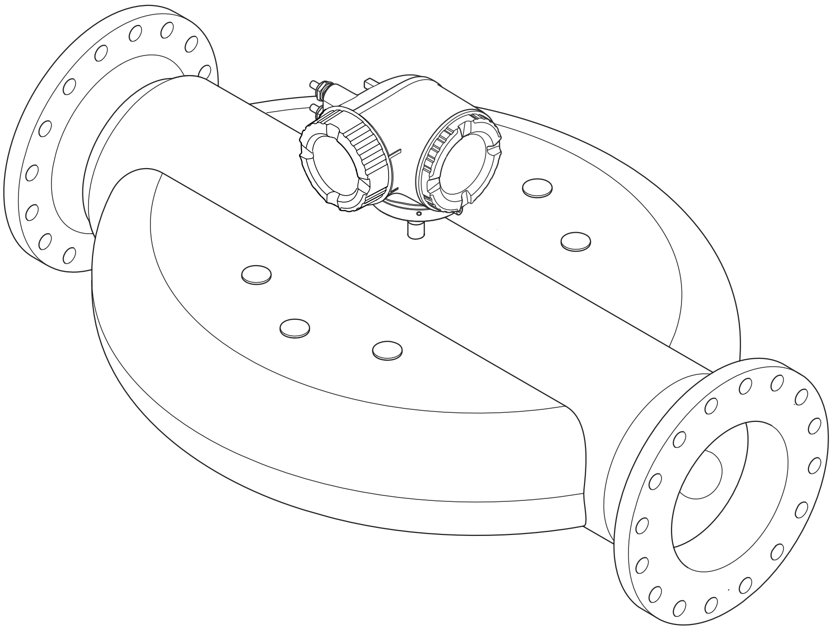
BA02118D/06/EN/01.22-00
71598688
2024-01-08

Valid as of version
01.00.zz (Device firmware)

# Operating Instructions
# **Proline Promass X 300**

## Coriolis flowmeter
## PROFINET with Ethernet-APL



Endress+Hauser
People for Process Automation

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

# Table of contents

## 9 System integration . . . . . . . . . . . . . . . . 73

## 10 Commissioning . . . . . . . . . . . . . . . . . . . 88

## 11 Operation . . . . . . . . . . . . . . . . . . . . . . . 157

## 12 Diagnostics and troubleshooting . . 180

# 1 About this document

## 1.1 Document function

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

## 1.2 Symbols

### 1.2.1 Safety symbols

**⚠ DANGER**

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

**⚠ WARNING**

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

**⚠ CAUTION**

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

**NOTICE**

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

### 1.2.2 Electrical symbols

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

### 1.2.3 Communication-specific symbols

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

| Symbol | Meaning |
|---|---|
| ☼ | **LED**<br>Light emitting diode is on. |
| ☼ | **LED**<br>Light emitting diode is flashing. |

## 1.2.4 Tool symbols

| Symbol | Meaning |
|---|---|
| ◐ | Flat-blade screwdriver |
| ⬡ | Allen key |
| 🔧 | Open-ended wrench |

## 1.2.5 Symbols for certain types of information

| Symbol | Meaning |
|---|---|
| ☑ | **Permitted**<br>Procedures, processes or actions that are permitted. |
| ☑ ☑ | **Preferred**<br>Procedures, processes or actions that are preferred. |
| ☒ | **Forbidden**<br>Procedures, processes or actions that are forbidden. |
| ℹ | **Tip**<br>Indicates additional information. |
| 📖 | Reference to documentation |
| 📄 | Reference to page |
| 🖼 | Reference to graphic |
| ▶ | Notice or individual step to be observed |
| 1., 2., 3.… | Series of steps |
| ↳ | Result of a step |
| ? | Help in the event of a problem |
| 👁 | Visual inspection |

## 1.2.6 Symbols in graphics

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

| Symbol | Meaning |
|---|---|
| ~~Ex~~ | Safe area (non-hazardous area) |
| ≈➡ | Flow direction |

## 1.3 Documentation

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

### 1.3.1 Document function

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

| Document type | Purpose and content of the document |
|---|---|
| Technical Information (TI) | **Planning aid for your device**<br>The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device. |
| Brief Operating Instructions (KA) | **Guide that takes you quickly to the 1st measured value**<br>The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning. |
| Operating Instructions (BA) | **Your reference document**<br>The Operating Instructions contain all the information that is required in the 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) | **Reference for your parameters**<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. The Safety Instructions are an integral part of the Operating Instructions.<br>ℹ Information on the Safety Instructions (XA) relevant to the device is provided on the nameplate. |
| Supplementary device-dependent documentation (SD/FY) | Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the device documentation. |

## 1.4 Registered trademarks

**Ethernet-APL™**
Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

# 2 Safety instructions

## 2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

## 2.2 Intended use

**Application and media**

The measuring device described in this manual is intended only for the flow measurement of liquids and gases.

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

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

To ensure that the measuring device remains in proper condition for the operation time:

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

**Incorrect use**

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

**⚠ WARNING**

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

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

**NOTICE**

**Verification for borderline cases:**

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

### Residual risks

**⚠ CAUTION**

**The electronics and the medium may cause the surfaces to heat up or freeze. Risk of burns or frostbite!**

- 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

When working on and with the device:

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

## 2.4 Operational safety

Damage to the device!

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

### Modifications to the device

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

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

### Repair

To ensure continued operational safety and reliability:

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

## 2.5 Product safety

This measuring device is designed in accordance with good engineering practice to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate.

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

## 2.6 IT security

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

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

## 2.7 Device-specific IT security

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

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

### 2.7.1 Protecting access via hardware write protection

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

Hardware write protection is disabled when the device is delivered → 🗎 155.

### 2.7.2 Protecting access via a password

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

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

### User-specific access code

Write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code (→ 🗎 154).

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

### WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→ 🗎 68), which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter (→ 🗎 146).

### Infrastructure mode

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

### General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, for example, see the "Write protection via access code" section → 🗎 154

## 2.7.3 Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server. The connection is via the service interface (CDI-RJ45), signal transmission connection for PROFINET with Ethernet-APL (IO1) or the WLAN interface.

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

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

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

## 2.7.4 Access via service interface (CDI-RJ45)

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

The use of relevant industrial standards and guidelines that have been defined by national and international safety committees, such as IEC/ISA62443 or the IEEE, is recommended.

This includes organizational security measures such as the assignment of access authorization as well as technical measures such as network segmentation.

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

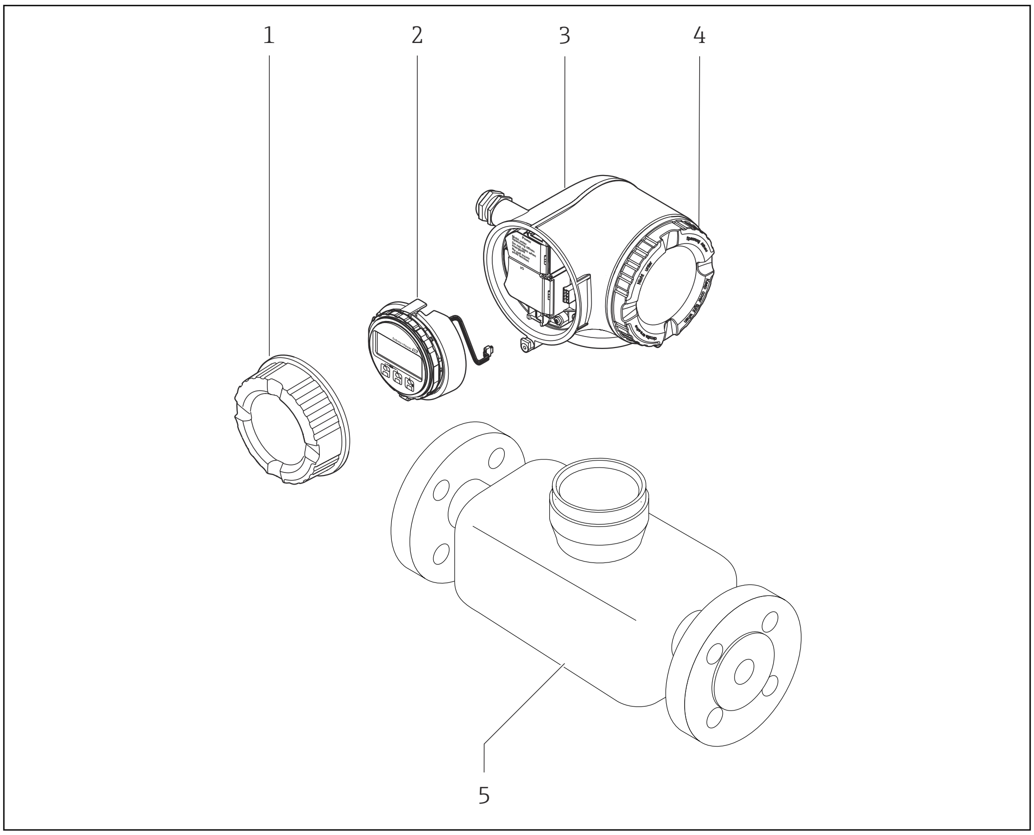
Order code for "Approval transmitter + sensor", options (Ex de): BA, BB, C1, C2, GA, GB, MA, MB, NA, NB

# 3 Product description

The device consists of a transmitter and a sensor.

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

## 3.1 Product design

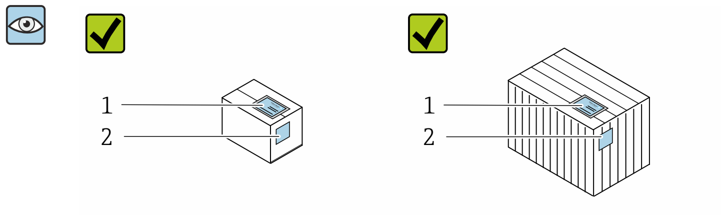


1 *Important components of a measuring device*

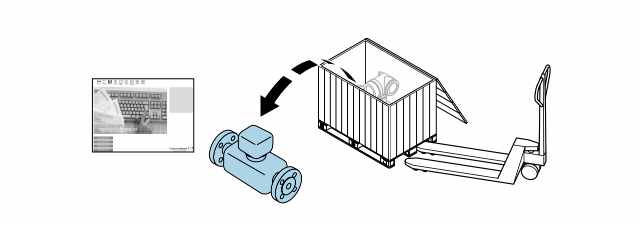
*1 Connection compartment cover*
*2 Display module*
*3 Transmitter housing*
*4 Electronics compartment cover*
*5 Sensor*

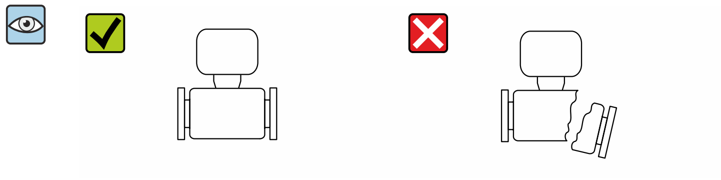
# 4 Incoming acceptance and product identification

## 4.1 Incoming acceptance

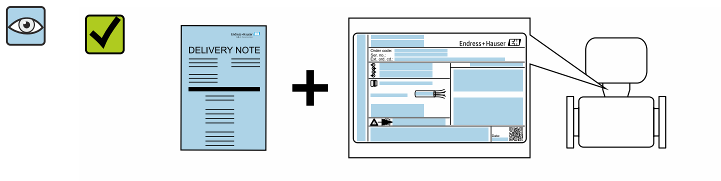


Are the order codes on the delivery note (1) and the product sticker (2) identical?

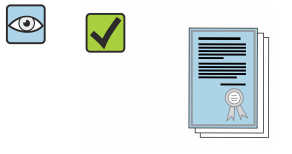




Are the goods undamaged?



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



Is the envelope present with accompanying documents?

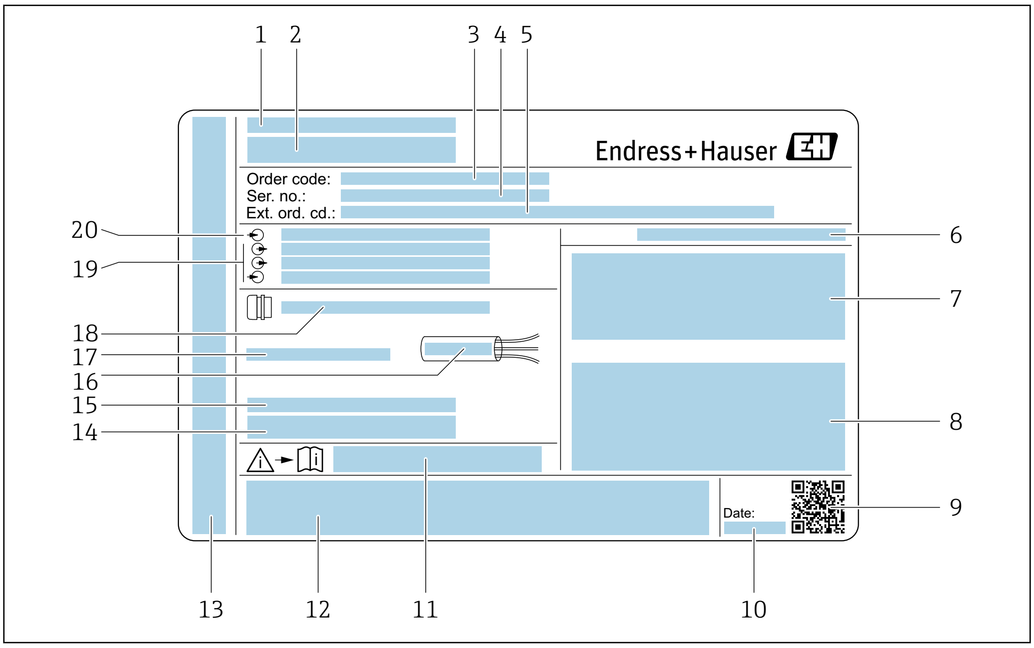
- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 🗎 16.

## 4.2 Product identification

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

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The chapters "Additional standard documentation on the device" and "Supplementary device-dependent documentation"
- The *Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the DataMatrix code on the nameplate.

### 4.2.1 Transmitter nameplate



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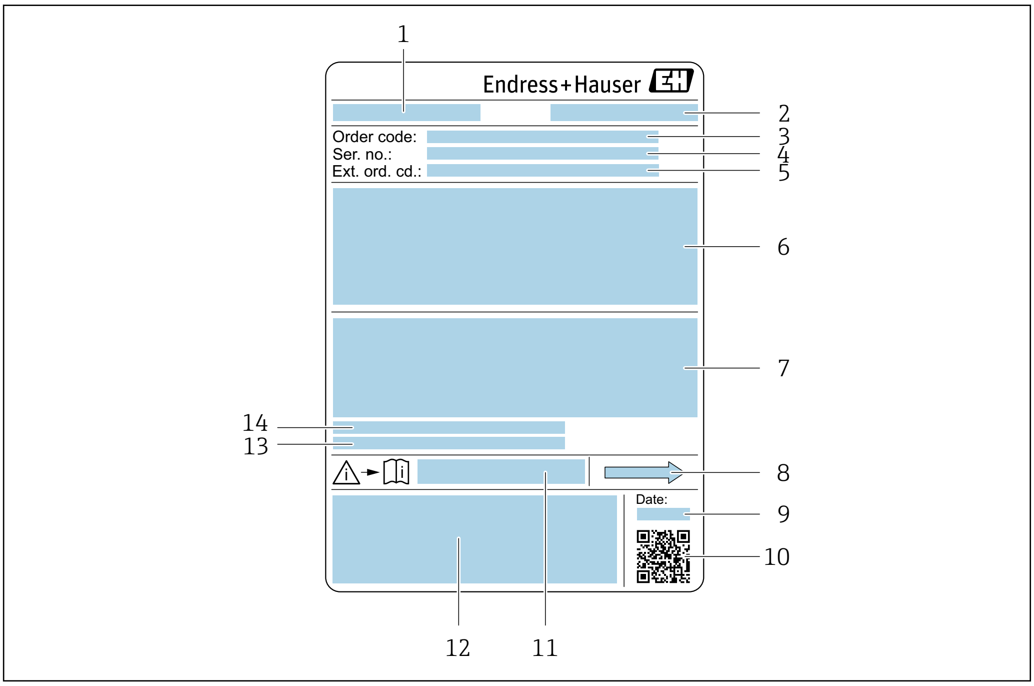
2 *Example of a transmitter nameplate*

1 *Place of manufacture*
2 *Name of the transmitter*
3 *Order code*
4 *Serial number (Ser. no.)*
5 *Extended order code (Ext. ord. cd.)*
6 *Degree of protection*
7 *Space for approvals: use in hazardous areas*
8 *Electrical connection data: available inputs and outputs*
9 *2-D matrix code*
10 *Date of manufacture: year-month*
11 *Document number of safety-related supplementary documentation*
12 *Space for approvals and certificates: e.g. CE mark, RCM tick*
13 *Space for degree of protection of connection and electronics compartment when used in hazardous areas*
14 *Firmware version (FW) and device revision (Dev.Rev.) from the factory*
15 *Space for additional information in the case of special products*
16 *Permitted temperature range for cable*
17 *Permitted ambient temperature ($T_a$)*
18 *Information on cable gland*
19 *Available inputs and outputs, supply voltage*
20 *Electrical connection data: supply voltage*

### 4.2.2 Sensor nameplate



3 *Example of a sensor nameplate*

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

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

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

### 4.2.3 Symbols on measuring device

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

# 5 Storage and transport

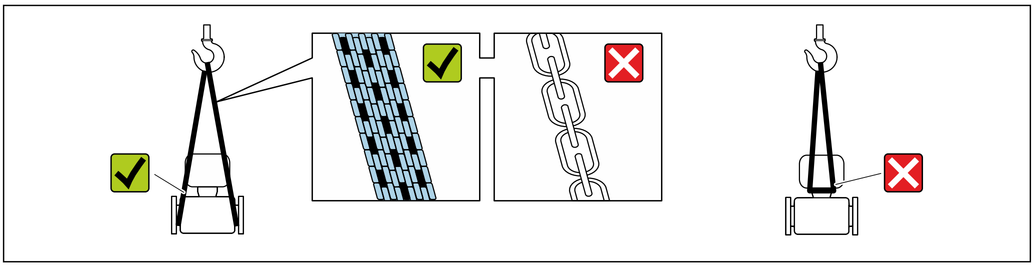
## 5.1 Storage conditions

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

Storage temperature → 🗎 284

## 5.2 Transporting the product

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



A0029252

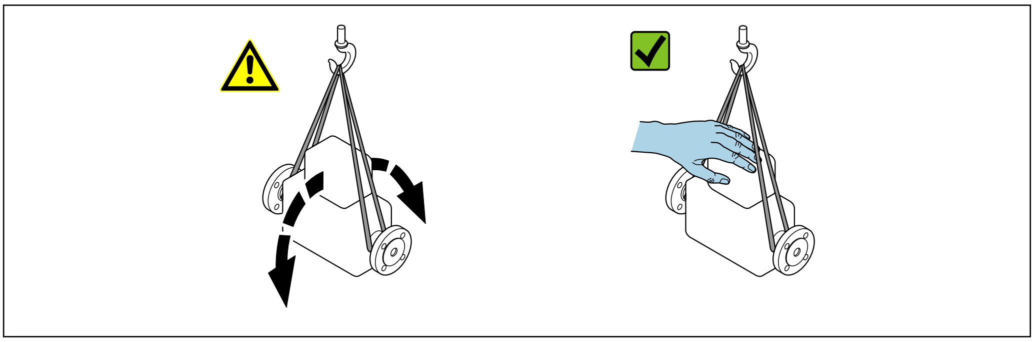
ℹ Do not remove protective covers or caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.

### 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).



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### 5.2.2 Measuring devices with lifting lugs

**⚠ CAUTION**

**Special transportation instructions for devices with lifting lugs**

- ▶ Only use the lifting lugs fitted on the device or flanges to transport the device.
- ▶ The device must always be secured at two lifting lugs at least.

### 5.2.3 Transporting with a fork lift

If transporting in wood crates, the floor structure enables the crates to be lifted lengthwise or at both sides using a forklift.

## 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:

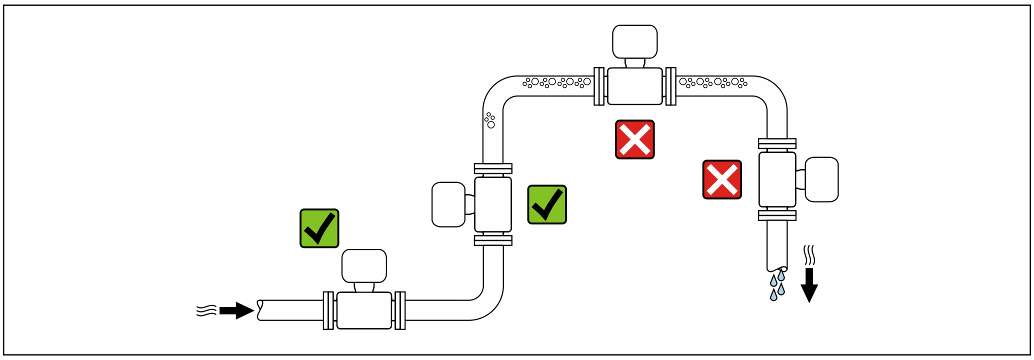
- Outer packaging of device
  Polymer stretch wrap, complying with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62EC, recyclability confirmed by Resy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

# 6 Mounting

## 6.1 Mounting requirements

### 6.1.1 Mounting position

**Mounting location**



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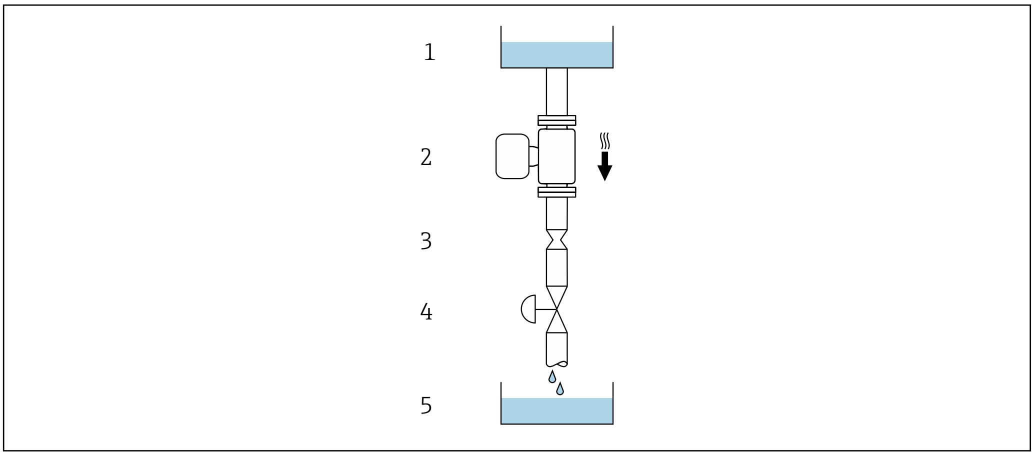
To prevent measuring errors arising from accumulation of gas bubbles in the measuring pipe, avoid the following mounting locations in the piping:
- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

*Installation in down pipes*

However, the following installation suggestion allows for installation in an open vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.



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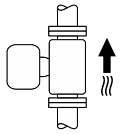
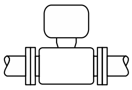
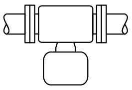
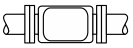
*4 Installation in a down pipe (e.g. for batching applications)*

1 *Supply tank*
2 *Sensor*
3 *Orifice plate, pipe restriction*
4 *Valve*
5 *Batching tank*

| DN | | Ø orifice plate, pipe restriction | |
|---|---|---|---|
| **[mm]** | **[in]** | **[mm]** | **[in]** |
| 300 | 12 | 210 | 8.27 |
| 350 | 14 | 210 | 8.27 |
| 400 | 16 | 210 | 8.27 |

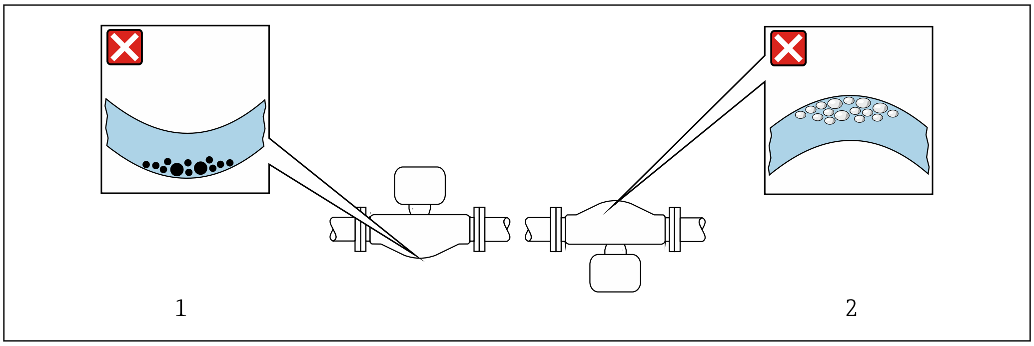
### Orientation

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

| Orientation | | | Recommendation |
|---|---|---|---|
| **A** | Vertical orientation |  A0015591 | ☑☑[1] |
| **B** | Horizontal orientation, transmitter at top |  A0015589 | ☑☑[2]<br>→ 🖼 5, 📄 22 |
| **C** | Horizontal orientation, transmitter at bottom |  A0015590 | ☑☑[3]<br>→ 🖼 5, 📄 22 |
| **D** | Horizontal orientation, transmitter at side |  A0015592 | ☑→ 🖼 5, 📄 22 |

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 fluid properties.



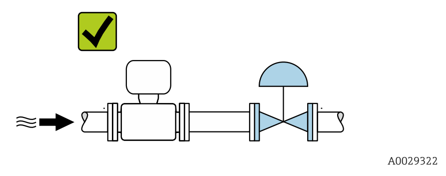
A0028774

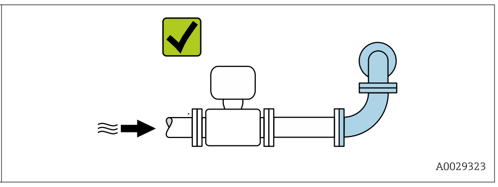
🖼 5 *Orientation of sensor with curved measuring tube*

*1 Avoid this orientation for fluids with entrained solids: Risk of solids accumulating.*
*2 Avoid this orientation for outgassing fluids: 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 → 🖹 23.





*Dimensions*

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

## 6.1.2 Environment and process requirements

### Ambient temperature range

| | |
|---|---|
| **Measuring device** | ▪ −40 to +60 °C (−40 to +140 °F)<br>▪ Order code for "Test, certificate", option JP: −50 to +60 °C (−58 to +140 °F) |
| **Readability of the local display** | −20 to +60 °C (−4 to +140 °F)<br>The readability of the display may be impaired at temperatures outside the temperature range. |

ℹ Dependency of ambient temperature on medium temperature → 🖹 285

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

ℹ You can order a weather protection cover from Endress+Hauser. → 🖹 266.

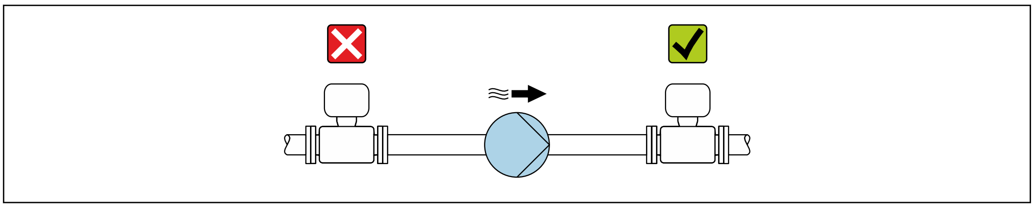
### System pressure

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

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

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

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



### Thermal insulation

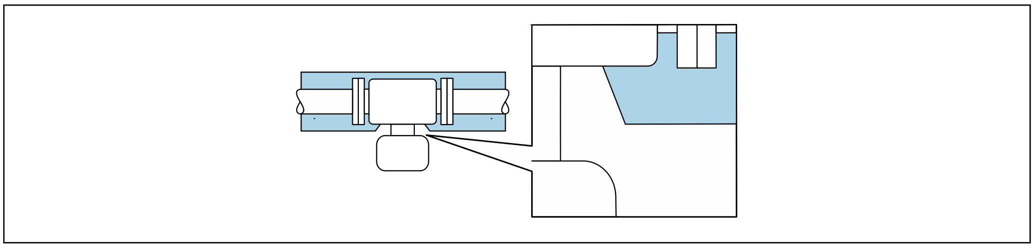
In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

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

**NOTICE**

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

- ▶ Recommended orientation: horizontal orientation, transmitter housing pointing downwards.
- ▶ Do not insulate the transmitter housing .
- ▶ Maximum permissible temperature at the lower end of the transmitter housing: 80 °C (176 °F)
- ▶ Thermal insulation with not isolated extended neck: We recommend that you do not insulate the extended neck in order to ensure optimum dissipation of heat.



6 *Thermal insulation with not isolated extended neck*

### Heating

**NOTICE**

**Electronics can overheat due to elevated ambient temperature!**

- ▶ Observe maximum permitted ambient temperature for the transmitter.
- ▶ Depending on the medium temperature, take the device orientation requirements into account.

Under critical climatic conditions, in particular, it is important to ensure that the temperature difference between the ambient temperature and the fluid temperature is not >100 K. Suitable measures must be taken, such as heating or insulation.

**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.

*Heating options*

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

### Vibrations

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

## 6.1.3 Special mounting 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
- In the case of measuring devices with the order code for "Housing", option B "Stainless, hygienic", to seal the connection compartment cover, screw it closed finger-tight and tighten it by another 45° (corresponds to 15 Nm).

### Rupture disk

Process-related information: → 🗎 287.

**⚠ 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.

The position of the rupture disk is indicated by a sticker affixed beside it.

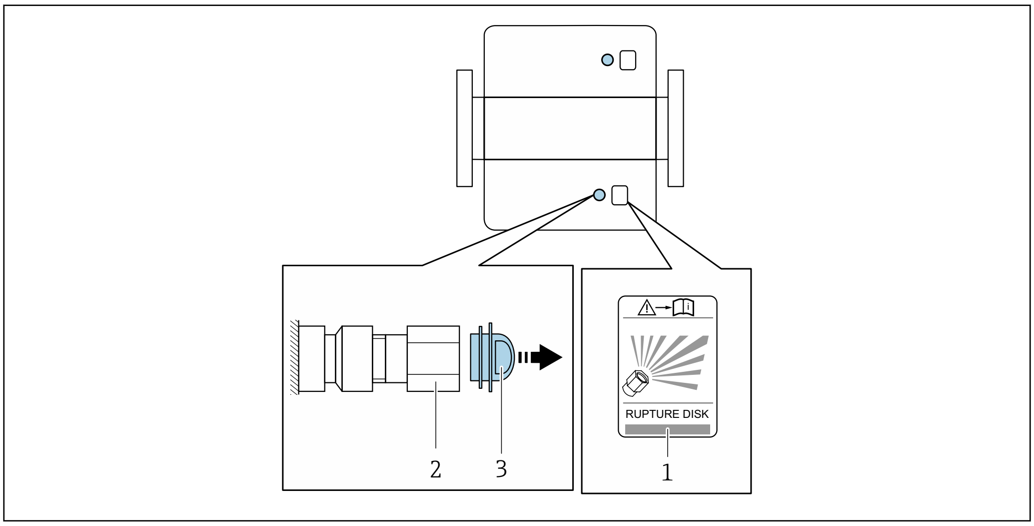
The transportation guard must be removed.

The existing connecting nozzles are not intended for the purpose of rinsing or pressure monitoring, but instead serve as the mounting location for the rupture disk.

In the event of a failure of the rupture disk, a drain device can be screwed onto the female thread of the rupture disk in order to drain off any escaping medium.

---

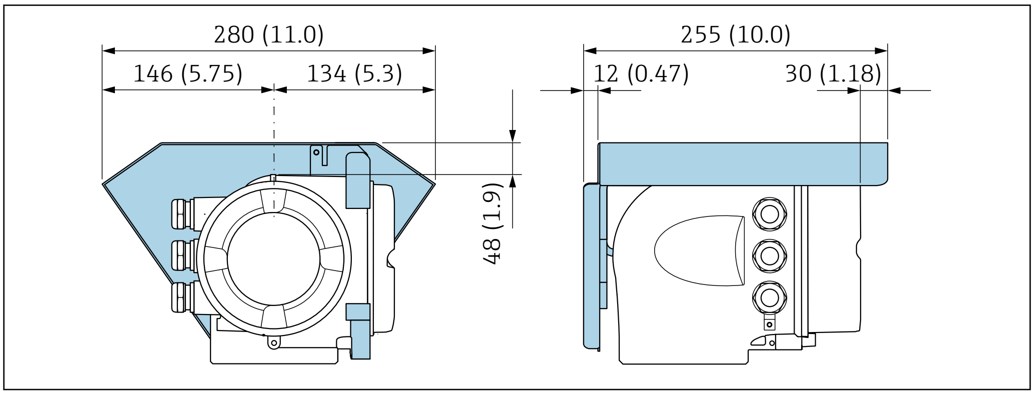
1) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating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



1 *Rupture disk label*
2 *Rupture disk with 1/2" NPT female thread and 1" width across flats*
3 *Transport protection*

For information on the dimensions, see the "Technical Information" document, "Mechanical construction" section (accessories).

### Weather protection cover



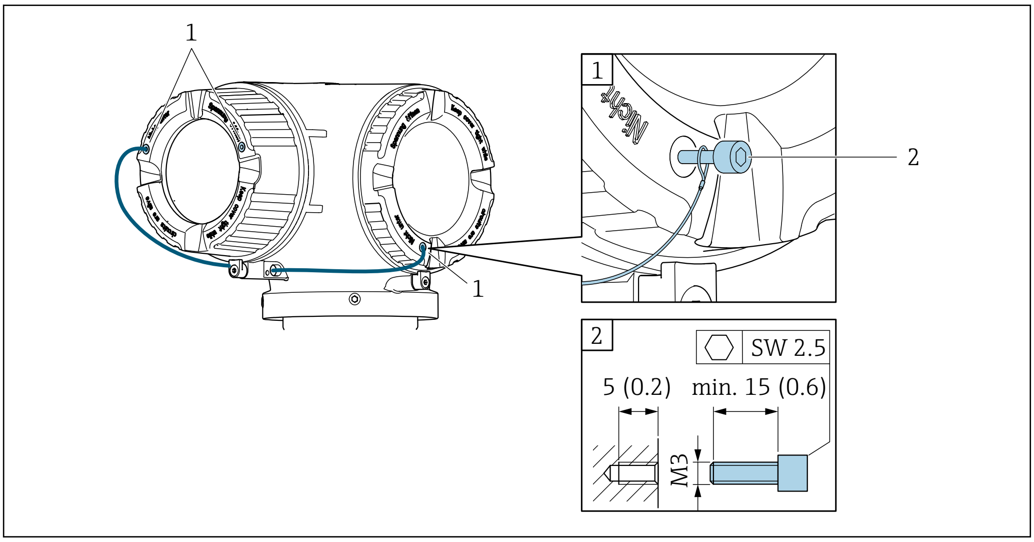
7 *Engineering unit mm (in)*

### Cover lock

**NOTICE**

**Order code "Housing", option L "Cast, stainless": The covers of the transmitter housing are provided with a borehole to lock the cover.**

The cover can be locked using screws and a chain or cable provided by the customer on site.
- ▶ The use of stainless steel chains or cables is recommended.
- ▶ If a protective coating is applied, it is recommended to use a heat shrink tube to protect the housing paint.



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

## 6.2 Mounting the measuring device

### 6.2.1 Required tools

**For sensor**

For flanges and other process connections: use a suitable mounting tool

### 6.2.2 Preparing the measuring device

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

### 6.2.3 Mounting the measuring device

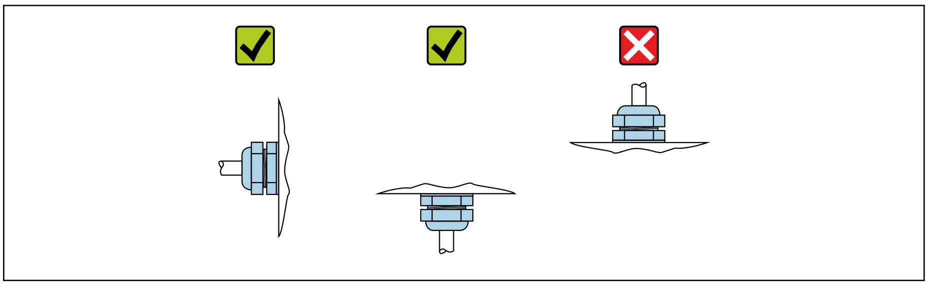
**⚠ WARNING**

**Danger due to improper process sealing!**

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

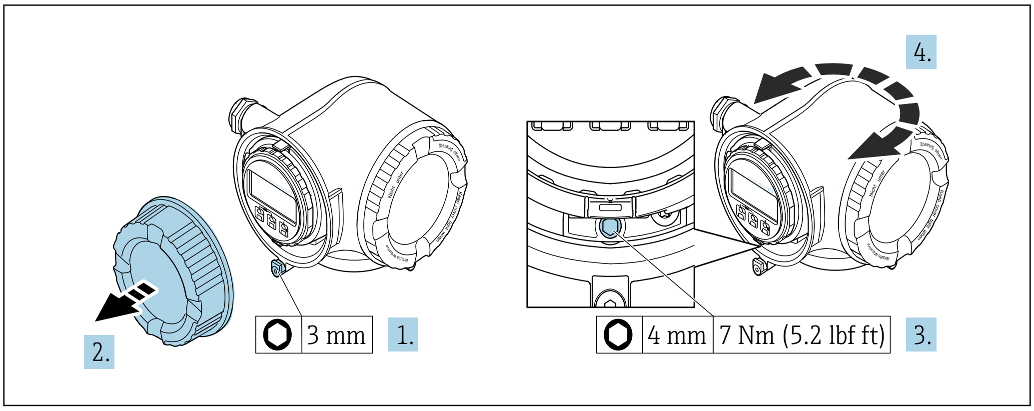
1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the medium.

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


A0029263

### 6.2.4 Turning the transmitter housing

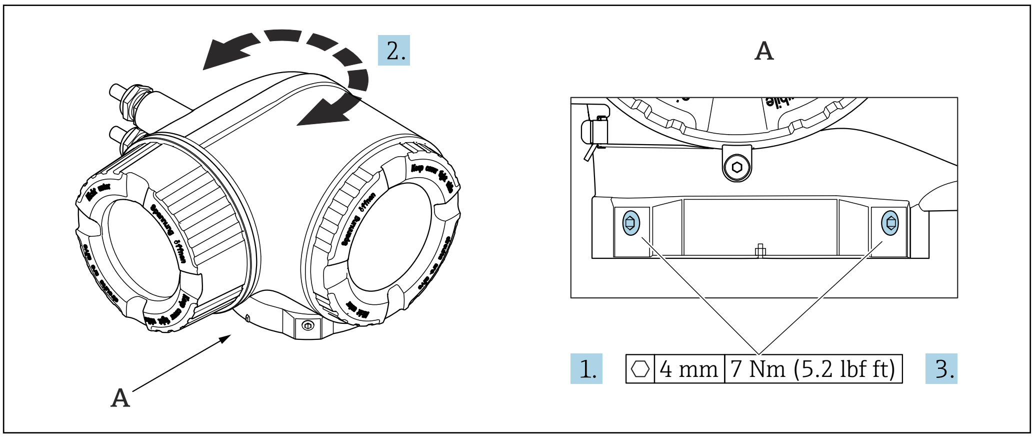
To provide easier access to the connection compartment or display module, the transmitter housing can be turned.



A0029993

8 *Non-Ex housing*

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

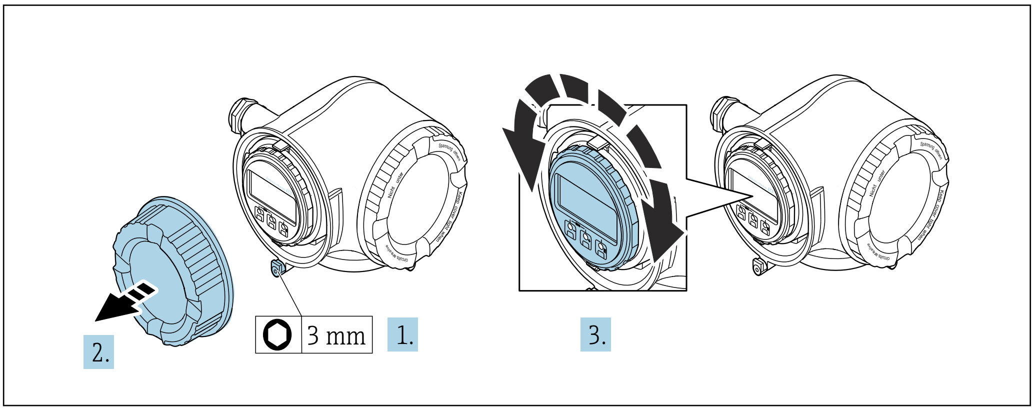


9 *Ex housing*

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

### 6.2.5 Turning the display module

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



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

## 6.3 Post-installation check

| | |
|---|---|
| Is the device undamaged (visual inspection)? | ☐ |
| Does the measuring device conform to the measuring point specifications?<br>For example:<br>▪ Process temperature → 🗎 285<br>▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)<br>▪ Ambient temperature<br>▪ Measuring range | ☐ |
| Has the correct orientation for the sensor been selected ?<br>▪ According to sensor type<br>▪ According to medium temperature<br>▪ According to medium properties (outgassing, with entrained solids) | ☐ |
| Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 🗎 22? | ☐ |
| Are the measuring point identification and labeling correct (visual inspection)? | ☐ |
| Is the device adequately protected from precipitation and direct sunlight? | ☐ |
| Are the securing screw and securing clamp tightened securely? | ☐ |

# 7 Electrical connection

**⚠ WARNING**

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

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

## 7.1 Electrical safety

In accordance with applicable national regulations.

## 7.2 Connecting requirements

### 7.2.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp: Allen key 3 mm
- Wire stripper
- When using stranded cables: Crimper for wire end ferrule
- For removing cables from terminal: Flat blade screwdriver ≤ 3 mm (0.12 in)

### 7.2.2 Requirements for connecting cable

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

**Protective grounding cable for the outer ground terminal**

Conductor cross-section < 2.1 mm$^2$ (14 AWG)

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

The grounding impedance must be less than 2 Ω.

**Permitted temperature range**

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

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

Standard installation cable is sufficient.

**Signal cable**

*PROFINET with Ethernet-APL*

The reference cable type for APL segments is fieldbus cable type A, MAU type 1 and 3 (specified in IEC 61158-2). This cable meets the requirements for intrinsically safe applications according to IEC TS 60079-47 and can also be used in non-intrinsically safe applications.

| | |
|---|---|
| **Cable type** | A |
| **Cable capacitance** | 45 to 200 nF/km |

| | |
|---|---|
| **Loop resistance** | 15 to 150 Ω/km |
| **Cable inductance** | 0.4 to 1 mH/km |

Further details are provided in the Ethernet-APL Engineering Guideline (https://www.ethernet-apl.org).

*Current output 0/4 to 20 mA*

- Standard installation cable is sufficient
- For custody transfer measurement, use a shielded cable: tin-plated copper braid, optical cover ≥ 85 %

*Pulse /frequency /switch output*

- Standard installation cable is sufficient
- For custody transfer measurement, use a shielded cable: tin-plated copper braid, optical cover ≥ 85 %

*Relay output*

Standard installation cable is sufficient.

*Current input 0/4 to 20 mA*

- Standard installation cable is sufficient
- For custody transfer measurement, use a shielded cable: tin-plated copper braid, optical cover ≥ 85 %

*Status input*

- Standard installation cable is sufficient
- For custody transfer measurement, use a shielded cable: tin-plated copper braid, optical cover ≥ 85 %

### Cable diameter

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

### Requirements for connecting cable – remote display and operating module DKX001

*Optionally available connecting cable*

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

| | |
|---|---|
| **Standard cable** | 2 × 2 × 0.34 mm$^2$ (22 AWG) PVC cable with common shield (2 pairs, pair-stranded) |
| **Flame resistance** | According to DIN EN 60332-1-2 |
| **Oil resistance** | According to DIN EN 60811-2-1 |
| **Shield** | Tin-plated copper braid, optical cover ≥ 85 % |
| **Capacitance: core/shield** | ≤ 200 pF/m |
| **L/R** | ≤ 24 µH/Ω |

| | |
|---|---|
| **Available cable length** | 5 m (15 ft)/10 m (35 ft)/20 m (65 ft)/30 m (100 ft) |
| **Operating temperature** | When mounted in a fixed position: −50 to +105 °C (−58 to +221 °F); when cable can move freely: −25 to +105 °C (−13 to +221 °F) |

*Standard cable - customer-specific cable*

With the following order option, no cable is supplied with the device and must be provided by the customer:
Order code for DKX001: Order code **040** for "Cable", option **1** "None, provided by customer, max 300 m"

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

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

### 7.2.3 Terminal assignment

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

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

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | |
|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (+) | 23 (–) |
| | | Device-specific terminal assignment: adhesive label in terminal cover. | | | | | |

Terminal assignment of the remote display and operating module → 🗎 38.

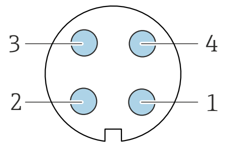
### 7.2.4 Available device plugs

Device plugs may not be used in hazardous areas!

**Order code for "Input; output 1", option RB "PROFINET with Ethernet-APL"**

| Order code<br>"Electrical connection" | Cable entry/connection<br>2 | <br>3 |
|---|---|---|
| L, N, P, U | M12 plug × 1 | – |

### 7.2.5 device plug pin assignment

|  | Pin | Assignment | Coding | Plug/socket |
|---|---|---|---|---|
| | 1 | APL signal - | A | Socket |
| | 2 | APL signal + | | |
| | 3 | Cable shield[1] | | |
| | 4 | Not assigned | | |
| | Metal plug housing | Cable shield | | |
| | [1] If a cable shield is used | | | |

### 7.2.6 Preparing the measuring device

**NOTICE**

**Insufficient sealing of the housing!**

Operational reliability of the measuring device could be compromised.

- ▶ Use suitable cable glands corresponding to the degree of protection.

1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
   Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
   Observe requirements for connecting cables → 🗎 31.

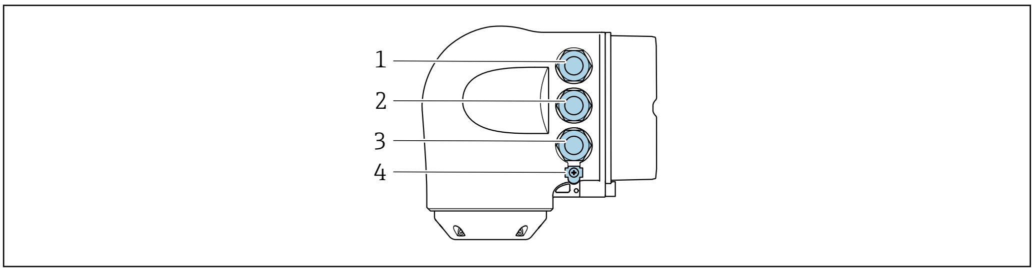
## 7.3 Connecting the measuring device

**NOTICE**

**An incorrect connection compromises electrical safety!**

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

### 7.3.1 Connecting the transmitter

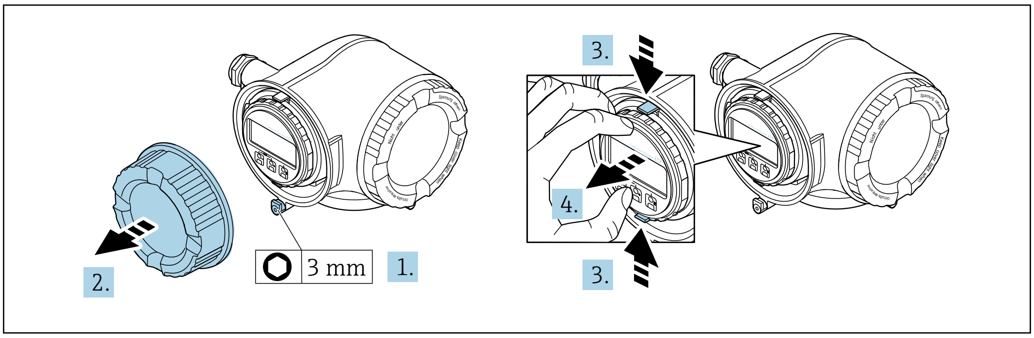


A0026781

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

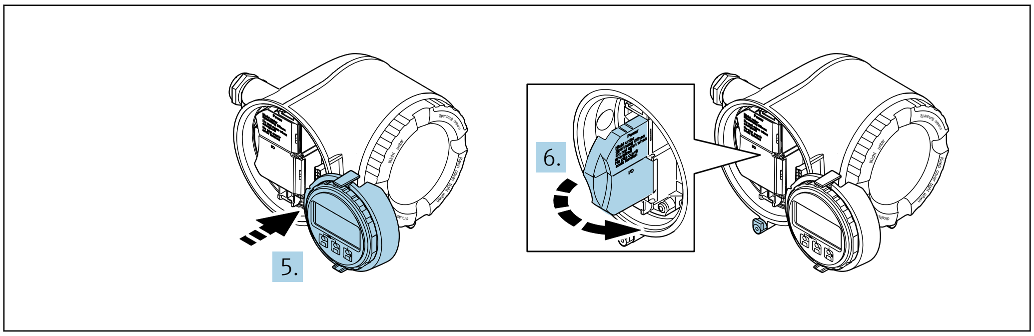
ℹ In addition to connecting the device via PROFINET with Ethernet-APL and the available inputs/outputs, an additional connection option is also available: Integrate into a network via the service interface (CDI-RJ45) .

**Connecting the plug**



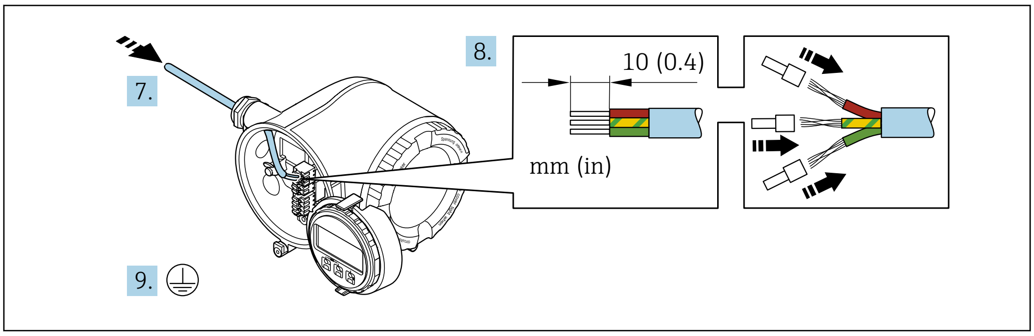
A0029813

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



A0029814

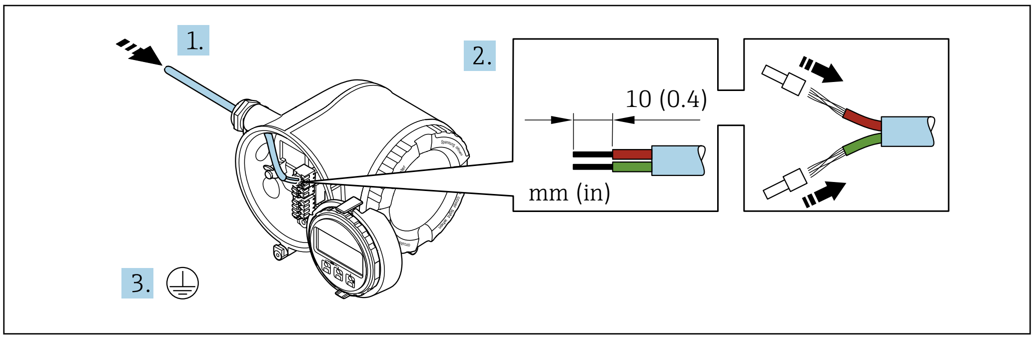
5. Attach the holder to the edge of the electronics compartment.
6. Open the terminal cover.



A0051111

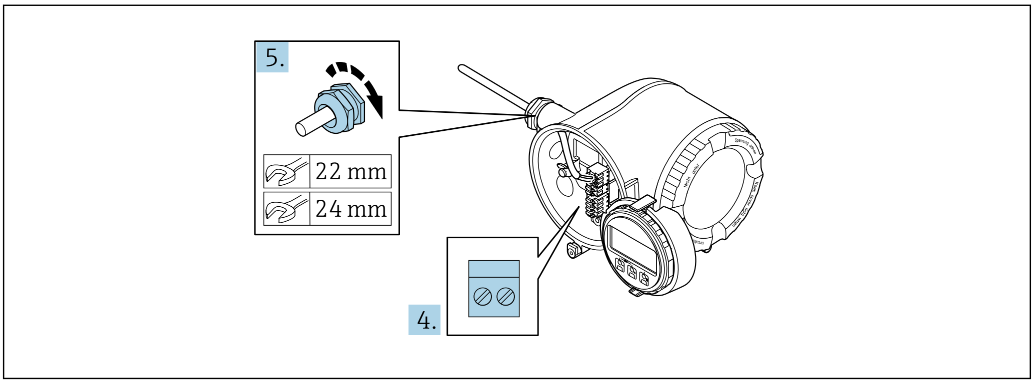
7. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
8. Strip the cable and cable ends and connect to terminals 26-27. In the case of stranded cables, also fit ferrules.
9. Connect protective earth (PE).
10. Firmly tighten the cable glands.
    - ↳ This concludes the connection via the APL port.

### Connecting the supply voltage and additional inputs/outputs



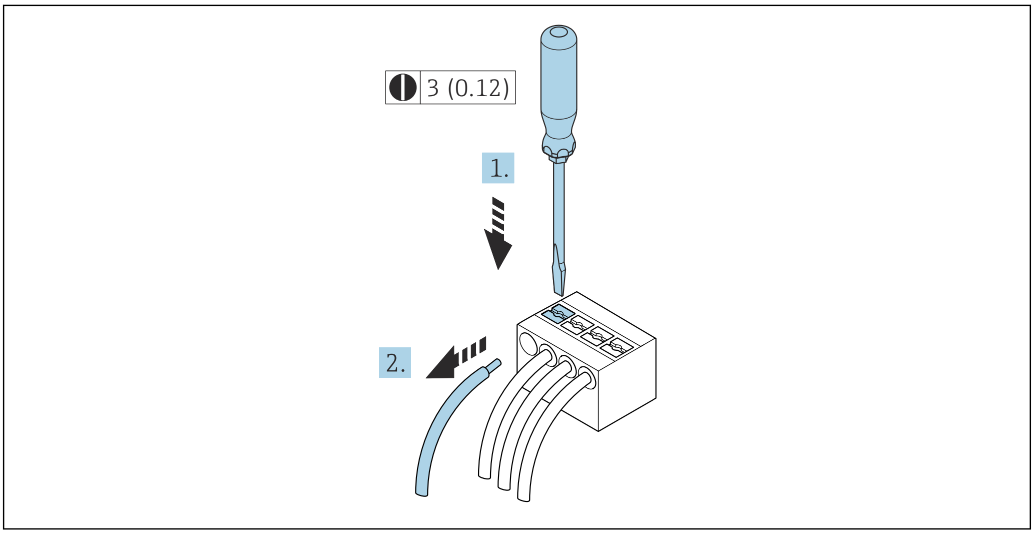
A0051128

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



4. Connect the cable according to the terminal assignment.
   ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
   **Supply voltage terminal assignment:** Adhesive label in the terminal cover or → 🗎 34.
5. Firmly tighten the cable glands.
   ↳ This concludes the cable connection process.
6. Close the terminal cover.
7. Fit the display module holder in the electronics compartment.
8. Screw on the connection compartment cover.
9. Secure the securing clamp of the connection compartment cover.

### Removing a cable



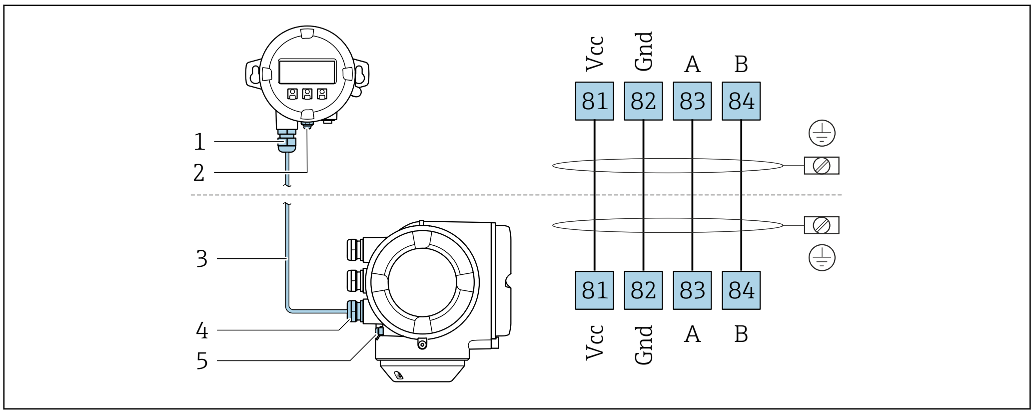
*10 Engineering unit mm (in)*

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

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

The remote display and operating module DKX001 is available as an optional extra → 🗎 266.

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



A0027518

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

## 7.4 Potential equalization

### 7.4.1 Requirements

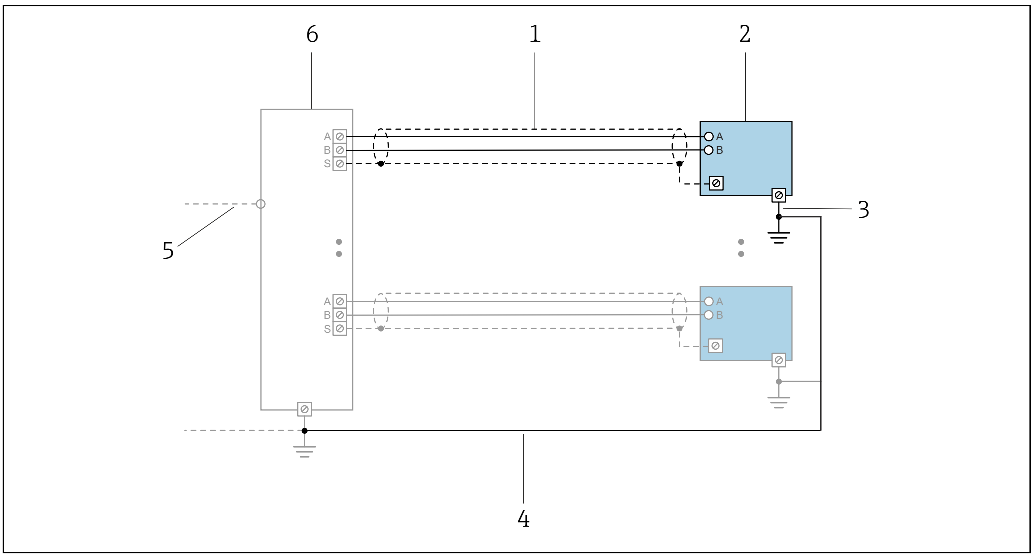
For potential equalization:
- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electrical potential
- Use a ground cable with a minimum cross-section of 6 mm$^2$ (0.0093 in$^2$) and a cable lug for potential equalization connections

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

# 7.5 Special connection instructions

## 7.5.1 Connection examples

### PROFINET with Ethernet-APL

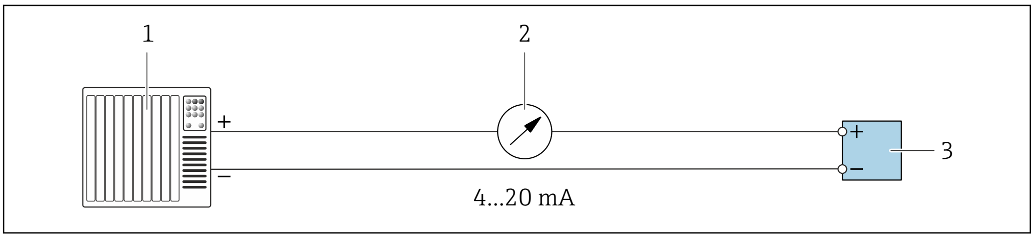


A0047536

11 Connection example for PROFINET with Ethernet-APL

1 Cable shield
2 Measuring device
3 Local grounding
4 Potential equalization
5 Trunk or TCP
6 Field switch

### Current output 4-20 mA



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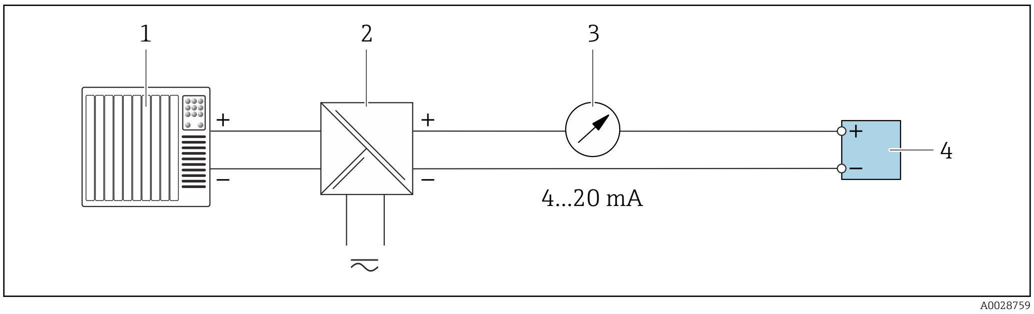
12 Connection example for 4-20 mA current output (active)

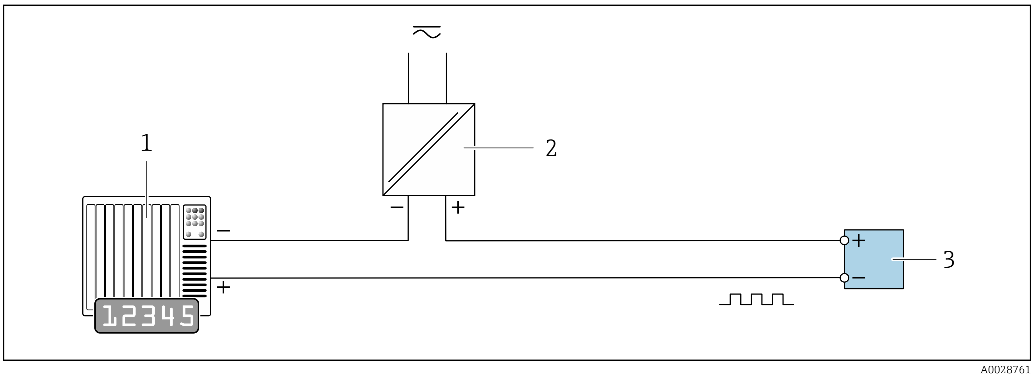
1 Automation system with current input (e.g. PLC)
2 Analog display unit: observe maximum load
3 Transmitter



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

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

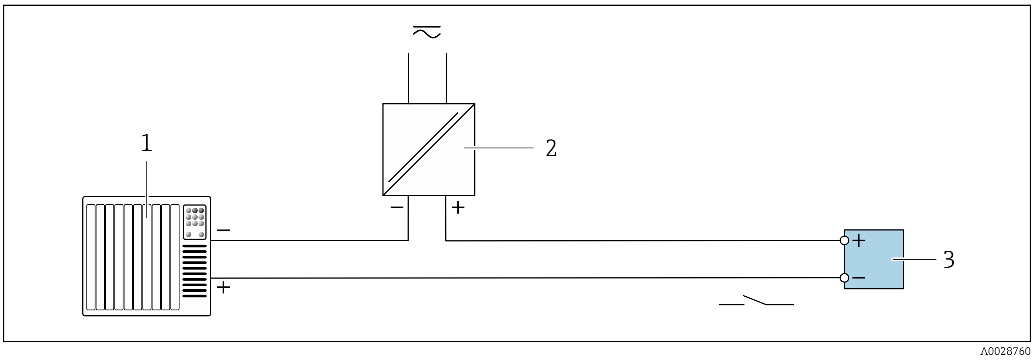
## Pulse/frequency output



14 Connection example for pulse/frequency output (passive)

1 Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)
2 Power supply
3 Transmitter: observe input values → 274

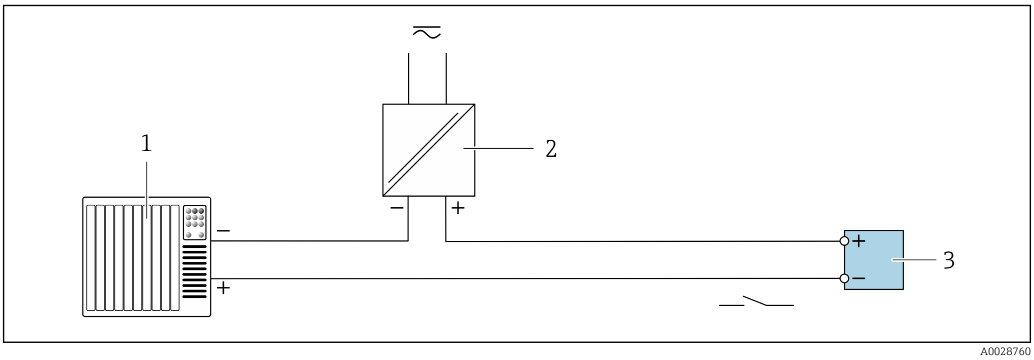
## Switch output



15 Connection example for switch output (passive)

1 Automation system with switch input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)
2 Power supply
3 Transmitter: observe input values → 274

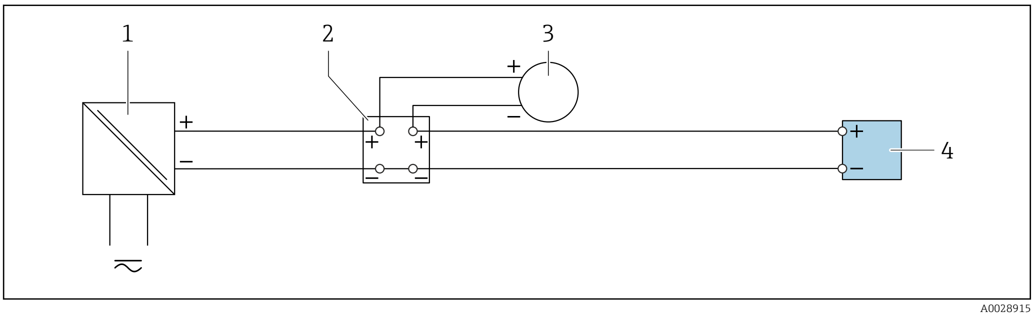
## Relay output



🖻 16 *Connection example for relay output (passive)*

1 *Automation system with relay input (e.g. PLC)*
2 *Power supply*
3 *Transmitter: observe input values → 🗎 275*

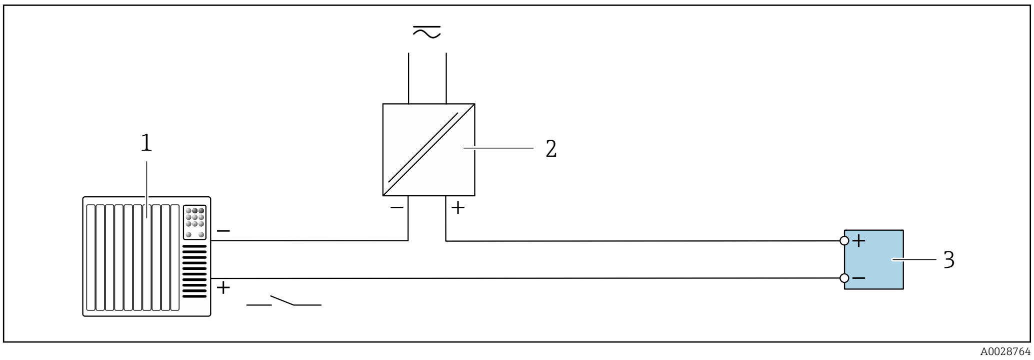
## Current input



🖻 17 *Connection example for 4 to 20 mA current input*

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

## Status input



🖻 18 *Connection example for status input*

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

# 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 factory-assigned device name can be changed using the DIP switches or the automation system.

Example: EH-Promass300-XXXX

| | |
|---|---|
| **EH** | Endress+Hauser |
| **Promass** | Instrument family |
| **300** | Transmitter |
| **XXXX** | 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 switch | Bit | Description |
|---|---|---|
| 1 | 128 | Configurable part of the device name |
| 2 | 64 | |
| 3 | 32 | |
| 4 | 16 | |
| 5 | 8 | |
| 6 | 4 | |
| 7 | 2 | |
| 8 | 1 | |

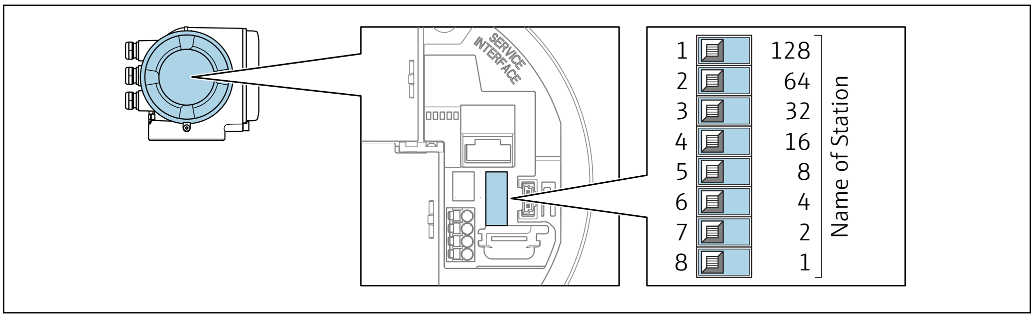
*Example: setting the device name EH-PROMASS300-065*

| DIP switch | ON/OFF | Bit | Device name |
|---|---|---|---|
| 1 | OFF | – | |
| 2 | ON | 64 | |
| 3...7 | OFF | – | |
| 8 | ON | 1 | |
| Serial number of the device: | | 065 | EH-PROMASS300-065 |

*Setting the device name*

Risk of electric shock when opening the transmitter housing.
- ▶ Before opening the transmitter housing:
- ▶ Disconnect the device from the power supply.

🛈 The default IP address may **not** be activated → 🗎 43.



1. Depending on the housing version, loosen the securing clamp or securing 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 .
3. Set the desired device name using the corresponding DIP switches on the I/O electronics module.
4. Reassemble the transmitter in the reverse order.
5. Reconnect the device to the power supply.
   ↳ The configured device address is used once the device is restarted.

### 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.

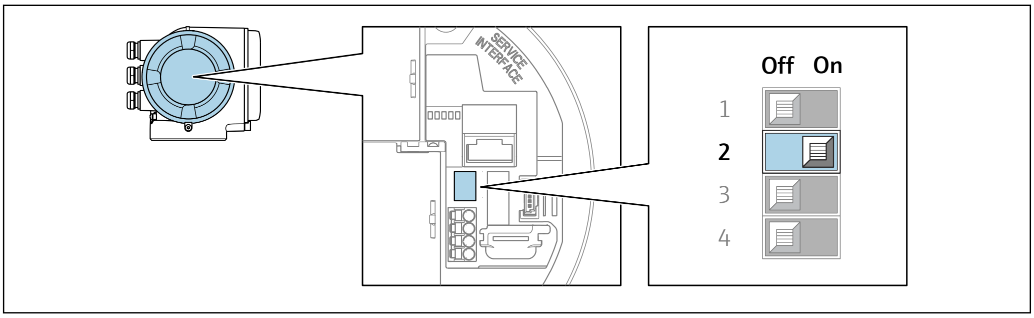
The complete device name (name of station) can be changed individually via the automation system.

- 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 device name is empty following the reset.
- When assigning the device name via the automation system: assign the device name in lower case letters.

## 7.6.2 Activating the default IP address

### Activating the default IP address by DIP switch

Risk of electric shock when opening the transmitter housing.
- ▶ Before opening the transmitter housing:
- ▶ Disconnect the device from the power supply.



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 .

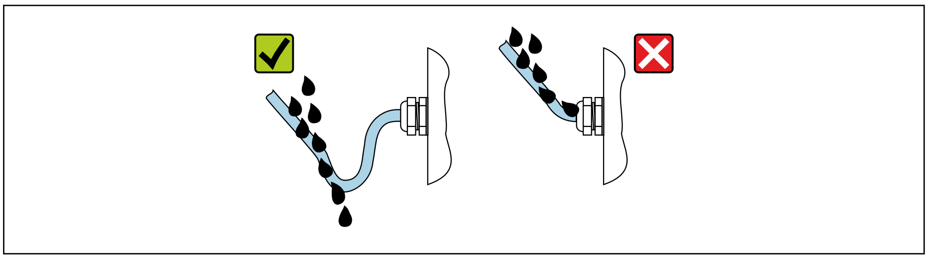
3. Set DIP switch no. 2 on the I/O electronics module from **OFF** → **ON**.
4. Reassemble the transmitter in the reverse order.
5. Reconnect the device to the power supply.
   ↳ The default IP address is used once the device is restarted.

## 7.7 Ensuring the degree of protection

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

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

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



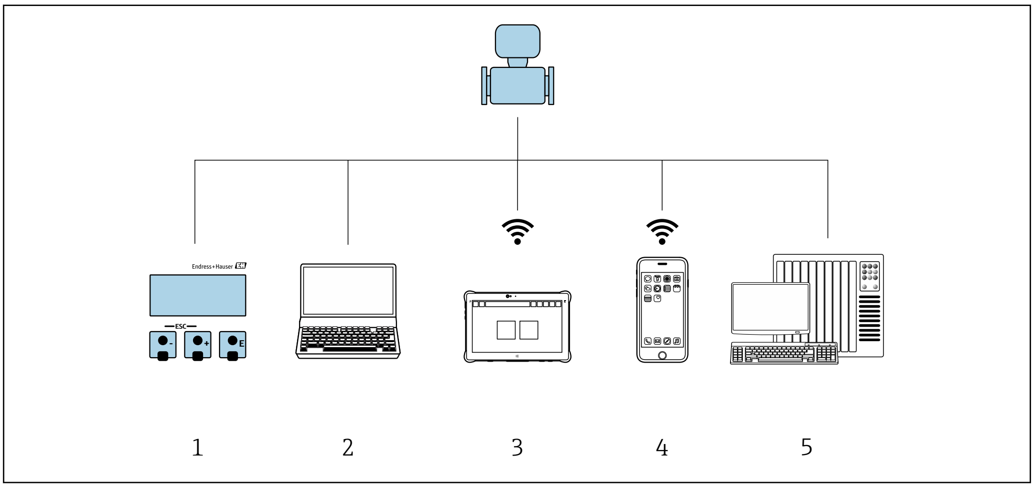
6. The cable glands supplied do not provide any housing protection if they are not used. Therefore, they must be replaced by dummy plugs that match the housing protection.

## 7.8 Post-connection check

| | |
|---|---|
| Are cables or the device undamaged (visual inspection)? | ☐ |
| Is the protective earthing established correctly? | |
| Do the cables used comply with the requirements ? | ☐ |
| Do the mounted cables have adequate strain relief? | ☐ |
| Are all cable glands installed, securely tightened and leak-tight? Cable run with "water trap" → 🖹 44? | ☐ |
| Is the terminal assignment correct ? | ☐ |
| If supply voltage is present, do values appear on the display module? | ☐ |
| Are dummy plugs inserted in unused cable entries and have transportation plugs been replaced with dummy plugs? | |

# 8 Operation options

## 8.1 Overview of operation options

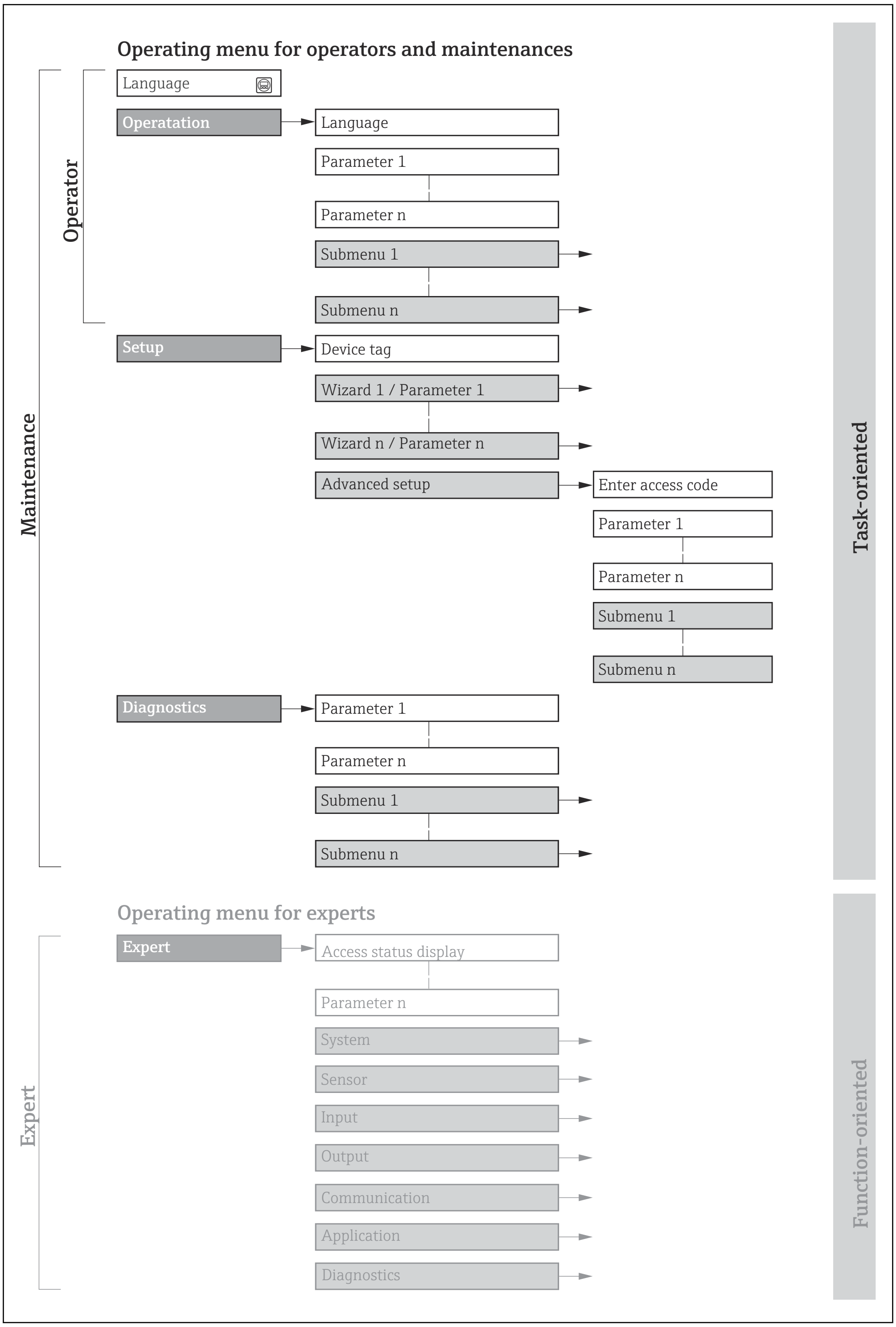


1 *Local operation via display module*
2 *Computer with web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, SIMATIC PDM)*
3 *Field Xpert SMT70*
4 *Mobile handheld terminal*
5 *Control system (e.g. PLC)*

## 8.2 Structure and function of the operating menu

### 8.2.1 Structure of the operating menu

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



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19 *Schematic structure of the operating menu*

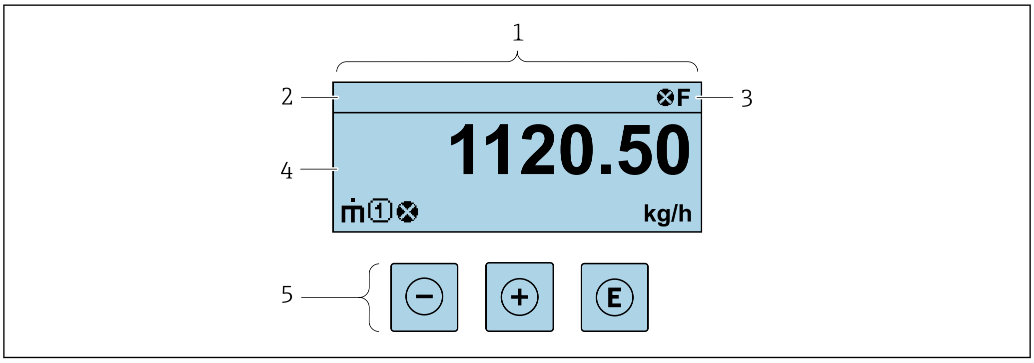
### 8.2.2 Operating philosophy

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

| Menu/parameter | | User role and tasks | Content/meaning |
|---|---|---|---|
| Language | Task-oriented | **Role "Operator", "Maintenance"**<br>Tasks during operation:<br>▪ Configuration of the operational display<br>▪ Reading measured values | ▪ Defining the operating language<br>▪ Defining the Web server operating language<br>▪ Resetting and controlling totalizers |
| Operation | | | ▪ Configuring the operational display (e.g. display format, display contrast)<br>▪ Resetting and controlling totalizers |
| Setup | | **"Maintenance" role**<br>Commissioning:<br>▪ Configuration of the measurement<br>▪ Configuration of the inputs and outputs<br>▪ Configuration of the communication interface | Wizards for quick commissioning:<br>▪ Configuration of the system units<br>▪ Configuration of the communication interface<br>▪ Definition of the medium<br>▪ Display the I/O configuration<br>▪ Configuration of the inputs<br>▪ Configuration of the outputs<br>▪ Configuration of the operational display<br>▪ Configuration of the low flow cut off<br>▪ Configuration of the detection of partially filled and empty pipes<br>Advanced setup<br>▪ For more customized configuration of the measurement (adaptation to special measuring conditions)<br>▪ Configuration of totalizers<br>▪ Configuration of WLAN settings<br>▪ Administration (define access code, reset measuring device) |
| Diagnostics | | **"Maintenance" role**<br>Troubleshooting:<br>▪ Diagnostics and elimination of process and device errors<br>▪ Measured value simulation | Contains all parameters for error detection and analyzing process and device errors:<br>▪ Diagnostic list<br>Contains up to 5 currently pending diagnostic messages.<br>▪ Event logbook<br>Contains event messages that have occurred.<br>▪ Device information<br>Contains information for identifying the device.<br>▪ Measured values<br>Contains all current measured values.<br>▪ **Data logging** submenu with the "Extended HistoROM" order option<br>Storage and visualization of measured values<br>▪ Heartbeat<br>The functionality of the device is checked on demand and the verification results are documented.<br>▪ Simulation<br>Is used to simulate measured values or output values. |
| | | | |
| Expert | Function-oriented | Tasks that require detailed knowledge of the function of the device:<br>▪ Commissioning measurements under difficult conditions<br>▪ Optimal adaptation of the measurement to difficult conditions<br>▪ Detailed configuration of the communication interface<br>▪ Error diagnostics in difficult cases | Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device:<br>▪ System<br>Contains all higher-level device parameters that do not pertain either to the measurement or to measured value communication.<br>▪ Sensor<br>Configuration of the measurement.<br>▪ Input<br>Configuration of the status input.<br>▪ Output<br>Configuration of the analog current outputs as well as the pulse/frequency and switch output.<br>▪ Communication<br>Configuration of the digital communication interface and the Web server.<br>▪ Application<br>Configuration of the functions that go beyond the actual measurement (e.g. totalizer).<br>▪ Diagnostics<br>Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology. |

# 8.3 Access to the operating menu via the local display

## 8.3.1 Operational display



*1 Operational display*
*2 Tag name*
*3 Status area*
*4 Display area for measured values (4-line)*
*5 Operating elements → 📖 54*

### Status area

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

- Status signals→ 📖 184
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior→ 📖 185
  - ⊗: Alarm
  - ⚠: Warning
- 🔒: Locking (the device is locked via the hardware )
- ⇆: Communication (communication via remote operation is active)

### Display area

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

*Measured variables*

| Symbol | Meaning |
|---|---|
| ṁ | Mass flow |
| V̇ | - Volume flow<br>- Corrected volume flow |
| ρ | - Density<br>- Reference density |
| 🌡 | Temperature |
| Σ | Totalizer<br>ℹ The measurement channel number indicates which of the three totalizers is displayed. |
| ⇥ | Status input |

*Measurement channel numbers*

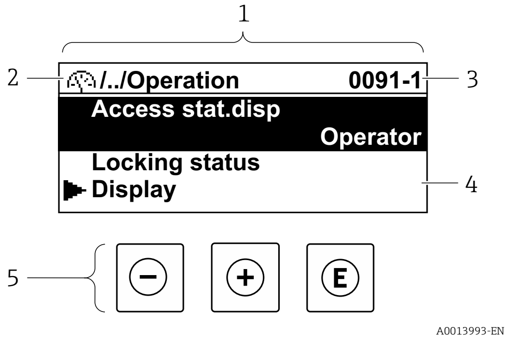
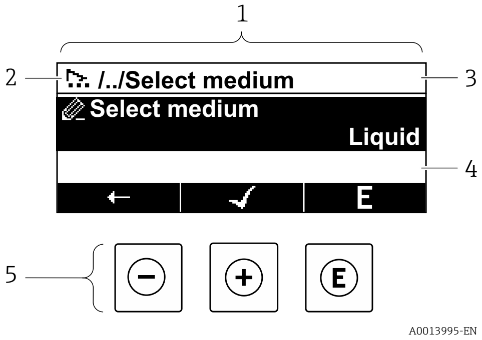
| Symbol | Meaning |
|---|---|
| 1 … 4 | Measurement channel 1 to 4 |
| The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. totalizer 1 to 3). | |

*Diagnostic behavior*

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable.
For information on the symbols → 🗎 185

ℹ The number and display format of the measured values can be configured via the **Format display** parameter (→ 🗎 122).

### 8.3.2 Navigation view

| In the submenu | In the wizard |
|---|---|
|  |  |

1 *Navigation view*
2 *Navigation path to current position*
3 *Status area*
4 *Display area for navigation*
5 *Operating elements →* 🖹 *54*

#### Navigation path

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

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

For more information about the icons in the menu, refer to the "Display area" section → 🖹 51

#### Status area

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

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

- For information on the diagnostic behavior and status signal → 🖹 184
- For information on the function and entry of the direct access code → 🖹 56

### Display area

*Menus*

| Symbol | Meaning |
|---|---|
| ⏲ | **Operation**<br>Appears:<br>▪ In the menu next to the "Operation" selection<br>▪ At the left in the navigation path in the **Operation** menu |
| 🔧 | **Setup**<br>Appears:<br>▪ In the menu next to the "Setup" selection<br>▪ At the left in the navigation path in the **Setup** menu |
| 🩺 | **Diagnostics**<br>Appears:<br>▪ In the menu next to the "Diagnostics" selection<br>▪ At the left in the navigation path in the **Diagnostics** menu |
| 🛠 | **Expert**<br>Appears:<br>▪ In the menu next to the "Expert" selection<br>▪ At the left in the navigation path in the **Expert** menu |

*Submenus, wizards, parameters*

| Symbol | Meaning |
|---|---|
| ▶ | Submenu |
| ▷ | Wizard |
| ✎ | Parameters within a wizard<br>ℹ No display symbol exists for parameters in submenus. |

*Locking*

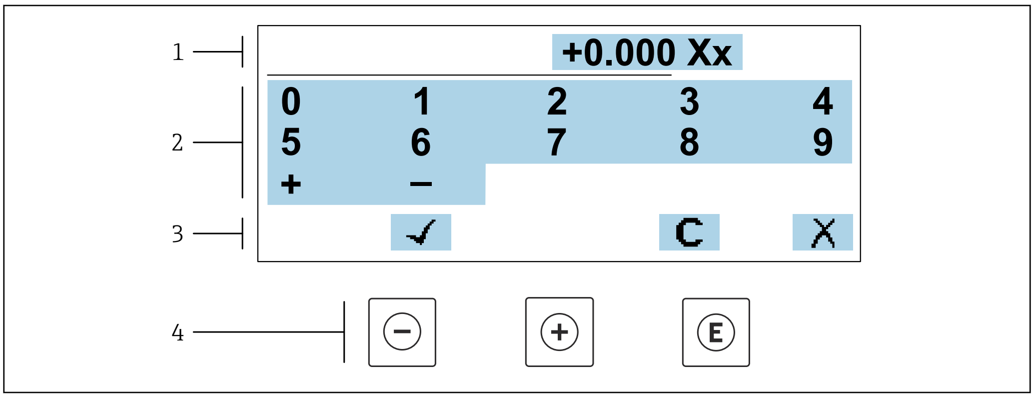
| Symbol | Meaning |
|---|---|
| 🔒 | **Parameter locked**<br>When displayed in front of a parameter name, indicates that the parameter is locked.<br>▪ By a user-specific access code<br>▪ By the hardware write protection switch |

*Wizard operation*

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

### 8.3.3 Editing view

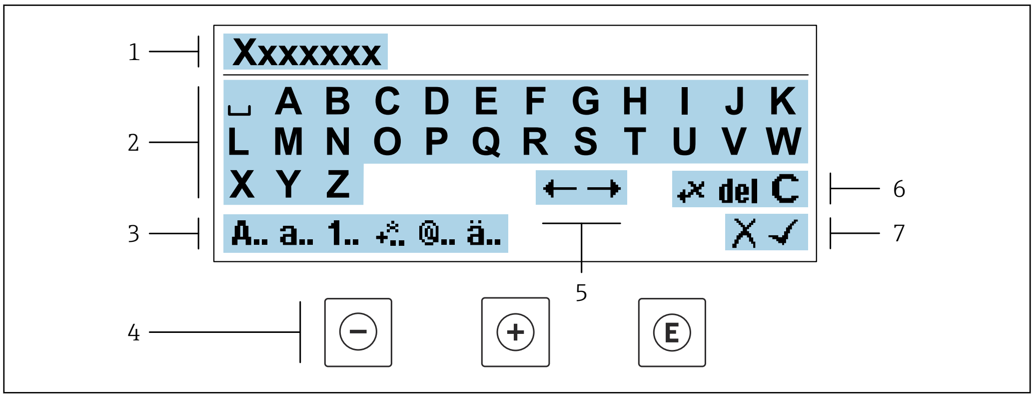
#### Numeric editor



20 *For entering values in parameters (e.g. limit values)*

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

#### Text editor



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

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

*Using the operating elements in the editing view*

| Key | Meaning |
|---|---|
| ⊖ | **Minus key**<br>Move the entry position to the left. |
| ⊕ | **Plus key**<br>Move the entry position to the right. |

| Key | Meaning |
|---|---|
| Ⓔ | **Enter key**<br>- Pressing the key briefly confirms the selection.<br>- Pressing the key for 2 s confirms your entry. |
| ⊖ + ⊕ | **Escape key combination (press keys simultaneously)**<br>Close the editing view without accepting a change. |

*Input screens*

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

*Controlling data entries*

| Symbol | Meaning |
|---|---|
| ←→ | Move entry position |
| ✕ | Reject entry |
| ✓ | Confirm entry |
| ←✕ | Delete character immediately to the left of the entry position |
| **del** | Delete character immediately to the right of the entry position |
| **C** | Clear all the characters entered |

## 8.3.4 Operating elements

| Key | Meaning |
|---|---|
| ⊖ | **Minus key**<br>*In menu, submenu*<br>Moves the selection bar upwards in a picklist.<br>*With a wizard*<br>Confirms the parameter value and goes to the previous parameter.<br>*For text and numeric editor*<br>Move the entry position to the left. |
| ⊕ | **Plus key**<br>*In menu, submenu*<br>Moves the selection bar downwards in a picklist.<br>*With a wizard*<br>Confirms the parameter value and goes to the next parameter.<br>*For text and numeric editor*<br>Move the entry position to the right. |
| Ⓔ | **Enter key**<br>*For operational display*<br>Pressing the key briefly opens the operating menu.<br>*In menu, submenu*<br>▪ Pressing the key briefly:<br>  ▪ Opens the selected menu, submenu or parameter.<br>  ▪ Starts the wizard.<br>  ▪ If help text is open, closes the help text of the parameter.<br>▪ Pressing the key for 2 s in a parameter:<br>If present, opens the help text for the function of the parameter.<br>*With a wizard*<br>Opens the editing view of the parameter.<br>*For text and numeric editor*<br>▪ Pressing the key briefly confirms the selection.<br>▪ Pressing the key for 2 s confirms your entry. |
| ⊖ + ⊕ | **Escape key combination (press keys simultaneously)**<br>*In menu, submenu*<br>▪ Pressing the key briefly:<br>  ▪ Exits the current menu level and takes you to the next level up.<br>  ▪ If help text is open, closes the help text of the parameter.<br>▪ Pressing the key for 2 s returns you to the operational display ("home position").<br>*With a wizard*<br>Exits the wizard and takes you to the next level up.<br>*For text and numeric editor*<br>Closes the editing view without applying changes. |
| ⊖ + Ⓔ | **Minus/Enter key combination (press and hold down the keys simultaneously)**<br>▪ If the keypad lock is enabled:<br>Pressing the key for 3 s disables the keypad lock.<br>▪ If the keypad lock is not enabled:<br>Pressing the key for 3 s opens the context menu including the selection for activating the keypad lock. |

## 8.3.5 Opening the context menu

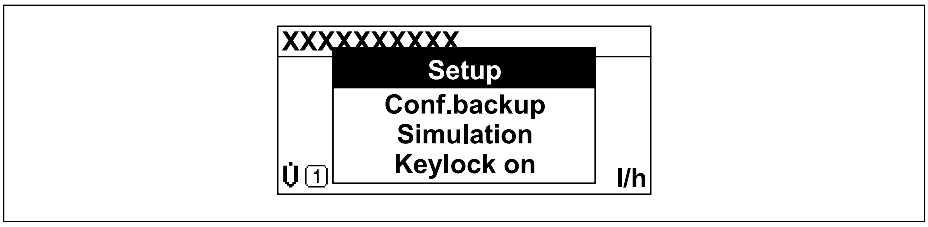
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

### Calling up and closing the context menu

The user is in the operational display.

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



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

### Calling up the menu via the context menu

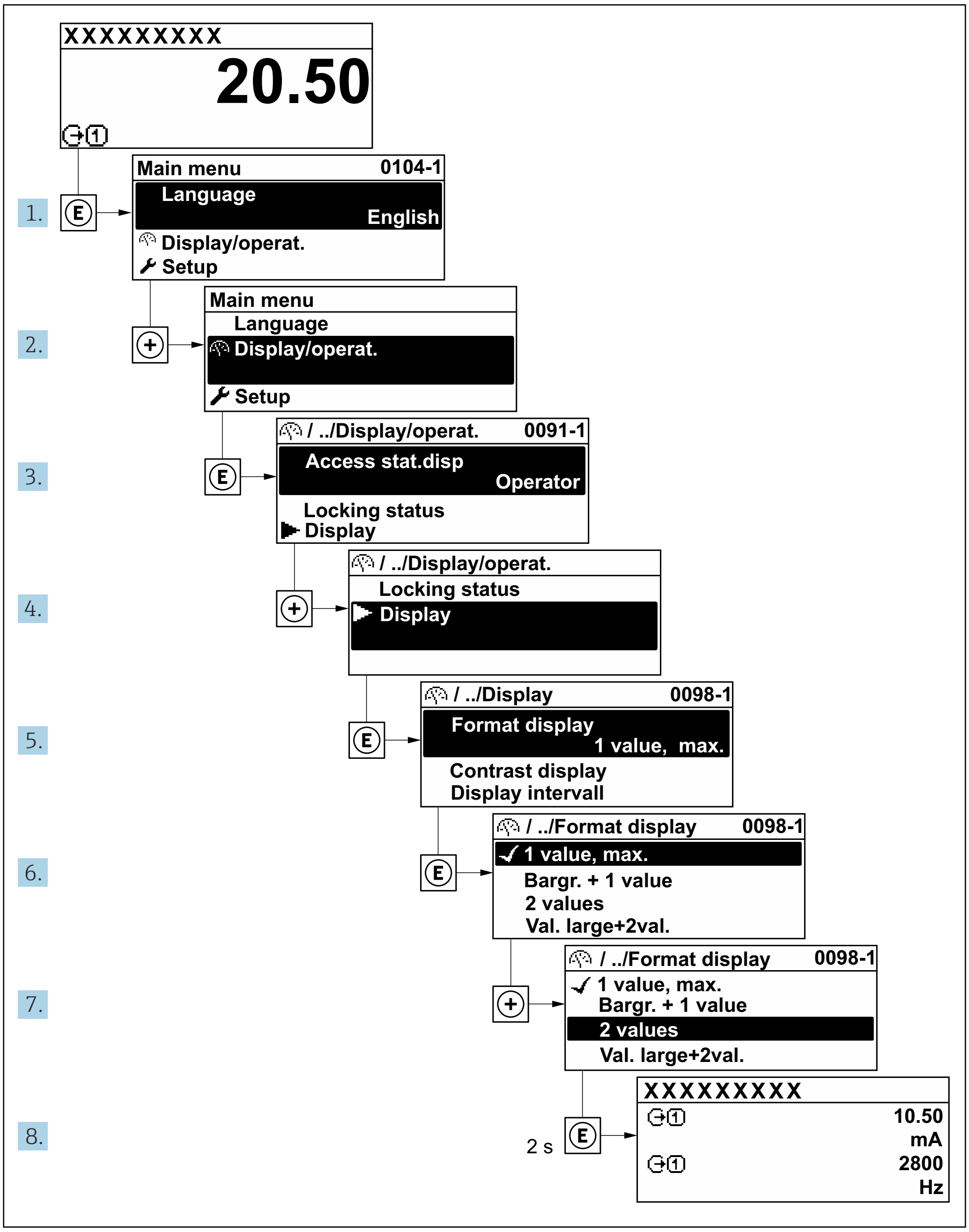
1. Open the context menu.
2. Press ⊞ to navigate to the desired menu.
3. Press 🄴 to confirm the selection.
   ↳ The selected menu opens.

## 8.3.6 Navigating and selecting from list

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

ℹ For an explanation of the navigation view with symbols and operating elements → 🗎 50

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



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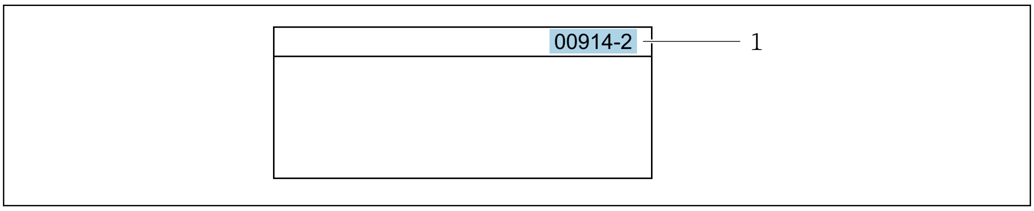
## 8.3.7 Calling the parameter directly

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

**Navigation path**
Expert → Direct access

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



1 *Direct access code*

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

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

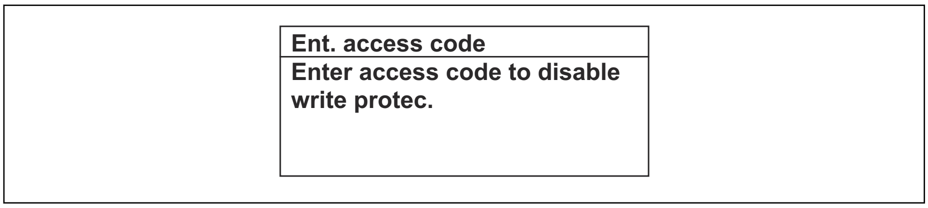
### 8.3.8 Calling up help text

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

#### Calling up and closing the help text

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

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



**Ent. access code**
**Enter access code to disable write protec.**

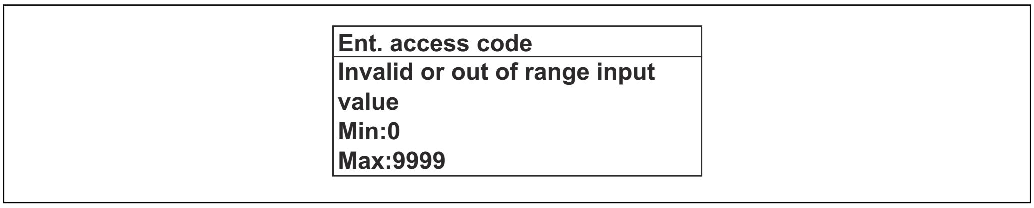
22 *Example: Help text for parameter "Enter access code"*

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

### 8.3.9 Changing the parameters

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

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



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

A0014049-EN

For a description of the editing view - consisting of the text editor and numeric editor - with symbols → 🗎 52, for a description of the operating elements → 🗎 54

## 8.3.10 User roles and related access authorization

The two user roles "Operator" and "Maintenance" have different write access to the parameters if the customer defines a user-specific access code. This protects the device configuration via the local display from unauthorized access → 🗎 154.

### Defining access authorization for user roles

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

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

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

| Access code status | Read access | Write access |
|---|---|---|
| An access code has not yet been defined (factory setting). | ✓ | ✓ |
| After an access code has been defined. | ✓ | ✓ [1] |

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

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

| Access code status | Read access | Write access |
|---|---|---|
| After an access code has been defined. | ✓ | – [1] |

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

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

## 8.3.11 Disabling write protection via access code

If the 🔒-symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using local operation → 🗎 154.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→ 🗎 128) via the respective access option.

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

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

### 8.3.12 Enabling and disabling the keypad lock

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

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

#### Switching on the keypad lock

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

**To activate the keylock manually:**

1. The device is in the measured value display.
   Press the ⊟ and 🄴 keys for 3 seconds.
   ↳ A context menu appears.
2. In the context menu select the **Keylock on** option.
   ↳ The keypad lock is switched on.

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

#### Switching off the keypad lock

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

## 8.4 Access to operating menu via Web browser

### 8.4.1 PROFINET with Ethernet-APL

| | |
|---|---|
| **Device use** | **Device connection to an APL field switch**<br>The device may only be operated according to the following APL port classifications:<br>- If used in hazardous areas: SLAA or SLAC [1]<br>- If used in non-hazardous areas: SLAX<br>- Connection values of APL field switch (for example corresponds to APL port classification SPCC or SPAA):<br>- Maximum input voltage: 15 $V_{DC}$<br>- Minimum output values: 0.54 W<br>**Device connection to an SPE switch**<br>If used in non-hazardous areas: suitable SPE switch<br>SPE switch prerequisite:<br>- Support of 10BASE-T1L standard<br>- Support of PoDL power class 10, 11 or 12<br>- Detection of SPE field devices without integrated PoDL module<br>Connection values of SPE switch:<br>- Maximum input voltage: 30 $V_{DC}$<br>- Minimum output values: 1.85 W |
| **PROFINET** | According to IEC 61158 and IEC 61784 |
| **Ethernet-APL** | According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated |
| **Data transfer** | 10 Mbit/s |
| **Current consumption** | **Transmitter**<br>Max. 55.56 mA |
| **Permitted supply voltage** | - Ex: 9 to 15 V<br>- Non-Ex: 9 to 32 V |
| **Network connection** | With integrated reverse polarity protection |

1) For more information on using the device in the hazardous area, see the Ex-specific Safety Instructions

### 8.4.2 Prerequisites

*Computer hardware*

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

1) Recommended cable: CAT5e, CAT6 or CAT7, with shielded connector (e.g. brand YAMAICHI ; Part No Y-ConProfixPlug63 / Prod. ID: 82-006660)

### *Computer software*

| **Software** | **Interface** | |
|---|---|---|
| | **CDI-RJ45** | **WLAN** |
| Recommended operating systems | - Microsoft Windows 8 or higher.<br>- Mobile operating systems:<br>  - iOS<br>  - Android<br>ℹ Microsoft Windows XP and Windows 7 is supported. | |
| Web browsers supported | - Microsoft Internet Explorer 8 or higher<br>- Microsoft Edge<br>- Mozilla Firefox<br>- Google Chrome<br>- Safari | |

### *Computer settings*

| **Settings** | **Interface** | |
|---|---|---|
| | **CDI-RJ45** | **WLAN** |
| User rights | Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (for adjusting the IP address, subnet mask etc.). | |
| Proxy server settings of the web browser | The web browser setting *Use proxy server for LAN* must be **disabled** . | |
| JavaScript | JavaScript must be enabled.<br>ℹ If JavaScript cannot be enabled: Enter http://192.168.1.212/servlet/basic.html in the address bar of the web browser. A fully functional but simplified version of the operating menu structure starts in the web browser.<br>ℹ When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) under **Internet options** in the web browser. | |
| Network connections | Only the active network connections to the measuring device should be used. | |
| | Switch off all other network connections such as WLAN. | Switch off all other network connections. |

ℹ In the event of connection problems: → 🗎 181

### *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>ℹ For information on enabling the Web server → 🗎 66 |

### *Measuring device: via WLAN interface*

| **Device** | **WLAN interface** |
|---|---|
| Measuring device | The measuring device has a WLAN antenna:<br>- Transmitter with integrated WLAN antenna<br>- Transmitter with external WLAN antenna |
| Web server | Web server and WLAN must be enabled; factory setting: ON<br>ℹ For information on enabling the Web server → 🗎 66 |

### 8.4.3 Establishing a connection

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

*Preparing the measuring device*

1. Depending on the housing version:
   Loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version:
   Unscrew or open the housing cover.
3. Connect the computer to the RJ45 plug via the standard Ethernet cable .

*Configuring the Internet protocol of the computer*

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

IP address of the device: 192.168.1.212 (factory setting)

The IP address can be assigned to the measuring device in a variety of ways:
- Software addressing:
  The IP address is entered via the **IP address** parameter (→ 🖹 92) .
- 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 .

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 → 🖹 68.
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:

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

**Via WLAN interface**

*Configuring the Internet protocol of the mobile terminal*

NOTICE

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

**NOTICE**

**Note the following to avoid a network conflict:**

- ▶ Avoid accessing the measuring device simultaneously from the same mobile terminal via the service interface (CDI-RJ45) and the WLAN interface.
- ▶ Only activate one service interface (CDI-RJ45 or WLAN interface).
- ▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

*Preparing the mobile terminal*

- ▶ Enable WLAN on the mobile terminal.

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

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promass_300_A802000).
2. If necessary, select the WPA2 encryption method.
3. Enter the password:
   Serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ The LED on the display module flashes. It is now possible to operate the measuring device with the web browser, FieldCare or DeviceCare.

ℹ The serial number can be found on the nameplate.

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

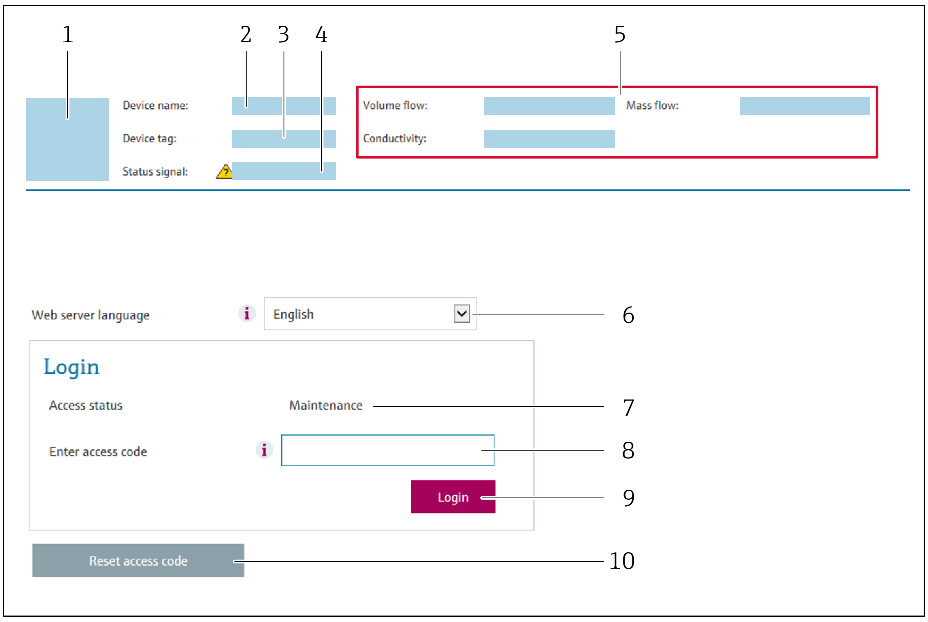
*Terminating the WLAN connection*

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

### Starting the Web browser

1. Start the Web browser on the computer.

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



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 (→ 🗎 149)*

ℹ If a login page does not appear, or if the page is incomplete → 🗎 181

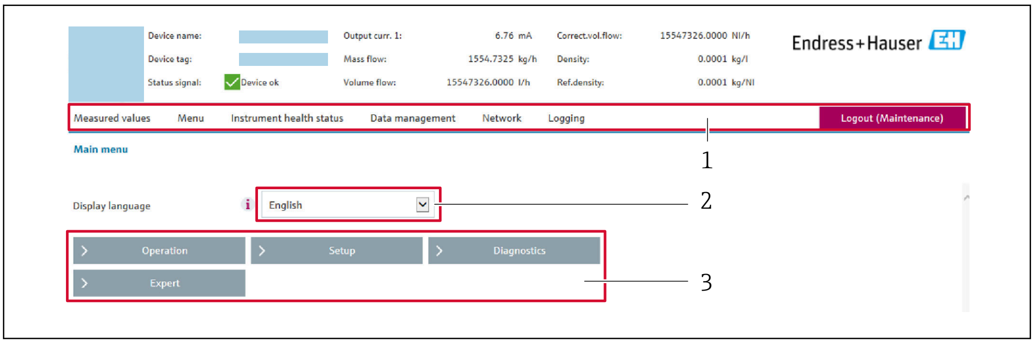
## 8.4.4 Logging on

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

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

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

## 8.4.5 User interface



Device name:
Device tag:
Status signal: ✓ Device ok
Output curr. 1: 6.76 mA
Mass flow: 1554.7325 kg/h
Volume flow: 15547326.0000 l/h
Correct.vol.flow: 15547326.0000 Nl/h
Density: 0.0001 kg/l
Ref.density: 0.0001 kg/Nl
Display language: English

A0029418

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

### Header

The following information appears in the header:
- Device name
- Device tag
- Device status with status signal → 🗎 187
- Current measured values

### Function row

| Functions | Meaning |
|---|---|
| Measured values | Displays the measured values of the device |
| Menu | ▪ Access to the operating menu from the measuring device<br>▪ The structure of the operating menu is the same as for the local display<br>🕮 Detailed information on the structure of the operating menu: see the Description of Device Parameters |
| Device status | Displays the diagnostic messages currently pending, listed in order of priority |
| Data management | Data exchange between computer and measuring device:<br>▪ Device configuration:<br>  ▪ Load settings from the device (XML format, save configuration)<br>  ▪ Save settings to the device (XML format, restore configuration)<br>▪ Logbook - Export Event logbook (.csv file)<br>▪ Documents - Export documents:<br>  ▪ Export backup data record (.csv file, create documentation of the measuring point configuration)<br>  ▪ Verification report (PDF file, only available with the "Heartbeat Verification" application package)<br>▪ Firmware update - Flashing a firmware version |
| Network | Configuration and checking of all the parameters required for establishing the connection to the measuring device:<br>▪ Network settings (e.g. IP address, MAC address)<br>▪ Device information (e.g. serial number, firmware version) |
| Logout | End the operation and call up the login page |

### Navigation area

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

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

| Option | Description |
|---|---|
| Off | ▪ The Web server is completely disabled.<br>▪ Port 80 is locked. |
| HTML Off | The HTML version of the Web server is not available. |
| On | ▪ The complete Web server functionality is available.<br>▪ JavaScript is used.<br>▪ The password is transferred in an encrypted state.<br>▪ Any change to the password is also transferred in an encrypted state. |

### Enabling the Web server

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

## 8.4.7 Logging out

ℹ 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) → 🗎 62.

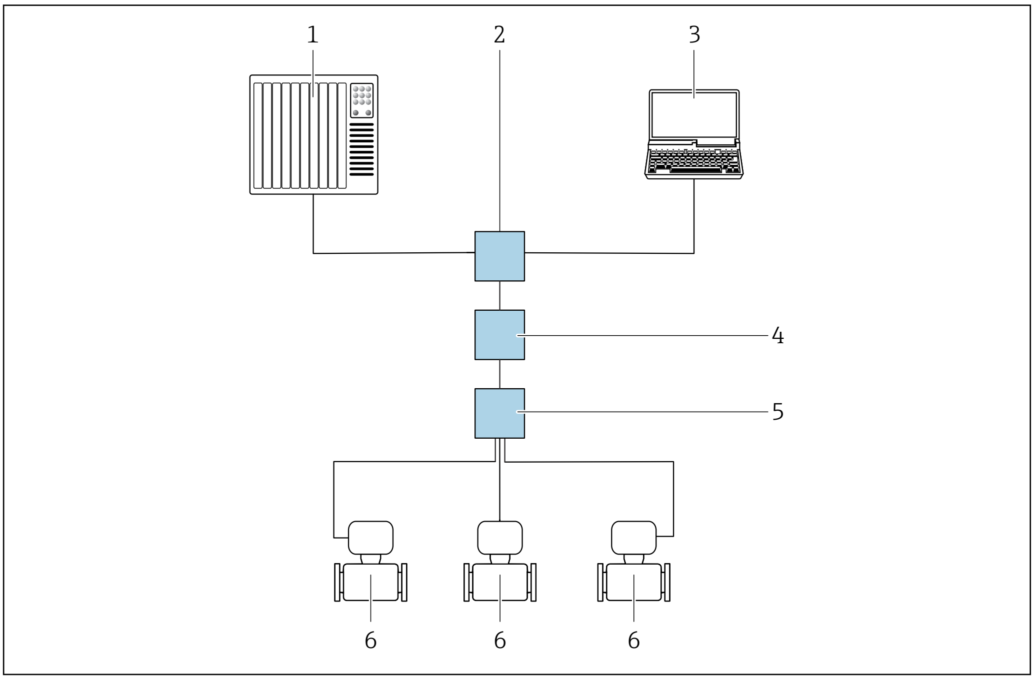
ℹ If communication with the web server was established via the default IP address 192.168.1.212, DIP switch no. 10 must be reset (from **ON** → **OFF**). Afterwards, the IP address of the device is active again for network communication.

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

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

### 8.5.1 Connecting the operating tool

**Via APL network**



🖻 23 *Options for remote operation via APL network*

| | |
|---|---|
| 1 | *Automation system, e.g. Simatic S7 (Siemens)* |
| 2 | *Ethernet switch, e.g. Scalance X204 (Siemens)* |
| 3 | *Computer with Web browser (e.g. Internet Explorer) for access to integrated Web server or computer with operating tool (e.g. FieldCare, DeviceCare with PROFINET COM DTM or SIMATIC PDM with FDI-Package)* |
| 4 | *APL power switch (optional)* |
| 5 | *APL field switch* |
| 6 | *Measuring device* |

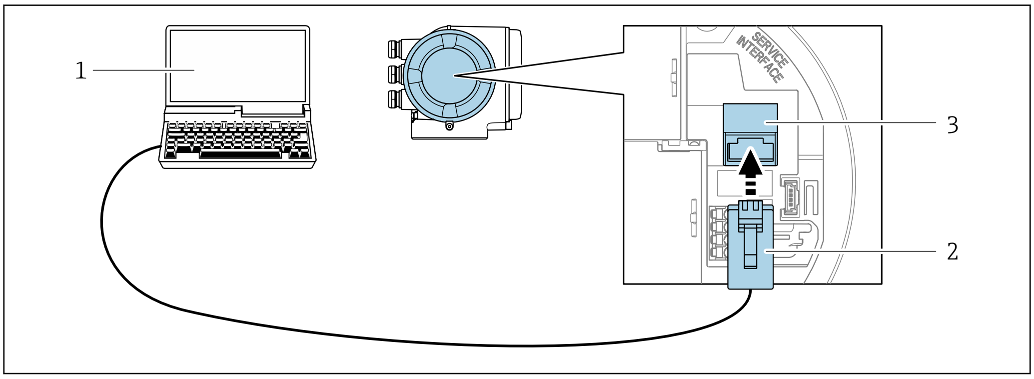
### Service interface

*Via service interface (CDI-RJ45)*

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

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

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

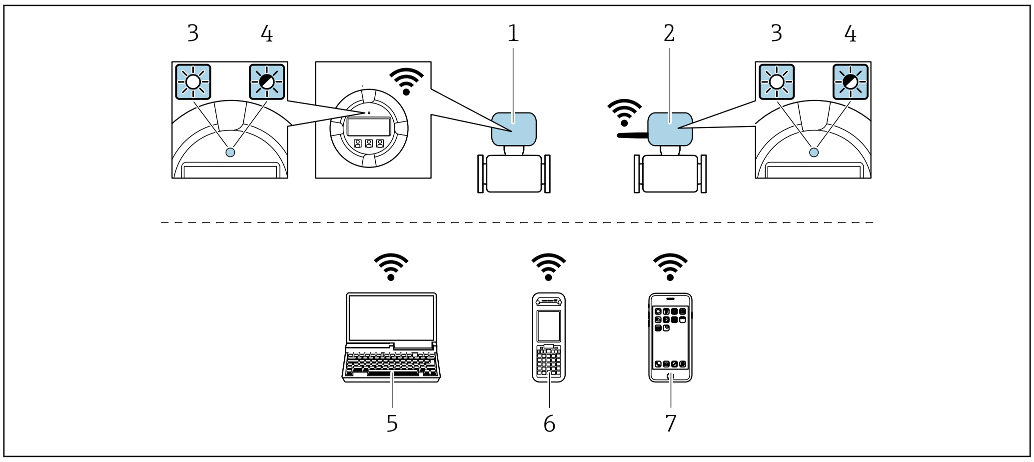


24 *Connection via service interface (CDI-RJ45)*

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

*Via WLAN interface*

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



1 *Transmitter with integrated WLAN antenna*
2 *Transmitter with external WLAN antenna*
3 *LED lit constantly: WLAN reception is enabled on measuring device*
4 *LED flashing: WLAN connection established between operating unit and measuring device*
5 *Computer with WLAN interface and Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or with operating tool (e.g. FieldCare, DeviceCare)*
6 *Mobile handheld terminal with WLAN interface and Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or operating tool (e.g. FieldCare, DeviceCare)*
7 *Smart phone or tablet (e.g. Field Xpert SMT70)*

| | |
|---|---|
| Function | WLAN: IEEE 802.11 b/g (2.4 GHz) |
| Encryption | WPA2-PSK AES-128 (in accordance with IEEE 802.11i) |
| Configurable WLAN channels | 1 to 11 |
| Degree of protection | IP67 |
| Available antennas | ▪ Internal antenna<br>▪ External antenna (optional)<br>In the event of poor transmission/reception conditions at the place of installation.<br>ℹ Only 1 antenna is active at any one time! |
| Range | ▪ Internal antenna: typically 10 m (32 ft)<br>▪ External antenna: typically 50 m (164 ft) |
| Materials (external antenna) | ▪ Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass<br>▪ Adapter: Stainless steel and nickel-plated brass<br>▪ Cable: Polyethylene<br>▪ Plug: Nickel-plated brass<br>▪ Angle bracket: Stainless steel |

*Configuring the Internet protocol of the mobile terminal*

**NOTICE**

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

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

**NOTICE**

**Note the following to avoid a network conflict:**

- ▶ Avoid accessing the measuring device simultaneously from the same mobile terminal via the service interface (CDI-RJ45) and the WLAN interface.
- ▶ Only activate one service interface (CDI-RJ45 or WLAN interface).
- ▶ If simultaneous communication is necessary: configure different IP address ranges, e.g. 192.168.0.1 (WLAN interface) and 192.168.1.212 (CDI-RJ45 service interface).

*Preparing the mobile terminal*

- ▶ Enable WLAN on the mobile terminal.

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

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promass_300_A802000).
2. If necessary, select the WPA2 encryption method.
3. Enter the password:
   Serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ The LED on the display module flashes. It is now possible to operate the measuring device with the web browser, FieldCare or DeviceCare.

ℹ The serial number can be found on the nameplate.

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

*Terminating the WLAN connection*

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

### 8.5.2 FieldCare

#### Function scope

FDT (Field Device Technology)-based 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 → 🗎 68
- WLAN interface → 🗎 68

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

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

#### Source for device description files

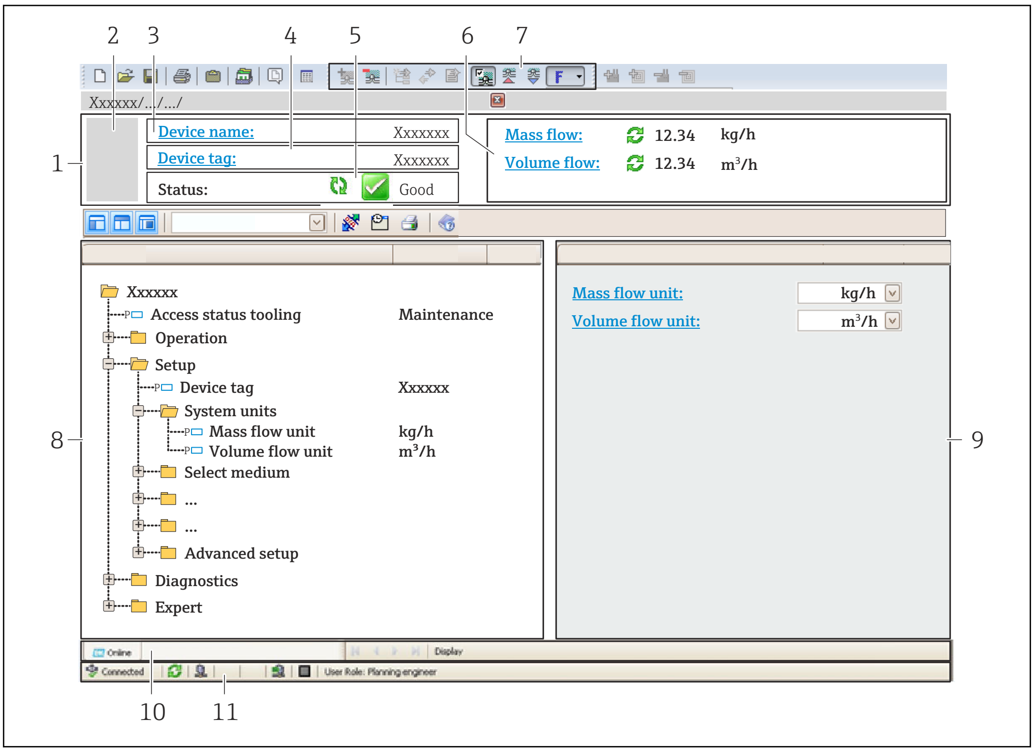
See information → 🗎 73

#### Establishing a connection

1. Start FieldCare and launch the project.
2. In the network: Add a device.
   ↳ The **Add device** window opens.
3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.
4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.
5. Select the desired device from the list and press **OK** to confirm.
   ↳ The **CDI Communication TCP/IP (Configuration)** window opens.
6. Enter the device address in the **IP address** field: 192.168.1.212 and press **Enter** to confirm.
7. Establish the online connection to the device.

For additional information, see Operating Instructions BA00027S and BA00059S

### User interface



Device name: Xxxxxxx
Device tag: Xxxxxxx
Status: Good
Mass flow: 12.34 kg/h
Volume flow: 12.34 $m^3$/h
Mass flow unit: kg/h
Volume flow unit: $m^3$/h

A0021051-EN

*1 Header*
*2 Picture of device*
*3 Device name*
*4 Tag name*
*5 Status area with status signal → 🗎 187*
*6 Display area for current measured values*
*7 Edit toolbar with additional functions such as save/load, event list and create documentation*
*8 Navigation area with operating menu structure*
*9 Working area*
*10 Range of action*
*11 Status area*

## 8.5.3 DeviceCare

### Function scope

Tool to connect and configure Endress+Hauser field devices.

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

For details, see Innovation Brochure IN01047S

### Source for device description files

See information → 🗎 73

## 8.5.4 SIMATIC PDM

### Function scope

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

### Source for device description files

See information → 🗎 73

# 9 System integration

## 9.1 Overview of device description files

### 9.1.1 Current version data for the device

| | | |
|---|---|---|
| Firmware version | 01.00.zz | ▪ On the title page of the Operating Instructions<br>▪ On the transmitter nameplate<br>▪ Firmware version Diagnostics → Device information → Firmware version |
| Manufacturer | 17 | Manufacturer<br>Expert → Communication → Physical block → Manufacturer |
| Device ID | 0xA43B | – |
| Device type ID | Promass 300 | Device type<br>Expert → Communication → Physical block → Device type |
| Device revision | 1 | – |
| PROFINET with Ethernet-APL version | 2.43 | Version of the PROFINET specification |

ℹ For an overview of the various firmware versions for the device → 🗎 262

### 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.

| | |
|---|---|
| FieldCare | ▪ www.endress.com → Download Area<br>▪ USB stick (contact Endress+Hauser)<br>▪ DVD (contact Endress+Hauser) |
| DeviceCare | ▪ www.endress.com → Download Area<br>▪ CD–ROM (contact Endress+Hauser)<br>▪ DVD (contact Endress+Hauser) |
| SIMATIC PDM (Siemens) | www.endress.com → Download Area |

## 9.2 Device master file (GSD)

In order to integrate field devices into a bus system, PROFINET 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.

The use of two different device master files (GSDs) is possible: the manufacturer-specific GSD and the 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-V2.43-EH-PROMASS_300_500_APL_yyyymmdd.xml

| | |
|---|---|
| **GSDML** | Description language |
| **V2.43** | Version of the PROFINET specification |
| **EH** | Endress+Hauser |
| **PROMASS** | Instrument family |
| **300_500_APL** | Transmitter |
| **yyyymmdd** | Date of issue (yyyy: year, mm: month, dd: day) |
| **.xml** | File name extension (XML file) |

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

Example of the name of a PA Profile device master file:

GSDML-V2.43-PA_Profile_V4.02-B333-FLOW_CORIOLIS-yyyymmdd.xml

| | |
|---|---|
| **GSDML** | Description language |
| **V2.43** | Version of the PROFINET specification |
| **PA_Profile_V4.02** | Version of the PA Profile specification |
| **B333** | PA Profile device identification |
| **FLOW** | Product family |
| **CORIOLIS** | Flow measuring principle |
| **yyyymmdd** | Date of issue (yyyy: year, mm: month, dd: day) |
| **.xml** | File name extension (XML file) |

| API | Supported modules | Input and output variables |
|---|---|---|
| 0x9700 | Analog input | Mass flow |
| | Analog input | Density |
| | Analog input | Temperature |
| | Totalizer | Totalizer value: mass/mass<br>Totalizer control |

Source for device master files (GSD):

| | |
|---|---|
| Manufacturer-specific GSD: | www.endress.com → Download Area |
| PA Profile GSD: | https://www.profibus.com/products/gsd-files/gsd-library-profile-for-process-control-devices-version-40 → Download Area |

## 9.3 Cyclic data transmission

### 9.3.1 Overview of the modules

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

| Measuring device | | | Sub-slot | Direction Data flow | Control system |
|---|---|---|---|---|---|
| API | Modules | Slot | | | |
| 0x9700 | Analog Input 1 (Mass flow) | 1 | 1 | → | PROFINET |
| | Analog Input 2 (Density) | 2 | 1 | → | |
| | Analog Input 3 (Temperature) | 3 | 1 | → | |
| | Analog Input 4 | 20 | 1 | → | |
| | Analog Input 5 | 21 | 1 | → | |
| | Analog Input 6 | 22 | 1 | → | |
| | Analog Input 7 | 23 | 1 | → | |
| | Analog Input 8 | 24 | 1 | → | |
| | Analog Input 9 | 25 | 1 | → | |
| | Analog Input 10 | 26 | 1 | → | |
| | Analog Input 11 | 27 | 1 | → | |
| | Analog Input 12 | 28 | 1 | → | |
| | Analog Input 13 | 29 | 1 | → | |
| | Analog Input 14 | 30 | 1 | → | |
| | Analog Input 15 | 31 | 1 | → | |
| | Analog Input 16 | 32 | 1 | → | |
| | Totalizer 1 (Mass) | 4 | 1 | →<br>← | |
| | Totalizer 2 | 70 | 1 | →<br>→ | |
| | Totalizer 3 | 71 | 1 | →<br>← | |
| | Binary Input 1 (Heartbeat) | 80 | 1 | → | |
| | Binary Input 2 | 81 | 1 | → | |
| | Analog Output 1 (Pressure) | 160 | 1 | ← | |
| | Analog Output 2 (Temperature) | 161 | 1 | ← | |
| | Analog Output 3 (Ref. density) | 162 | 1 | ← | |
| | Analog Output 4 (% Sediment and water) | 163 | 1 | ← | |
| | Analog Output 5 (Water cut percentage) | 164 | 1 | ← | |
| | Analog Output 6 (Appl. Spec. out 0) | 165 | 1 | ← | |
| | Analog Output 7 (Appl. Spec. out 1) | 166 | 1 | ← | |
| | Binary Output 1 (Heartbeat) | 210 | 1 | → | |
| | Binary Output 2 | 211 | 1 | ← | |
| | Enumerated Output | 240 | 1 | ← | |

## 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, including 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 standardized status information pertaining to the input variable.

*Selection: input variable*

| Slot | Sub-slot | Input variables |
|---|---|---|
| 1 | 1 | Mass flow |
| 2 | 1 | Density |

| Slot | Sub-slot | Input variables |
|---|---|---|
| 3 | 1 | Temperature |
| 20 to 32 | 1 | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency<br>▪ Frequency fluctuation<br>▪ Oscillation damping<br>▪ Tube damping fluctuation<br>▪ Signal asymmetry<br>▪ Exciter current<br>▪ Application-specific output 0<br>▪ Application-specific output 1<br>▪ Index inhomogeneous medium<br>▪ Index suspended bubbles<br>▪ Index sensor asymmetry<br>▪ Current output 1<br>▪ Current output 2<br>▪ Current output 3<br>**Additional input variables with the Heartbeat Verification application package**<br>▪ Carrier pipe temperature<br>▪ Oscillation damping 1<br>▪ Oscillation frequency 1<br>▪ Oscillation amplitude 0<br>▪ Oscillation amplitude 1<br>▪ Frequency fluctuation 1<br>▪ Tube damping fluctuation 1<br>▪ Exciter current 1<br>▪ HBSI<br>**Additional input variables with the Concentration Measurement application package**<br>▪ Concentration<br>▪ Target mass flow<br>▪ Carrier mass flow<br>▪ Target volume flow<br>▪ Carrier volume flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>**Additional input variables with the Petroleum application package**<br>▪ Alternative reference density<br>▪ GSV flow<br>▪ Alternative GSV flow<br>▪ NSV flow<br>▪ Alternative NSV flow<br>▪ S&W volume flow<br>▪ Water cut %<br>▪ Oil density<br>▪ Water density<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow |

*Data structure*

*Output data of Analog Output*

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

[1] Status coding → 🗎 85

### 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*

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

| Slot | Compensation value |
|---|---|
| 20…32 | Application-specific Input module 0 |
| 20…32 | Application-specific Input module 1 |

*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 [1] |

[1] Status coding → 🗎 85

### Binary Input module

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

Binary input variables are used by the measuring device to transmit the state of device functions to the automation system.

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

*Selection: Device function Binary Input Slot 80*

| Slot | Sub-slot | Bit | Device function | Status (meaning) |
|---|---|---|---|---|
| 80 | 1 | 0 | Verification has not been performed. | ▪ 0 (device function not active)<br>▪ 1 (device function active) |
| | | 1 | Verification has failed. | |
| | | 2 | Currently performing verification. | |
| | | 3 | Verification completed. | |
| | | 4 | Verification has failed. | |

| Slot | Sub-slot | Bit | Device function | Status (meaning) |
|---|---|---|---|---|
| | | 5 | Verification performed successfully. | |
| | | 6 | Verification has not been performed. | |
| | | 7 | Reserved | |

*Selection: Device function Binary Input Slot 81*

| Slot | Sub-slot | Bit | Device function | Status (meaning) |
|---|---|---|---|---|
| 81 | 1 | 0 | Partially empty pipe detection | ▪ 0 (device function not active)<br>▪ 1 (device function active) |
| | | 1 | Low flow cut off | |
| | | 2 | Reserved | |
| | | 3 | Reserved | |
| | | 4 | Reserved | |
| | | 5 | Reserved | |
| | | 6 | Reserved | |
| | | 7 | Reserved | |

*Data structure*

*Input data of Binary Input*

| Byte 1 | Byte 2 |
|---|---|
| Binary Input | Status [1] |

1) Status coding → 🗎 85

### Mass module

Transmit mass counter value from the measuring device to the automation system.

The Mass module cyclically transmits the mass, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

*Selection: input variable*

| Slot | Sub-slot | Input variables |
|---|---|---|
| 4 | 1 | Mass |

*Data structure*

*Volume input data*

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

1) Status coding → 🗎 85

### Mass Totalizer Control module

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

The Mass Totalizer Control module cyclically transmits a selected totalizer value, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

*Selection: input variable*

| Slot | Sub-slot | Input variable |
|---|---|---|
| 4 | 1 | Mass |

*Data structure*

*Mass Totalizer Control input data*

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

[1] Status coding → 🖹 85

*Selection: output variable*

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

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

*Data structure*

*Mass Totalizer Control output data*

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

### Totalizer module

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

The Totalizer module cyclically transmits a selected totalizer value, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

*Selection: input variable*

| Slot | Sub-slot | Input variable |
|---|---|---|
| 70 to 71 | 1 | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Target mass flow [1]<br>▪ Carrier mass flow<br>▪ Target volume flow<br>▪ Carrier volume flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ GSV flow [2]<br>▪ Alternative GSV flow [2]<br>▪ NSV flow [2]<br>▪ Alternative NSV flow [2]<br>▪ S&W volume flow [2]<br>▪ Oil mass flow [2]<br>▪ Water mass flow [2]<br>▪ Oil volume flow [2]<br>▪ Water volume flow [2]<br>▪ Oil corrected volume flow [2]<br>▪ Raw value mass flow [2] |

1) Only available with the Concentration application package
2) Only available with the Petroleum application package

*Data structure*

*Totalizer input data*

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

1) Status coding → 🗎 85

**Totalizer Control module**

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

The Totalizer Control module cyclically transmits a selected totalizer value, including the status, from the measuring device to the automation system. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

*Selection: input variable*

| Slot | Sub-slot | Input variable |
|---|---|---|
| 70 to 71 | 1 | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Target mass flow [1]<br>▪ Carrier mass flow<br>▪ Target volume flow<br>▪ Carrier volume flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ GSV flow [2]<br>▪ Alternative GSD flow [2]<br>▪ NSV flow [2]<br>▪ Alternative NSV flow [2]<br>▪ S&W volume flow [2]<br>▪ Oil mass flow [2]<br>▪ Water mass flow [2]<br>▪ Oil volume flow [2]<br>▪ Water volume flow [2]<br>▪ Oil corrected volume flow [2]<br>▪ Raw value mass flow [2] |

1) Only available with the Concentration application package
2) Only available with the Petroleum application package

*Data structure*

*Totalizer Control input data*

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

1) Status coding → 📄 85

*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 |

**Analog Output module**

Transmit a compensation value from the automation system to the measuring device.

Analog Output modules cyclically transmit compensation values, including the status and 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.

*Assigned compensation values*

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

| Slot | Sub-slot | Compensation value |
|---|---|---|
| 160 | 1 | Pressure |
| 161 | | Temperature |
| 162 | | Reference density |
| 163 | | External value for % S&W (sediment and water) [1] |
| 164 | | External value for % Water cut [1] |
| 165 | | Appl. Spec. Outp. 0 |
| 166 | | Appl. Spec. Outp. 1 |

1) Only available with the Petroleum application package.

*Data structure*

*Output data of Analog Output*

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

1) Status coding → 🗎 85

*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.

### Binary Output module

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

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

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

*Selection: Device function Binary Output Slot 210*

| Slot | Sub-slot | Bit | Device function | Status (meaning) |
|---|---|---|---|---|
| 210 | 1 | 0 | Start verification. | A change of status from 0 to 1 starts Heartbeat Verification [1] |
| | | 1 | Reserved | |
| | | 2 | Reserved | |
| | | 3 | Reserved | |
| | | 4 | Reserved | |
| | | 5 | Reserved | |
| | | 6 | Reserved | |
| | | 7 | Reserved | |

1) Only available with the Heartbeat application package

*Selection: Device function Binary Output Slot 211*

| Slot | Sub-slot | Bit | Device function | Status (meaning) |
|---|---|---|---|---|
| 211 | 1 | 0 | Flow override | ▪ 0 (disable device function)<br>▪ 1 (enable device function) |
| | | 1 | Zero adjust | |
| | | 2 | Relay output | Relay output value:<br>▪ 0<br>▪ 1 |
| | | 3 | Relay output | |
| | | 4 | Relay output | |
| | | 5 | Reserved | |
| | | 6 | Reserved | |
| | | 7 | Reserved | |

*Data structure*

*Binary Output input data*

| Byte 1 | Byte 2 |
|---|---|
| Binary Output | Status [1] [2] |

1) Status coding → 🗎 85
2) If the status is BAD, the control variable is not adopted.

### Concentration module

ℹ Only available with the Concentration Measurement application package.

*Assigned device functions*

| Slot | Input variables |
|---|---|
| 240 | 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 to 0x27 | A measured value is not available because a device error has occurred. |
| BAD - Process related | 0x28 to 0x2B | A measured value is not available because the process conditions are not within the device's technical specification limits. |
| BAD - Function check | 0x3C to 0x03F | A function check is active (e.g. cleaning or calibration) |
| UNCERTAIN - Initial value | 0x4F to 0x4F | A predefined value is output until a correct measured value is available again or corrective measures have been performed that change this status. |

| Status | Coding (hex) | Meaning |
|---|---|---|
| UNCERTAIN - Maintenance demanded | 0x68 to 0x6B | Signs of wear and tear have been detected on the measuring device. Short-term maintenance is needed to ensure that the measuring device remains operational.<br>The measured value might be invalid. The use of the measured value depends on the application. |
| UNCERTAIN - Process related | 0x78 to 0x7B | 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. |
| GOOD - OK | 0x80 to 0x83 | No error has been diagnosed. |
| GOOD - Maintenance required | 0xA4 to 0xA7 | The measured value is valid.<br>The device will require servicing in the near future. |
| GOOD - Maintenance demanded | 0xA8 to 0xAB | The measured value is valid.<br>It is highly advisable to service the device in the near future. |
| GOOD - Function check | 0xBC to 0XBF | The measured value is valid.<br>The measuring device is performing an internal function check. The function check does not have any noticeable effect on the process. |

## 9.3.4 Factory setting

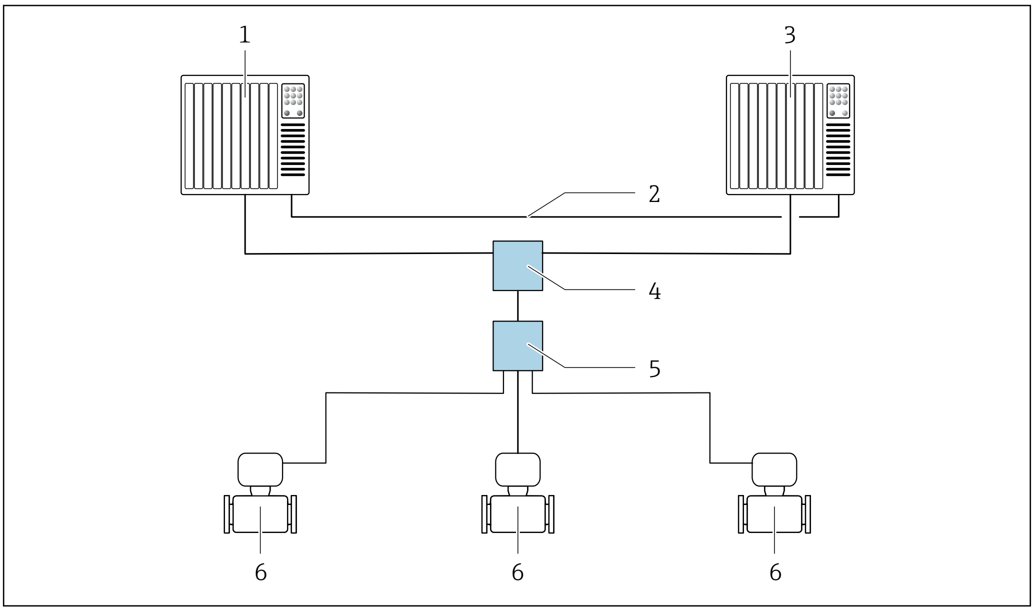
The slots are already assigned in the automation system for initial commissioning.

### Assigned slots

| Slot | Factory setting |
|---|---|
| 1 | Mass flow |
| 2 | Density |
| 3 | Temperature |
| 4 | Mass |
| 20 to 32 | – |
| 70 to 71 | – |
| 80 to 81 | – |
| 160 to 166 | – |
| 210 to 211 | – |
| 240 | – |

## 9.4 System redundancy S2

A redundant layout with two automation systems is necessary for processes that are in continuous operation. If one system fails the second system guarantees continued, uninterrupted operation. The measuring device supports S2 system redundancy and can communicate with both automation systems simultaneously.



*25 Example of the layout of a redundant system (S2): star topology*

1 *Automation system 1*
2 *Synchronization of automation systems*
3 *Automation system 2*
4 *Industrial Ethernet Managed Switch*
5 *APL field switch*
6 *Measuring device*

All the devices in the network must support S2 system redundancy.

# 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.

- "Post-installation check" checklist → 🗎 30
- "Post-connection check" checklist → 🗎 44

## 10.2 Switching on the measuring device

▶ After a successful post-installation and post-connection check, switch on the device.
  ↳ After a successful startup, the local display switches automatically from the startup display to the operational display.

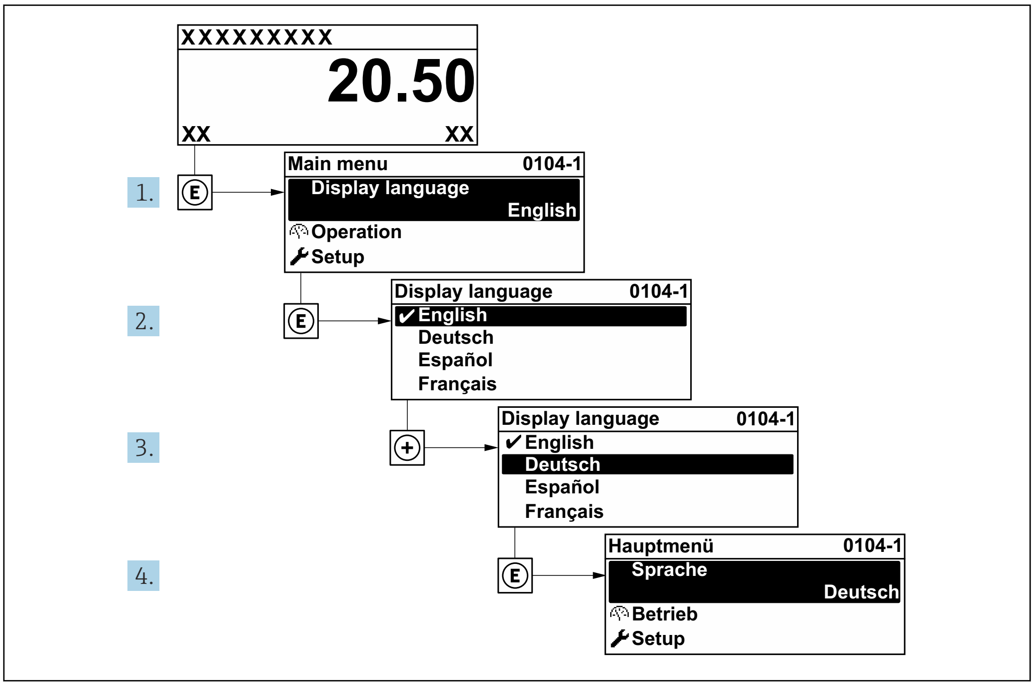
ℹ If the local display is blank or if a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" → 🗎 180.

## 10.3 Connecting via FieldCare

- For FieldCare → 🗎 68 connection
- For connecting via FieldCare → 🗎 70
- For the FieldCare → 🗎 71 user interface

## 10.4 Setting the operating language

Factory setting: English or ordered local language

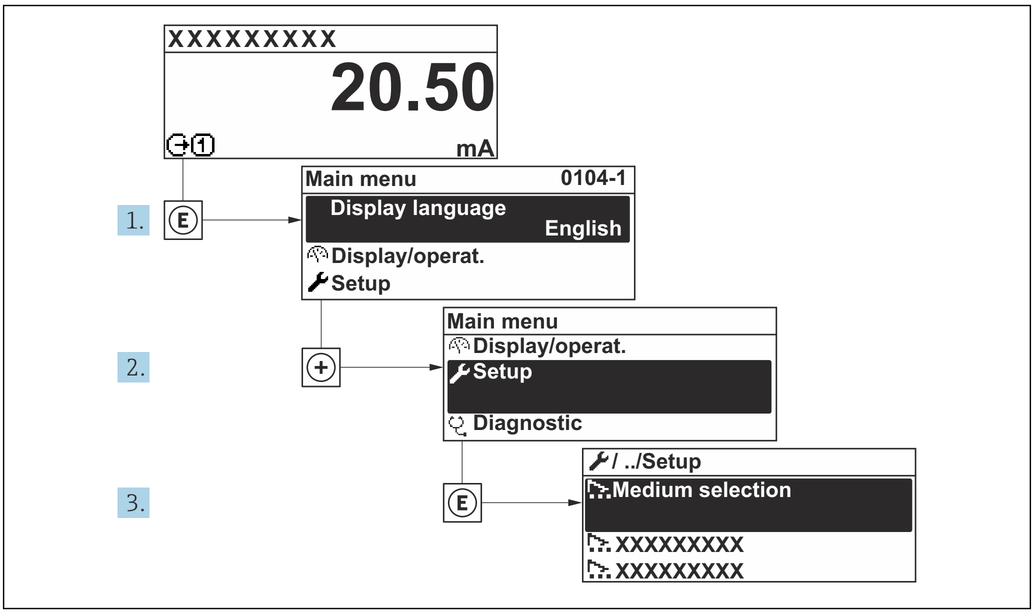


A0029420

26 *Taking the example of the local display*

## 10.5 Configuring the measuring device

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



27 *Taking the example of the local display*

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

**Setup**

| | |
|---|---|
| PROFINET device name | → 90 |
| ▶ **Communication** | → 90 |
| ▶ **System units** | → 92 |
| ▶ **Medium selection** | → 95 |
| ▶ **Analog inputs** | → 98 |
| ▶ **I/O configuration** | → 101 |
| ▶ **Current input 1 to n** | → 102 |
| ▶ **Status input 1 to n** | → 103 |
| ▶ **Current output 1 to n** | → 104 |

| | |
|---|---|
| ▶ **Pulse/frequency/switch output 1 to n** | → 🗎 108 |
| ▶ **Relay output 1 to n** | → 🗎 117 |
| ▶ **Display** | → 🗎 120 |
| ▶ **Low flow cut off** | → 🗎 125 |
| ▶ **Partially filled pipe detection** | → 🗎 126 |
| ▶ **Advanced setup** | → 🗎 127 |

## 10.5.1 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 .

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 |
|---|---|---|---|
| PROFINET device name | Name of the measuring point. | Max. 32 characters such as letters and numbers. | EH-PROMASS300 serial number of the device |

## 10.5.2 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**

| | |
|---|---|
| ▶ **APL port** | → 🗎 91 |
| ▶ **Service interface** | → 🗎 91 |
| ▶ **Network diagnostics** | → 🗎 92 |

### "APL port" submenu

**Navigation**
"Setup" menu → Communication → APL port

**▶ APL port**

| | |
|---|---|
| IP address (7263) | → 🗎 91 |
| Subnet mask (7265) | → 🗎 91 |
| Default gateway (7264) | → 🗎 91 |
| MAC address (7262) | → 🗎 91 |

### Parameter overview with brief description

| Parameter | Description | User entry / User interface | Factory setting |
|---|---|---|---|
| IP address | Enter the IP address of the measuring device. | Character string comprising numbers, letters and special characters (15) | 0.0.0.0 |
| Default gateway | Enter IP address for the default gateway of the measuring device. | Character string comprising numbers, letters and special characters (15) | 0.0.0.0 |
| Subnet mask | Enter subnet mask of the measuring device. | Character string comprising numbers, letters and special characters (15) | 255.255.255.0 |
| MAC address | Shows the MAC address of the measuring device. | Character string comprising numbers, letters and special characters | |

### "Service interface" submenu

**Navigation**
"Setup" menu → Communication → Service interface

**▶ Service interface**

| | |
|---|---|
| IP address (7209) | → 🗎 92 |
| Subnet mask (7211) | → 🗎 92 |
| Default gateway (7210) | → 🗎 92 |
| MAC address (7214) | → 🗎 92 |

### Parameter overview with brief description

| Parameter | Description | User entry / User interface | Factory setting |
|---|---|---|---|
| IP address | Enter the IP address of the measuring device. | 4 octet: 0 to 255 (in the particular octet) | 192.168.1.212 |
| Subnet mask | Displays the subnet mask. | 4 octet: 0 to 255 (in the particular octet) | 255.255.255.0 |
| Default gateway | Displays the default gateway. | 4 octet: 0 to 255 (in the particular octet) | 0.0.0.0 |
| MAC address | Displays the MAC address of the measuring device.<br>ℹ MAC = Media Access Control | Unique 12-digit character string comprising letters and numbers, e.g.: 00:07:05:10:01:5F | Each measuring device is given an individual address. |

### "Network diagnostics" submenu

**Navigation**
"Setup" menu → Communication → Network diagnostics

**▶ Network diagnostics**

| | |
|---|---|
| Mean squared error (7258) | → 🗎 92 |
| Number of failed received packets (7257) | → 🗎 92 |

### Parameter overview with brief description

| Parameter | Description | User interface | Factory setting |
|---|---|---|---|
| Mean squared error | Provides an indication of the link signal quality. | Signed floating-point number | 0 dB |
| Number of failed received packets | Shows the number of failed received packets. | 0 to 65 535 | 0 |

## 10.5.3 Setting the system units

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

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

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

**▶ System units**

| | |
|---|---|
| Mass flow unit | → 🗎 93 |
| Mass unit | → 🗎 93 |

| | |
|---|---|
| Volume flow unit | → 🗎 93 |
| Volume unit | → 🗎 93 |
| Corrected volume flow unit | → 🗎 93 |
| Corrected volume unit | → 🗎 93 |
| Density unit | → 🗎 93 |
| Reference density unit | → 🗎 94 |
| Density 2 unit | → 🗎 94 |
| Temperature unit | → 🗎 94 |
| Pressure unit | → 🗎 94 |

### Parameter overview with brief description

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Mass flow unit | Select mass flow unit.<br>*Effect*<br>The selected unit applies for:<br>▪ Output<br>▪ Low flow cut off<br>▪ Simulation process variable | Unit choose list | Country-specific:<br>▪ kg/h<br>▪ lb/min |
| Mass unit | Select mass unit. | Unit choose list | Country-specific:<br>▪ kg<br>▪ lb |
| Volume flow unit | Select volume flow unit.<br>*Effect*<br>The selected unit applies for:<br>▪ Output<br>▪ Low flow cut off<br>▪ Simulation process variable | Unit choose list | Depends on country:<br>▪ l/h<br>▪ gal/min (us) |
| Volume unit | Select volume unit. | Unit choose list | Country-specific:<br>▪ l (DN > 150 (6"): **m³** option)<br>▪ gal (us) |
| Corrected volume flow unit | Select corrected volume flow unit.<br>*Result*<br>The selected unit applies for:<br>**Corrected volume flow** parameter (→ 🗎 160) | Unit choose list | Country-specific:<br>▪ Nl/h<br>▪ Sft³/min |
| Corrected volume unit | Select corrected volume unit. | Unit choose list | Country-specific:<br>▪ Nl<br>▪ Sft³ |
| Density unit | Select density unit.<br>*Effect*<br>The selected unit applies for:<br>▪ Output<br>▪ Simulation process variable<br>▪ Density adjustment (**Expert** menu) | Unit choose list | Country-specific:<br>▪ kg/l<br>▪ lb/ft³ |

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Reference density unit | Select reference density unit. | Unit choose list | Country-dependent<br>▪ kg/Nl<br>▪ lb/Sft³ |
| Density 2 unit | Select second density unit. | Unit choose list | Depends on country:<br>▪ kg/l<br>▪ lb/ft³ |
| Temperature unit | Select temperature unit.<br>*Effect*<br>The selected unit applies for:<br>▪ **Electronic temperature** parameter (6053)<br>▪ **Maximum value** parameter (6051)<br>▪ **Minimum value** parameter (6052)<br>▪ **Maximum value** parameter (6108)<br>▪ **Minimum value** parameter (6109)<br>▪ **Carrier pipe temperature** parameter (6027)<br>▪ **Maximum value** parameter (6029)<br>▪ **Minimum value** parameter (6030)<br>▪ **Reference temperature** parameter (1816)<br>▪ **Temperature** parameter | Unit choose list | Country-specific:<br>▪ °C<br>▪ °F |
| Pressure unit | Select process pressure unit.<br>*Result*<br>The unit is taken from:<br>▪ **Pressure value** parameter (→ 🗎 97)<br>▪ **External pressure** parameter (→ 🗎 97)<br>▪ Pressure value | Unit choose list | Country-specific:<br>▪ bar a<br>▪ psi a |

## 10.5.4 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 type | → 🗎 96 |
| Select gas type | → 🗎 96 |
| Reference sound velocity | → 🗎 96 |
| Reference sound velocity | → 🗎 96 |
| Temperature coefficient sound velocity | → 🗎 96 |
| Temperature coefficient sound velocity | → 🗎 96 |
| Pressure compensation | → 🗎 96 |
| Pressure value | → 🗎 97 |
| External pressure | → 🗎 97 |

### Parameter overview with brief description

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

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

* Visibility depends on order options or device settings

### 10.5.5 Configuration of the Analog Inputs

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

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

| | | |
|---|---|---|
| **▶ Analog inputs** | | |
| | **▶ Mass flow** | → 🗎 98 |

**"Analog inputs" submenu**

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

| | | |
|---|---|---|
| **▶ Mass flow** | | |
| | Assign process variable (11074) | → 🗎 100 |
| | Damping (11073) | → 🗎 101 |

### Parameter overview with brief description

| Parameter | Description | User interface / User entry | Factory setting |
|---|---|---|---|
| Parent class | | 0 to 255 | 70 |

| Parameter | Description | User interface / User entry | Factory setting |
|---|---|---|---|
| Assign process variable | Select a process variable. | ▪ Mass flow<br>▪ Volume flow<br>▪ Density<br>▪ Temperature<br>▪ Carrier pipe temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation frequency 1<br>▪ Oscillation amplitude 0<br>▪ Oscillation amplitude 1<br>▪ Frequency fluctuation 0<br>▪ Frequency fluctuation 1<br>▪ Oscillation damping 0<br>▪ Oscillation damping 1<br>▪ Oscillation damping fluctuation 0<br>▪ Oscillation damping fluctuation 1<br>▪ Signal asymmetry<br>▪ Torsion signal asymmetry *<br>▪ Exciter current 0<br>▪ Exciter current 1<br>▪ HBSI<br>▪ Current input 1<br>▪ Current input 2<br>▪ Current input 3<br>▪ Application specific output 0<br>▪ Application specific output 1<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ Test point 0<br>▪ Test point 1<br>▪ Sensor index coil asymmetry<br>▪ Raw value mass flow<br>▪ Corrected volume flow<br>▪ Target mass flow<br>▪ Carrier mass flow<br>▪ Target volume flow<br>▪ Carrier volume flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Reference density<br>▪ Reference density alternative<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ NSV flow<br>▪ NSV flow alternative *<br>▪ S&W volume flow<br>▪ Water cut *<br>▪ Oil density<br>▪ Water density<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Concentration<br>▪ Dynamic viscosity<br>▪ Kinematic viscosity<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity | Mass flow |

| Parameter | Description | User interface / User entry | Factory setting |
|---|---|---|---|
| Damping | Enter time constant for input damping (PT1 element). Damping reduces the effect of fluctuations in the measured value on the output signal. | Positive floating-point number | 1.0 s |

* Visibility depends on order options or device settings

### 10.5.6 Displaying the I/O configuration

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

**Navigation**
"Setup" menu → I/O configuration

**▶ I/O configuration**

| | |
|---|---|
| I/O module 1 to n terminal numbers | → 🗎 101 |
| I/O module 1 to n information | → 🗎 101 |
| I/O module 1 to n type | → 🗎 101 |
| Apply I/O configuration | → 🗎 101 |
| I/O alteration code | → 🗎 101 |

#### Parameter overview with brief description

| Parameter | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|
| I/O module 1 to n terminal numbers | Shows the terminal numbers used by the I/O module. | ▪ Not used<br>▪ 26-27 (I/O 1)<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| I/O module 1 to n information | Shows information of the plugged I/O module. | ▪ Not plugged<br>▪ Invalid<br>▪ Not configurable<br>▪ Configurable<br>▪ PROFINET | – |
| I/O module 1 to n type | Shows the I/O module type. | ▪ Off<br>▪ Current output *<br>▪ Current input *<br>▪ Status input *<br>▪ Pulse/frequency/switch output *<br>▪ Double pulse output *<br>▪ Relay output * | Off |
| Apply I/O configuration | Apply parameterization of the freely configurable I/O module. | ▪ No<br>▪ Yes | No |
| I/O alteration code | Enter the code in order to change the I/O configuration. | Positive integer | 0 |

* Visibility depends on order options or device settings

### 10.5.7 Configuring the current input

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

**Navigation**
"Setup" menu → Current input

**▶ Current input 1 to n**

| | |
|---|---|
| Terminal number | → 🗎 102 |
| Signal mode | → 🗎 102 |
| 0/4 mA value | → 🗎 102 |
| 20 mA value | → 🗎 102 |
| Current span | → 🗎 102 |
| Failure mode | → 🗎 103 |
| Failure value | → 🗎 103 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Terminal number | – | Shows the terminal numbers used by the current input module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Signal mode | The measuring device is **not** approved for use in the hazardous area with type of protection Ex-i. | Select the signal mode for the current input. | ▪ Passive<br>▪ Active * | Active |
| 0/4 mA value | – | Enter 4 mA value. | Signed floating-point number | 0 |
| 20 mA value | – | Enter 20 mA value. | Signed floating-point number | Depends on country and nominal diameter |
| Current span | – | Select current range for process value output and upper/lower level for alarm signal. | ▪ 4…20 mA (4… 20.5 mA)<br>▪ 4…20 mA NE (3.8…20.5 mA)<br>▪ 4…20 mA US (3.9…20.8 mA)<br>▪ 0…20 mA (0… 20.5 mA) | Country-specific:<br>▪ 4…20 mA NE (3.8…20.5 mA)<br>▪ 4…20 mA US (3.9…20.8 mA) |

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Failure mode | – | Define input behavior in alarm condition. | ▪ Alarm<br>▪ Last valid value<br>▪ Defined value | Alarm |
| Failure value | In the **Failure mode** parameter, the **Defined value** option is selected. | Enter value to be used by the device if input value from external device is missing. | Signed floating-point number | 0 |

* Visibility depends on order options or device settings

## 10.5.8 Configuring the status input

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

### Navigation

"Setup" menu → Status input 1 to n

**▶ Status input 1 to n**

| | |
|---|---|
| Assign status input | → 🗎 103 |
| Terminal number | → 🗎 103 |
| Active level | → 🗎 104 |
| Terminal number | → 🗎 103 |
| Response time status input | → 🗎 104 |
| Terminal number | → 🗎 103 |

### Parameter overview with brief description

| Parameter | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|
| Assign status input | Select function for the status input. | ▪ Off<br>▪ Reset totalizer 1<br>▪ Reset totalizer 2<br>▪ Reset totalizer 3<br>▪ Reset all totalizers<br>▪ Flow override<br>▪ Zero adjustment<br>▪ Reset weighted averages *<br>▪ Reset weighted averages + totalizer 3 * | Off |
| Terminal number | Shows the terminal numbers used by the status input module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |

| Parameter | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|
| Active level | Define input signal level at which the assigned function is triggered. | ▪ High<br>▪ Low | High |
| Response time status input | Define the minimum amount of time the input signal level must be present before the selected function is triggered. | 5 to 200 ms | 50 ms |

* Visibility depends on order options or device settings

### 10.5.9 Configuring the current output

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

**Navigation**
"Setup" menu → Current output

**▶ Current output 1 to n**

| | |
|---|---|
| Terminal number | → 🗎 104 |
| Signal mode | → 🗎 104 |
| Process variable current output | → 🗎 105 |
| Current range output | → 🗎 106 |
| Lower range value output | → 🗎 106 |
| Upper range value output | → 🗎 106 |
| Fixed current | → 🗎 106 |
| Damping current output | → 🗎 106 |
| Failure behavior current output | → 🗎 107 |
| Failure current | → 🗎 107 |

#### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Terminal number | – | Shows the terminal numbers used by the current output module. | ▪ Not used<br>▪ 26-27 (I/O 1)<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Signal mode | – | Select the signal mode for the current output. | ▪ Active *<br>▪ Passive * | Active |

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Process variable current output | – | Select the process variable for the current output. | ▪ Off *<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Temperature<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Reference density alternative *<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Concentration *<br>▪ Application specific output 0 *<br>▪ Application specific output 1 *<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index *<br>▪ Raw value mass flow<br>▪ Exciter current 0<br>▪ Oscillation damping 0<br>▪ Oscillation damping fluctuation 0 *<br>▪ Oscillation frequency 0<br>▪ Frequency fluctuation 0 *<br>▪ Signal asymmetry<br>▪ Torsion signal asymmetry *<br>▪ Carrier pipe temperature *<br>▪ Frequency fluctuation 0 * | Mass flow |

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| | | | ▪ Oscillation amplitude 0 *<br>▪ Oscillation damping fluctuation 0 *<br>▪ HBSI *<br>▪ Pressure *<br>▪ Electronics temperature<br>▪ Sensor index coil asymmetry<br>▪ Test point 0<br>▪ Test point 1 | |
| Current range output | – | Select current range for process value output and upper/lower level for alarm signal. | ▪ 4...20 mA NE (3.8...20.5 mA)<br>▪ 4...20 mA US (3.9...20.8 mA)<br>▪ 4...20 mA (4... 20.5 mA)<br>▪ 0...20 mA (0... 20.5 mA)<br>▪ Fixed value | Depends on country:<br>▪ 4...20 mA NE (3.8...20.5 mA)<br>▪ 4...20 mA US (3.9...20.8 mA) |
| Lower range value output | One of the following options is selected in the **Current span** parameter (→ 🗎 106):<br>▪ 4...20 mA NE (3.8...20.5 mA)<br>▪ 4...20 mA US (3.9...20.8 mA)<br>▪ 4...20 mA (4... 20.5 mA)<br>▪ 0...20 mA (0... 20.5 mA) | Enter lower range value for the measured value range. | Signed floating-point number | Depends on country:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| Upper range value output | One of the following options is selected in the **Current span** parameter (→ 🗎 106):<br>▪ 4...20 mA NE (3.8...20.5 mA)<br>▪ 4...20 mA US (3.9...20.8 mA)<br>▪ 4...20 mA (4... 20.5 mA)<br>▪ 0...20 mA (0... 20.5 mA) | Enter upper range value for the measured value range. | Signed floating-point number | Depends on country and nominal diameter |
| Fixed current | The **Fixed current** option is selected in the **Current span** parameter (→ 🗎 106). | Defines the fixed output current. | 0 to 22.5 mA | 22.5 mA |
| Damping current output | A process variable is selected in the **Assign current output** parameter (→ 🗎 105) and one of the following options is selected in the **Current span** parameter (→ 🗎 106):<br>▪ 4...20 mA NE (3.8...20.5 mA)<br>▪ 4...20 mA US (3.9...20.8 mA)<br>▪ 4...20 mA (4... 20.5 mA)<br>▪ 0...20 mA (0... 20.5 mA) | Set reaction time for output signal to fluctuations in the measured value. | 0.0 to 999.9 s | 1.0 s |

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Failure behavior current output | A process variable is selected in the **Assign current output** parameter (→ 🖹 105) and one of the following options is selected in the **Current span** parameter (→ 🖹 106):<br>▪ 4...20 mA NE (3.8...20.5 mA)<br>▪ 4...20 mA US (3.9...20.8 mA)<br>▪ 4...20 mA (4... 20.5 mA)<br>▪ 0...20 mA (0... 20.5 mA) | Define output behavior in alarm condition. | ▪ Min.<br>▪ Max.<br>▪ Last valid value<br>▪ Actual value<br>▪ Fixed value | Max. |
| Failure current | The **Defined value** option is selected in the **Failure mode** parameter. | Enter current output value in alarm condition. | 0 to 22.5 mA | 22.5 mA |

* Visibility depends on order options or device settings

## 10.5.10 Configuring the pulse/frequency/switch output

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

### Navigation

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

**▶ Pulse/frequency/switch output 1 to n**

| | |
|---|---|
| Operating mode | → 🗎 108 |

### Parameter overview with brief description

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Operating mode | Define the output as a pulse, frequency or switch output. | ▪ Pulse<br>▪ Frequency<br>▪ Switch | Pulse |

### Configuring the pulse output

### Navigation

"Setup" menu → Pulse/frequency/switch output

**▶ Pulse/frequency/switch output 1 to n**

| | |
|---|---|
| Operating mode | → 🗎 109 |
| Terminal number | → 🗎 109 |
| Signal mode | → 🗎 109 |
| Assign pulse output | → 🗎 109 |
| Pulse scaling | → 🗎 109 |
| Pulse width | → 🗎 109 |
| Failure mode | → 🗎 110 |
| Invert output signal | → 🗎 110 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Operating mode | – | Define the output as a pulse, frequency or switch output. | ▪ Pulse<br>▪ Frequency<br>▪ Switch | Pulse |
| Terminal number | – | Shows the terminal numbers used by the PFS output module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Signal mode | – | Select the signal mode for the PFS output. | ▪ Passive<br>▪ Active *<br>▪ Passive NE | Passive |
| Assign pulse output | The **Pulse** option is selected in the **Operating mode** parameter. | Select process variable for pulse output. | ▪ Off<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow * | Off |
| Pulse scaling | The **Pulse** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign pulse output** parameter (→ 🗎 109). | Enter quantity for measured value at which a pulse is output. | Positive floating point number | Depends on country and nominal diameter |
| Pulse width | The **Pulse** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign pulse output** parameter (→ 🗎 109). | Define time width of the output pulse. | 0.05 to 2 000 ms | 100 ms |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Failure mode | The **Pulse** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign pulse output** parameter (→ 🗎 109). | Define output behavior in alarm condition. | ▪ Actual value<br>▪ No pulses | No pulses |
| Invert output signal | – | Invert the output signal. | ▪ No<br>▪ Yes | No |

* Visibility depends on order options or device settings

### Configuring the frequency output

#### Navigation

"Setup" menu → Pulse/frequency/switch output

**▶ Pulse/frequency/switch output 1 to n**

| | |
|---|---|
| Operating mode | → 🗎 111 |
| Terminal number | → 🗎 111 |
| Signal mode | → 🗎 111 |
| Assign frequency output | → 🗎 112 |
| Minimum frequency value | → 🗎 113 |
| Maximum frequency value | → 🗎 113 |
| Measuring value at minimum frequency | → 🗎 113 |
| Measuring value at maximum frequency | → 🗎 113 |
| Failure mode | → 🗎 113 |
| Failure frequency | → 🗎 113 |
| Invert output signal | → 🗎 113 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Operating mode | – | Define the output as a pulse, frequency or switch output. | ▪ Pulse<br>▪ Frequency<br>▪ Switch | Pulse |
| Terminal number | – | Shows the terminal numbers used by the PFS output module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Signal mode | – | Select the signal mode for the PFS output. | ▪ Passive<br>▪ Active *<br>▪ Passive NE | Passive |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Assign frequency output | In the **Operating mode** parameter (→ 🖹 108), the **Frequency** option is selected. | Select process variable for frequency output. | ▪ Off<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Time period signal frequency (TPS) *<br>▪ Temperature<br>▪ Pressure<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Reference density alternative *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Concentration *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Application specific output 0 *<br>▪ Application specific output 1 *<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index *<br>▪ HBSI *<br>▪ Raw value mass flow<br>▪ Exciter current 0<br>▪ Oscillation damping 0<br>▪ Oscillation damping fluctuation 0 *<br>▪ Oscillation frequency 0<br>▪ Frequency fluctuation 0 *<br>▪ Oscillation amplitude 0 *<br>▪ Signal asymmetry | Off |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| | | | ▪ Torsion signal asymmetry *<br>▪ Carrier pipe temperature *<br>▪ Electronics temperature<br>▪ Sensor index coil asymmetry<br>▪ Test point 0<br>▪ Test point 1 | |
| Minimum frequency value | The **Frequency** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign frequency output** parameter (→ 🗎 112). | Enter minimum frequency. | 0.0 to 10 000.0 Hz | 0.0 Hz |
| Maximum frequency value | The **Frequency** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign frequency output** parameter (→ 🗎 112). | Enter maximum frequency. | 0.0 to 10 000.0 Hz | 10 000.0 Hz |
| Measuring value at minimum frequency | The **Frequency** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign frequency output** parameter (→ 🗎 112). | Enter measured value for minimum frequency. | Signed floating-point number | Depends on country and nominal diameter |
| Measuring value at maximum frequency | The **Frequency** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign frequency output** parameter (→ 🗎 112). | Enter measured value for maximum frequency. | Signed floating-point number | Depends on country and nominal diameter |
| Failure mode | The **Frequency** option is selected in the **Operating mode** parameter (→ 🗎 108) and a process variable is selected in the **Assign frequency output** parameter (→ 🗎 112). | Define output behavior in alarm condition. | ▪ Actual value<br>▪ Defined value<br>▪ 0 Hz | 0 Hz |
| Failure frequency | In the **Operating mode** parameter (→ 🗎 108), the **Frequency** option is selected, in the **Assign frequency output** parameter (→ 🗎 112) a process variable is selected, and in the **Failure mode** parameter, the **Defined value** option is selected. | Enter frequency output value in alarm condition. | 0.0 to 12 500.0 Hz | 0.0 Hz |
| Invert output signal | – | Invert the output signal. | ▪ No<br>▪ Yes | No |

* Visibility depends on order options or device settings

### Configuring the switch output

**Navigation**
"Setup" menu → Pulse/frequency/switch output

**▸ Pulse/frequency/switch output 1 to n**

| | |
|---|---|
| Operating mode | → 📖 114 |
| Terminal number | → 📖 114 |
| Signal mode | → 📖 114 |
| Switch output function | → 📖 115 |
| Assign diagnostic behavior | → 📖 115 |
| Assign limit | → 📖 116 |
| Assign flow direction check | → 📖 116 |
| Assign status | → 📖 117 |
| Switch-on value | → 📖 117 |
| Switch-off value | → 📖 117 |
| Switch-on delay | → 📖 117 |
| Switch-off delay | → 📖 117 |
| Failure mode | → 📖 117 |
| Invert output signal | → 📖 117 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Operating mode | – | Define the output as a pulse, frequency or switch output. | ▪ Pulse<br>▪ Frequency<br>▪ Switch | Pulse |
| Terminal number | – | Shows the terminal numbers used by the PFS output module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Signal mode | – | Select the signal mode for the PFS output. | ▪ Passive<br>▪ Active *<br>▪ Passive NE | Passive |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Switch output function | The **Switch** option is selected in the **Operating mode** parameter. | Select function for switch output. | ▪ Off<br>▪ On<br>▪ Diagnostic behavior<br>▪ Limit<br>▪ Flow direction check<br>▪ Status | Off |
| Assign diagnostic behavior | ▪ In the **Operating mode** parameter, the **Switch** option is selected.<br>▪ In the **Switch output function** parameter, the **Diagnostic behavior** option is selected. | Select diagnostic behavior for switch output. | ▪ Alarm<br>▪ Alarm or warning<br>▪ Warning | Alarm |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Assign limit | ▪ In the **Operating mode** parameter, the **Switch** option is selected.<br>▪ In the **Switch output function** parameter, the **Limit** option is selected. | Select process variable for limit function. | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Reference density alternative *<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Concentration *<br>▪ Temperature<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Oscillation damping<br>▪ Pressure<br>▪ Application specific output 0 *<br>▪ Application specific output 1 *<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index * | Volume flow |
| Assign flow direction check | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Flow direction check** option is selected in the **Switch output function** parameter. | Select process variable for flow direction monitoring. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow * | Mass flow |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Assign status | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Status** option is selected in the **Switch output function** parameter. | Select device status for switch output. | ▪ Partially filled pipe detection<br>▪ Low flow cut off<br>▪ Binary output *<br>▪ Binary output *<br>▪ Binary output * | Partially filled pipe detection |
| Switch-on value | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Limit** option is selected in the **Switch output function** parameter. | Enter measured value for the switch-on point. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| Switch-off value | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Limit** option is selected in the **Switch output function** parameter. | Enter measured value for the switch-off point. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| Switch-on delay | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Limit** option is selected in the **Switch output function** parameter. | Define delay for the switch-on of status output. | 0.0 to 100.0 s | 0.0 s |
| Switch-off delay | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Limit** option is selected in the **Switch output function** parameter. | Define delay for the switch-off of status output. | 0.0 to 100.0 s | 0.0 s |
| Failure mode | – | Define output behavior in alarm condition. | ▪ Actual status<br>▪ Open<br>▪ Closed | Open |
| Invert output signal | – | Invert the output signal. | ▪ No<br>▪ Yes | No |

* Visibility depends on order options or device settings

### 10.5.11 Configuring the relay output

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

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

**▶ Relay output 1 to n**

| | |
|---|---|
| Terminal number | → 🗎 118 |
| Relay output function | → 🗎 118 |
| Assign flow direction check | → 🗎 118 |
| Assign limit | → 🗎 119 |

| | |
|---|---|
| Assign diagnostic behavior | → 🗎 119 |
| Assign status | → 🗎 119 |
| Switch-off value | → 🗎 119 |
| Switch-off delay | → 🗎 120 |
| Switch-on value | → 🗎 120 |
| Switch-on delay | → 🗎 120 |
| Failure mode | → 🗎 120 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Terminal number | – | Shows the terminal numbers used by the relay output module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Relay output function | – | Select the function for the relay output. | ▪ Closed<br>▪ Open<br>▪ Diagnostic behavior<br>▪ Limit<br>▪ Flow direction check<br>▪ Status | Closed |
| Assign flow direction check | The **Flow direction check** option is selected in the **Relay output function** parameter. | Select process variable for flow direction monitoring. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow * | Mass flow |

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

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Switch-off delay | In the **Relay output function** parameter, the **Limit** option is selected. | Define delay for the switch-off of status output. | 0.0 to 100.0 s | 0.0 s |
| Switch-on value | The **Limit** option is selected in the **Relay output function** parameter. | Enter measured value for the switch-on point. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| Switch-on delay | In the **Relay output function** parameter, the **Limit** option is selected. | Define delay for the switch-on of status output. | 0.0 to 100.0 s | 0.0 s |
| Failure mode | – | Define output behavior in alarm condition. | ▪ Actual status<br>▪ Open<br>▪ Closed | Open |

* Visibility depends on order options or device settings

### 10.5.12 Configuring the local display

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

**Navigation**
"Setup" menu → Display

**▶ Display**

| | |
|---|---|
| Format display | → 🗎 122 |
| Value 1 display | → 🗎 123 |
| 0% bargraph value 1 | → 🗎 124 |
| 100% bargraph value 1 | → 🗎 124 |
| Value 2 display | → 🗎 124 |
| Value 3 display | → 🗎 124 |
| 0% bargraph value 3 | → 🗎 124 |
| 100% bargraph value 3 | → 🗎 124 |
| Value 4 display | → 🗎 124 |
| Value 5 display | → 🗎 124 |
| Value 6 display | → 🗎 124 |

| | |
|---|---|
| Value 7 display | → 🗎 124 |
| Value 8 display | → 🗎 124 |

### Parameter overview with brief description

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

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Value 1 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Temperature<br>▪ Pressure<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Reference density alternative *<br>▪ Weighted density average *<br>▪ Weighted temperature average *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Concentration *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Application specific output 0 *<br>▪ Application specific output 1 *<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index *<br>▪ HBSI *<br>▪ Raw value mass flow<br>▪ Exciter current 0<br>▪ Oscillation damping 0<br>▪ Oscillation damping fluctuation 0 *<br>▪ Oscillation frequency 0 | Mass flow |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| | | | ▪ Frequency fluctuation 0 *<br>▪ Oscillation amplitude 0 *<br>▪ Signal asymmetry<br>▪ Torsion signal asymmetry *<br>▪ Carrier pipe temperature *<br>▪ Electronics temperature<br>▪ Sensor index coil asymmetry<br>▪ Test point 0<br>▪ Test point 1<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 * | |
| 0% bargraph value 1 | A local display is provided. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| 0% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| 100% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Value 5 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Value 6 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Value 7 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Value 8 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |

* Visibility depends on order options or device settings

### 10.5.13 Configuring the low flow cut off

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

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

**▶ Low flow cut off**

| | |
|---|---|
| Assign process variable | → 🗎 125 |
| On value low flow cutoff | → 🗎 125 |
| Off value low flow cutoff | → 🗎 125 |
| Pressure shock suppression | → 🗎 125 |

#### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for low flow cut off. | ▪ Off<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow * | Mass flow |
| On value low flow cutoff | A process variable is selected in the **Assign process variable** parameter (→ 🗎 125). | Enter on value for low flow cut off. | Positive floating-point number | Depends on country and nominal diameter |
| Off value low flow cutoff | A process variable is selected in the **Assign process variable** parameter (→ 🗎 125). | Enter off value for low flow cut off. | 0 to 100.0 % | 50 % |
| Pressure shock suppression | A process variable is selected in the **Assign process variable** parameter (→ 🗎 125). | Enter time frame for signal suppression (= active pressure shock suppression). | 0 to 100 s | 0 s |

* Visibility depends on order options or device settings

### 10.5.14 Configuring partially filled pipe detection

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

**Navigation**
"Setup" menu → Partially filled pipe detection

**▶ Partially filled pipe detection**

| | |
|---|---|
| Assign process variable | → 🗎 126 |
| Low value partial filled pipe detection | → 🗎 126 |
| High value partial filled pipe detection | → 🗎 126 |
| Response time part. filled pipe detect. | → 🗎 126 |

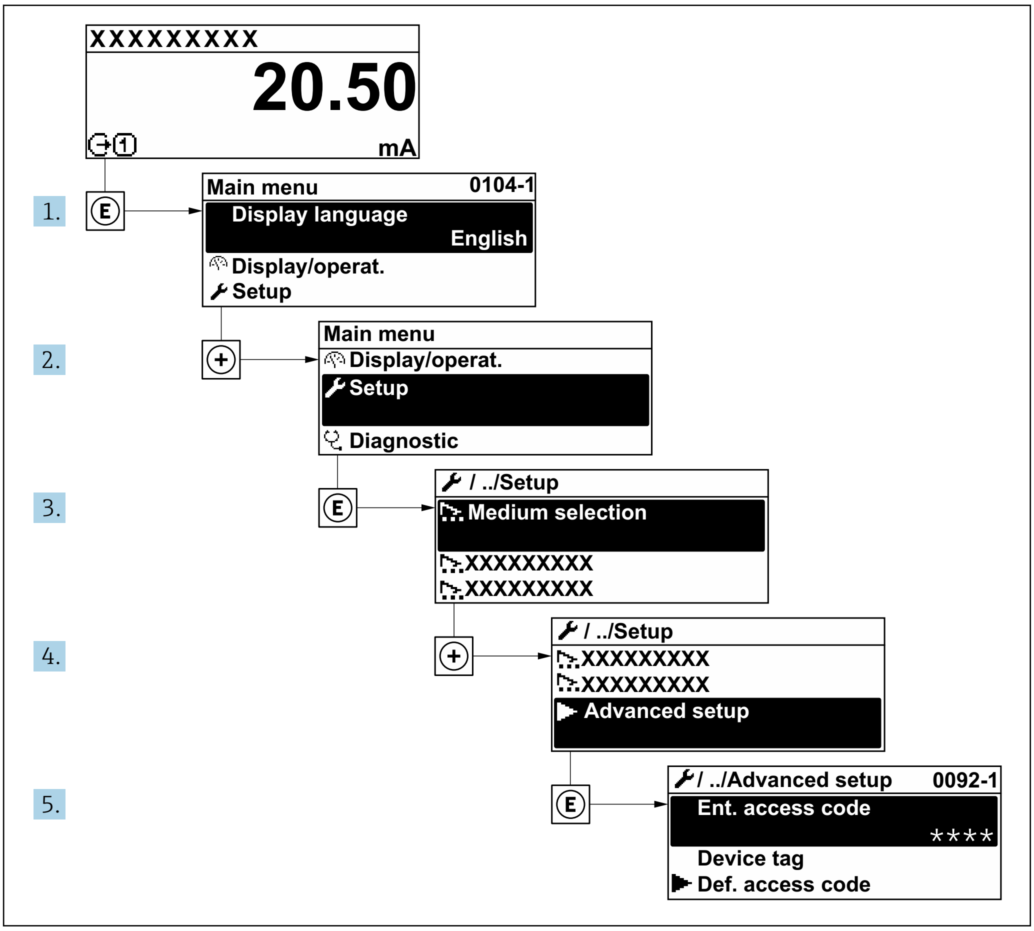
#### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for partially filled pipe detection. | ▪ Off<br>▪ Density<br>▪ Calculated reference density | Off |
| Low value partial filled pipe detection | A process variable is selected in the **Assign process variable** parameter (→ 🗎 126). | Enter lower limit value for deactivating partialy filled pipe detection. | Signed floating-point number | Depends on country:<br>▪ 200 kg/m$^3$<br>▪ 12.5 lb/ft$^3$ |
| High value partial filled pipe detection | A process variable is selected in the **Assign process variable** parameter (→ 🗎 126). | Enter upper limit value for deactivating partialy filled pipe detection. | Signed floating-point number | Depends on country:<br>▪ 6 000 kg/m$^3$<br>▪ 374.6 lb/ft$^3$ |
| Response time part. filled pipe detect. | A process variable is selected in the **Assign process variable** parameter (→ 🗎 126). | Use this function to enter the minimum time (hold time) the signal must be present before diagnostic message S962 "Pipe only partly filled" is triggered in the event of a partially filled or empty measuring pipe. | 0 to 100 s | 1 s |

## 10.6 Advanced settings

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

*Navigation to the "Advanced setup" submenu*



A0032223-EN

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

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

| | | |
|---|---|---|
| ▶ **Advanced setup** | | |
| | Enter access code (0003) | → 🗎 128 |
| | ▶ **Calculated values** | → 🗎 128 |
| | ▶ **Sensor adjustment** | → 🗎 130 |
| | ▶ **Totalizer 1 to n** | → 🗎 136 |
| | ▶ **Display** | → 🗎 138 |

| | |
|---|---|
| ▶ **WLAN settings** | → 🗎 144 |
| ▶ **Viscosity** | → 🗎 146 |
| ▶ **Concentration** | → 🗎 147 |
| ▶ **Petroleum** | → 🗎 147 |
| ▶ **Heartbeat setup** | → 🗎 147 |
| ▶ **Configuration backup** | → 🗎 147 |
| ▶ **Administration** | → 🗎 148 |

### 10.6.1 Using the parameter to enter the access code

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

**Parameter overview with brief description**

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

### 10.6.2 Calculated process variables

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

ℹ 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

▶ **Calculated values**

| | |
|---|---|
| ▶ **Corrected volume flow calculation** | → 🗎 129 |

### "Corrected volume flow calculation" submenu

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

**▶ Corrected volume flow calculation**

| | |
|---|---|
| Select reference density (1812) | → 🗎 129 |
| External reference density (6198) | → 🗎 129 |
| Fixed reference density (1814) | → 🗎 129 |
| Reference temperature (1816) | → 🗎 129 |
| Linear expansion coefficient (1817) | → 🗎 129 |
| Square expansion coefficient (1818) | → 🗎 129 |

### Parameter overview with brief description

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

---

* Visibility depends on order options or device settings

### 10.6.3 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 | → 🗎 130 |
| **▶ Zero verification** | → 🗎 133 |
| **▶ Zero adjustment** | → 🗎 134 |

#### Parameter overview with brief description

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Installation direction | Select sign of flow direction. | ▪ Forward flow<br>▪ Reverse flow | Forward flow |

#### Density adjustment

ℹ With density adjustment, a high level of accuracy is achieved only at the point of adjustment and at the relevant density and temperature. However, the accuracy of a density adjustment is only ever as good as the quality of the reference measuring data provided. Therefore it is not a substitute for special density calibration.

*Performing density adjustment*

ℹ Note the following before performing the adjustment:
- A density adjustment only makes sense if there is little variation in the operating conditions and the density adjustment is performed under the operating conditions.
- The density adjustment scales the internally computed density value with a user-specific slope and offset.
- A 1-point or 2-point density adjustment can be performed.
- For a 2-point density adjustment, there must be a difference of at least 0.2 kg/l between the two target density values.
- The reference media must be gas-free or pressurized so that any gas they contain is compressed.
- The reference density measurements must be performed at the same medium temperature that prevails in the process, as otherwise the density adjustment will not be accurate.
- The correction resulting from the density adjustment can be deleted with the **Restore original** option.

#### "1 point adjustment" option

1. In the **Density adjustment mode** parameter, select the **1 point adjustment** option and confirm.

2. In the **Density setpoint 1** parameter, enter the density value and confirm.
   ↳ In the **Execute density adjustment** parameter the following options are now available:
   Ok
   **Measure density 1** option
   Restore original
3. Select the **Measure density 1** option and confirm.
4. If 100% was reached in the **Progress** parameter on the display and the **Ok** option is displayed in the **Execute density adjustment** parameter, then confirm.
   ↳ In the **Execute density adjustment** parameter the following options are now available:
   Ok
   Calculate
   Cancel
5. Select the **Calculate** option and confirm.

If the adjustment was completed successfully, the **Density adjustment factor** parameter and the **Density adjustment offset** parameter and the values calculated for them are shown on the display.

**"2 point adjustment" option**

1. In the **Density adjustment mode** parameter, select the **2 point adjustment** option and confirm.
2. In the **Density setpoint 1** parameter, enter the density value and confirm.
3. In the **Density setpoint 2** parameter, enter the density value and confirm.
   ↳ In the **Execute density adjustment** parameter the following options are now available:
   Ok
   Measure density 1
   Restore original
4. Select the **Measure density 1** option and confirm.
   ↳ In the **Execute density adjustment** parameter the following options are now available:
   Ok
   Measure density 2
   Restore original
5. Select the **Measure density 2** option and confirm.
   ↳ In the **Execute density adjustment** parameter the following options are now available:
   Ok
   Calculate
   Cancel
6. Select the **Calculate** option and confirm.

If the **Density adjust failure** option is displayed in the **Execute density adjustment** parameter, call up the options and select the **Cancel** option. The density adjustment is canceled and can be repeated.

If the adjustment was completed successfully, the **Density adjustment factor** parameter and the **Density adjustment offset** parameter and the values calculated for them are shown on the display.

### Navigation

"Expert" menu → Sensor → Sensor adjustment → Density adjustment

**▶ Density adjustment**

| | |
|---|---|
| Density adjustment mode | → 🗎 132 |
| Density setpoint 1 | → 🗎 132 |
| Density setpoint 2 | → 🗎 132 |
| Execute density adjustment | → 🗎 132 |
| Progress | → 🗎 132 |
| Density adjustment factor | → 🗎 133 |
| Density adjustment offset | → 🗎 133 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Density adjustment mode | – | Select the method for field density adjustment to correct the factory setting. | ▪ 1 point adjustment<br>▪ 2 point adjustment | 1 point adjustment |
| Density setpoint 1 | – | Enter density for the first reference media. | The entry depends on the unit selected in the **Density unit** parameter (0555). | 1 kg/l |
| Density setpoint 2 | In the **Density adjustment mode** parameter, the **2 point adjustment** option is selected. | Enter density for the second reference media. | The entry depends on the unit selected in the **Density unit** parameter (0555). | 1 kg/l |
| Execute density adjustment | – | Select the next step to be performed for the density adjustment. | ▪ Cancel*<br>▪ Busy*<br>▪ Ok*<br>▪ Density adjust failure*<br>▪ Measure density 1*<br>▪ Measure density 2*<br>▪ Calculate*<br>▪ Restore original* | Ok |
| Progress | – | Shows the progress of the process. | 0 to 100 % | – |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Density adjustment factor | – | Shows the calculated correction factor for the density. | Signed floating-point number | 1 |
| Density adjustment offset | – | Shows the calculated correction offset for the density. | Signed floating-point number | 0 |

* Visibility depends on order options or device settings

### Zero point verification and zero adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 🗎 280. Therefore, a zero adjustment in the field is generally not required.

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

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

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

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

*Zero point verification*

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

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

**▶ Zero verification**

| | |
|---|---|
| Process conditions | → 🗎 134 |
| Progress | → 🗎 134 |
| Status | → 🗎 134 |
| Additional information | → 🗎 134 |

| | |
|---|---|
| Recommendation: | → 🗎 134 |
| Root cause | → 🗎 134 |
| Abort cause | → 🗎 134 |
| Zero point measured | → 🗎 134 |
| Zero point standard deviation | → 🗎 134 |

### Parameter overview with brief description

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

*Zero adjust*

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

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

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

| ▶ Zero adjustment | |
|---|---|
| Process conditions | → 📖 135 |
| Progress | → 📖 135 |
| Status | → 📖 135 |
| Root cause | → 📖 135 |
| Abort cause | → 📖 135 |
| Root cause | → 📖 135 |
| Reliability of measured zero point | → 📖 136 |
| Additional information | → 📖 136 |
| Reliability of measured zero point | → 📖 136 |
| Zero point measured | → 📖 136 |
| Zero point standard deviation | → 📖 136 |
| Select action | → 📖 136 |

### Parameter overview with brief description

| Parameter | Description | Selection / User interface | Factory setting |
|---|---|---|---|
| Process conditions | Ensure process conditions as follows. | ▪ Tubes are completely filled<br>▪ Process operational pressure applied<br>▪ No-flow conditions (closed valves)<br>▪ Process and ambient temperatures stable | – |
| Progress | Shows the progress of the process. | 0 to 100 % | – |
| Status | Shows the status of the process. | ▪ Busy<br>▪ Failed<br>▪ Done | – |
| Abort cause | Indicates why the wizard was aborted. | ▪ Check process conditions!<br>▪ A technical issue has occurred | – |
| Root cause | Shows the diagnostic and remedy. | ▪ Zero point too high. Ensure no-flow.<br>▪ Zero point is unstable. Ensure no-flow.<br>▪ Fluctuation high. Avoid 2-phase medium. | – |

| Parameter | Description | Selection / User interface | Factory setting |
|---|---|---|---|
| Reliability of measured zero point | Indicates the reliability of the zero point measured. | ▪ Not done<br>▪ Good<br>▪ Uncertain | – |
| Additional information | Indicate whether to display additional information. | ▪ Hide<br>▪ Show | Hide |
| Zero point measured | Shows the zero point measured for the adjustment. | Signed floating-point number | – |
| Zero point standard deviation | Shows the standard deviation of the zero point measured. | Positive floating-point number | – |
| Select action | Select the zero point value to apply. | ▪ Restore<br>▪ Keep current zero point<br>▪ Apply zero point measured<br>▪ Apply factory zero point * | Keep current zero point |

* Visibility depends on order options or device settings

### 10.6.4 Configuring the totalizer

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

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

**▶ Totalizer 1 to n**

Assign process variable 1 to n (11104–1 to n) → 🗎 137

Process variable unit 1 to n (11107–1 to n) → 🗎 137

Totalizer 1 to n operation mode (11102–1 to n) → 🗎 137

Totalizer 1 to n control (11101–1 to n) → 🗎 137

Totalizer 1 to n failure behavior (11103–1 to n) → 🗎 137

### Parameter overview with brief description

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Assign process variable 1 to n | Select process variable for totalizer. | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Raw value mass flow | Mass flow |
| Process variable unit 1 to n | Select the unit for the process variable of the totalizer. | Unit choose list | kg |
| Totalizer 1 to n operation mode | Select totalizer operation mode, e.g. only totalize forward flow or only totalize reverse flow. | ▪ Net<br>▪ Forward<br>▪ Reverse | Forward |
| Totalizer 1 to n control | Operate the totalizer. | ▪ Reset + hold<br>▪ Preset + hold<br>▪ Hold<br>▪ Totalize | Totalize |
| Totalizer 1 to n failure behavior | Select totalizer behavior in the event of a device alarm. | ▪ Hold<br>▪ Continue<br>▪ Last valid value + continue | Continue |

* Visibility depends on order options or device settings

### 10.6.5 Carrying out additional display configurations

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

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

**▶ Display**

| | |
|---|---|
| Format display | → 🗎 140 |
| Value 1 display | → 🗎 141 |
| 0% bargraph value 1 | → 🗎 142 |
| 100% bargraph value 1 | → 🗎 142 |
| Decimal places 1 | → 🗎 142 |
| Value 2 display | → 🗎 142 |
| Decimal places 2 | → 🗎 142 |
| Value 3 display | → 🗎 142 |
| 0% bargraph value 3 | → 🗎 142 |
| 100% bargraph value 3 | → 🗎 142 |
| Decimal places 3 | → 🗎 142 |
| Value 4 display | → 🗎 142 |
| Decimal places 4 | → 🗎 143 |
| Value 5 display | → 🗎 143 |
| 0% bargraph value 5 | → 🗎 143 |
| 100% bargraph value 5 | → 🗎 143 |
| Decimal places 5 | → 🗎 143 |
| Value 6 display | → 🗎 143 |
| Decimal places 6 | → 🗎 143 |
| Value 7 display | → 🗎 143 |

| | |
|---|---|
| 0% bargraph value 7 | → 🗎 143 |
| 100% bargraph value 7 | → 🗎 143 |
| Decimal places 7 | → 🗎 143 |
| Value 8 display | → 🗎 143 |
| Decimal places 8 | → 🗎 144 |
| Display language | → 🗎 144 |
| Display interval | → 🗎 144 |
| Display damping | → 🗎 144 |
| Header | → 🗎 144 |
| Header text | → 🗎 144 |
| Separator | → 🗎 144 |
| Backlight | → 🗎 144 |

### Parameter overview with brief description

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

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Value 1 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Temperature<br>▪ Pressure<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Reference density alternative *<br>▪ Weighted density average *<br>▪ Weighted temperature average *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Concentration *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Application specific output 0 *<br>▪ Application specific output 1 *<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index *<br>▪ HBSI *<br>▪ Raw value mass flow<br>▪ Exciter current 0<br>▪ Oscillation damping 0<br>▪ Oscillation damping fluctuation 0 *<br>▪ Oscillation frequency 0 | Mass flow |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| | | | ▪ Frequency fluctuation 0 *<br>▪ Oscillation amplitude 0 *<br>▪ Signal asymmetry<br>▪ Torsion signal asymmetry *<br>▪ Carrier pipe temperature *<br>▪ Electronics temperature<br>▪ Sensor index coil asymmetry<br>▪ Test point 0<br>▪ Test point 1<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 * | |
| 0% bargraph value 1 | A local display is provided. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Decimal places 1 | A measured value is specified in the **Value 1 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Decimal places 2 | A measured value is specified in the **Value 2 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| 0% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| 100% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Decimal places 3 | A measured value is specified in the **Value 3 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Decimal places 4 | A measured value is specified in the **Value 4 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 5 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| 0% bargraph value 5 | An option was selected in the **Value 5 display** parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Depends on country:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| 100% bargraph value 5 | An option was selected in the **Value 5 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Decimal places 5 | A measured value is specified in the **Value 5 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 6 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| Decimal places 6 | A measured value is specified in the **Value 6 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 7 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |
| 0% bargraph value 7 | An option was selected in the **Value 7 display** parameter. | Enter 0% value for bar graph display. | Signed floating-point number | Depends on country:<br>▪ 0 kg/h<br>▪ 0 lb/min |
| 100% bargraph value 7 | An option was selected in the **Value 7 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Decimal places 7 | A measured value is specified in the **Value 7 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Value 8 display | A local display is provided. | Select the measured value that is shown on the local display. | For the picklist, see the **Value 1 display** parameter (→ 🗎 123) | None |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Decimal places 8 | A measured value is specified in the **Value 8 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx<br>▪ x.xxxxx<br>▪ x.xxxxxx | x.xx |
| Display language | A local display is provided. | Set display language. | ▪ English<br>▪ Deutsch<br>▪ Français<br>▪ Español<br>▪ Italiano<br>▪ Nederlands<br>▪ Portuguesa<br>▪ Polski<br>▪ русский язык (Russian)<br>▪ Svenska<br>▪ Türkçe<br>▪ 中文 (Chinese)<br>▪ 日本語 (Japanese)<br>▪ 한국어 (Korean)<br>▪ tiếng Việt (Vietnamese)<br>▪ čeština (Czech) | English (alternatively, the ordered language is preset in the device) |
| Display interval | A local display is provided. | Set time measured values are shown on display if display alternates between values. | 1 to 10 s | 5 s |
| Display damping | A local display is provided. | Set display reaction time to fluctuations in the measured value. | 0.0 to 999.9 s | 0.0 s |
| Header | A local display is provided. | Select header contents on local display. | ▪ Device tag<br>▪ Free text | Device tag |
| Header text | The **Free text** option is selected in the **Header** parameter. | Enter display header text. | Max. 12 characters, such as letters, numbers or special characters (e.g. @, %, /) | ------------ |
| Separator | A local display is provided. | Select decimal separator for displaying numerical values. | ▪ . (point)<br>▪ , (comma) | . (point) |
| Backlight | One of the following conditions is met:<br>▪ Order code for "Display; operation", option **F** "4-line, illum.; touch control"<br>▪ Order code for "Display; operation", option **G** "4-line, illum.; touch control +WLAN"<br>▪ Order code for "Display; operation", option **O** "Remote display 4-line illuminated; 10m/30ft cable; touch control" | Switch the local display backlight on and off. | ▪ Disable<br>▪ Enable | Enable |

* Visibility depends on order options or device settings

### 10.6.6 WLAN configuration

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

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

**▶ WLAN settings**

| | |
|---|---|
| WLAN | → 🗎 145 |
| WLAN mode | → 🗎 145 |
| SSID name | → 🗎 145 |
| Network security | → 🗎 146 |
| Security identification | → 🗎 146 |
| User name | → 🗎 146 |
| WLAN password | → 🗎 146 |
| WLAN IP address | → 🗎 146 |
| WLAN MAC address | → 🗎 146 |
| WLAN passphrase | → 🗎 146 |
| WLAN MAC address | → 🗎 146 |
| Assign SSID name | → 🗎 146 |
| SSID name | → 🗎 146 |
| Connection state | → 🗎 146 |
| Received signal strength | → 🗎 146 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| WLAN | – | Switch WLAN on and off. | ▪ Disable<br>▪ Enable | Enable |
| WLAN mode | – | Select WLAN mode. | ▪ WLAN access point<br>▪ WLAN Client | WLAN access point |
| SSID name | The client is activated. | Enter the user-defined SSID name (max. 32 characters). | – | – |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Network security | – | Select the security type of the WLAN network. | ▪ Unsecured<br>▪ WPA2-PSK<br>▪ EAP-PEAP with MSCHAPv2 *<br>▪ EAP-PEAP MSCHAPv2 no server authentic. *<br>▪ EAP-TLS * | WPA2-PSK |
| Security identification | – | Select security settings and download these settings via menu Data management > Security > WLAN. | ▪ Trusted issuer certificate<br>▪ Device certificate<br>▪ Device private key | – |
| User name | – | Enter user name. | – | – |
| WLAN password | – | Enter WLAN password. | – | – |
| WLAN IP address | – | Enter IP address of the WLAN interface of the device. | 4 octet: 0 to 255 (in the particular octet) | 192.168.1.212 |
| WLAN MAC address | – | Enter MAC address of the WLAN interface of the device. | Unique 12-digit character string comprising letters and numbers | Each measuring device is given an individual address. |
| WLAN passphrase | The **WPA2-PSK** option is selected in the **Security type** parameter. | Enter the network key (8 to 32 characters).<br>ℹ The network key supplied with the device should be changed during commissioning for security reasons. | 8 to 32-digit character string comprising numbers, letters and special characters (without spaces) | Serial number of the measuring device (e.g. L100A802000) |
| Assign SSID name | – | Select which name will be used for SSID: device tag or user-defined name. | ▪ Device tag<br>▪ User-defined | User-defined |
| SSID name | ▪ The **User-defined** option is selected in the **Assign SSID name** parameter.<br>▪ The **WLAN access point** option is selected in the **WLAN mode** parameter. | Enter the user-defined SSID name (max. 32 characters).<br>ℹ The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another. | Max. 32-digit character string comprising numbers, letters and special characters | EH_device designation_last 7 digits of the serial number (e.g. EH_Promass_300_A 802000) |
| Connection state | – | Displays the connection status. | ▪ Connected<br>▪ Not connected | Not connected |
| Received signal strength | – | Shows the received signal strength. | ▪ Low<br>▪ Medium<br>▪ High | High |

* Visibility depends on order options or device settings

### 10.6.7 Viscosity application package

For detailed information on the parameter descriptions for the Viscosity application package, see the Special Documentation for the device → 🗎 300

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

### 10.6.8 Concentration Measurement application package

For detailed information on the parameter descriptions for the Concentration application package, see the Special Documentation for the device → 🗎 300

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

### 10.6.9 Petroleum application package

For detailed information on the parameter descriptions for the Petroleum application package, see the Special Documentation for the device → 🗎 300

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

### 10.6.10 Heartbeat Technology application package

For detailed information on the parameter descriptions for the Heartbeat setup application package, see the Special Documentation for the device → 🗎 300

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

### 10.6.11 Configuration management

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

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

**▶ Configuration backup**

| | |
|---|---|
| Operating time | → 🗎 147 |
| Last backup | → 🗎 147 |
| Configuration management | → 🗎 148 |
| Backup state | → 🗎 148 |
| Comparison result | → 🗎 148 |

#### Parameter overview with brief description

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

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

* Visibility depends on order options or device settings

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

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

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

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

## 10.6.12 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** → 🗎 149

**▶ Reset access code** → 🗎 149

Device reset → 🗎 150

### Using the parameter to define the access code

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

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

**▶ Define access code**

Define access code → 🗎 149

Confirm access code → 🗎 149

### Parameter overview with brief description

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

### Using the parameter to reset the access code

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

**▶ Reset access code**

Operating time → 🗎 149

Reset access code → 🗎 149

### Parameter overview with brief description

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

### Using the parameter to reset the device

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

### Parameter overview with brief description

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

* Visibility depends on order options or device settings

## 10.7 Simulation

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

**Navigation**
"Diagnostics" menu → Simulation

**▶ Simulation**

| | |
|---|---|
| Assign simulation process variable | → 🗎 152 |
| Process variable value | → 🗎 152 |
| Current input 1 to n simulation | → 🗎 153 |
| Value current input 1 to n | → 🗎 153 |
| Status input 1 to n simulation | → 🗎 153 |
| Input signal level 1 to n | → 🗎 153 |
| Current output 1 to n simulation | → 🗎 152 |
| Current output value | → 🗎 152 |
| Frequency output 1 to n simulation | → 🗎 152 |
| Frequency output 1 to n value | → 🗎 152 |
| Pulse output simulation 1 to n | → 🗎 153 |
| Pulse value 1 to n | → 🗎 153 |

| | |
|---|---|
| Switch output simulation 1 to n | → 🗎 153 |
| Switch state 1 to n | → 🗎 153 |
| Relay output 1 to n simulation | → 🗎 153 |
| Switch state 1 to n | → 🗎 153 |
| Device alarm simulation | → 🗎 153 |
| Diagnostic event category | → 🗎 153 |
| Diagnostic event simulation | → 🗎 153 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Assign simulation process variable | – | Select a process variable for the simulation process that is activated. | ▪ Off<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Reference density alternative *<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Temperature<br>▪ Concentration *<br>▪ Time period signal frequency (TPS) * | Off |
| Process variable value | A process variable is selected in the **Assign simulation process variable** parameter (→ 🗎 152). | Enter the simulation value for the selected process variable. | Depends on the process variable selected | 0 |
| Current output 1 to n simulation | – | Switch the simulation of the current output on and off. | ▪ Off<br>▪ On | Off |
| Current output value | In the **Current output 1 to n simulation** parameter, the **On** option is selected. | Enter the current value for simulation. | 3.59 to 22.5 mA | 3.59 mA |
| Frequency output 1 to n simulation | In the **Operating mode** parameter, the **Frequency** option is selected. | Switch the simulation of the frequency output on and off. | ▪ Off<br>▪ On | Off |
| Frequency output 1 to n value | In the **Frequency simulation 1 to n** parameter, the **On** option is selected. | Enter the frequency value for the simulation. | 0.0 to 12 500.0 Hz | 0.0 Hz |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Pulse output simulation 1 to n | In the **Operating mode** parameter, the **Pulse** option is selected. | Set and switch off the pulse output simulation.<br>ℹ For **Fixed value** option: **Pulse width** parameter (→ 🗎 109) defines the pulse width of the pulses output. | ▪ Off<br>▪ Fixed value<br>▪ Down-counting value | Off |
| Pulse value 1 to n | In the **Pulse output simulation 1 to n** parameter, the **Down-counting value** option is selected. | Enter the number of pulses for simulation. | 0 to 65 535 | 0 |
| Switch output simulation 1 to n | In the **Operating mode** parameter, the **Switch** option is selected. | Switch the simulation of the switch output on and off. | ▪ Off<br>▪ On | Off |
| Switch state 1 to n | – | Select the status of the status output for the simulation. | ▪ Open<br>▪ Closed | Open |
| Relay output 1 to n simulation | – | Switch simulation of the relay output on and off. | ▪ Off<br>▪ On | Off |
| Switch state 1 to n | The **On** option is selected in the **Switch output simulation 1 to n** parameter parameter. | Select status of the relay output for the simulation. | ▪ Open<br>▪ Closed | Open |
| Device alarm simulation | – | Switch the device alarm on and off. | ▪ Off<br>▪ On | Off |
| Diagnostic event category | – | Select a diagnostic event category. | ▪ Sensor<br>▪ Electronics<br>▪ Configuration<br>▪ Process | Process |
| Diagnostic event simulation | – | Select a diagnostic event to simulate this event. | ▪ Off<br>▪ Diagnostic event picklist (depends on the category selected) | Off |
| Current input 1 to n simulation | – | Switch simulation of the current input on and off. | ▪ Off<br>▪ On | Off |
| Value current input 1 to n | In the **Current input 1 to n simulation** parameter, the **On** option is selected. | Enter the current value for simulation. | 0 to 22.5 mA | 0 mA |
| Status input 1 to n simulation | – | Switch simulation of the status input on and off. | ▪ Off<br>▪ On | Off |
| Input signal level 1 to n | In the **Status input simulation** parameter, the **On** option is selected. | Select the signal level for the simulation of the status input. | ▪ High<br>▪ Low | High |

* Visibility depends on order options or device settings

## 10.8 Protecting settings from unauthorized access

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

- Protect access to parameters via access code → 🗎 154
- Protect access to local operation via key locking → 🗎 59
- Protect access to measuring device via write protection switch → 🗎 155

### 10.8.1 Write protection via access code

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

#### Defining the access code via local display

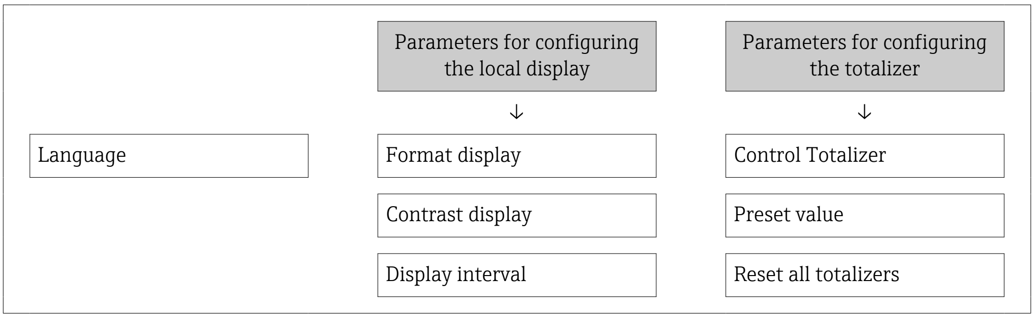
1. Navigate to the **Define access code** parameter (→ 📄 149).
2. Define a max. 16-digit character string comprising numbers, letters and special characters as the access code.
3. Enter the access code again in the **Confirm access code** parameter (→ 📄 149) to confirm the code.
   ↳ The 🔒-symbol appears in front of all write-protected parameters.

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

ℹ
- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 📄 58.
- The user role with which the user is currently logged on via the local display → 📄 58 is indicated by the **Access status** parameter. Navigation path: Operation → Access status

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

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



#### Defining the access code via the Web browser

1. Navigate to the **Define access code** parameter (→ 📄 149).
2. Define a max. 16-digit numeric code as an access code.

3. Enter the access code again in the **Confirm access code** parameter (→ 🗎 149) to confirm the code.
   ↳ The Web browser switches to the login page.

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

ℹ
- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 🗎 58.
- The user role with which the user is currently logged on via Web browser is indicated by the **Access status** parameter. Navigation path: Operation → Access status

#### Resetting the access code

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

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

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

1. Note down the serial number of the device.
2. Read off the **Operating time** parameter.
3. Contact the local Endress+Hauser service organization and tell them the serial number and the operating time.
   ↳ Get the calculated reset code.
4. Enter the reset code in the **Reset access code** parameter (→ 🗎 149).
   ↳ The access code has been reset to the factory setting **0000**. It can be redefined → 🗎 154.

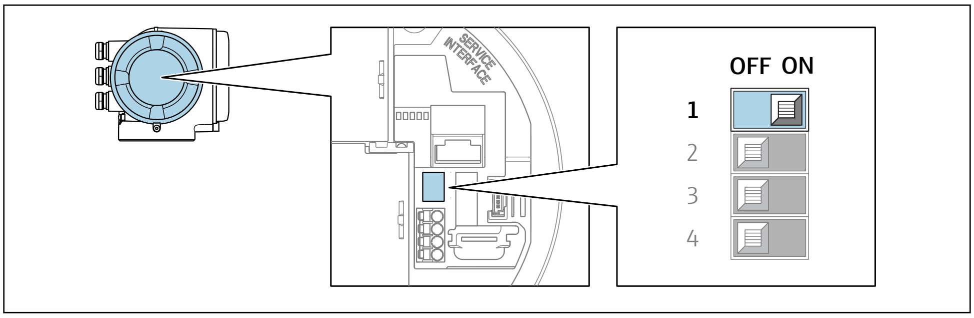
ℹ For IT security reasons, the calculated reset code is only valid for 96 hours from the specified operating time and for the specific serial number. If you cannot return to the device within 96 hours, you should either increase the operating time you read out by a few days or switch off the device.

### 10.8.2 Write protection via write protection switch

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

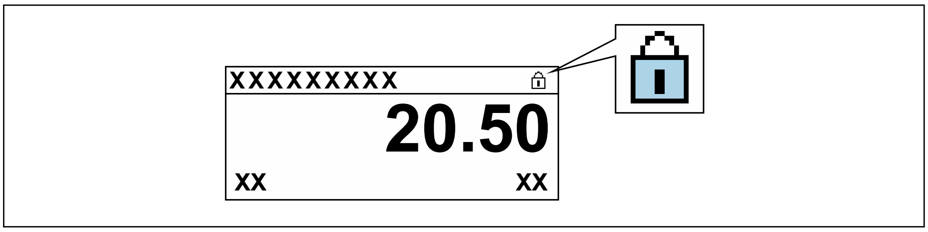
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):
- Via local display
- Via PROFINET protocol

1.



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

↳ In the **Locking status** parameter, the **Hardware locked** option is displayed → 📄 157. In addition, on the local display the 🔒 symbol appears in front of the parameters in the header of the operational display and in the navigation view.



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

↳ No option is displayed in the **Locking status** parameter → 📄 157. On the local display, the 🔒 symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

# 11 Operation

## 11.1 Reading off the device locking status

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

Operation → Locking status

*Function scope of the "Locking status" parameter*

| Options | Description |
|---|---|
| None | The access authorization displayed in the **Access status** parameter applies → 🗎 58. Only appears on local display. |
| Hardware locked | The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) → 🗎 155. |
| 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 → 🗎 88
- For information on the operating languages supported by the measuring device → 🗎 290

## 11.3 Configuring the display

Detailed information:
- On the basic settings for the local display → 🗎 120
- On the advanced settings for the local display → 🗎 138

## 11.4 Reading measured values

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

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

**▶ Measured values**

| | |
|---|---|
| **▶ Measured variables** | → 🗎 158 |
| **▶ Totalizer** | → 🗎 168 |
| **▶ Input values** | → 🗎 169 |
| **▶ Output values** | → 🗎 170 |

### 11.4.1 "Measured variables" submenu

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

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

**▶ Measured variables**

| | |
|---|---|
| Mass flow | → 🗎 160 |
| Volume flow | → 🗎 160 |
| Corrected volume flow | → 🗎 160 |
| Density | → 🗎 160 |
| Reference density | → 🗎 160 |
| Temperature | → 🗎 160 |
| Pressure | → 🗎 160 |
| Concentration | → 🗎 160 |
| Target mass flow | → 🗎 161 |
| Carrier mass flow | → 🗎 161 |
| Target corrected volume flow | → 🗎 161 |
| Carrier corrected volume flow | → 🗎 161 |
| Target volume flow | → 🗎 161 |
| Carrier volume flow | → 🗎 162 |
| CTL | → 🗎 162 |
| CPL | → 🗎 162 |
| CTPL | → 🗎 162 |
| S&W volume flow | → 🗎 163 |
| S&W correction value | → 🗎 163 |
| Reference density alternative | → 🗎 163 |

| | |
|---|---|
| GSV flow | → 🗎 163 |
| GSV flow alternative | → 🗎 163 |
| NSV flow | → 🗎 164 |
| NSV flow alternative | → 🗎 164 |
| Oil CTL | → 🗎 164 |
| Oil CPL | → 🗎 164 |
| Oil CTPL | → 🗎 164 |
| Water CTL | → 🗎 165 |
| CTL alternative | → 🗎 165 |
| CPL alternative | → 🗎 165 |
| CTPL alternative | → 🗎 165 |
| Oil reference density | → 🗎 165 |
| Water reference density | → 🗎 166 |
| Oil density | → 🗎 166 |
| Water density | → 🗎 166 |
| Water cut | → 🗎 166 |
| Oil volume flow | → 🗎 166 |
| Oil corrected volume flow | → 🗎 167 |
| Oil mass flow | → 🗎 167 |
| Water volume flow | → 🗎 167 |
| Water corrected volume flow | → 🗎 167 |
| Water mass flow | → 🗎 167 |
| Weighted density average | → 🗎 168 |
| Weighted temperature average | → 🗎 168 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| Mass flow | – | Displays the mass flow that is currently measured.<br>*Dependency*<br>The unit is taken from: **Mass flow unit** parameter (→ 🖹 93) | Signed floating-point number | – |
| Volume flow | – | Displays the volume flow that is currently calculated.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 🖹 93). | Signed floating-point number | – |
| Corrected volume flow | – | Displays the corrected volume flow that is currently calculated.<br>*Dependency*<br>The unit is taken from: **Corrected volume flow unit** parameter (→ 🖹 93) | Signed floating-point number | – |
| Density | – | Shows the density currently measured.<br>*Dependency*<br>The unit is taken from the **Density unit** parameter (→ 🖹 93). | Signed floating-point number | – |
| Reference density | – | Displays the reference density that is currently calculated.<br>*Dependency*<br>The unit is taken from: **Reference density unit** parameter (→ 🖹 94) | Signed floating-point number | – |
| Temperature | – | Shows the medium temperature currently measured.<br>*Dependency*<br>The unit is taken from: **Temperature unit** parameter (→ 🖹 94) | Signed floating-point number | – |
| Pressure | – | Displays either a fixed or external pressure value.<br>*Dependency*<br>The unit is taken from the **Pressure unit** parameter (→ 🖹 94). | Signed floating-point number | – |
| Concentration | For the following order code: Order code for "Application package", option **ED** "Concentration"<br>🛈 The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the concentration that is currently calculated.<br>*Dependency*<br>The unit is taken from the **Concentration unit** parameter. | Signed floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| Target mass flow | With the following conditions:<br>Order code for "Application package", option **ED** "Concentration"<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the mass flow that is currently measured for the target medium.<br>*Dependency*<br>The unit is taken from the **Mass flow unit** parameter (→ 🗎 93). | Signed floating-point number | – |
| Carrier mass flow | With the following conditions:<br>Order code for "Application package", option **ED** "Concentration"<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the mass flow of the carrier medium that is currently measured.<br>*Dependency*<br>The unit is taken from: **Mass flow unit** parameter (→ 🗎 93) | Signed floating-point number | – |
| Target corrected volume flow | With the following conditions:<br>▪ Order code for "Application package", option **ED** "Concentration"<br>▪ The **Ethanol in water** option or **%mass / %volume** option is selected in the **Liquid type** parameter.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the corrected volume flow that is currently measured for the target fluid.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 🗎 93). | Signed floating-point number | – |
| Carrier corrected volume flow | With the following conditions:<br>▪ Order code for "Application package", option **ED** "Concentration"<br>▪ In the **Liquid type** parameter, the **Ethanol in water** option or **%mass / %volume** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the corrected volume flow currently measured for the carrier fluid.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 🗎 93). | Signed floating-point number | – |
| Target volume flow | With the following conditions:<br>▪ Order code for "Application package", option **ED** "Concentration"<br>▪ The **Ethanol in water** option or **%mass / %volume** option is selected in the **Liquid type** parameter.<br>▪ The **%vol** option is selected in the **Concentration unit** parameter.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the volume flow currently measured for the target medium.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 🗎 93). | Signed floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| Carrier volume flow | With the following conditions:<br>▪ Order code for "Application package", option **ED** "Concentration"<br>▪ The **Ethanol in water** option or **%mass / %volume** option is selected in the **Liquid type** parameter.<br>▪ The **%vol** option is selected in the **Concentration unit** parameter.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the volume flow currently measured for the carrier medium.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 🗎 93). | Signed floating-point number | – |
| CTL | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 reference temperature. | Positive floating-point number | – |
| CPL | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 reference pressure. | Positive floating-point number | – |
| CTPL | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 reference temperature and reference pressure. | Positive floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| S&W volume flow | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the S&W volume flow which is calculated from the measured total volume flow minus the net volume flow.<br>*Dependency*<br>The unit is taken from:<br>**Volume flow unit** parameter | Signed floating-point number | – |
| S&W correction value | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **S&W input mode** parameter, the **External value** option or the **Current input 1…n** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Shows the correction value for sediment and water. | Positive floating-point number | – |
| Reference density alternative | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the fluid density at the alternative reference temperature.<br>*Dependency*<br>The unit is taken from:<br>**Reference density unit** parameter | Signed floating-point number | – |
| GSV flow | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the measured total volume flow, corrected to the reference temperature and the reference pressure.<br>*Dependency*<br>The unit is taken from:<br>**Corrected volume flow unit** parameter | Signed floating-point number | – |
| GSV flow alternative | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the measured total volume flow, corrected to the alternative reference temperature and the alternative reference pressure.<br>*Dependency*<br>The unit is taken from:<br>**Corrected volume flow unit** parameter | Signed floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| NSV flow | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the net volume flow which is calculated from the measured total volume flow minus the value for sediment & water and minus the shrinkage.<br>*Dependency*<br>The unit is taken from: **Corrected volume flow unit** parameter | Signed floating-point number | – |
| NSV flow alternative | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the net volume flow which is calculated from the measured alternative total volume minus the value for sediment & water and minus the shrinkage.<br>*Dependency*<br>The unit is taken from: **Corrected volume flow unit** parameter | Signed floating-point number | – |
| Oil CTL | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | 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 | 1 |
| Oil reference density | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Shows the oil density at the reference temperature. | Signed floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| Water reference density | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Shows the water density at the reference temperature. | Signed floating-point number | – |
| Oil density | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the density of the oil currently measured. | Signed floating-point number | – |
| Water density | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the density of the water currently measured. | Signed floating-point number | – |
| Water cut | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **API referenced correction** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the percentage water volume flow in relation to the total volume flow of the fluid. | 0 to 100 % | – |
| Oil volume flow | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the currently calculated volume flow of the oil.<br>Dependency:<br>- Based on the value displayed in the **Water cut** parameter<br>- The unit is taken from: **Volume flow unit** parameter | Signed floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| Oil corrected volume flow | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the currently calculated volume flow of the oil, calculated to values at reference temperature and reference pressure.<br>Dependency:<br>- Based on the value displayed in the **Water cut** parameter<br>- The unit is taken from: **Corrected volume flow unit** parameter | Signed floating-point number | – |
| Oil mass flow | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the currently calculated mass flow of the oil.<br>Dependency:<br>- Based on the value displayed in the **Water cut** parameter<br>- The unit is taken from: **Mass flow unit** parameter | Signed floating-point number | – |
| Water volume flow | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the currently calculated volume flow of the water.<br>Dependency:<br>- Based on the value displayed in the **Water cut** parameter<br>- The unit is taken from: **Volume flow unit** parameter | Signed floating-point number | – |
| Water corrected volume flow | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the currently calculated volume flow of the water, calculated to values at reference temperature and reference pressure.<br>Dependency:<br>- Based on the value displayed in the **Water cut** parameter<br>- The unit is taken from: **Corrected volume flow unit** parameter | Signed floating-point number | – |
| Water mass flow | For the following order code:<br>- "Application package", option **EJ** "Petroleum"<br>- In the **Petroleum mode** parameter, the **Net oil & water cut** option is selected.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the currently calculated mass flow of the water.<br>Dependency:<br>- Based on the value displayed in the **Water cut** parameter<br>- The unit is taken from: **Mass flow unit** parameter | Signed floating-point number | – |

| Parameter | Prerequisite | Description | User interface | Factory setting |
|---|---|---|---|---|
| Weighted density average | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ "Application package", option **EM** "Petroleum + Locking function"<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the weighted average for the density since the last time the density averages were reset.<br>Dependency:<br>▪ The unit is taken from: **Density unit** parameter<br>▪ The value is reset to NaN (Not a Number) via the **Reset weighted averages** parameter | Signed floating-point number | – |
| Weighted temperature average | For the following order code:<br>▪ "Application package", option **EJ** "Petroleum"<br>▪ "Application package", option **EM** "Petroleum + Locking function"<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Displays the weighted average for the temperature since the last time the temperature averages were reset.<br>Dependency:<br>▪ The unit is taken from: **Temperature unit** parameter<br>▪ The value is reset to NaN (Not a Number) via the **Reset weighted averages** parameter | Signed floating-point number | – |

## 11.4.2 Totalizer

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

### Navigation

"Diagnostics" menu → Measured values → Totalizer

**▶ Totalizer**

| | |
|---|---|
| Assign process variable 1 to n | → 🗎 169 |
| Totalizer 1 to n value | → 🗎 169 |
| Totalizer 1 to n status | → 🗎 169 |
| Totalizer 1 to n status (Hex) | → 🗎 169 |

### Parameter overview with brief description

| Parameter | Description | Selection / User interface | Factory setting |
|---|---|---|---|
| Assign process variable 1 to n | Select process variable for totalizer. | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Raw value mass flow | Mass flow |
| Totalizer 1 to n value | Shows the totalizer value reported to the controller for further processing. | Signed floating-point number | 0 kg |
| Totalizer 1 to n status | Shows the status of the totalizer value reported to the controller for further processing ('Good', 'Uncertain', 'Bad'). | ▪ Good<br>▪ Uncertain<br>▪ Bad | Good |
| Totalizer 1 to n status (Hex) | Shows the status of the totalizer value reported to the controller for further processing (Hex). | 0 to 255 | 128 |

* Visibility depends on order options or device settings

## 11.4.3 "Input values" submenu

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

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

- ▶ **Input values**
  - ▶ **Current input 1 to n** → 🗎 169
  - ▶ **Status input 1 to n** → 🗎 170

### Input values of current input

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

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

**▶ Current input 1 to n**

| | |
|---|---|
| Measured values 1 to n | → 📖 170 |
| Measured current 1 to n | → 📖 170 |

### Parameter overview with brief description

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

### Input values of status input

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

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

**▶ Status input 1 to n**

| | |
|---|---|
| Value status input | → 📖 170 |

### Parameter overview with brief description

| Parameter | Description | User interface |
|---|---|---|
| Value status input | Shows the current input signal level. | ▪ High<br>▪ Low |

## 11.4.4 Output values

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

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

**▶ Output values**

| | |
|---|---|
| **▶ Current output 1 to n** | → 📖 171 |

**▶ Pulse/frequency/switch output 1 to n** → 🗎 171

**▶ Relay output 1 to n** → 🗎 172

### Output values of current output

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

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

**▶ Current output 1 to n**

Output current → 🗎 171

Measured current → 🗎 171

### Parameter overview with brief description

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

### Output values for pulse/frequency/switch output

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

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

**▶ Pulse/frequency/switch output 1 to n**

Output frequency → 🗎 172

Pulse output 1 to n → 🗎 172

Switch state → 🗎 172

### Parameter overview with brief description

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

### Output values for relay output

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

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

**▶ Relay output 1 to n**

| | |
|---|---|
| Switch state | → 🗎 172 |
| Switch cycles | → 🗎 172 |
| Max. switch cycles number | → 🗎 172 |

### Parameter overview with brief description

| Parameter | Description | User interface |
|---|---|---|
| Switch state | Shows the current relay switch status. | ▪ Open<br>▪ Closed |
| Switch cycles | Shows number of all performed switch cycles. | Positive integer |
| Max. switch cycles number | Shows the maximal number of guaranteed switch cycles. | Positive integer |

## 11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:
- Basic settings using the**Setup** menu (→ 🗎 89)
- Advanced settings using the**Advanced setup** submenu (→ 🗎 127)

## 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**

| | |
|---|---|
| Totalizer 1 to n control (11101–1 to n) | → 🗎 173 |
| Preset value 1 to n (11108–1 to n) | → 🗎 173 |
| Reset all totalizers (2806) | → 🗎 173 |

**Parameter overview with brief description**

| Parameter | Description | Selection / User entry | Factory setting |
|---|---|---|---|
| Totalizer 1 to n control | Operate the totalizer. | ▪ Reset + hold<br>▪ Preset + hold<br>▪ Hold<br>▪ Totalize | Totalize |
| Preset value 1 to n | Specify start value for totalizer. | Signed floating-point number | 0 kg |
| Reset all totalizers | Reset all totalizers to 0 and start. | ▪ Cancel<br>▪ Reset + totalize | Cancel |

## 11.6.1 Function scope of "Control Totalizer" parameter

| Options | Description |
|---|---|
| Totalize | The totalizer is started or continues running. |
| Reset + hold | The totaling process is stopped and the totalizer is reset to 0. |
| Preset + hold [1] | The totaling process is stopped and the totalizer is set to its defined start value from the **Preset value** parameter. |
| Reset + totalize | The totalizer is reset to 0 and the totaling process is restarted. |
| Preset + totalize [1] | The totalizer is set to the defined start value in the **Preset value** parameter and the totaling process is restarted. |
| Hold | Totalizing is stopped. |

1) Visible depending on the order options or device settings

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

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

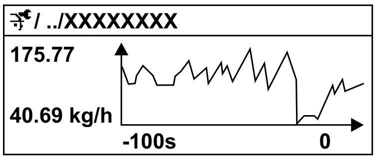
## 11.7 Show data logging

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

Data logging is also available via:
- Plant Asset Management Tool FieldCare → 📄 70.
- Web browser

### Function scope

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



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28 *Chart of a measured value trend*

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

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

### Navigation

"Diagnostics" menu → Data logging

**▶ Data logging**

| | |
|---|---|
| Assign channel 1 | → 📄 176 |
| Assign channel 2 | → 📄 177 |
| Assign channel 3 | → 📄 177 |
| Assign channel 4 | → 📄 177 |
| Logging interval | → 📄 177 |
| Clear logging data | → 📄 177 |
| Data logging | → 📄 177 |
| Logging delay | → 📄 177 |
| Data logging control | → 📄 177 |

| | |
|---|---|
| Data logging status | → 📄 178 |
| Entire logging duration | → 📄 178 |

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Assign channel 1 | The **Extended HistoROM** application package is available. | Assign process variable to logging channel. | ▪ Off<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow *<br>▪ Density<br>▪ Reference density *<br>▪ Temperature<br>▪ Pressure<br>▪ GSV flow *<br>▪ GSV flow alternative *<br>▪ NSV flow *<br>▪ NSV flow alternative *<br>▪ S&W volume flow *<br>▪ Reference density alternative *<br>▪ Water cut *<br>▪ Oil density *<br>▪ Water density *<br>▪ Oil mass flow *<br>▪ Water mass flow *<br>▪ Oil volume flow *<br>▪ Water volume flow *<br>▪ Oil corrected volume flow *<br>▪ Water corrected volume flow *<br>▪ Concentration *<br>▪ Target mass flow *<br>▪ Carrier mass flow *<br>▪ Target volume flow *<br>▪ Carrier volume flow *<br>▪ Target corrected volume flow *<br>▪ Carrier corrected volume flow *<br>▪ Application specific output 0 *<br>▪ Application specific output 1 *<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index *<br>▪ HBSI *<br>▪ Raw value mass flow<br>▪ Exciter current 0<br>▪ Oscillation damping 0<br>▪ Oscillation damping fluctuation 0 *<br>▪ Oscillation frequency 0<br>▪ Frequency fluctuation 0 *<br>▪ Oscillation amplitude * | Off |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| | | | ▪ Oscillation amplitude 1 *<br>▪ Signal asymmetry<br>▪ Torsion signal asymmetry *<br>▪ Carrier pipe temperature *<br>▪ Electronics temperature<br>▪ Sensor index coil asymmetry<br>▪ Test point 0<br>▪ Test point 1<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 * | |
| Assign channel 2 | The **Extended HistoROM** application package is available.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Assign a process variable to logging channel. | For the picklist, see the **Assign channel 1** parameter (→ 🗎 176) | Off |
| Assign channel 3 | The **Extended HistoROM** application package is available.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Assign a process variable to logging channel. | For the picklist, see the **Assign channel 1** parameter (→ 🗎 176) | Off |
| Assign channel 4 | The **Extended HistoROM** application package is available.<br>ℹ The software options currently enabled are displayed in the **Software option overview** parameter. | Assign a process variable to logging channel. | For the picklist, see the **Assign channel 1** parameter (→ 🗎 176) | Off |
| Logging interval | The **Extended HistoROM** application package is available. | Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory. | 0.1 to 3 600.0 s | 1.0 s |
| Clear logging data | The **Extended HistoROM** application package is available. | Clear the entire logging data. | ▪ Cancel<br>▪ Clear data | Cancel |
| Data logging | – | Select the type of data logging. | ▪ Overwriting<br>▪ Not overwriting | Overwriting |
| Logging delay | In the **Data logging** parameter, the **Not overwriting** option is selected. | Enter the time delay for measured value logging. | 0 to 999 h | 0 h |
| Data logging control | In the **Data logging** parameter, the **Not overwriting** option is selected. | Start and stop measured value logging. | ▪ None<br>▪ Delete + start<br>▪ Stop | None |

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

* Visibility depends on order options or device settings

## 11.8 Gas Fraction Handler

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

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

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

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

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

For detailed information on the parameter descriptions of the Gas Fraction Handler, see the Special Documentation for the device → 🗎 300

### 11.8.1 "Measurement mode" submenu

**Navigation**
"Expert" menu → Sensor → Measurement mode

**▸ Measurement mode**

Gas Fraction Handler (6377) → 🗎 178

**Parameter overview with brief description**

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Gas Fraction Handler | Activates the Gas Fraction Handler function for two phase media. | ▪ Off<br>▪ Moderate<br>▪ Powerful | Moderate |

### 11.8.2 "Medium index" submenu

**Navigation**
"Expert" menu → Application → Medium index

**▶ Medium index**

| | |
|---|---|
| Inhomogeneous medium index (6368) | → 🗎 179 |
| Cut off inhomogeneous wet gas (6375) | → 🗎 179 |
| Cut off inhomogeneous liquid (6374) | → 🗎 179 |
| Suspended bubbles index (6376) | → 🗎 179 |
| Cut off suspended bubbles (6370) | → 🗎 179 |

#### Parameter overview with brief description

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

# 12 Diagnostics and troubleshooting

## 12.1 General troubleshooting

*For local display*

| Error | Possible causes | Remedy |
|---|---|---|
| Local display dark and no output signals | Supply voltage does not match that specified on the nameplate. | Apply the correct supply voltage . |
| Local display dark and no output signals | The polarity of the supply voltage is wrong. | Correct the polarity. |
| Local display dark and no output signals | No contact between connecting cables and terminals. | Check the connection of the cables and correct if necessary. |
| Local display dark and no output signals | Terminals are not plugged into the I/O electronics module correctly.<br>Terminals are not plugged into the main electronics module correctly. | Check terminals. |
| Local display dark and no output signals | I/O electronics module is defective.<br>Main electronics module is defective. | Order spare part → 🗎 264. |
| Local display is dark, but signal output is within the valid range | Display is set too bright or too dark. | ▪ Set the display brighter by simultaneously pressing ⊞ + 🄴.<br>▪ Set the display darker by simultaneously pressing ⊟ + 🄴. |
| Local display is dark, but signal output is within the valid range | The cable of the display module is not plugged in correctly. | Insert the plug correctly into the main electronics module and display module. |
| Local display is dark, but signal output is within the valid range | Display module is defective. | Order spare part → 🗎 264. |
| Backlighting of local display is red | Diagnostic event with "Alarm" diagnostic behavior has occurred. | Take remedial measures → 🗎 190 |
| Text on local display appears in a foreign language and cannot be understood. | Incorrect operating language is configured. | 1. Press 2 s ⊟ + ⊞ ("home position").<br>2. Press 🄴.<br>3. Set the desired language in the **Display language** parameter (→ 🗎 144). |
| Message on local display:<br>"Communication Error"<br>"Check Electronics" | Communication between the display module and the electronics is interrupted. | ▪ Check the cable and the connector between the main electronics module and display module.<br>▪ Order spare part → 🗎 264. |

*For output signals*

| Error | Possible causes | Remedial action |
|---|---|---|
| Signal output outside the valid range | Main electronics module is defective. | Order spare part → 🗎 264. |
| Device shows correct value on local display, but signal output is incorrect, though in the valid range. | Parametrization errors | Check parameterization and correct it. |
| Device measures incorrectly. | Configuration error or device is operated outside the application. | 1. Check and correct parameter configuration.<br>2. Observe limit values specified in the "Technical Data". |

*For access*

| Problem | Possible causes | Remedy |
|---|---|---|
| No write access to parameters. | Hardware write protection is enabled. | Set the write protection switch on the main electronics module to the **OFF** position → 🗎 155. |
| No write access to parameters. | Current user role has limited access authorization. | 1. Check user role → 🗎 58.<br>2. Enter correct customer-specific access code → 🗎 58. |
| No connection to web server. | Web server is disabled. | Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary→ 🗎 66. |
| | Incorrect settings for the Ethernet interface of the computer. | 1. Check the properties of the Internet protocol (TCP/IP) → 🗎 62→ 🗎 62.<br>2. Check the network settings with the IT manager. |
| No connection to web server. | Incorrect WLAN access data. | ▪ Check WLAN network status.<br>▪ Log on to the device again using WLAN access data.<br>▪ Check that WLAN is enabled on the measuring device and operating device → 🗎 62. |
| | WLAN communication is disabled. | – |
| Not connecting to web server, FieldCare or DeviceCare. | No WLAN network available. | ▪ Check if WLAN reception is present: LED on display module is lit blue<br>▪ Check if WLAN connection is enabled: LED on display module flashes blue<br>▪ Switch on instrument function. |
| Network connection not present or unstable. | WLAN network is weak. | ▪ Operating device is outside of reception range: Check network status on operating device.<br>▪ To improve network performance, use an external WLAN antenna. |
| | Parallel WLAN and Ethernet communication. | ▪ Check network settings.<br>▪ Temporarily enable only the WLAN as an interface. |
| Web browser is frozen and operation no longer possible. | Data transfer is active. | Wait until data transfer or current action is finished. |
| | Connection lost | 1. Check cable connection and power supply.<br>2. Refresh the Web browser and restart if necessary. |
| Content of web browser is incomplete or difficult to read. | Not using optimum version of Web server. | 1. Use the correct Web browser version → 🗎 60.<br>2. Clear the Web browser cache and restart the Web browser. |
| | Unsuitable view settings. | Change the font size/display ratio of the Web browser. |
| No or incomplete display of contents in the web browser. | ▪ JavaScript is not enabled<br>▪ JavaScript cannot be enabled | 1. Enable JavaScript.<br>2. Enter http://XXX.XXX.X.X.XX/servlet/basic.html as the IP address. |
| Operation with FieldCare or DeviceCare is not possible via CDI-RJ45 service interface (port 8000). | Firewall of computer or network is preventing communication. | Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access. |
| Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports) is not possible. | Firewall of computer or network is preventing communication. | Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access. |

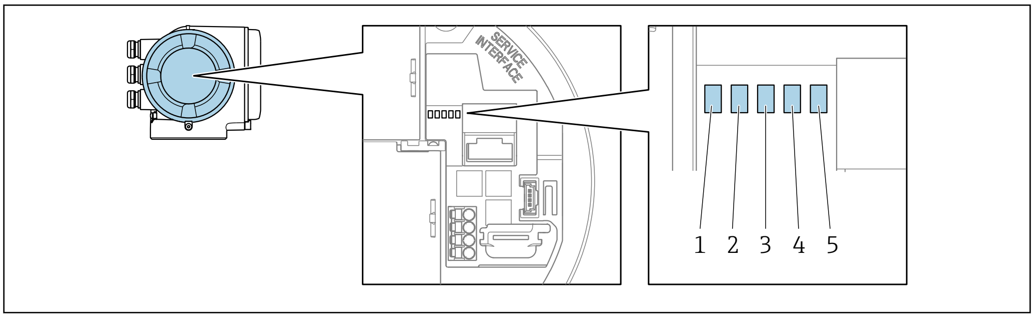
*For system integration*

| 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 light emitting diodes

### 12.2.1 Transmitter

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



1 *Supply voltage*
2 *Device status*
3 *Flashing/network status*
4 *Port 1 active: PROFINET with Ethernet-APL*
5 *Port 2 active: service interface (CDI)*

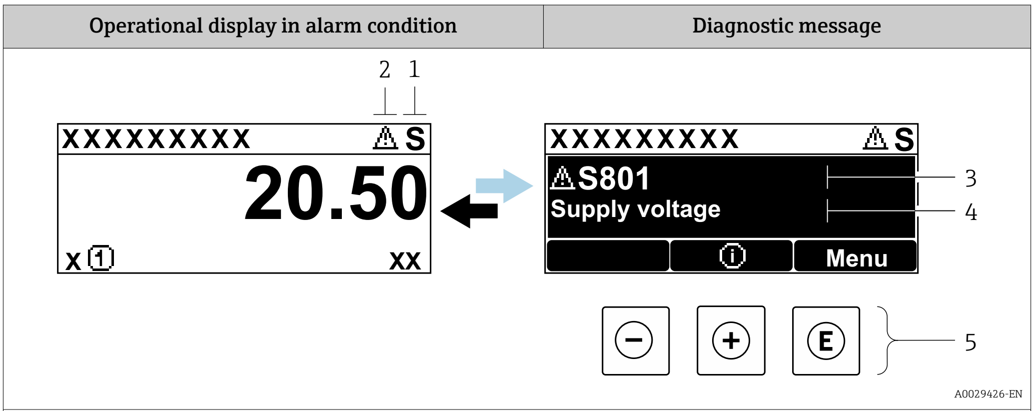
| LED | | Color | Meaning |
|---|---|---|---|
| 1 | Supply voltage | Off | Supply voltage is off or too low. |
| | | Green | Supply voltage is ok. |
| 2 | Device status/module status (normal operation) | Off | Firmware error |
| | | Green | Device status is ok. |
| | | Flashing green | Device is not configured. |
| | | Flashing red | A diagnostic event with "Warning" diagnostic behavior has occurred. |
| | | Red | A diagnostic event with "Alarm" diagnostic behavior has occurred. |
| | | Flashing red/green | The device restarts/self-test. |
| 3 | Flashing/network status | Green | Cyclic data exchange is active. |
| | | Flashing green | Following request from automation system:<br>Flash frequency: 1 Hz (flash functionality: 500 ms on, 500 ms off)<br>If no "Name of Station" is defined:<br>▪ Flash frequency: 4 Hz<br>▪ Display: no "Name of Station" available. |
| | | Red | IP address is available but there is no connection to the automation system |
| | | Flashing red | Cyclic data exchange was active but the connection was disconnected:<br>Flash frequency: 3 Hz |

| LED | | Color | Meaning |
|---|---|---|---|
| 4 | Port 1 active:<br>PROFINET with Ethernet-APL | Off | Not connected or no connection established. |
| | | White | Connection available, no active communication |
| | | Flashing white | Connection with active communication |
| 5 | Port 2 active:<br>Service interface (CDI-RJ45) | Off | Not connected or no connection established. |
| | | Amber | Connection available but no activity. |
| | | Flashing amber | Activity present. |

## 12.3 Diagnostic information on local display

### 12.3.1 Diagnostic message

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



1 *Status signal*
2 *Diagnostic behavior*
3 *Diagnostic behavior with diagnostic code*
4 *Short text*
5 *Operating elements*

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

Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
- Via parameter → 🗎 256
- Via submenus → 🗎 257

**Status signals**

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

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

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

### Diagnostic behavior

| Symbol | Meaning |
|---|---|
| ⊗ | **Alarm**<br>▪ Measurement is interrupted.<br>▪ Signal outputs and totalizers assume the defined alarm condition.<br>▪ A diagnostic message is generated. |
| ⚠ | **Warning**<br>Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated. |

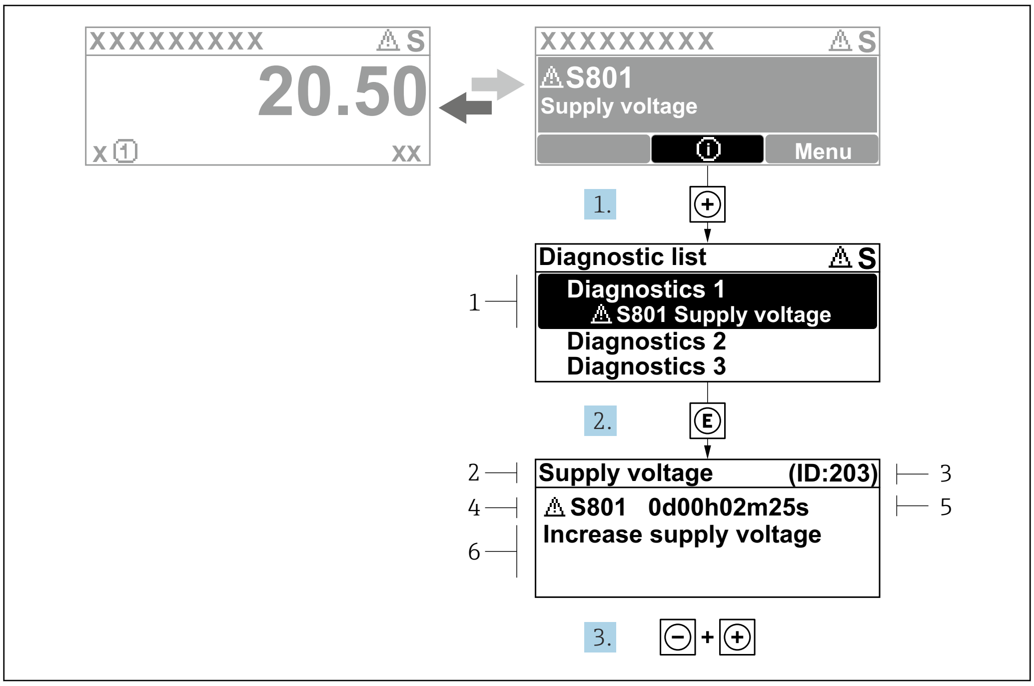
### Diagnostic information

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

### Operating elements

| Key | Meaning |
|---|---|
| ⊕ | **Plus key**<br>*In a menu, submenu*<br>Opens the message about remedy information. |
| Ⓔ | **Enter key**<br>*In a menu, submenu*<br>Opens the operating menu. |

### 12.3.2 Calling up remedial measures



29 *Message for remedial measures*

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

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

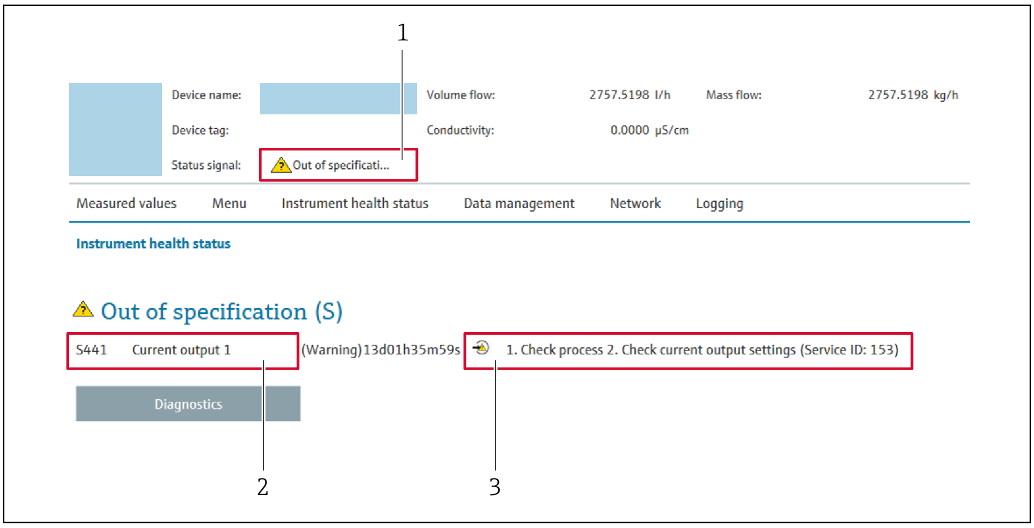
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

1. Press 🄴.
   ↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press ⊟ + ⊞ simultaneously.
   ↳ The message for the remedial measures closes.

## 12.4 Diagnostic information in the Web browser

### 12.4.1 Diagnostic options

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



Device name:

Device tag:

Status signal: ⚠ Out of specificati...

Volume flow: 2757.5198 l/h

Mass flow: 2757.5198 kg/h

Conductivity: 0.0000 µS/cm

Instrument health status

⚠ Out of specification (S)

S441 Current output 1 (Warning)13d01h35m59s 1. Check process 2. Check current output settings (Service ID: 153)

A0031056

1 *Status area with status signal*
2 *Diagnostic information*
3 *Remedial measures with service ID*

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter → 🗎 256
- Via submenu → 🗎 257

### Status signals

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

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

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

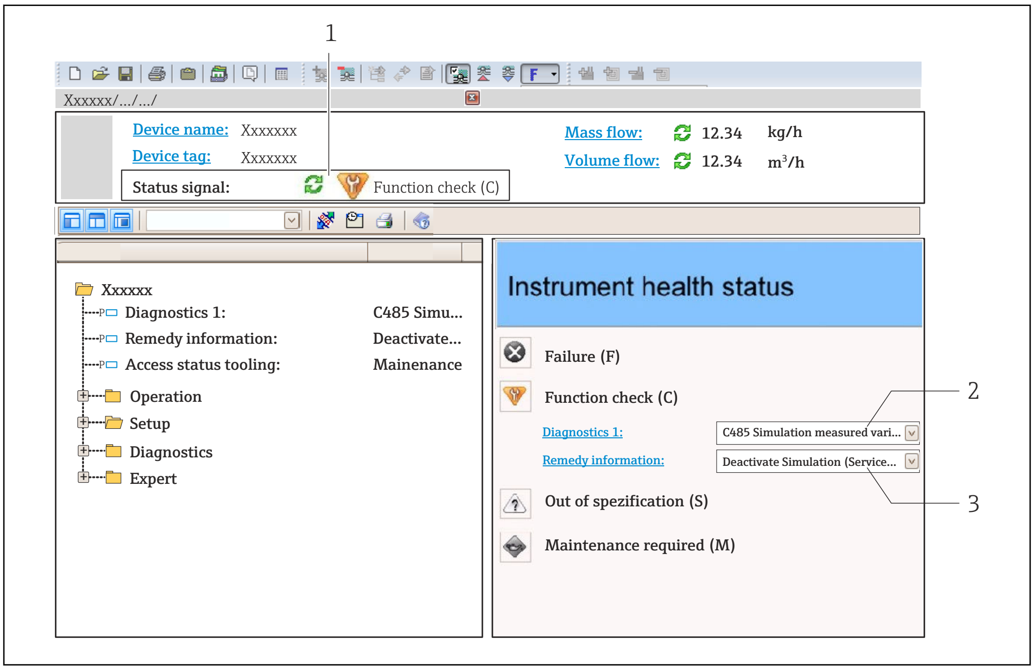
### 12.4.2 Calling up remedy information

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

## 12.5 Diagnostic information in FieldCare or DeviceCare

### 12.5.1 Diagnostic options

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


Xxxxxx/.../.../

Device name: Xxxxxxx

Device tag: Xxxxxxx

Status signal: Function check (C)

Mass flow: 12.34 kg/h

Volume flow: 12.34 m³/h

Xxxxxx

Diagnostics 1: C485 Simu...

Remedy information: Deactivate...

Access status tooling: Mainenance

Instrument health status

Failure (F)

Function check (C)

Diagnostics 1: C485 Simulation measured vari...

Remedy information: Deactivate Simulation (Service...

Out of spezification (S)

Maintenance required (M)

1 *Status area with status signal → 🖹 184*
2 *Diagnostics information → 🖹 185*
3 *Remedial measures with service ID*

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter → 🖹 256
- Via submenu → 🖹 257

### Diagnostic information

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

## 12.5.2 Calling up remedy information

Remedy information is provided for every diagnostic event to ensure that problems can be rectified quickly:
- On the home page
  Remedy information is displayed in a separate field below the diagnostics information.
- In the **Diagnostics** menu
  Remedy information can be called up in the working area of the user interface.

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

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

## 12.6 Adapting the diagnostic information

### 12.6.1 Adapting the diagnostic behavior

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

Expert → System → Diagnostic handling → Diagnostic behavior

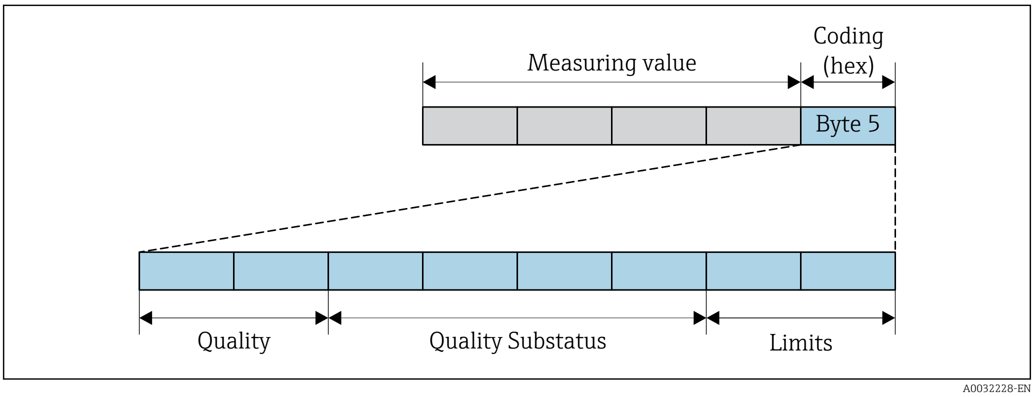
#### Available diagnostic behaviors

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

#### 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.



30 *Structure of the status byte*

The content 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 with Ethernet-APL 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 to 0x27 |
| BAD - Process related | 0x28 to 0x2B |
| BAD - Function check | 0x3C to 0x3F |
| UNCERTAIN - Initial value | 0x4C to 0x4F |
| UNCERTAIN - Maintenance demanded | 0x68 to 0x6B |
| UNCERTAIN - Process related | 0x78 to 0x7B |
| GOOD - OK | 0x80 to 0x83 |
| GOOD - Maintenance required | 0xA4 to 0xA7 |
| GOOD - Maintenance demanded | 0xA8 to 0xAB |
| GOOD - Function check | 0xBC to 0xBF |

## 12.7 Overview of diagnostic information

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

ℹ In the case of some items of diagnostic information, the diagnostic behavior can be changed. Adapting the diagnostic information → 🗎 189

### 12.7.1 Diagnostic of sensor

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| No. | Short text | | |
| 002 | Sensor unknown | | 1. Check if the correct sensor is mounted<br>2. Check if the 2-D matrix code on the sensor is undamaged |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| Diagnostic information | | Remedy instructions |
|---|---|---|
| **No.** | **Short text** | |
| 022 | Temperature sensor defective | 1. If available: Check connection cable between sensor and transmitter<br>2. Check or replace sensor electronic module (ISEM)<br>3. Replace sensor |

| **Measured variable status** | |
|---|---|
| Quality | Good |
| Quality substatus | Ok |
| Coding (hex) | 0x80 to 0x83 |
| Status signal | F |
| Diagnostic behavior | Alarm |

**Influenced measured variables**

- Oscillation amplitude 1
- Oscillation amplitude 2
- Application specific output
- Application specific output
- Signal asymmetry
- Carrier mass flow
- Carrier pipe temperature
- Target corrected volume flow
- Carrier corrected volume flow
- Sensor index coil asymmetry
- Concentration
- Oscillation damping 1
- Oscillation damping 2
- Density
- Oil density
- Water density
- Test point
- Test point
- Dynamic viscosity
- Sensor electronics temperature (ISEM)
- GSV flow
- GSV flow alternative
- Kinematic viscosity
- Mass flow
- Oil mass flow
- Water mass flow
- Inhomogeneous medium index
- Suspended bubbles index
- HBSI
- NSV flow
- NSV flow alternative
- External pressure
- Exciter current 1
- Exciter current 2
- Oscillation frequency 1
- Oscillation frequency 2
- Raw value mass flow
- S&W volume flow
- Torsion signal asymmetry
- Reference density
- Reference density alternative
- Corrected volume flow
- Oil corrected volume flow
- Water corrected volume flow
- Oscillation damping fluctuation 1
- Oscillation damping fluctuation 2
- Frequency fluctuation 1
- Frequency fluctuation 2
- Target mass flow
- Carrier volume flow
- Target volume flow
- Temp. compensated dynamic viscosity
- Temp. compensated kinematic viscosity
- Temperature
- Volume flow
- Oil volume flow
- Water volume flow
- Water cut

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 046 | Sensor limit exceeded | | 1. Check process conditions<br>2. Check sensor |
| | **Measured variable status [from the factory] 1)** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM) | ▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density | ▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">062</td><td colspan="2">Sensor connection faulty</td><td rowspan="7">1. If available: Check connection cable between sensor and transmitter<br>2. Check or replace sensor electronic module (ISEM)<br>3. Replace sensor</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">063</td><td colspan="2">Exciter current faulty</td><td rowspan="7">1. If available: Check connection cable between sensor and transmitter<br>2. Check or replace sensor electronic module (ISEM)<br>3. Replace sensor</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 082 | Data storage inconsistent | | Check module connections |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| No. | Short text | | |
| 083 | Memory content inconsistent | | 1. Restart device<br>2. Restore S-DAT data<br>3. Replace S-DAT |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">119</td><td colspan="2">Sensor initialization active</td><td rowspan="7">Sensor initialization in progress, please wait</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>C</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | | Remedy instructions |
|---|---|---|---|---|
| **No.** | **Short text** | | | |
| 140 | Sensor signal asymmetrical | | | 1. If available: Check connection cable between sensor and transmitter<br>2. Check or replace sensor electronic module (ISEM)<br>3. Replace sensor |
| | **Measured variable status [from the factory] [1]** | | | |
| | Quality | Good | | |
| | Quality substatus | Ok | | |
| | Coding (hex) | 0x80 to 0x83 | | |
| | Status signal | S | | |
| | Diagnostic behavior | Alarm | | |
| | **Influenced measured variables** | | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 141 | Zero adjustment failed | | 1. Check process conditions<br>2. Repeat commissioning procedure<br>3. Check sensor |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">142</td><td colspan="2">Sensor index coil asymmetry too high</td><td rowspan="7">Check sensor</td></tr>
<tr><td colspan="2"><b>Measured variable status [from the factory] [1]</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>S</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 144 | Measurement error too high | | 1. Check process conditions<br>2. Check or change sensor |
| | **Measured variable status [from the factory]** 1) | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ■ Oscillation amplitude 1<br>■ Oscillation amplitude 2<br>■ Application specific output<br>■ Application specific output<br>■ Signal asymmetry<br>■ Carrier mass flow<br>■ Carrier pipe temperature<br>■ Target corrected volume flow<br>■ Carrier corrected volume flow<br>■ Sensor index coil asymmetry<br>■ Concentration<br>■ Oscillation damping 1<br>■ Oscillation damping 2<br>■ Density<br>■ Oil density<br>■ Water density<br>■ Test point<br>■ Test point<br>■ Dynamic viscosity<br>■ Sensor electronics temperature (ISEM)<br>■ GSV flow<br>■ GSV flow alternative<br>■ Kinematic viscosity<br>■ Mass flow<br>■ Oil mass flow<br>■ Water mass flow<br>■ Inhomogeneous medium index<br>■ Suspended bubbles index<br>■ HBSI<br>■ NSV flow<br>■ NSV flow alternative<br>■ External pressure<br>■ Exciter current 1<br>■ Exciter current 2<br>■ Oscillation frequency 1<br>■ Oscillation frequency 2<br>■ Raw value mass flow<br>■ S&W volume flow<br>■ Torsion signal asymmetry<br>■ Reference density<br>■ Reference density alternative<br>■ Corrected volume flow<br>■ Oil corrected volume flow<br>■ Water corrected volume flow<br>■ Oscillation damping fluctuation 1<br>■ Oscillation damping fluctuation 2<br>■ Frequency fluctuation 1<br>■ Frequency fluctuation 2<br>■ Target mass flow<br>■ Carrier volume flow<br>■ Target volume flow<br>■ Temp. compensated dynamic viscosity<br>■ Temp. compensated kinematic viscosity<br>■ Temperature<br>■ Volume flow<br>■ Oil volume flow<br>■ Water volume flow<br>■ Water cut | | |

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

### 12.7.2 Diagnostic of electronic

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="10">201</td><td colspan="2">Electronics faulty</td><td rowspan="7">1. Restart device<br>2. Replace electronics</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| No. | Short text | | |
| 242 | Firmware incompatible | | 1. Check firmware version<br>2. Flash or replace electronic module |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">252</td><td colspan="2">Module incompatible</td><td rowspan="7">1. Check electronic modules<br>2. Check if correct modules are available (e.g. NEx, Ex)<br>3. Replace electronic modules</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 262 | Module connection interrupted | | 1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics<br>2. Check or replace ISEM or main electronics |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">270</td><td colspan="2">Main electronics defective</td><td rowspan="7">1. Restart device<br>2. Replace main electronic module</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td>▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity</td><td>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry</td><td>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">271</td><td colspan="2">Main electronics faulty</td><td rowspan="7">1. Restart device<br>2. Replace main electronic module</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 272 | Main electronics faulty | | Restart device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 273 | Main electronics defective | | 1. Pay attention to display emergency operation<br>2. Replace main electronics |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 275 | I/O module defective | | Change I/O module |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 276 | I/O module faulty | | 1. Restart device<br>2. Change I/O module |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 283 | Memory content inconsistent | | Restart device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="10">302</td><td colspan="2">Device verification active</td><td rowspan="7">Device verification active, please wait.</td></tr>
<tr><td colspan="2"><b>Measured variable status [from the factory]</b> [1]</td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Function check</td></tr>
<tr><td>Coding (hex)</td><td>0xBC to 0xBF</td></tr>
<tr><td>Status signal</td><td>C</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">Oscillation amplitude 1<br>Oscillation amplitude 2<br>Application specific output<br>Application specific output<br>Signal asymmetry<br>Carrier mass flow<br>Carrier pipe temperature<br>Target corrected volume flow<br>Carrier corrected volume flow<br>Sensor index coil asymmetry<br>Concentration<br>Measured values<br>Oscillation damping 1<br>Oscillation damping 2<br>Density<br>Oil density<br>Water density<br>Test point<br>Test point<br>Dynamic viscosity<br>Sensor electronics temperature (ISEM)<br>GSV flow<br>GSV flow alternative<br>Kinematic viscosity<br>Mass flow<br>Oil mass flow<br>Water mass flow<br>Inhomogeneous medium index<br>Suspended bubbles index<br>HBSI<br>NSV flow<br>NSV flow alternative<br>External pressure<br>Exciter current 1<br>Exciter current 2<br>Oscillation frequency 1<br>Oscillation frequency 2<br>Raw value mass flow<br>S&W volume flow<br>Torsion signal asymmetry<br>Reference density<br>Reference density alternative<br>Corrected volume flow<br>Oil corrected volume flow<br>Water corrected volume flow<br>Oscillation damping fluctuation 1<br>Oscillation damping fluctuation 2<br>Frequency fluctuation 1<br>Frequency fluctuation 2<br>Target mass flow<br>Carrier volume flow<br>Target volume flow<br>Temp. compensated dynamic viscosity<br>Temp. compensated kinematic viscosity<br>Temperature<br>Volume flow<br>Oil volume flow<br>Water volume flow<br>Water cut</td></tr>
</table>

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

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="10">303</td><td colspan="2">I/O 1 to n configuration changed</td><td rowspan="7">1. Apply I/O module configuration (parameter 'Apply I/O configuration')<br>2. Afterwards reload device description and check wiring</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>M</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">–</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 304 | Device verification failed | | 1. Check verification report<br>2. Repeat commissioning procedure<br>3. Check sensor |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 311 | Sensor electronics (ISEM) faulty | | Maintenance required!<br>Do not reset device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | M | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | Oscillation amplitude 1<br>Oscillation amplitude 2<br>Application specific output<br>Application specific output<br>Signal asymmetry<br>Carrier mass flow<br>Carrier pipe temperature<br>Target corrected volume flow<br>Carrier corrected volume flow<br>Sensor index coil asymmetry<br>Concentration<br>Measured values<br>Oscillation damping 1<br>Oscillation damping 2<br>Density<br>Oil density<br>Water density<br>Test point<br>Test point<br>Dynamic viscosity | Sensor electronics temperature (ISEM)<br>GSV flow<br>GSV flow alternative<br>Kinematic viscosity<br>Mass flow<br>Oil mass flow<br>Water mass flow<br>Inhomogeneous medium index<br>Suspended bubbles index<br>HBSI<br>NSV flow<br>NSV flow alternative<br>External pressure<br>Exciter current 1<br>Exciter current 2<br>Oscillation frequency 1<br>Oscillation frequency 2<br>Raw value mass flow<br>S&W volume flow<br>Torsion signal asymmetry | Reference density<br>Reference density alternative<br>Corrected volume flow<br>Oil corrected volume flow<br>Water corrected volume flow<br>Oscillation damping fluctuation 1<br>Oscillation damping fluctuation 2<br>Frequency fluctuation 1<br>Frequency fluctuation 2<br>Target mass flow<br>Carrier volume flow<br>Target volume flow<br>Temp. compensated dynamic viscosity<br>Temp. compensated kinematic viscosity<br>Temperature<br>Volume flow<br>Oil volume flow<br>Water volume flow<br>Water cut |

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 330 | Flash file invalid | | 1. Update firmware of device<br>2. Restart device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | M | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 331 | Firmware update failed | | 1. Update firmware of device<br>2. Restart device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">332</td><td colspan="2">Writing in HistoROM backup failed</td><td rowspan="7">1. Replace user interface board<br>2. Ex d/XP: replace transmitter</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">361</td><td colspan="2">I/O module 1 to n faulty</td><td rowspan="7">1. Restart device<br>2. Check electronic modules<br>3. Change I/O module or main electronics</td></tr>
<tr><th colspan="2">Measured variable status</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 369 | Matrix code scanner defective | | Replace matrix code scanner |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 371 | Temperature sensor defective | | Contact service |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | M | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |

- Oscillation amplitude 1
- Oscillation amplitude 2
- Application specific output
- Application specific output
- Signal asymmetry
- Carrier mass flow
- Carrier pipe temperature
- Target corrected volume flow
- Carrier corrected volume flow
- Sensor index coil asymmetry
- Concentration
- Measured values
- Oscillation damping 1
- Oscillation damping 2
- Density
- Oil density
- Water density
- Test point
- Test point
- Dynamic viscosity
- Sensor electronics temperature (ISEM)
- GSV flow
- GSV flow alternative
- Kinematic viscosity
- Mass flow
- Oil mass flow
- Water mass flow
- Inhomogeneous medium index
- Suspended bubbles index
- HBSI
- NSV flow
- NSV flow alternative
- External pressure
- Exciter current 1
- Exciter current 2
- Oscillation frequency 1
- Oscillation frequency 2
- Raw value mass flow
- S&W volume flow
- Torsion signal asymmetry
- Reference density
- Reference density alternative
- Corrected volume flow
- Oil corrected volume flow
- Water corrected volume flow
- Oscillation damping fluctuation 1
- Oscillation damping fluctuation 2
- Frequency fluctuation 1
- Frequency fluctuation 2
- Target mass flow
- Carrier volume flow
- Target volume flow
- Temp. compensated dynamic viscosity
- Temp. compensated kinematic viscosity
- Temperature
- Volume flow
- Oil volume flow
- Water volume flow
- Water cut

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 372 | Sensor electronics (ISEM) faulty | | 1. Restart device<br>2. Check if failure recurs<br>3. Replace sensor electronic module (ISEM) |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 373 | Sensor electronics (ISEM) faulty | | Transfer data or reset device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">374</td><td colspan="2">Sensor electronics (ISEM) faulty</td><td rowspan="7">1. Restart device<br>2. Check if failure recurs<br>3. Replace sensor electronic module (ISEM)</td></tr>
<tr><th colspan="2">Measured variable status [from the factory] 1)</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>S</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

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

| Diagnostic information | | Remedy instructions |
|---|---|---|
| **No.** | **Short text** | |
| 375 | I/O- 1 to n communication failed | 1. Restart device<br>2. Check if failure recurs<br>3. Replace module rack inclusive electronic modules |

**Measured variable status**

| | |
|---|---|
| Quality | Good |
| Quality substatus | Ok |
| Coding (hex) | 0x80 to 0x83 |
| Status signal | F |
| Diagnostic behavior | Alarm |

**Influenced measured variables**

- Oscillation amplitude 1
- Oscillation amplitude 2
- Application specific output
- Application specific output
- Signal asymmetry
- Carrier mass flow
- Carrier pipe temperature
- Target corrected volume flow
- Carrier corrected volume flow
- Sensor index coil asymmetry
- Concentration
- Measured values
- Oscillation damping 1
- Oscillation damping 2
- Density
- Oil density
- Water density
- Test point
- Test point
- Dynamic viscosity
- Sensor electronics temperature (ISEM)
- GSV flow
- GSV flow alternative
- Kinematic viscosity
- Mass flow
- Oil mass flow
- Water mass flow
- Inhomogeneous medium index
- Suspended bubbles index
- HBSI
- NSV flow
- NSV flow alternative
- External pressure
- Exciter current 1
- Exciter current 2
- Oscillation frequency 1
- Oscillation frequency 2
- Raw value mass flow
- S&W volume flow
- Torsion signal asymmetry
- Reference density
- Reference density alternative
- Corrected volume flow
- Oil corrected volume flow
- Water corrected volume flow
- Oscillation damping fluctuation 1
- Oscillation damping fluctuation 2
- Frequency fluctuation 1
- Frequency fluctuation 2
- Target mass flow
- Carrier volume flow
- Target volume flow
- Temp. compensated dynamic viscosity
- Temp. compensated kinematic viscosity
- Temperature
- Volume flow
- Oil volume flow
- Water volume flow
- Water cut

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">378</td><td colspan="2">Supply voltage ISEM faulty</td><td rowspan="7">1. If available: Check connection cable between sensor and transmitter<br>2. Replace main electronic module<br>3. Replace sensor electronic module (ISEM)</td></tr>
<tr><td colspan="2">**Measured variable status**</td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3">**Influenced measured variables**</td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">382</td><td colspan="2">Data storage</td><td rowspan="7">1. Insert T-DAT<br>2. Replace T-DAT</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 383 | Memory content | | Reset device |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 387 | HistoROM data faulty | | Contact service organization |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |

**Influenced measured variables**

- Oscillation amplitude 1
- Oscillation amplitude 2
- Application specific output
- Application specific output
- Signal asymmetry
- Carrier mass flow
- Carrier pipe temperature
- Target corrected volume flow
- Carrier corrected volume flow
- Sensor index coil asymmetry
- Concentration
- Measured values
- Oscillation damping 1
- Oscillation damping 2
- Density
- Oil density
- Water density
- Test point
- Test point
- Dynamic viscosity
- Sensor electronics temperature (ISEM)
- GSV flow
- GSV flow alternative
- Kinematic viscosity
- Mass flow
- Oil mass flow
- Water mass flow
- Inhomogeneous medium index
- Suspended bubbles index
- HBSI
- NSV flow
- NSV flow alternative
- External pressure
- Exciter current 1
- Exciter current 2
- Oscillation frequency 1
- Oscillation frequency 2
- Raw value mass flow
- S&W volume flow
- Torsion signal asymmetry
- Reference density
- Reference density alternative
- Corrected volume flow
- Oil corrected volume flow
- Water corrected volume flow
- Oscillation damping fluctuation 1
- Oscillation damping fluctuation 2
- Frequency fluctuation 1
- Frequency fluctuation 2
- Target mass flow
- Carrier volume flow
- Target volume flow
- Temp. compensated dynamic viscosity
- Temp. compensated kinematic viscosity
- Temperature
- Volume flow
- Oil volume flow
- Water volume flow
- Water cut

### 12.7.3 Diagnostic of configuration

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">410</td><td colspan="2">Data transfer failed</td><td rowspan="7">1. Retry data transfer<br>2. Check connection</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td>▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity</td><td>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry</td><td>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 412 | Processing download | | Download active, please wait |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 431 | Trim 1 to n required | | Carry out trim |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 437 | Configuration incompatible | | 1. Update firmware<br>2. Execute factory reset |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">438</td><td colspan="2">Dataset different</td><td rowspan="7">1. Check dataset file<br>2. Check device parameterization<br>3. Download new device parameterization</td></tr>
<tr><th colspan="2">Measured variable status</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>M</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">■ Oscillation amplitude 1<br>■ Oscillation amplitude 2<br>■ Application specific output<br>■ Application specific output<br>■ Signal asymmetry<br>■ Carrier mass flow<br>■ Carrier pipe temperature<br>■ Target corrected volume flow<br>■ Carrier corrected volume flow<br>■ Sensor index coil asymmetry<br>■ Concentration<br>■ Measured values<br>■ Oscillation damping 1<br>■ Oscillation damping 2<br>■ Density<br>■ Oil density<br>■ Water density<br>■ Test point<br>■ Test point<br>■ Dynamic viscosity<br>■ Sensor electronics temperature (ISEM)<br>■ GSV flow<br>■ GSV flow alternative<br>■ Kinematic viscosity<br>■ Mass flow<br>■ Oil mass flow<br>■ Water mass flow<br>■ Inhomogeneous medium index<br>■ Suspended bubbles index<br>■ HBSI<br>■ NSV flow<br>■ NSV flow alternative<br>■ External pressure<br>■ Exciter current 1<br>■ Exciter current 2<br>■ Oscillation frequency 1<br>■ Oscillation frequency 2<br>■ Raw value mass flow<br>■ S&W volume flow<br>■ Torsion signal asymmetry<br>■ Reference density<br>■ Reference density alternative<br>■ Corrected volume flow<br>■ Oil corrected volume flow<br>■ Water corrected volume flow<br>■ Oscillation damping fluctuation 1<br>■ Oscillation damping fluctuation 2<br>■ Frequency fluctuation 1<br>■ Frequency fluctuation 2<br>■ Target mass flow<br>■ Carrier volume flow<br>■ Target volume flow<br>■ Temp. compensated dynamic viscosity<br>■ Temp. compensated kinematic viscosity<br>■ Temperature<br>■ Volume flow<br>■ Oil volume flow<br>■ Water volume flow<br>■ Water cut</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">441</td><td colspan="2">Current output 1 to n saturated</td><td rowspan="7">1. Check current output settings<br>2. Check process</td></tr>
<tr><th colspan="2">Measured variable status</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>S</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">–</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 442 | Frequency output 1 saturated | | 1. Check frequency output settings<br>2. Check process |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 443 | Pulse output 1 saturated | | 1. Check pulse output settings<br>2. Check process |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 444 | Current input 1 to n saturated | | 1. Check current input settings<br>2. Check connected device<br>3. Check process |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | Measured values | | |

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

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">453</td><td colspan="2">Flow override active</td><td rowspan="7">Deactivate flow override</td></tr>
<tr><td colspan="2"><b>Measured variable status</b></td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>C</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 484 | Failure mode simulation active | | Deactivate simulation |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM) | ▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density | ▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 485 | Process variable simulation active | | Deactivate simulation |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 486 | Current input 1 to n simulation active | | Deactivate simulation |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | Measured values | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 491 | Current output 1 to n simulation active | | Deactivate simulation |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 492 | Frequency output 1 to n simulation active | | Deactivate simulation frequency output |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 493 | Pulse output simulation active | | Deactivate simulation pulse output |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 494 | Switch output 1 to n simulation active | | Deactivate simulation switch output |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 495 | Diagnostic event simulation active | | Deactivate simulation |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 496 | Status input 1 to n simulation active | | Deactivate simulation status input |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">520</td><td colspan="2">I/O 1 to n hardware configuration invalid</td><td rowspan="7">1. Check I/O hardware configuration<br>2. Replace wrong I/O module<br>3. Plug the module of double pulse output on correct slot</td></tr>
<tr><th colspan="2">Measured variable status</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>F</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">–</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">528</td><td colspan="2">Concentration calculation not possible</td><td rowspan="7">Out of valid range of the selected calculation algorithm<br>1. Check concentration settings<br>2. Check measured values, e.g. density or temperature</td></tr>
<tr><th colspan="2">Measured variable status</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>S</td></tr>
<tr><td>Diagnostic behavior</td><td>Alarm</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">▪ Carrier mass flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Concentration<br>▪ Density<br>▪ Mass flow<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Volume flow</td></tr>
</table>

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">529</td><td colspan="2">Concentration calculation not accurate</td><td rowspan="7">Out of valid range of the selected calculation algorithm<br>1. Check concentration settings<br>2. Check measured values, e.g. density or temperature</td></tr>
<tr><th colspan="2">Measured variable status</th></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>S</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><th colspan="3">Influenced measured variables</th></tr>
<tr><td colspan="3">▪ Carrier mass flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Concentration<br>▪ Density<br>▪ Mass flow<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Volume flow</td></tr>
</table>

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 537 | Configuration | | 1. Check IP addresses in network<br>2. Change IP address |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 594 | Relay output 1 to n simulation active | | Deactivate simulation switch output |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | C | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | – | | |

### 12.7.4 Diagnostic of process

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 803 | Loop current 1 faulty | | 1. Check wiring<br>2. Change I/O module |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 830 | Ambient temperature too high | | Reduce ambient temp. around the sensor housing |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM) | ▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density | ▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 831 | Ambient temperature too low | | Increase ambient temp. around the sensor housing |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | Oscillation amplitude 1<br>Oscillation amplitude 2<br>Application specific output<br>Application specific output<br>Signal asymmetry<br>Carrier mass flow<br>Carrier pipe temperature<br>Target corrected volume flow<br>Carrier corrected volume flow<br>Sensor index coil asymmetry<br>Concentration<br>Oscillation damping 1<br>Oscillation damping 2<br>Density<br>Oil density<br>Water density<br>Test point<br>Test point<br>Dynamic viscosity<br>Sensor electronics temperature (ISEM) | GSV flow<br>GSV flow alternative<br>Kinematic viscosity<br>Mass flow<br>Oil mass flow<br>Water mass flow<br>Inhomogeneous medium index<br>Suspended bubbles index<br>HBSI<br>NSV flow<br>NSV flow alternative<br>External pressure<br>Exciter current 1<br>Exciter current 2<br>Oscillation frequency 1<br>Oscillation frequency 2<br>Raw value mass flow<br>S&W volume flow<br>Torsion signal asymmetry<br>Reference density | Reference density alternative<br>Corrected volume flow<br>Oil corrected volume flow<br>Water corrected volume flow<br>Oscillation damping fluctuation 1<br>Oscillation damping fluctuation 2<br>Frequency fluctuation 1<br>Frequency fluctuation 2<br>Target mass flow<br>Carrier volume flow<br>Target volume flow<br>Temp. compensated dynamic viscosity<br>Temp. compensated kinematic viscosity<br>Temperature<br>Volume flow<br>Oil volume flow<br>Water volume flow<br>Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 832 | Electronics temperature too high | | Reduce ambient temperature |
| | **Measured variable status [from the factory] 1)** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| No. | Short text | | |
| 833 | Electronics temperature too low | | Increase ambient temperature |
| | **Measured variable status [from the factory]** 1) | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

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

<table>
<tr><th colspan="3">Diagnostic information</th><th rowspan="2">Remedy instructions</th></tr>
<tr><th>No.</th><th colspan="2">Short text</th></tr>
<tr><td rowspan="9">834</td><td colspan="2">Process temperature too high</td><td rowspan="7">Reduce process temperature</td></tr>
<tr><td colspan="2"><b>Measured variable status [from the factory]</b> [1]</td></tr>
<tr><td>Quality</td><td>Good</td></tr>
<tr><td>Quality substatus</td><td>Ok</td></tr>
<tr><td>Coding (hex)</td><td>0x80 to 0x83</td></tr>
<tr><td>Status signal</td><td>S</td></tr>
<tr><td>Diagnostic behavior</td><td>Warning</td></tr>
<tr><td colspan="3"><b>Influenced measured variables</b></td></tr>
<tr><td colspan="3">▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut</td></tr>
</table>

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 835 | Process temperature too low | | Increase process temperature |
| | **Measured variable status [from the factory] 1)** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ■ Oscillation amplitude 1<br>■ Oscillation amplitude 2<br>■ Application specific output<br>■ Application specific output<br>■ Signal asymmetry<br>■ Carrier mass flow<br>■ Carrier pipe temperature<br>■ Target corrected volume flow<br>■ Carrier corrected volume flow<br>■ Sensor index coil asymmetry<br>■ Concentration<br>■ Oscillation damping 1<br>■ Oscillation damping 2<br>■ Density<br>■ Oil density<br>■ Water density<br>■ Test point<br>■ Test point<br>■ Dynamic viscosity<br>■ Sensor electronics temperature (ISEM)<br>■ GSV flow<br>■ GSV flow alternative<br>■ Kinematic viscosity<br>■ Mass flow<br>■ Oil mass flow<br>■ Water mass flow<br>■ Inhomogeneous medium index<br>■ Suspended bubbles index<br>■ HBSI<br>■ NSV flow<br>■ NSV flow alternative<br>■ External pressure<br>■ Exciter current 1<br>■ Exciter current 2<br>■ Oscillation frequency 1<br>■ Oscillation frequency 2<br>■ Raw value mass flow<br>■ S&W volume flow<br>■ Torsion signal asymmetry<br>■ Reference density<br>■ Reference density alternative<br>■ Corrected volume flow<br>■ Oil corrected volume flow<br>■ Water corrected volume flow<br>■ Oscillation damping fluctuation 1<br>■ Oscillation damping fluctuation 2<br>■ Frequency fluctuation 1<br>■ Frequency fluctuation 2<br>■ Target mass flow<br>■ Carrier volume flow<br>■ Target volume flow<br>■ Temp. compensated dynamic viscosity<br>■ Temp. compensated kinematic viscosity<br>■ Temperature<br>■ Volume flow<br>■ Oil volume flow<br>■ Water volume flow<br>■ Water cut | | |

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

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 842 | Process value below limit | | 1. Decrease process value<br>2. Check application<br>3. Check sensor |
| | **Measured variable status [from the factory]** 1) | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM) | ▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density | ▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 862 | Partly filled pipe | | 1. Check for gas in process<br>2. Adjust detection limits |
| | **Measured variable status [from the factory] 1)** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Application specific output<br>▪ Application specific output<br>▪ Carrier mass flow<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Concentration<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ S&W volume flow<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 882 | Input signal faulty | | 1. Check input signal parameterization<br>2. Check external device<br>3. Check process conditions |
| | **Measured variable status** | | |
| | Quality | Bad | |
| | Quality substatus | Maintenance alarm | |
| | Coding (hex) | 0x24 to 0x27 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 910 | Tubes not oscillating | | 1. If available: Check connection cable between sensor and transmitter<br>2. Check or replace sensor electronic module (ISEM)<br>3. Check sensor |
| | **Measured variable status** | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | F | |
| | Diagnostic behavior | Alarm | |
| | **Influenced measured variables** | | |
| | – | | |

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 912 | Medium inhomogeneous | | 1. Check process cond.<br>2. Increase system pressure |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM) | ▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density | ▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 913 | Medium unsuitable | | 1. Check process conditions<br>2. Check electronic modules or sensor |
| | **Measured variable status [from the factory]** 1) | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 915 | Viscosity ouf of specification | | 1. Avoid 2-phase flow<br>2. Increase system pressure<br>3. Verify viscosity and density are within range<br>4. Check process conditions |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 941 | API/ASTM temperature out of specificat. | | 1. Check process temperature with selected API/ASTM commodity group<br>2. Check API/ASTM-related parameters |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oil density<br>▪ Water density<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ S&W volume flow<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut | | |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 942 | API/ASTM density out of specification | | 1. Check process density with selected API/ASTM commodity group<br>2. Check API/ASTM-related parameters |
| | **Measured variable status [from the factory]** 1) | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oil density<br>▪ Water density<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Mass flow<br>▪ Oil mass flow | ▪ Water mass flow<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ S&W volume flow<br>▪ Reference density alternative<br>▪ Corrected volume flow | ▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| **No.** | **Short text** | | |
| 943 | API pressure out of specification | | 1. Check process pressure with selected API commodity group<br>2. Check API related parameters |
| | **Measured variable status [from the factory]** 1) | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oil density<br>▪ Water density<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Mass flow<br>▪ Oil mass flow | ▪ Water mass flow<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ S&W volume flow<br>▪ Reference density alternative<br>▪ Corrected volume flow | ▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 944 | Monitoring failed | | Check process conditions for Heartbeat Monitoring |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Signal asymmetry<br>▪ Carrier pipe temperature<br>▪ Sensor index coil asymmetry<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Test point<br>▪ Test point | ▪ Dynamic viscosity<br>▪ Kinematic viscosity<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2 | ▪ Raw value mass flow<br>▪ Torsion signal asymmetry<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity |

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

| **Diagnostic information** | | | **Remedy instructions** |
|---|---|---|---|
| **No.** | **Short text** | | |
| 948 | Oscillation damping too high | | Check process conditions |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity<br>▪ Sensor electronics temperature (ISEM) | ▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry<br>▪ Reference density | ▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

| Diagnostic information | | | Remedy instructions |
|---|---|---|---|
| No. | Short text | | |
| 984 | Condensation risk | | 1. Decrease ambient temperature<br>2. Increase medium temperature |
| | **Measured variable status [from the factory]** [1] | | |
| | Quality | Good | |
| | Quality substatus | Ok | |
| | Coding (hex) | 0x80 to 0x83 | |
| | Status signal | S | |
| | Diagnostic behavior | Warning | |
| | **Influenced measured variables** | | |
| | ▪ Oscillation amplitude 1<br>▪ Oscillation amplitude 2<br>▪ Application specific output<br>▪ Application specific output<br>▪ Signal asymmetry<br>▪ Carrier mass flow<br>▪ Carrier pipe temperature<br>▪ Target corrected volume flow<br>▪ Carrier corrected volume flow<br>▪ Sensor index coil asymmetry<br>▪ Concentration<br>▪ Measured values<br>▪ Oscillation damping 1<br>▪ Oscillation damping 2<br>▪ Density<br>▪ Oil density<br>▪ Water density<br>▪ Test point<br>▪ Test point<br>▪ Dynamic viscosity | ▪ Sensor electronics temperature (ISEM)<br>▪ GSV flow<br>▪ GSV flow alternative<br>▪ Kinematic viscosity<br>▪ Mass flow<br>▪ Oil mass flow<br>▪ Water mass flow<br>▪ Inhomogeneous medium index<br>▪ Suspended bubbles index<br>▪ HBSI<br>▪ NSV flow<br>▪ NSV flow alternative<br>▪ External pressure<br>▪ Exciter current 1<br>▪ Exciter current 2<br>▪ Oscillation frequency 1<br>▪ Oscillation frequency 2<br>▪ Raw value mass flow<br>▪ S&W volume flow<br>▪ Torsion signal asymmetry | ▪ Reference density<br>▪ Reference density alternative<br>▪ Corrected volume flow<br>▪ Oil corrected volume flow<br>▪ Water corrected volume flow<br>▪ Oscillation damping fluctuation 1<br>▪ Oscillation damping fluctuation 2<br>▪ Frequency fluctuation 1<br>▪ Frequency fluctuation 2<br>▪ Target mass flow<br>▪ Carrier volume flow<br>▪ Target volume flow<br>▪ Temp. compensated dynamic viscosity<br>▪ Temp. compensated kinematic viscosity<br>▪ Temperature<br>▪ Volume flow<br>▪ Oil volume flow<br>▪ Water volume flow<br>▪ Water cut |

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

## 12.8 Pending diagnostic events

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

ℹ To call up the measures to rectify a diagnostic event:
- Via local display → 🗎 186
- Via web browser → 🗎 187
- Via "FieldCare" operating tool → 🗎 188
- Via "DeviceCare" operating tool → 🗎 188

ℹ Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 🗎 257

### Navigation

"Diagnostics" menu

**Diagnostics**

| | |
|---|---|
| Actual diagnostics | → 🗎 257 |
| Previous diagnostics | → 🗎 257 |

| | |
|---|---|
| Operating time from restart | → 🗎 257 |
| Operating time | → 🗎 257 |

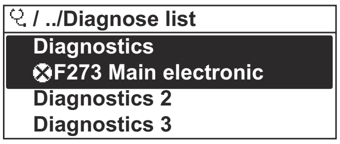
**Parameter overview with brief description**

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

## 12.9 Diagnostic list

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

**Navigation path**
Diagnostics → Diagnostic list



A0014006-EN

31 *Taking the example of the local display*

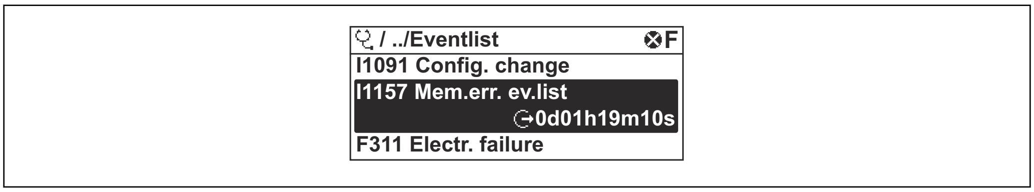
ℹ To call up the measures to rectify a diagnostic event:
- Via local display → 🗎 186
- Via web browser → 🗎 187
- Via "FieldCare" operating tool → 🗎 188
- Via "DeviceCare" operating tool → 🗎 188

## 12.10 Event logbook

### 12.10.1 Reading out the event logbook

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

**Navigation path**
**Diagnostics** menu → **Event logbook** submenu → Event list



/ ../Eventlist ⊗F
I1091 Config. change
I1157 Mem.err. ev.list
⊖0d01h19m10s
F311 Electr. failure

A0014008-EN

🗎 32 *Taking the example of the local display*

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

The event history includes entries for:
- Diagnostic events → 🗎 190
- Information events → 🗎 258

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

ℹ To call up the measures to rectify a diagnostic event:
- Via local display → 🗎 186
- Via web browser → 🗎 187
- Via "FieldCare" operating tool → 🗎 188
- Via "DeviceCare" operating tool → 🗎 188

ℹ For filtering the displayed event messages → 🗎 258

### 12.10.2 Filtering the event logbook

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

**Navigation path**
Diagnostics → Event logbook → Filter options

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

### 12.10.3 Overview of information events

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

| Info number | Info name |
|---|---|
| I1000 | --------(Device ok) |
| I1079 | Sensor changed |

| Info number | Info name |
|---|---|
| I1089 | Power on |
| I1090 | Configuration reset |
| I1091 | Configuration changed |
| I1092 | HistoROM backup deleted |
| I1111 | Density adjust failure |
| I11280 | ZeroPT verified and adjustm. recommended |
| I11281 | ZeroPT verif. and adjust. not recommend. |
| I1137 | Electronics changed |
| I1151 | History reset |
| I1155 | Reset electronics temperature |
| I1156 | Memory error trend |
| I1157 | Memory error event list |
| I1209 | Density adjustment ok |
| I1221 | Zero point adjust failure |
| I1222 | Zero point adjustment ok |
| I1256 | Display: access status changed |
| I1278 | I/O module restarted |
| I1335 | Firmware changed |
| I1361 | Web server: login failed |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1444 | Device verification passed |
| I1445 | Device verification failed |
| I1447 | Record application reference data |
| I1448 | Application reference data recorded |
| I1449 | Recording application ref. data failed |
| I1450 | Monitoring off |
| I1451 | Monitoring on |
| I1457 | Measurement error verification failed |
| I1459 | I/O module verification failed |
| I1460 | HBSI verification failed |
| I1461 | Sensor verification failed |
| I1462 | Sensor electronic module verific. failed |
| I1512 | Download started |
| I1513 | Download finished |
| I1514 | Upload started |
| I1515 | Upload finished |
| I1618 | I/O module 2 replaced |
| I1619 | I/O module 3 replaced |
| I1621 | I/O module 4 replaced |
| I1622 | Calibration changed |
| I1624 | All totalizers reset |
| I1625 | Write protection activated |

| Info number | Info name |
|---|---|
| I1626 | Write protection deactivated |
| I1627 | Web server: login successful |
| I1628 | Display: login successful |
| I1629 | CDI: login successful |
| I1631 | Web server access changed |
| I1632 | Display: login failed |
| I1633 | CDI: login failed |
| I1634 | Reset to factory settings |
| I1635 | Reset to delivery settings |
| I1639 | Max. switch cycles number reached |
| I1649 | Hardware write protection activated |
| I1650 | Hardware write protection deactivated |
| I1712 | New flash file received |
| I1725 | Sensor electronic module (ISEM) changed |
| I1726 | Configuration backup failed |

## 12.11 Resetting the measuring device

The entire device configuration or some of the configuration can be reset to a defined state with the **Device reset** parameter (→ 🗎 150).

### 12.11.1 Function scope of "Device reset" parameter

| Options | Description |
|---|---|
| Cancel | No action is executed and the user exits the parameter. |
| To delivery settings | Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting. |
| Restart device | The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged. |

## 12.12 Device information

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

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

▶ **Device information**

| | |
|---|---|
| Device tag | → 🗎 261 |
| Serial number | → 🗎 261 |
| Firmware version | → 🗎 261 |

| | |
|---|---|
| Device name | → 🗎 261 |
| Manufacturer | → 🗎 261 |
| Order code | → 🗎 261 |
| Extended order code 1 | → 🗎 261 |
| Extended order code 2 | → 🗎 261 |
| Extended order code 3 | → 🗎 262 |
| ENP version | → 🗎 262 |

### Parameter overview with brief description

| Parameter | Description | User interface | Factory setting |
|---|---|---|---|
| Device tag | Shows name of measuring point. | Character string comprising numbers, letters and special characters | Promass |
| Serial number | Shows the serial number of the measuring device. | Max. 11-digit character string comprising letters and numbers. | – |
| Firmware version | Shows the device firmware version installed. | Character string in the format xx.yy.zz | – |
| Device name | Shows the name of the transmitter.<br>ℹ The name can be found on the nameplate of the transmitter. | Promass 300/500 | – |
| Device name | | Character string comprising numbers, letters and special characters | Prowirl |
| Manufacturer | Displays the manufacturer. | Character string comprising numbers, letters and special characters | Endress+Hauser |
| Order code | Shows the device order code.<br>ℹ The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field. | Character string composed of letters, numbers and certain punctuation marks (e.g. /). | – |
| Extended order code 1 | Shows the 1st part of the extended order code.<br>ℹ 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>ℹ The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |

| Parameter | Description | User interface | Factory setting |
|---|---|---|---|
| Extended order code 3 | Shows the 3rd part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| ENP version | Shows the version of the electronic nameplate (ENP). | Character string | 2.02.00 |

## 12.13 Firmware history

| Release date | Firmware version | Order code for "Firmware version" | Firmware changes | Documentation type | Documentation |
|---|---|---|---|---|---|
| 2023 | 01.00.zz | Option **61** | Original firmware | Operating Instructions | BA02118D/06/EN/01.21 |

It is possible to flash the firmware to the current version using 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 → Downloads
- Specify the following details:
  - Product root: e.g. 8X3B
    The product root is the first part of the order code: see the nameplate on the device.
  - Text search: Manufacturer's information
  - Media type: Documentation – Technical Documentation

# 13 Maintenance

## 13.1 Maintenance tasks

No special maintenance work is required.

### 13.1.1 Exterior cleaning

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

## 13.2 Measuring and test equipment

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

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

List of some of the measuring and testing equipment: → 🗎 266→ 🗎 267

## 13.3 Endress+Hauser services

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

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

# 14 Repair

## 14.1 General information

### 14.1.1 Repair and conversion concept

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

### 14.1.2 Notes for repair and conversion

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

## 14.2 Spare parts

*Device Viewer* (www.endress.com/deviceviewer):
All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

ℹ Measuring device serial number:
- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→ 🗎 261) in the **Device information** submenu.

## 14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

## 14.4 Return

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

1. Refer to the web page for information:
   http://www.endress.com/support/return-material
   ↳ Select the region.
2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

## 14.5 Disposal

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

### 14.5.1 Removing the measuring device

1. Switch off the device.

**⚠ WARNING**

**Danger to persons from process conditions!**

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

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

### 14.5.2 Disposing of the measuring device

**⚠ WARNING**

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

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

Observe the following notes during disposal:

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

# 15 Accessories

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

## 15.1 Device-specific accessories

### 15.1.1 For the transmitter

| Accessories | Description |
|---|---|
| Proline 300 transmitter | Transmitter for replacement or storage. Use the order code to define the following specifications:<br>▪ Approvals<br>▪ Output<br>▪ Input<br>▪ Display/operation<br>▪ Housing<br>▪ Software<br>ℹ Order code: 8X3BXX<br>🕮 Installation Instructions EA01200D |
| Remote display and operating module DKX001 | ▪ If ordered directly with the measuring device:<br>Order code for "Display; operation", option O "Remote display 4-line, illuminated; 10 m (30 ft) cable; touch control"<br>▪ If ordered separately:<br>  ▪ Measuring device: order code for "Display; operation", option M "W/o, prepared for remote display"<br>  ▪ DKX001: Via the separate product structure DKX001<br>▪ If ordered subsequently:<br>DKX001: Via the separate product structure DKX001<br>**Mounting bracket for DKX001**<br>▪ If ordered directly: order code for "Accessory enclosed", option RA "Mounting bracket, pipe 1/2""<br>▪ If ordered subsequently: order number: 71340960<br>**Connecting cable (replacement cable)**<br>Via the separate product structure: DKX002<br>ℹ Further information on display and operating module DKX001→ 🗎 291.<br>🕮 Special Documentation SD01763D |
| External WLAN antenna | External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area".<br>ℹ ▪ The external WLAN antenna is not suitable for use in hygienic applications.<br>▪ Additional information regarding the WLAN interface → 🗎 68.<br>ℹ Order number: 71351317<br>🕮 Installation Instructions EA01238D |
| Weather protection cover | Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.<br>ℹ Order number: 71343505<br>🕮 Installation Instructions EA01160D |

## 15.2 Communication-specific accessories

| Accessories | Description |
|---|---|
| Fieldgate FXA42 | Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices<br>▪ Technical Information TI01297S<br>▪ Operating Instructions BA01778S<br>▪ Product page: www.endress.com/fxa42 |
| Field Xpert SMT50 | The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.<br>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.<br>▪ Technical Information TI01342S<br>▪ Operating Instructions BA01709S<br>▪ Product page: www.endress.com/smt50 |
| Field Xpert SMT70 | The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.<br>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.<br>▪ Technical Information TI01342S<br>▪ Operating Instructions BA01709S<br>▪ Product page: www.endress.com/smt70 |
| Field Xpert SMT77 | The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.<br>▪ Technical Information TI01418S<br>▪ Operating Instructions BA01923S<br>▪ Product page: www.endress.com/smt77 |

## 15.3 Service-specific accessories

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

| **Accessory** | **Description** |
|---|---|
| FieldCare | FDT-based plant asset management tool from Endress+Hauser.<br>It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.<br>Operating Instructions BA00027S and BA00059S |
| DeviceCare | Tool for connecting and configuring Endress+Hauser field devices.<br>Innovation brochure IN01047S |

## 15.4 System components

| **Accessories** | **Description** |
|---|---|
| Memograph M graphic data manager | The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.<br>▪ Technical Information TI00133R<br>▪ Operating Instructions BA00247R |
| Cerabar M | The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.<br>▪ Technical Information TI00426P and TI00436P<br>▪ Operating Instructions BA00200P and BA00382P |
| Cerabar S | The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.<br>▪ Technical Information TI00383P<br>▪ Operating Instructions BA00271P |
| iTEMP | The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.<br>"Fields of Activity" document FA00006T |

# 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 | The device consists of a transmitter and a sensor.<br>The device is available as a compact version:<br>The transmitter and sensor form a mechanical unit.<br>Information on the structure of the device → 🗎 14 |

## 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] | [t/h] | [tn. sh./h] |
| 300 | 12 | 0 to 4 100 | 0 to 4 520 |
| 350 | 14 | 0 to 4 100 | 0 to 4 520 |
| 400 | 16 | 0 to 4 100 | 0 to 4 520 |

#### Measuring range for gases

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

$\dot{m}_{max(G)}$ = minimum of $(\dot{m}_{max(F)} \cdot \rho_G : x)$ 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$^3$] at operating conditions |
| **x** | Limitation constant for max. gas flow [kg/m$^3$] |
| **$c_G$** | Sound velocity (gas) [m/s] |
| **$d_i$** | Measuring tube internal diameter [m] |
| **π** | Pi |
| **n = 4** | Number of measuring tubes |

| DN | | x |
|---|---|---|
| [mm] | [in] | [kg/m$^3$] |
| 300 | 12 | 200 |
| 350 | 14 | 200 |
| 400 | 16 | 200 |

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

ℹ Flow limit → 🗎 287

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Operable flow range

Over 1000 : 1.

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

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Input signal

### External measured values

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

ℹ Various pressure and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 🗎 268

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

*Current input*

The measured values are written from the automation system to the measuring device via the current input → 🗎 271.

*Digital communication*

The measured values are written by the automation system via PROFINET with Ethernet-APL.

### Current input 0/4 to 20 mA

| | |
|---|---|
| **Current input** | 0/4 to 20 mA (active/passive) |
| **Current span** | ▪ 4 to 20 mA (active)<br>▪ 0/4 to 20 mA (passive) |
| **Resolution** | 1 µA |
| **Voltage drop** | Typically: 0.6 to 2 V for 3.6 to 22 mA (passive) |
| **Maximum input voltage** | ≤ 30 V (passive) |
| **Open-circuit voltage** | ≤ 28.8 V (active) |
| **Possible input variables** | ▪ Pressure<br>▪ Temperature<br>▪ Density |

### Status input

| | |
|---|---|
| **Maximum input values** | ▪ DC −3 to 30 V<br>▪ If status input is active (ON): $R_i$ >3 kΩ |
| **Response time** | Configurable: 5 to 200 ms |

| | |
|---|---|
| **Input signal level** | Low signal: DC −3 to +5 V<br>High signal: DC 12 to 30 V |
| **Assignable functions** | Off<br>Reset the individual totalizers separately<br>Reset all totalizers<br>Flow override |

## 16.4 Output

Output signal

### PROFINET with Ethernet-APL

| | |
|---|---|
| **Device use** | **Device connection to an APL field switch**<br>The device may only be operated according to the following APL port classifications:<br>- If used in hazardous areas: SLAA or SLAC [1)]<br>- If used in non-hazardous areas: SLAX<br>Connection values of APL field switch (for example corresponds to APL port classification SPCC or SPAA, for instance):<br>- Maximum input voltage: 15 $V_{DC}$<br>- Minimum output values: 0.54 W<br>**Device connection to an SPE switch**<br>- In non-hazardous areas, the device can be used with a suitable SPE switch: The device can be connected to an SPE switch with a maximum voltage of 30 $V_{DC}$ and a minimum output power of 1.85 W.<br>- The SPE switch must support the 10BASE-T1L standard and the PoDL power classes 10, 11 or 12 and have a function to disable power class recognition. |
| **PROFINET** | According to IEC 61158 and IEC 61784 |
| **Ethernet-APL** | According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated |
| **Data transfer** | 10 Mbit/s |
| **Current consumption** | **Transmitter**<br>- Max. 400 mA(24 V)<br>- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz) |
| **Permitted supply voltage** | 9 to 30 V |
| **Network connection** | With integrated reverse polarity protection |

1) For more information on using the device in the hazardous area, see the Ex-specific Safety Instructions

### Current output 4 to 20 mA

| | |
|---|---|
| **Signal mode** | Can be set to:<br>- Active<br>- Passive |
| **Current span** | Can be set to:<br>- 4 to 20 mA NAMUR<br>- 4 to 20 mA US<br>- 4 to 20 mA<br>- 0 to 20 mA (only if the signal mode is active)<br>- Fixed current |
| **Maximum output values** | 22.5 mA |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Maximum input voltage** | DC 30 V (passive) |
| **Load** | 0 to 700 Ω |
| **Resolution** | 0.38 µA |

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

## Pulse/frequency/switch output

| | |
|---|---|
| **Function** | Can be configured as pulse, frequency or switch output |
| **Version** | Open collector<br>Can be set to:<br>▪ Active<br>▪ Passive<br>▪ Passive NAMUR<br>ℹ Ex-i, passive |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Voltage drop** | For 22.5 mA: ≤ DC 2 V |
| **Pulse output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Maximum output current** | 22.5 mA (active) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Pulse width** | Configurable: 0.05 to 2 000 ms |
| **Maximum pulse rate** | 10 000 Impulse/s |
| **Pulse value** | Configurable |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow |
| **Frequency output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Maximum output current** | 22.5 mA (active) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Output frequency** | Configurable: end value frequency 2 to 10 000 Hz($f_{max}$ = 12 500 Hz) |
| **Damping** | Configurable: 0 to 999.9 s |
| **Pulse/pause ratio** | 1:1 |

| | |
|---|---|
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation damping 0<br>▪ Signal asymmetry<br>▪ Exciter current 0<br>ℹ The range of options increases if the measuring device has one or more application packages. |
| **Switch output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Switching behavior** | Binary, conductive or non-conductive |
| **Switching delay** | Configurable: 0 to 100 s |
| **Number of switching cycles** | Unlimited |
| **Assignable functions** | ▪ Off<br>▪ On<br>▪ Diagnostic behavior<br>▪ Limit value<br>  ▪ Mass flow<br>  ▪ Volume flow<br>  ▪ Corrected volume flow<br>  ▪ Density<br>  ▪ Reference density<br>  ▪ Temperature<br>  ▪ Totalizer 1-3<br>▪ Flow direction monitoring<br>▪ Status<br>  ▪ Partially filled pipe detection<br>  ▪ Low flow cut off<br>ℹ The range of options increases if the measuring device has one or more application packages. |

## Relay output

| | |
|---|---|
| **Function** | Switch output |
| **Version** | Relay output, galvanically isolated |
| **Switching behavior** | Can be set to:<br>▪ NO (normally open), factory setting<br>▪ NC (normally closed) |

| | |
|---|---|
| **Maximum switching capacity (passive)** | ▪ DC 30 V, 0.1 A<br>▪ AC 30 V, 0.5 A |
| **Assignable functions** | ▪ Off<br>▪ On<br>▪ Diagnostic behavior<br>▪ Limit value<br>  ▪ Mass flow<br>  ▪ Volume flow<br>  ▪ Corrected volume flow<br>  ▪ Density<br>  ▪ Reference density<br>  ▪ Temperature<br>  ▪ Totalizer 1-3<br>▪ Flow direction monitoring<br>▪ Status<br>  ▪ Partially filled pipe detection<br>  ▪ Low flow cut off<br>ℹ The range of options increases if the measuring device has one or more application packages. |

### User-configurable input/output

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

The following inputs and outputs are available for assignment:
- Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Pulse/frequency/switch output
- Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Status input

Signal on alarm

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

### PROFINET with Ethernet-APL

| | |
|---|---|
| **Device diagnostics** | Diagnostics according to PROFINET PA Profile 4 |

### Current output 0/4 to 20 mA

*4 to 20 mA*

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

*0 to 20 mA*

| | |
|---|---|
| **Failure mode** | Choose from:<br>▪ Maximum alarm: 22 mA<br>▪ Definable value between: 0 to 20.5 mA |

## Pulse/frequency/switch output

| **Pulse output** | |
|---|---|
| **Failure mode** | Choose from:<br>▪ Actual value<br>▪ No pulses |
| **Frequency output** | |
| **Failure mode** | Choose from:<br>▪ Actual value<br>▪ 0 Hz<br>▪ Definable value between: 2 to 12 500 Hz |
| **Switch output** | |
| **Failure mode** | Choose from:<br>▪ Current status<br>▪ Open<br>▪ Closed |

## Relay output

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

## Local display

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

Status signal as per NAMUR recommendation NE 107

## Interface/protocol

- Via digital communication:
  PROFINET with Ethernet-APL
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

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

## Web browser

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

## Light emitting diodes (LED)

| | |
|---|---|
| **Status information** | Status indicated by various light emitting diodes<br>The following information is displayed depending on the device version:<br>▪ Supply voltage active<br>▪ Data transmission active<br>▪ Device alarm/error has occurred<br>▪ PROFINET network available<br>▪ PROFINET connection established<br>▪ PROFINET blinking feature<br>ℹ Diagnostic information via light emitting diodes → 🗎 182 |

### Low flow cut off

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

### Galvanic isolation

The outputs are galvanically isolated:

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

### protocol-specific data

| | |
|---|---|
| **Protocol** | Application layer protocol for decentral device periphery and distributed automation, Version 2.43 |
| **Communication type** | Ethernet Advanced Physical Layer 10BASE-T1L |
| **Conformance Class** | Conformance Class B (PA) |
| **Netload Class** | PROFINET Netload Robustness Class 2 10 Mbit/s |
| **Baud rates** | 10 Mbit/s Full-duplex |
| **Cycle times** | 64 ms |
| **Polarity** | Automatic correction of crossed "APL signal +" and "APL signal -" signal lines |
| **Media Redundancy Protocol (MRP)** | Not possible (point-to-point connection to APL field switch) |
| **System redundancy support** | System redundancy S2 (2 AR with 1 NAP) |
| **Device profile** | PROFINET PA profile 4 (Application interface identifier API: 0x9700) |
| **Manufacturer ID** | 17 |
| **Device type ID** | 0xA43B |
| **Device description files (GSD, DTM, FDI)** | Information and files at:<br>▪ www.endress.com → Download Area<br>▪ www.profibus.com |
| **Supported connections** | ▪ 2x AR (IO Controller AR)<br>▪ 2x AR (IO Supervisor Device AR connection allowed) |
| **Configuration options for measuring device** | ▪ DIP switches on the electronics module, for device name assignment (last part)<br>▪ Asset management software (FieldCare, DeviceCare, Field Xpert)<br>▪ Integrated Web server via Web browser and IP address<br>▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device.<br>▪ Onsite operation |
| **Configuration of the device name** | ▪ DIP switches on the electronics module, for device name assignment (last part)<br>▪ DCP protocol<br>▪ Asset management software (FieldCare, DeviceCare, Field Xpert)<br>▪ Integrated Web server |

| | |
|---|---|
| **Supported functions** | ▪ Identification & Maintenance, simple device identifier via:<br>  ▪ Control system<br>  ▪ Nameplate<br>▪ Measured value status<br>The process variables are communicated with a measured value status<br>▪ Blinking feature via the local display for simple device identification and assignment<br>▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM with FDI package) |
| **System integration** | Information regarding system integration .<br>▪ Cyclic data transmission<br>▪ Overview and description of the modules<br>▪ Status coding<br>▪ Factory setting |

## 16.5 Power supply

### Terminal assignment

→ 🗎 34

### Available device plugs

→ 🗎 34

### Pin assignment, device plug

→ 🗎 34

### Supply voltage

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

### Power consumption

**Transmitter**

Max. 10 W (active power)

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

### Current consumption

**Transmitter**

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

### Power supply failure

- Totalizers stop at the last value measured.
- 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.

### Overcurrent protection element

The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own.

- The circuit breaker must be easy to reach and labeled accordingly.
- Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.

**Electrical connection**

→ 🗎 35

**Potential equalization**

→ 🗎 38

**Terminals**

Spring-loaded terminals: Suitable for strands and strands with ferrules.
Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

**Cable entries**

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

**Cable specification**

→ 🗎 31

**Overvoltage protection**

| | |
|---|---|
| **Mains voltage fluctuations** | → 🗎 279 |
| **Overvoltage category** | Overvoltage category II |
| **Short-term, temporary overvoltage** | Up to 1200 V between cable and ground, for max. 5 s |
| **Long-term, temporary overvoltage** | Up to 500 V between cable and ground |

## 16.6 Performance characteristics

**Reference operating conditions**

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

ℹ To obtain measured errors, use the *Applicator* sizing tool → 🗎 267

**Maximum measured error**

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

### Base accuracy

ℹ Design fundamentals → 🗎 283

*Mass flow and volume flow (liquids)*

- ±0.05 % o.r. (optional for mass flow: PremiumCal; order code for "Calibration flow", option D)
- ±0.10 % o.r. (standard)

*Mass flow (gases)*

±0.35 % o.r.

*Density (liquids)*

| Under reference conditions<br>[g/cm³] | Standard density calibration [1]<br>[g/cm³] | Wide-range Density specification [2] [3]<br>[g/cm³] |
|---|---|---|
| ±0.0005 | ±0.01 | ±0.001 |

1) Valid over the entire temperature and density range
2) Valid range for special density calibration: 0 to 2 g/cm³, +5 to +80 °C (+41 to +176 °F)
3) order code for "Application package", option EE "Special density"

*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] |
| 300 | 12 | 137 | 5.03 |
| 350 | 14 | 137 | 5.03 |
| 400 | 16 | 137 | 5.03 |

## Flow values

Flow values as turndown parameters depending on the nominal diameter.

*SI units*

| DN | 1:1 | 1:10 | 1:20 | 1:50 | 1:100 | 1:500 |
|---|---|---|---|---|---|---|
| [mm] | [kg/h] | [kg/h] | [kg/h] | [kg/h] | [kg/h] | [kg/h] |
| 300 | 4 100 000 | 410 000 | 205 000 | 82 000 | 41 000 | 8 200 |
| 350 | 4 100 000 | 410 000 | 205 000 | 82 000 | 41 000 | 8 200 |
| 400 | 4 100 000 | 410 000 | 205 000 | 82 000 | 41 000 | 8 200 |

*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] |
| 12 | 150 700 | 15 070 | 7 535 | 3 014 | 1 507 | 301.4 |
| 14 | 150 700 | 15 070 | 7 535 | 3 014 | 1 507 | 301.4 |
| 16 | 150 700 | 15 070 | 7 535 | 3 014 | 1 507 | 301.4 |

## Accuracy of outputs

The outputs have the following base accuracy specifications.

*Current output*

| | |
|---|---|
| **Accuracy** | ±5 µA |

*Pulse/frequency output*

o.r. = of reading

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

### Repeatability

o.r. = of reading; 1 $g/cm^3$ = 1 kg/l; T = medium temperature

**Base repeatability**

ℹ Design fundamentals → 🗎 283

*Mass flow and volume flow (liquids)*

±0.025 % o.r. (PremiumCal)
±0.05 % o.r.

*Mass flow (gases)*

±0.25 % o.r.

*Density (liquids)*

±0.00025 $g/cm^3$

*Temperature*

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

### Response time

The response time depends on the configuration (damping).

### Influence of ambient temperature

**Current output**

| | |
|---|---|
| **Temperature coefficient** | Max. 1 μA/°C |

**Pulse/frequency output**

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

### Influence of medium temperature

**Mass flow and volume flow**

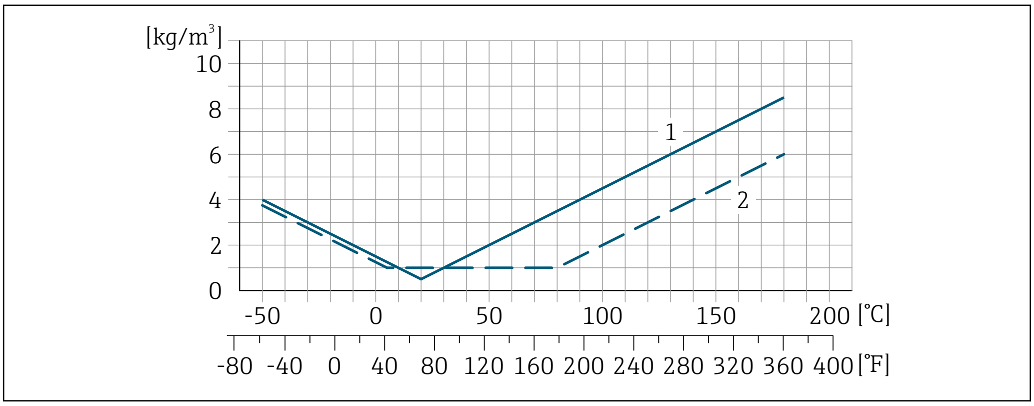
o.f.s. = of full scale value

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

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

**Density**
If there is a difference between the density calibration temperature and the process temperature, the measured error of the sensors is typically ±0.00005 $g/cm^3$/°C (±0.000025 $g/cm^3$/°F). Field density adjustment is possible.

**Wide-range density specification (special density calibration)**
If the process temperature is outside the valid range (→ 🗎 280) the measured error is ±0.00005 $g/cm^3$ /°C (±0.000025 $g/cm^3$ /°F)



1 *Field density adjustment, for example at +20 °C (+68 °F)*
2 *Special density calibration*

**Temperature**
±0.005 · T °C (± 0.005 · (T − 32) °F)

Influence of medium pressure

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

o.r. = of reading

ℹ 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] | | |
| 300 | 12 | −0.009 | −0.0006 |
| 350 | 14 | −0.009 | −0.0006 |
| 400 | 16 | −0.009 | −0.0006 |

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

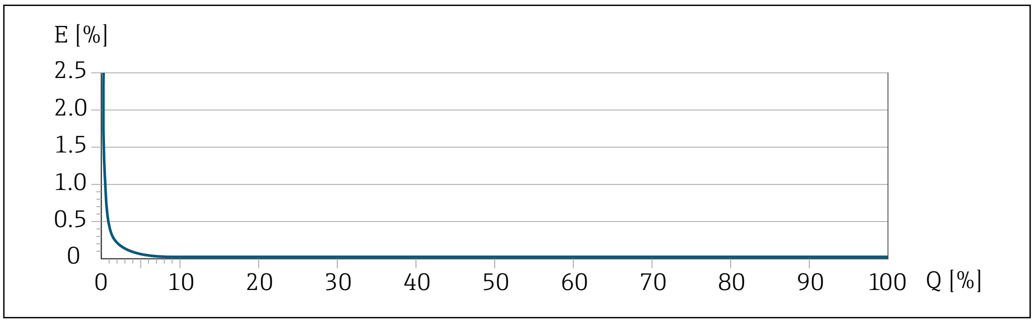
*Calculation of the maximum measured error as a function of the flow rate*

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

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

| Flow rate | Maximum repeatability in % o.r. |
|---|---|
| $\geq \frac{½ \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$<br>A0021335 | $\pm \text{BaseRepeat}$<br>A0021340 |
| $< \frac{½ \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$<br>A0021336 | $\pm ½ \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$<br>A0021337 |

### Example of maximum measured error



A0028808

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

## 16.7 Mounting

Mounting requirements

→ 🗎 21

## 16.8 Environment

Ambient temperature range

→ 🗎 23

### Temperature tables

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

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

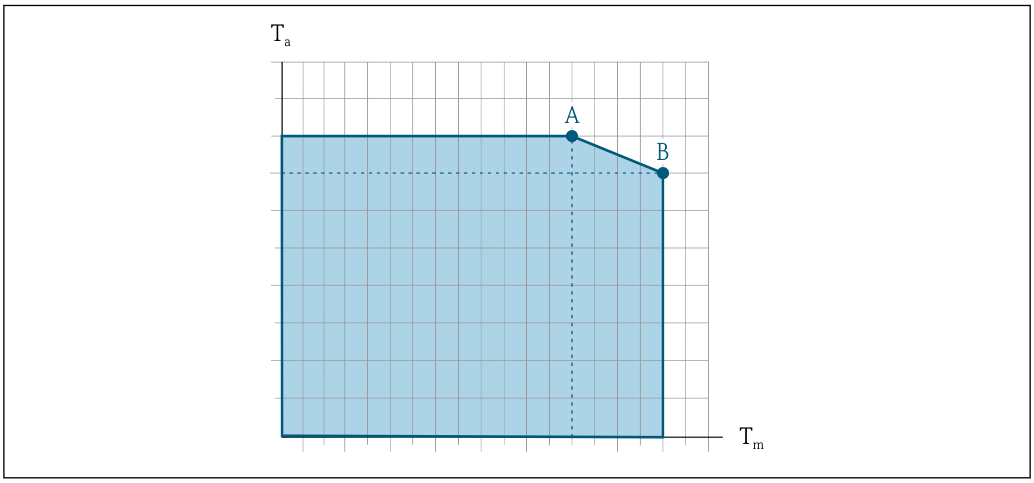
| | |
|---|---|
| Storage temperature | –50 to +80 °C (–58 to +176 °F) |
| Climate class | DIN EN 60068-2-38 (test Z/AD) |
| Relative humidity | The device is suitable for use in outdoor and indoor areas with a relative humidity of 4 to 95%. |

| | |
|---|---|
| Operating height | According to EN 61010-1<br>▪ ≤ 2 000 m (6 562 ft)<br>▪ > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series) |
| Degree of protection | **Transmitter**<br>▪ IP66/67, Type 4X enclosure, suitable for pollution degree 4<br>▪ When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2<br>▪ Display module: IP20, Type 1 enclosure, suitable for pollution degree 2<br>**Optional**<br>Order code for "Sensor options", option CM "IP69<br>**External WLAN antenna**<br>IP67 |
| Vibration- and shock-resistance | **Vibration sinusoidal, in accordance with IEC 60068-2-6**<br>▪ 2 to 8.4 Hz, 3.5 mm peak<br>▪ 8.4 to 2 000 Hz, 1 g peak<br>**Vibration broad-band random, according to IEC 60068-2-64**<br>▪ 10 to 200 Hz, 0.003 $g^2$/Hz<br>▪ 200 to 2 000 Hz, 0.001 $g^2$/Hz<br>▪ Total: 1.54 g rms<br>**Shock half-sine, according to IEC 60068-2-27**<br>6 ms 30 g<br>**Rough handling shocks, according to IEC 60068-2-31** |
| Mechanical load | Transmitter housing:<br>▪ Protect against mechanical effects, such as shock or impact<br>▪ Do not use as a ladder or climbing aid |
| Electromagnetic compatibility (EMC) | Details are provided in the Declaration of Conformity.<br>This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments. |

## 16.9 Process

| | |
|---|---|
| Medium temperature range | –50 to +180 °C (–58 to +356 °F) |

### Dependency of ambient temperature on medium temperature



*33 Exemplary representation, values in the table below.*

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

ℹ Values for devices that are used in the hazardous area:
Separate Ex documentation (XA) for the device → 🖹 299.

| **Not insulated** | | | | **Insulated** | | | |
|---|---|---|---|---|---|---|---|
| **A** | | **B** | | **A** | | **B** | |
| **$T_a$** | **$T_m$** | **$T_a$** | **$T_m$** | **$T_a$** | **$T_m$** | **$T_a$** | **$T_m$** |
| 60 °C (140 °F) | 170 °C (338 °F) | 55 °C (131 °F) | 180 °C (356 °F) | 60 °C (140 °F) | 110 °C (230 °F) | 50 °C (122 °F) | 180 °C (356 °F) |

Density

0 to 5 000 kg/$m^3$ (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.

ℹ 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.

If there is a need to drain the leaking medium into a discharge device, the sensor should be fitted with a rupture disk. Connect the discharge to the additional threaded connection .

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

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

Maximum pressure: 2 bar (29.0 psi)

### Burst pressure of the sensor housing

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

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

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]** |
| 300 | 12 | 28 | 406 |
| 350 | 14 | 28 | 406 |
| 400 | 16 | 28 | 406 |

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 5.5 to 6.5 bar (80 to 94 psi) can be used (order code for "Sensor option", option CA "rupture disk").

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

**Flow limit**

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

For an overview of the full scale values for the measuring range, see the "Measuring range" section → 🗎 270

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

To calculate the flow limit, use the *Applicator* sizing tool → 🗎 267

Pressure loss

ℹ To calculate the pressure loss, use the *Applicator* sizing tool → 🗎 267

System pressure

→ 🗎 23

## 16.10 Mechanical construction

Design, dimensions

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

Weight

All values (weight exclusive of packaging material) refer to devices with ASME B16.5 Class 150 flanges. Weight specifications including transmitter as per order code for "Housing", option A "Aluminum, coated".

Different values due to different transmitter versions:
- Transmitter version for the hazardous area
  (Order code for "Housing", option A "Aluminum, coated"; Ex d): +2 kg (+4.4 lbs)
- Cast transmitter version, stainless
  (Order code for "Housing", option L "Cast, stainless"): +6 kg (+13 lbs)

### Weight in SI units

| DN [mm] | Weight [kg] |
|---|---|
| 300 | 553 |
| 350 | 577 |
| 400 | 601 |

### Weight in US units

| DN [in] | Weight [lbs] |
|---|---|
| 12 | 1219 |
| 14 | 1272 |
| 16 | 1325 |

Materials

### Transmitter housing

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

*Window material*

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

### Cable entries/cable glands

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

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

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

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

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

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

### Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel, 1.4404 (316L)

### Measuring tubes

Stainless steel, 1.4404 (316/316L);
Manifold: stainless steel, 1.4404 (316/316L)

### Process connections

Flanges in accordance with EN 1092-1 (DIN2501) / ASME B 16.5:
Stainless steel, 1.4404 (F316/F316L)

ℹ Available process connections→ 🗎 290

### Seals

Welded process connections without internal seals

### Accessories

*Protective cover*

Stainless steel, 1.4404 (316L)

*External WLAN antenna*

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

Process connections

Fixed flange connections:
- EN 1092-1 (DIN 2501) flange
- EN 1092-1 (DIN 2512N) flange
- ASME B16.5 flange

ℹ Process connection materials → 🗎 289

Surface roughness

All data refer to parts in contact with the medium. The following surface roughness categories can be ordered.
Not polished

## 16.11 Operability

Languages

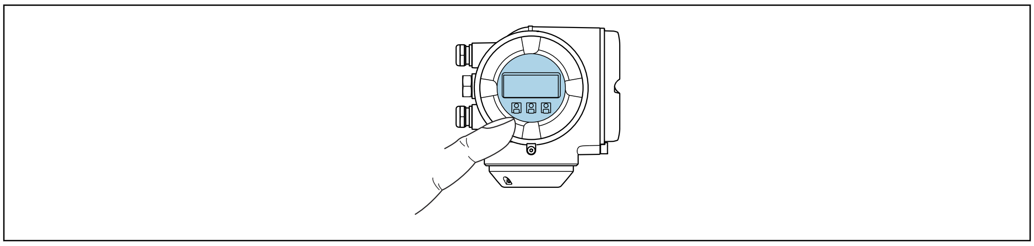
Can be operated in the following languages:
- Via local operation
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish
- Via Web browser
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian,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

Local operation

**Via display module**

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

ℹ Information about WLAN interface → 🗎 68



A0026785

34 *Operation with touch control*

*Display elements*

- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured

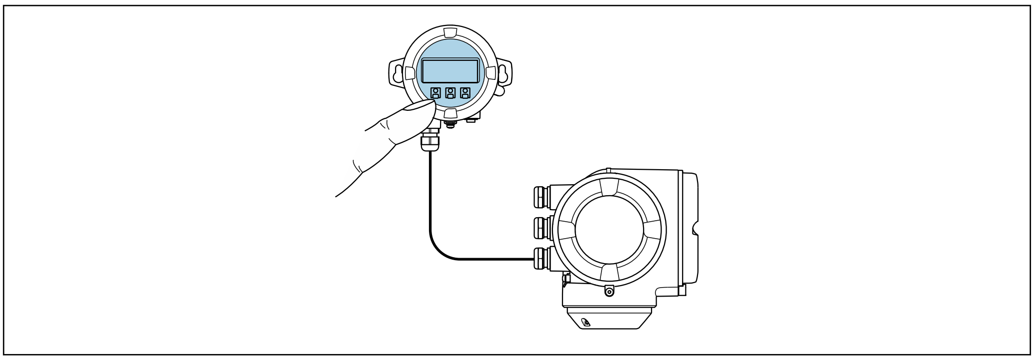
*Operating elements*

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

### Via remote display and operating module DKX001

ℹ The remote display and operating module DKX001 is available as an optional extra → 🗎 266.

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



35 *Operation via remote display and operating module DKX001*

*Display and operating elements*

The display and operating elements correspond to those of the display module → 🗎 290.

*Housing material*

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

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

*Cable entry*

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

*Connecting cable*

→ 🗎 32

*Dimensions*

Information about dimensions:

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

| | |
|---|---|
| Remote operation | → 🗎 67 |
| Service interface | → 🗎 68 |

## Supported operating tools

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

| Supported operating tools | Operating unit | Interface | Additional information |
|---|---|---|---|
| Web browser | Notebook, PC or tablet with Web browser | ▪ CDI-RJ45 service interface<br>▪ WLAN interface | Special Documentation for the device → 🗎 300 |
| DeviceCare SFE100 | Notebook, PC or tablet with Microsoft Windows system | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Fieldbus protocol | → 🗎 267 |
| FieldCare SFE500 | Notebook, PC or tablet with Microsoft Windows system | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Fieldbus protocol | → 🗎 267 |
| Field Xpert | SMT70/77/50 | ▪ All fieldbus protocols<br>▪ WLAN interface<br>▪ Bluetooth<br>▪ CDI-RJ45 service interface | Operating Instructions BA01202S<br>Device description files: Use update function of handheld terminal |
| SmartBlue app | Smart phone or tablet with iOs or Android | WLAN | → 🗎 267 |

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

- Field Device Manager (FDM) from Honeywell → www.process.honeywell.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

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

### Web server

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

Access to the network is required for the Ethernet-APL connection.

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

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

- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)

- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package → 🗎 297)

📖 Web server special documentation → 🗎 300

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HistoROM data management

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

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

### Additional information on the data storage concept

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

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

### Data backup

#### Automatic

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

#### Manual

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

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

### Data transmission

**Manual**
- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.: GSDML for PROFINET

### Event list

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

### Data logging

**Manual**

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

## 16.12 Certificates and approvals

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

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

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**CE mark**

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

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**UKCA marking**

The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

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

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**Ex approval**

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

Certification PROFINET with Ethernet-APL

**PROFINET interface**

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET PA Profile 4
  - PROFINET Netload Robustness Class 2 10 Mbps
  - APL conformance test
- 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) UK/G1/x (x = category)
  on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"
  a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
  b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices not bearing this marking (without PED or UKCA) are designed and manufactured according to sound engineering practice. They meet the requirements of
  a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or
  b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105.
  The scope of application is indicated
  a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or
  b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.

Radio approval

The measuring device has radio approval.

📖 For detailed information on the radio approval, see the Special Documentation → 🗎 300

Additional certification

**CRN approval**

Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.

### Tests and certificates

- EN10204-3.1 material certificate, wetted parts and sensor housing
- Pressure test, internal process, inspection certificate
- PMI test (XRF), internal procedure, wetted parts, test report
- EN10204-2.1 confirmation of compliance with the order and EN10204-2.2 test report

*Testing of welded connections*

| Option | Test standard | | | | Component | |
|---|---|---|---|---|---|---|
| | ISO 23277 AL2x (PT)<br>ISO 10675-1 AL1 (RT, DR) | ASME B31.3 NFS | ASME VIII Div.1 Appx. 4+8 | NORSOK M-601 | Measuring tube | Process connection |
| KF | x | | | | PT | RT |
| KK | | x | | | PT | RT |
| KP | | | x | | PT | RT |

| Option | Test standard | | | | Component | |
|---|---|---|---|---|---|---|
| | ISO 23277 AL2x (PT)<br>ISO 10675-1 AL1 (RT, DR) | ASME B31.3 NFS | ASME VIII Div.1 Appx. 4+8 | NORSOK M-601 | Measuring tube | Process connection |
| KR | | | | x | VT, PT | VT, RT |
| PT = penetrant testing, RT = radiographic testing, VT = visual testing<br>All options with test report | | | | | | |

Other standards and guidelines

- EN 60529
  Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
  Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
  Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- IEC/EN 61326-2-3
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
  The application of the pressure equipment directive to process control devices
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnosis of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications
- NAMUR NE 132
  Coriolis mass meter
- NACE MR0103
  Materials resistant to sulfide stress cracking in corrosive petroleum refining environments.
- NACE MR0175/ISO 15156-1
  Materials for use in H2S-containing Environments in Oil and Gas Production.
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components.
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

## 16.13 Application packages

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

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

Detailed information on the application packages:
Special Documentation for the device → 🗎 299

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**Diagnostic functionality**

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

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

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

Data logging (line recorder):
- Memory capacity for up to 1000 measured values is activated.
- 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.
- Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.

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

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**Heartbeat Technology**

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

**Heartbeat Verification**
Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

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

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

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**Concentration measurement**

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

Calculation and outputting of fluid concentrations.

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

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

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**Special density**

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

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

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

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

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**Petroleum**

Order code for "Application package", option EJ "Petroleum"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package.

- 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.

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**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 for order → 🗎 266

## 16.15 Supplementary documentation

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

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Standard documentation

### Brief Operating Instructions

*Brief Operating Instructions for the sensor*

| Measuring device | Documentation code |
|---|---|
| Proline Promass X | KA01288D |

*Brief Operating Instructions for transmitter*

| Measuring device | Documentation code |
|---|---|
| Proline 300 | KA01517D |

### Technical Information

| Measuring device | Documentation code |
|---|---|
| Promass X 300 | TI01279D |

### Description of Device Parameters

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

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Supplementary device-dependent documentation

### Safety instructions

Safety instructions for electrical equipment for hazardous areas.

| Contents | Documentation code |
|---|---|
| ATEX/IECEx Ex d/Ex de | XA01405D |
| ATEX/IECEx Ex ec | XA01439D |
| cCSAus XP | XA01373D |
| cCSAus Ex d/ Ex de | XA01372D |
| cCSAus Ex nA | XA01507D |
| INMETRO Ex d/Ex de | XA01468D |
| INMETRO Ex ec | XA01470D |
| NEPSI Ex d/Ex de | XA01469D |
| NEPSI Ex nA | XA01471D |
| EAC Ex d/Ex de | XA01656D |

| Contents | Documentation code |
|---|---|
| EAC Ex nA | XA01657D |
| JPN Ex d | XA01778D |

*Remote display and operating module DKX001*

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

## Special Documentation

| Contents | Documentation code |
|---|---|
| Information on the Pressure Equipment Directive | SD01614D |
| Remote display and operating module DKX001 | SD01763D |
| Radio approvals for WLAN interface for A309/A310 display module | SD01793D |
| Web server | SD02760D |
| Heartbeat Technology | SD02731D |
| Concentration measurement | SD02735D |
| Petroleum | SD02739D |

## Installation Instructions

| Contents | Comment |
|---|---|
| Installation instructions for spare part sets and accessories | ▪ Access the overview of all the available spare part sets via *Device Viewer* → 🗎 264<br>▪ Accessories available for order with Installation Instructions → 🗎 266 |

# Index

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