version 2.3 |
| Device diagnostics | According to "Application Layer protocol for decentralized periphery", Version 2.3   |                    |  |

**Local display**

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



Status signal as per NAMUR recommendation NE 107

**Interface/protocol**

- Via digital communication:  
PROFINET
- Via service interface  
Service interface CDI-RJ45
- Plain text display  
With information on cause and remedial actions

**Web browser**

|                           |   |
|---------------------------|---|
| <b>Plain text display</b> | With information on cause and remedial measures |
|---------------------------|---|

**LEDs**

|                           |   |
|---------------------------|---|
| <b>Status information</b> | <p>Status indicated by various LEDs</p> <p>The following information is displayed depending on the device version:</p> <ul style="list-style-type: none"> <li>■ Supply voltage active</li> <li>■ Data transmission active</li> <li>■ Device alarm/error has occurred</li> <li>■ Network available</li> <li>■ Connection established</li> <li>■ PROFINET blinking feature</li> </ul> <p> Diagnostic information via LEDs</p> |
|---------------------------|---|

Low flow cut off

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

Galvanic isolation


The following connections are galvanically isolated from each other:


- Outputs
- Power supply

Protocol-specific data

**protocol-specific data**

|  |   |
|--|---|
| <b>Protocol</b>                            | "Application layer protocol for decentral device periphery and distributed automation", version 2.3   |
| <b>Conformity class</b>                    | B   |
| <b>Communication type</b>                  | 100 Mbps  |
| <b>Device profile</b>                      | Application interface identifier 0xF600<br>Generic device   |
| <b>Manufacturer ID</b>                     | 0x11  |
| <b>Device type ID</b>                      | 0x844A  |
| <b>Device description files (GSD, DTM)</b> | <p>Information and files available at:</p> <ul style="list-style-type: none"> <li>■ <a href="https://www.endress.com/download">https://www.endress.com/download</a><br/>On the device product page: PRODUCTS → Product Finder → Links</li> <li>■ <a href="https://www.profibus.com">https://www.profibus.com</a></li> </ul> |

|  |   |
|--|---|
| <b>Baud rates</b>  | Automatic 100 Mbit/s with full-duplex detection   |
| <b>Periods</b>   | From 8 ms   |
| <b>Polarity</b>  | Auto-polarity for automatic correction of crossed TxD and RxD pairs   |
| <b>Supported connections</b>   | <ul style="list-style-type: none"> <li>■ 1 x AR (Application Relation)</li> <li>■ 1 x Input CR (Communication Relation)</li> <li>■ 1 x Output CR (Communication Relation)</li> <li>■ 1 x Alarm CR (Communication Relation)</li> </ul>   |
| <b>Configuration options for measuring instrument</b>                    | <ul style="list-style-type: none"> <li>■ DIP switches on the electronics module, for device name assignment (last part)</li> <li>■ Manufacturer-specific software (FieldCare, DeviceCare)</li> <li>■ Web browser</li> <li>■ Device master file (GSD), can be read out via the integrated web server of the measuring instrument</li> </ul>  |
| <b>Configuration of the device name</b>                                  | <ul style="list-style-type: none"> <li>■ DIP switches on the electronics module, for device name assignment (last part)</li> <li>■ DCP protocol</li> </ul>  |
| <b>Output values</b><br>(from measuring instrument to automation system) | <p><b>Analog Input module (slot 1 to 14)</b></p> <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow</li> <li>■ Carrier mass flow</li> <li>■ Density</li> <li>■ Reference density</li> <li>■ Concentration</li> <li>■ Temperature</li> <li>■ Carrier pipe temperature</li> <li>■ Electronics temperature</li> <li>■ Oscillation frequency</li> <li>■ Oscillation amplitude</li> <li>■ Frequency fluctuation</li> <li>■ Oscillation damping</li> <li>■ Tube damping fluctuation</li> <li>■ Signal asymmetry</li> <li>■ Exciter current</li> </ul> <p><b>Discrete Input module (slot 1 to 14)</b></p> <ul style="list-style-type: none"> <li>■ Empty pipe detection</li> <li>■ Low flow cut off</li> </ul> <p><b>Diagnostics Input module (slot 1 to 14)</b></p> <ul style="list-style-type: none"> <li>■ Last diagnostics</li> <li>■ Current diagnostics</li> </ul> <p><b>Totalizer 1 to 3 (slot 15 to 17)</b></p> <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> </ul> <p><b>Heartbeat Verification module (fixed assignment)</b><br/>Verification status (slot 23)</p> <p> The range of options increases if the measuring device has one or more application packages.</p> |

|   |  |
|---|--|
| <b>Input values</b><br>(from automation system to measuring instrument) | <b>Analog Output module (fixed assignment)</b> <ul style="list-style-type: none"> <li>External pressure (slot 18)</li> <li>External temperature (slot 19)</li> <li>External reference density (slot 20)</li> </ul> <b>Discrete Output module (fixed assignment)</b> <ul style="list-style-type: none"> <li>Activate/deactivate positive zero return (slot 21)</li> <li>Perform zero adjustment (slot 22)</li> </ul> <b>Totalizer 1 to 3 (slot 15 to 17)</b> <ul style="list-style-type: none"> <li>Totalize</li> <li>Reset and hold</li> <li>Preset and hold</li> <li>Stop</li> <li>Operating mode configuration: <ul style="list-style-type: none"> <li>Net flow total</li> <li>Forward flow total</li> <li>Reverse flow total</li> </ul> </li> </ul> <b>Heartbeat Verification module (fixed assignment)</b><br>Start verification (slot 23) <div>  The range of options increases if the measuring device has one or more application packages. </div> |
| <b>Supported functions</b>  | <ul style="list-style-type: none"> <li>Identification &amp; maintenance<br/>Simple device identification via: <ul style="list-style-type: none"> <li>Control system</li> <li>Nameplate</li> </ul> </li> <li>Measured value status<br/>The process variables are communicated with a measured value status</li> <li>Blinking feature via the local display for simple device identification and assignment</li> </ul>   |

### Administration of software options

| Input/output value | Process variable            | Category                           | Slot   |
|--------------------|-----------------------------|------------------------------------|--------|
| Output value       | Mass flow                   | Process variable                   | 1...14 |
|                    | Volume flow                 |                                    |        |
|                    | Corrected volume flow       |                                    |        |
|                    | Density                     |                                    |        |
|                    | Reference density           |                                    |        |
|                    | Temperature                 |                                    |        |
|                    | Electronics temperature     |                                    |        |
|                    | Oscillation frequency       |                                    |        |
|                    | Frequency fluctuation       |                                    |        |
|                    | Oscillation damping         |                                    |        |
|                    | Oscillation frequency       |                                    |        |
|                    | Signal asymmetry            |                                    |        |
|                    | Exciter current             |                                    |        |
|                    | Empty pipe detection        |                                    |        |
|                    | Low flow cut off            |                                    |        |
|                    | Current device diagnostics  |                                    |        |
|                    | Previous device diagnostics |                                    |        |
| Output value       | Target mass flow            | Concentration <sup>1)</sup>        | 1...14 |
|                    | Carrier mass flow           |                                    |        |
|                    | Concentration               |                                    |        |
| Output value       | Oscillation damping 1       | Heartbeat Technology <sup>2)</sup> | 1...14 |




| Input/output value | Process variable           | Category               | Slot |
|--------------------|----------------------------|------------------------|------|
|                    | Oscillation frequency 1    |                        |      |
|                    | Oscillation amplitude 0    |                        |      |
|                    | Oscillation amplitude 1    |                        |      |
|                    | Frequency fluctuation 1    |                        |      |
|                    | Tube damping fluctuation 1 |                        |      |
|                    | Exciter current 1          |                        |      |
| Input value        | External density           | Process monitoring     | 18   |
|                    | External temperature       |                        | 19   |
|                    | External reference density |                        | 20   |
|                    | Flow override              |                        | 21   |
|                    | Zero adjustment            |                        | 22   |
|                    | Verification status        | Heartbeat Verification | 23   |

- 1) Only available with the "Concentration" application package.
- 2) Only available with the Heartbeat Technology application package.

Startup configuration

|                             |   |
|-----------------------------|---|
| Startup configuration (NSU) | <p>If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used.</p> <p>The following configuration is taken from the automation system:</p> <ul style="list-style-type: none"><li>■ Management<ul style="list-style-type: none"><li>■ Software revision</li><li>■ Write protection</li></ul></li><li>■ System units<ul style="list-style-type: none"><li>■ Mass flow</li><li>■ Mass</li><li>■ Volume flow</li><li>■ Volume</li><li>■ Corrected volume flow</li><li>■ Corrected volume</li><li>■ Density</li><li>■ Reference density</li><li>■ Temperature</li><li>■ Pressure</li></ul></li><li>■ Concentration application package<ul style="list-style-type: none"><li>■ Coefficients A0 to A4</li><li>■ Coefficients B1 to B3</li></ul></li><li>■ Sensor adjustment</li><li>■ Process parameters<ul style="list-style-type: none"><li>■ Damping (flow, density, temperature)</li><li>■ Flow override</li></ul></li><li>■ Low flow cut off<ul style="list-style-type: none"><li>■ Assign process variable</li><li>■ Switch-on/switch-off point</li><li>■ Pressure shock suppression</li></ul></li><li>■ Empty pipe detection<ul style="list-style-type: none"><li>■ Assign process variable</li><li>■ Limit values</li><li>■ Response time</li><li>■ Max. damping</li></ul></li><li>■ Corrected volume flow calculation<ul style="list-style-type: none"><li>■ External reference density</li><li>■ Fixed reference density</li><li>■ Reference temperature</li><li>■ Linear expansion coefficient</li><li>■ Square expansion coefficient</li></ul></li><li>■ Measuring mode<ul style="list-style-type: none"><li>■ Medium</li><li>■ Gas type</li><li>■ Reference sound velocity</li><li>■ Temperature coefficient sound velocity</li></ul></li><li>■ External compensation<ul style="list-style-type: none"><li>■ Pressure compensation</li><li>■ Pressure value</li><li>■ External pressure</li></ul></li><li>■ Diagnostic settings</li><li>■ Diagnostic behavior for diverse diagnostic information</li></ul> |
|-----------------------------|---|

16.5 Power supply

|                     |  |
|---------------------|--|
| Terminal assignment | →  26 |
| Supply voltage      | The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).  |

## Power consumption

**Transmitter**

| Order code for "Output" | Maximum Power consumption |
|-------------------------|---------------------------|
| Option R: PROFINET      | 3.5 W                     |

## Current consumption

**Transmitter**

| Order code for "Output" | Maximum current consumption | Maximum switch-on current |
|-------------------------|-----------------------------|---------------------------|
| Option R: PROFINET      | 145 mA                      | 18 A (< 0.125 ms)         |


## Device fuse

Fine-wire fuse (slow-blow) T2A

## Power supply failure

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

## Electrical connection

→  27

## Potential equalization

→  30


## Terminals

**Transmitter**Spring terminals for wire cross-sections 0.5 to 2.5 mm<sup>2</sup> (20 to 14 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:
  - M20
  - G ½"
  - NPT ½"


## Cable specification

→  25

## 16.6 Performance characteristics

## Reference operating conditions

- Error limits based on ISO 11631
- Water
  - +15 to +45 °C (+59 to +113 °F)
  - 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

To obtain measured errors, use the *Applicator* sizing tool →  129

## Maximum measurement error

o.r. = of reading; 1 g/cm<sup>3</sup> = 1 kg/l; T = medium temperature

**Base accuracy**

 Design fundamentals →  142

*Mass flow and volume flow (liquids)*

- ±0.15 % o.r.
- ±0.10 % o.r. (order code for "Calibration flow", option A, B, C, for mass flow)
- ±0.25 % o.r.

*Mass flow (gases)*

±0.50 % o.r.

*Density (liquids)*

| Under reference conditions<br>[g/cm <sup>3</sup> ] | Standard density calibration<br>[g/cm <sup>3</sup> ] |
|--|--|
| ±0.0005  | ±0.002   |

*Temperature*

±0.5 °C ± 0.005 · T °C (±0.9 °F ± 0.003 · (T – 32) °F)

**Zero point stability**

| DN   |               | Zero point stability |          |
|------|---------------|----------------------|----------|
| [mm] | [in]          | [kg/h]               | [lb/min] |
| 8    | $\frac{3}{8}$ | 0.20                 | 0.007    |
| 15   | $\frac{1}{2}$ | 0.65                 | 0.024    |
| 25   | 1             | 1.80                 | 0.066    |
| 40   | 1½            | 4.50                 | 0.165    |
| 50   | 2             | 7.0                  | 0.257    |
| 80   | 3             | 18.0                 | 0.6615   |

**Flow values**

Flow values as turndown parameters depending on 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     |
| 25   | 18 000  | 1 800  | 900    | 360    | 180    | 36     |
| 40   | 45 000  | 4 500  | 2 250  | 900    | 450    | 90     |
| 50   | 70 000  | 7 000  | 3 500  | 1 400  | 700    | 140    |
| 80   | 180 000 | 18 000 | 9 000  | 3 600  | 1 800  | 360    |

*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] |
| $\frac{3}{8}$ | 73.50    | 7.350    | 3.675    | 1.470    | 0.735    | 0.147    |
| $\frac{1}{2}$ | 238.9    | 23.89    | 11.95    | 4.778    | 2.389    | 0.478    |
| 1             | 661.5    | 66.15    | 33.08    | 13.23    | 6.615    | 1.323    |
| 1½            | 1654     | 165.4    | 82.70    | 33.08    | 16.54    | 3.308    |
| 2             | 2573     | 257.3    | 128.7    | 51.46    | 25.73    | 5.146    |
| 3             | 6615     | 661.5    | 330.8    | 132.3    | 66.15    | 13.23    |

**Accuracy of outputs**

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

The outputs have the following base accuracy specifications:

---

Repeatability o.r. = of reading;  $1 \text{ g/cm}^3 = 1 \text{ kg/l}$ ; T = medium temperature

**Base repeatability**

 Design fundamentals →  142

*Mass flow and volume flow (liquids)*

$\pm 0.075 \%$  o.r.

$\pm 0.05 \%$  o.r. (calibration option, for mass flow)

*Mass flow (gases)*

$\pm 0.25 \%$  o.r. (up to a Mach number of 0.2)

*Density (liquids)*

$\pm 0.00025 \text{ g/cm}^3$

*Temperature*

$\pm 0.25 \text{ }^\circ\text{C} \pm 0.0025 \cdot T \text{ }^\circ\text{C}$  ( $\pm 0.45 \text{ }^\circ\text{F} \pm 0.0015 \cdot (T-32) \text{ }^\circ\text{F}$ )

---

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

---

Influence of medium temperature

**Mass flow**

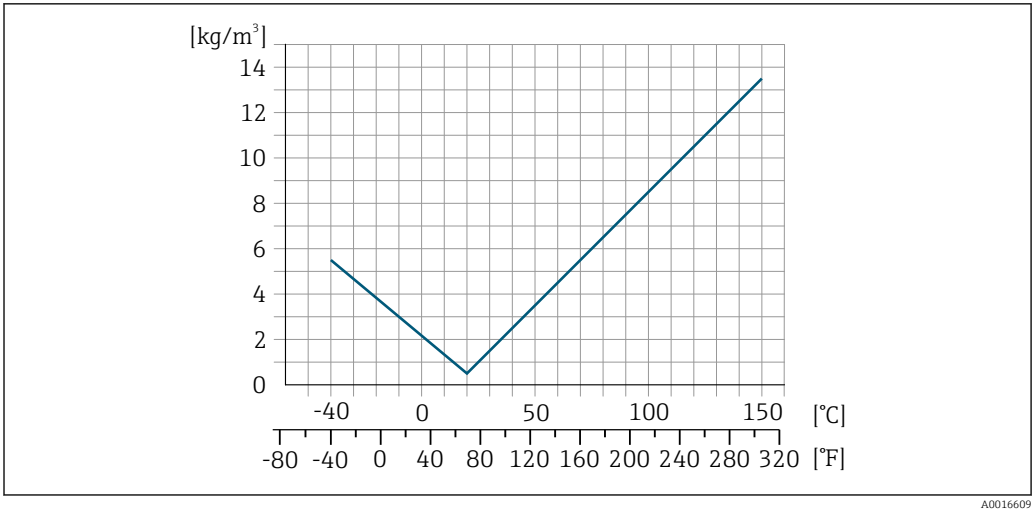
o.f.s. = of full scale value

If there is a difference between the temperature during zero adjustment and the process temperature, the additional measurement error of the sensors is typically  $\pm 0.0002 \%$  o.f.s./ $^\circ\text{C}$  ( $\pm 0.0001 \%$  o. f.s./ $^\circ\text{F}$ ).

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 measurement error of the sensors is typically  $\pm 0.0001 \text{ g/cm}^3/^\circ\text{C}$  ( $\pm 0.00005 \text{ g/cm}^3/^\circ\text{F}$ ). Field density adjustment is possible.



16 Field density adjustment, for example at +20 °C (+68 °F)

**Temperature**  
 $\pm 0.005 \cdot T \text{ }^{\circ}\text{C}$  ( $\pm 0.005 \cdot (T - 32) \text{ }^{\circ}\text{F}$ )

Influence of medium pressure

The following shows how the process pressure (gauge pressure) affects the accuracy of the mass flow.

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    | 3⁄8  | no effect    |              |
| 15   | 1⁄2  | no effect    |              |
| 25   | 1    | no effect    |              |
| 40   | 1½   | no effect    |              |
| 50   | 2    | −0.009       | −0.0006      |
| 80   | 3    | −0.020       | −0.0014      |

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

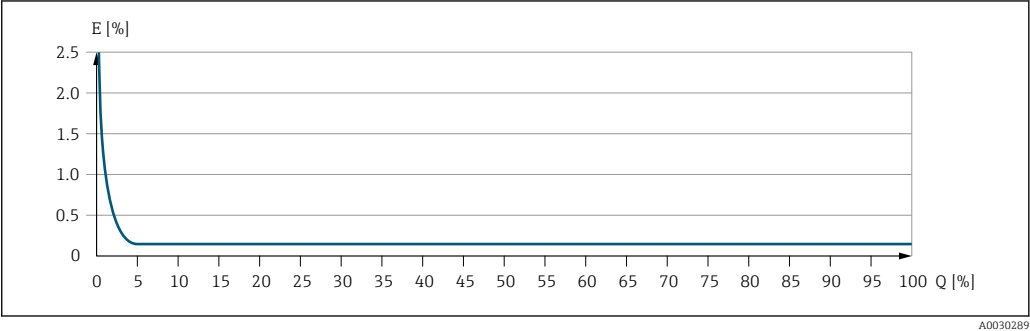
Calculation of the maximum measured error as a function of the flow rate

| Flow rate  | Maximum measured error in % o.r.   |
|--|--|
| $\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$<br><small>A0021332</small> | $\pm \text{BaseAccu}$<br><small>A0021339</small>                                     |
| $< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$<br><small>A0021333</small>    | $\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$<br><small>A0021334</small> |

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

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

Example of maximum measurement error



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



16.7    Installation

Installation requirements    → 18

16.8    Environment

Ambient temperature range    → 20 → 20

Temperature tables



-  Observe the interdependencies between the permitted ambient and fluid temperatures when operating the device in hazardous areas.
-  For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

Storage temperature    -40 to +80 °C (-40 to +176 °F), preferably at +20 °C (+68 °F)

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

Degree of protection    **Transmitter and sensor**

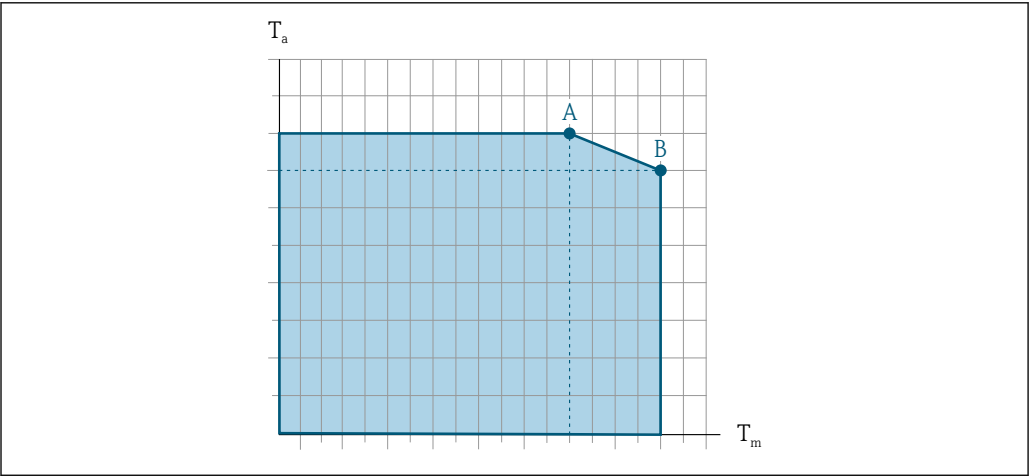
- Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
- With the order code for "Sensor options", option CM: IP69 can also be ordered
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2


|   |  |
|---|--|
| Vibration resistance and shock resistance | <div><div><div>Sinusoidal vibration similar to IEC 60068-2-6</div><div><div>■ 2 to 8.4 Hz, 3.5 mm peak</div><div>■ 8.4 to 2 000 Hz, 1 g peak</div></div></div><div><div>Broadband random vibration similar to IEC 60068-2-64</div><div><div>■ 10 to 200 Hz, 0.003 g<sup>2</sup>/Hz</div><div>■ 200 to 2 000 Hz, 0.001 g<sup>2</sup>/Hz</div><div>■ Total: 1.54 g rms</div></div></div><div><div>Half-sine shocks similar to IEC 60068-2-27</div><div>6 ms 30 g</div></div><div><div>Rough handling shocks similar to IEC 60068-2-31</div></div></div>            |
| Electromagnetic compatibility (EMC)       | <div><div><div>■ As per IEC/EN 61326</div><div>■ Complies with emission limits for industry as per EN 55011 (class A)</div></div><div><div> Details are provided in the Declaration of Conformity.</div><div><div> This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.</div></div></div></div> |

16.9 Process


|                          |                                 |
|--------------------------|---------------------------------|
| Medium temperature range | -40 to +150 °C (-40 to +302 °F) |
|--------------------------|---------------------------------|

Dependency of ambient temperature on medium temperature



 17 Exemplary representation, values in the table below.

$T_a$  Ambient temperature  
 $T_m$  Medium temperature  
A Maximum permitted medium temperature  $T_m$  at  $T_{a\ max} = 60\text{ °C}$  (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

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



| Not insulated  |                 |                |                | Insulated      |                 |                |                 |
|----------------|-----------------|----------------|----------------|----------------|-----------------|----------------|-----------------|
| A              |                 | B              |                | A              |                 | B              |                 |
| T <sub>a</sub> | T <sub>m</sub>  | T <sub>a</sub> | T <sub>m</sub> | T <sub>a</sub> | T <sub>m</sub>  | T <sub>a</sub> | T <sub>m</sub>  |
| 60 °C (140 °F) | 150 °C (302 °F) | –              | –              | 60 °C (140 °F) | 110 °C (230 °F) | 55 °C (131 °F) | 150 °C (302 °F) |

Medium density 0 to 5 000 kg/m<sup>3</sup> (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.

In the event of a tube failure, the pressure level inside the sensor housing will rise according to the operating process pressure. If the user judges that the sensor housing burst pressure does not provide an adequate safety margin, the device can be fitted with a rupture disk. This prevents excessively high pressure from forming inside the sensor housing. Therefore, the use of a rupture disk is strongly recommended in applications involving high gas pressures, and particularly in applications in which the process pressure is greater than 2/3 of the sensor housing burst pressure.

#### Burst pressure of the sensor housing

If the device is fitted with a rupture disk (order code for "Sensor option", option CA "Rupture disk"), the rupture disk trigger pressure is decisive.

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    | $\frac{3}{8}$ | 250                           | 3 620 |
| 15   | $\frac{1}{2}$ | 250                           | 3 620 |
| 25   | 1             | 250                           | 3 620 |
| 40   | 1½            | 200                           | 2 900 |
| 50   | 2             | 180                           | 2 610 |
| 80   | 3             | 120                           | 1 740 |










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

Rupture disk

To increase the level of safety, a device version with a rupture disk with a trigger pressure of 10 to 15 bar (145 to 217.5 psi) can be used (order code for "Sensor option", option CA "rupture disk").

The use of rupture disks cannot be combined with the separately available heating jacket.

|                   |   |
|-------------------|---|
| Internal cleaning | <ul style="list-style-type: none"> <li>■ CIP cleaning</li> <li>■ SIP cleaning</li> </ul> <p><b>Options</b><br/>Oil- and grease-free version for wetted parts, without declaration<br/>Order code for "Service", option HA <sup>2)</sup></p>   |
| Flow limit        | <p>Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.</p> <p> For an overview of the full scale values for the measuring range, see the "Measuring range" section →  132</p> <ul style="list-style-type: none"> <li>■ The minimum recommended full scale value is approx. 1/20 of the maximum full scale value</li> <li>■ For the most common applications, 20 to 50 % of the maximum full scale value can be considered ideal</li> <li>■ A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity &lt; 1 m/s (&lt; 3 ft/s).</li> <li>■ For gas measurement the following rules apply:             <ul style="list-style-type: none"> <li>■ The flow velocity in the measuring tubes should not exceed half the speed of sound (0.5 Mach)</li> <li>■ The maximum mass flow depends on the density of the gas: formula</li> </ul> </li> </ul> <p> To calculate the flow limit, use the <i>Applicator</i> sizing tool →  129</p> |
| Pressure loss     | <p> To calculate the pressure loss, use the <i>Applicator</i> sizing tool →  129</p>  |
| System pressure   | →  20  |

2) Cleaning only refers to the measuring instrument. Any accessories that have been supplied are not cleaned.

## 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: order code for "Housing", option A "Compact, aluminum coated".

#### Weight in SI units

| DN<br>[mm] | Weight [kg] |
|------------|-------------|
| 8          | 4.5         |
| 15         | 4.8         |
| 25         | 6.4         |
| 40         | 10.4        |
| 50         | 15.5        |
| 80         | 29          |

#### Weight in US units

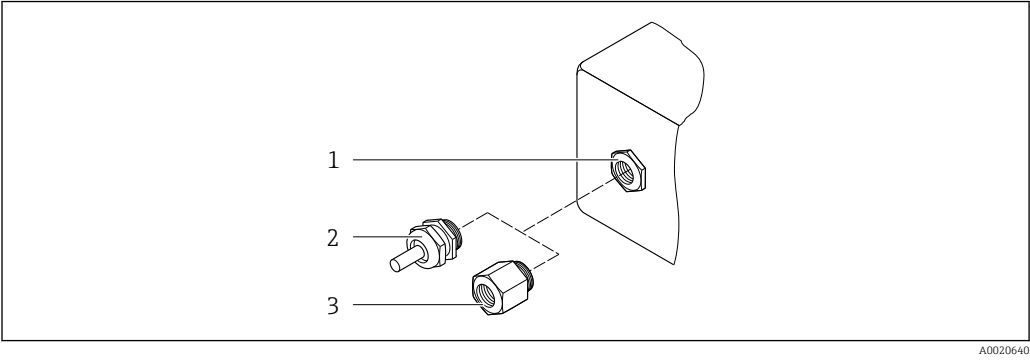
| DN<br>[in] | Weight [lbs] |
|------------|--------------|
| 3/8        | 10           |
| 1/2        | 11           |
| 1          | 14           |
| 1 1/2      | 23           |
| 2          | 34           |
| 3          | 64           |

### Materials

#### Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated":  
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, hygienic, stainless":  
Hygienic version, stainless steel 1.4301 (304)
- Order code for "Housing", option **C** "Ultra-compact, hygienic, stainless":  
Hygienic version, stainless steel 1.4301 (304)
- Window material for optional local display (→ 150):
  - For order code for "Housing", option **A**: glass
  - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands



18 Possible cable entries/cable glands

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

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

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

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

Order code for "Housing", option B "Compact, hygienic, 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" |                                |

Device plug

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

Sensor housing



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

Measuring tubes

Stainless steel, 1.4539 (904L); manifold: stainless steel, 1.4404 (316L)

### Process connections

- Flanges similar to EN 1092-1 (DIN2501) / similar to ASME B 16.5 / as per JIS B2220: Stainless steel, 1.4404 (F316/F316L)
- All other process connections: Stainless steel, 1.4404 (316/316L)

 Available process connections →  149

### Seals

Welded process connections without internal seals

### Accessories

*Safety Barrier Promass 100*

Housing: Polyamide

### Process connections

- Fixed flange connections:
  - EN 1092-1 (DIN 2501) flange
  - EN 1092-1 (DIN 2512N) flange
  - NAMUR lengths in accordance with NE 132
  - 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
- 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
- VCO connections:
  - 8-VCO-4
  - 12-VCO-4

 Process connection materials →  147

### Surface roughness

All data relate to parts in contact with medium.

*The following surface roughness categories can be ordered:*

| Category  | Method   | Option(s)/Order code<br>"Measuring tube mat., wetted surface" |
|---|--|---|
| Not polished  | –  | SA  |
| $Ra \leq 0.76 \mu\text{m}$ (30 $\mu\text{in}$ ) <sup>1)</sup> | Mechanically polished <sup>2)</sup>                                | SB  |
| $Ra \leq 0.76 \mu\text{m}$ (30 $\mu\text{in}$ ) <sup>1)</sup> | Mechanically polished <sup>2)</sup> , welds in as-welded condition | SJ  |
| $Ra \leq 0.38 \mu\text{m}$ (15 $\mu\text{in}$ ) <sup>1)</sup> | Mechanically polished <sup>2)</sup>                                | SC  |
| $Ra \leq 0.38 \mu\text{m}$ (15 $\mu\text{in}$ ) <sup>1)</sup> | Mechanically polished <sup>2)</sup> , welds in as-welded condition | SK  |

1) Ra according to ISO 21920

2) Inaccessible weld seams between pipe and manifold are excluded

## 16.11 Operability


### Local display

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

#### Display element

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

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

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

#### *"Compact, aluminum coated" housing version*

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

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

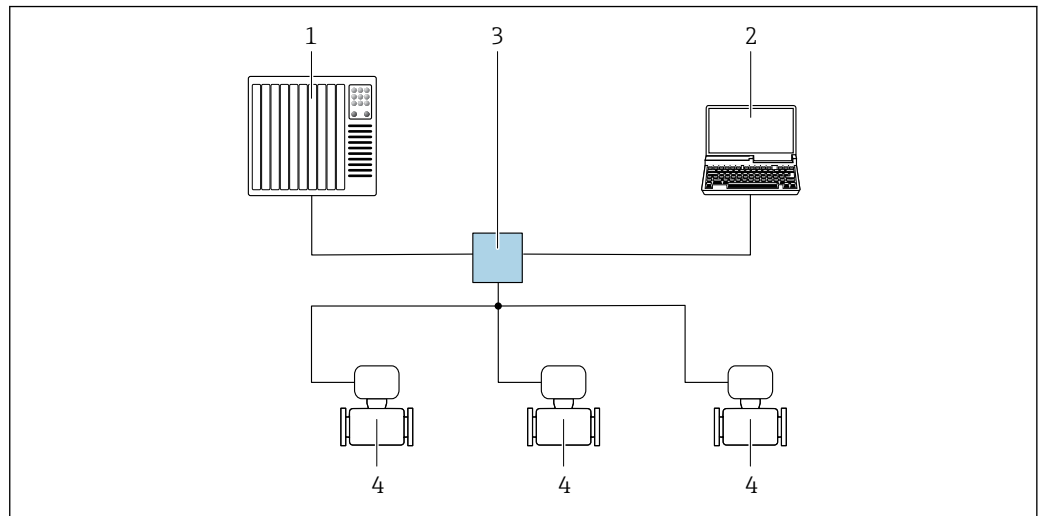
1. Press in the side latches of the local display.
2. Remove the local display from the main electronics module. Pay attention to the length of the connecting cable when doing so.

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

### Remote operation

#### Via PROFINET network

This communication interface is available in device versions with PROFINET.

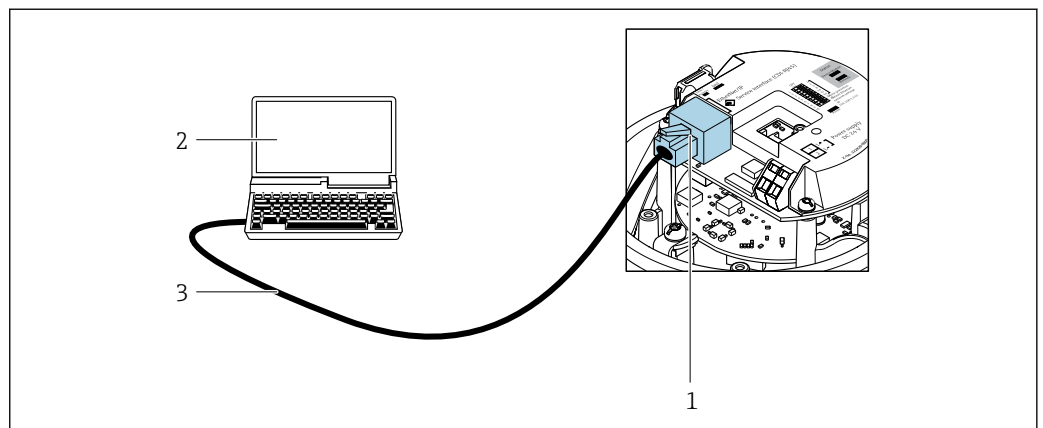
*Star topology*

A0026545

19 Options for remote operation via PROFINET network: star topology

- 1 Automation system, e.g. Simatic S7 (Siemens)
- 2 Computer with web browser for accessing integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet switch, e.g. Scalance X204 (Siemens)
- 4 Measuring instrument

## Service interface

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

A0016940

20 Connection for order code for "Output", option R: PROFINET

- 1 Service interface (CDI-RJ45) and PROFINET interface of the measuring instrument with access to the integrated web server
- 2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet connecting cable with RJ45 plug

## Languages

Can be operated in the following languages:

Via "FieldCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

## 16.12 Certificates and approvals

Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page:

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

|                        |   |
|------------------------|---|
| CE mark                | <p>The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p>   |
| UKCA marking           | <p>The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.</p> <p>Contact address Endress+Hauser UK:<br/> Endress+Hauser Ltd.<br/> Floats Road<br/> Manchester M23 9NF<br/> United Kingdom<br/> <a href="http://www.uk.endress.com">www.uk.endress.com</a></p>   |
| Ex-approval            | <p>The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.</p>   |
| Hygienic compatibility | <ul style="list-style-type: none"> <li>■ 3-A approval <ul style="list-style-type: none"> <li>■ Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval.</li> <li>■ The 3-A approval refers to the measuring instrument.</li> <li>■ When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument.<br/>A remote display module must be installed in accordance with the 3-A Standard.</li> <li>■ Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.<br/>Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.</li> </ul> </li> <li>■ EHEDG-tested (Type EL Class I) <p>Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.</p> <p>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" (<a href="http://www.ehedg.org">www.ehedg.org</a>).</p> <p>To meet the requirements for EHEDG certification, the orientation of the device must ensure drainability.</p> <p>Test criteria for cleanability according to EHEDG is a flow velocity of 1.5 m/s in the process line. This speed must be ensured for EHEDG-compliant cleaning.</p> </li> <li>■ FDA CFR 21</li> </ul> |



- Food Contact Materials Regulation (EC) 1935/2004
- Food Contact Materials Regulation GB 4806
- The requirements of the Food Contact Material regulations must be observed when selecting the material versions.



Observe special installation instructions

#### 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.

#### Certification PROFINET

##### **PROFINET interface**

The measuring instrument is certified and registered by the PROFIBUS Nutzerorganisation e.V. (PNO). The measuring system meets all the requirements of the following specifications:

- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET Netload Class 2 100 Mbit/s
- The device can also be operated with certified devices of other manufacturers (interoperability).
- The device supports PROFINET S2 system redundancy.

#### Pressure Equipment Directive

- With the marking
  - a) PED/G1/x (x = category) or
  - b) PESR/G1/x (x = category)
 on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"
  - a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
  - b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of
  - a) Art. 4, Section 3 of the Pressure Equipment Directive 2014/68/EU or
  - b) Part 1, Section 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) in Schedule 3, Section 2 of Statutory Instruments 2016 No. 1105.

#### External standards and guidelines

- EN 60529  
Degrees of protection provided by enclosure (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

- GB 30439.5  
Safety requirements for industrial automation products - Part 5: Flowmeter safety requirements
- EN 61326-1/-2-3  
EMC requirements for electrical equipment for measurement, control and laboratory use
- NAMUR NE 21  
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32  
Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43  
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53  
Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 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 diagnostics 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](http://www.endress.com).



Detailed information on the application packages:  
Special Documentation → 156

### Heartbeat Technology

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

#### Heartbeat Verification

Meets the requirement for traceable verification in accordance with DIN ISO 9001:2015 Clause 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 total test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk evaluation.

### Heartbeat Monitoring

Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:

- Draw conclusions - using these data and other information - about the impact the process influences (e.g. corrosion, abrasion, deposit buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.g. gas pockets.



Detailed information on Heartbeat Technology:  
Special Documentation → 156

### 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:

Concentration calculation from user-defined tables.

The measured values are output via the digital and analog outputs of the measuring instrument.



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

### Petroleum & locking function

Order code for "Application package", option EM "Petroleum & locking function"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package. It is also possible to lock the settings.

- Corrected volume flow and calculated reference density in accordance with the "API Manual of Petroleum Measurement Standards, Chapter 11.1"
- Water content, based on density measurement
- Weighted mean of the density and temperature



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

## 16.14 Accessories



Overview of accessories available to order → 128

## 16.15 Documentation



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

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

### Standard documentation

### Brief Operating Instructions

*Brief Operating Instructions for the sensor*

| Measuring instrument | Documentation code |
|----------------------|--------------------|
| Proline Promass E    | KA01260D           |

*Transmitter Brief Operating Instructions*

| Measuring device    | Documentation code |
|---------------------|--------------------|
| Proline Promass 100 | KA01336D           |

**Technical Information**

| Measuring device      | Documentation code |
|-----------------------|--------------------|
| Proline Promass E 100 | TI01351D           |

**Description of Device Parameters**

| Measuring device    | Documentation code |
|---------------------|--------------------|
| Proline Promass 100 | GP01037D           |

Supplementary device-  
dependent documentation

**Safety Instructions**

| Content          | Documentation code |
|------------------|--------------------|
| ATEX/IECEX Ex i  | XA00159D           |
| ATEX/IECEX Ex nA | XA01029D           |
| cCSAus IS        | XA00160D           |
| INMETRO Ex i     | XA01219D           |
| INMETRO Ex nA    | XA01220D           |

**Special Documentation**

| Contents  | Documentation code |
|---|--------------------|
| Information on the Pressure Equipment Directive | SD01614D           |
| Concentration measurement                       | SD01503D           |
| Heartbeat Technology                            | SD01493D           |
| Web server                                      | SD01823D           |

**Installation Instructions**

| Contents  | Note  |
|---|---|
| Installation instructions for spare part sets and accessories | <ul style="list-style-type: none"> <li>Access the overview of all the available spare part sets via <i>Device Viewer</i> →  126</li> <li>Accessories available for order with Installation Instructions →  128</li> </ul> |

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