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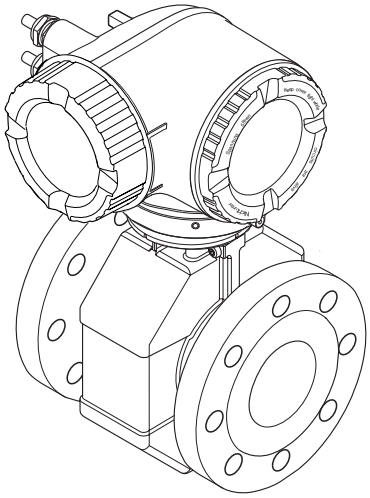
Valid as of version
01.00.zz (Device firmware)



# Operating Instructions
# **Proline Promag P 300 EtherNet/IP**

Electromagnetic flowmeter



Endress+Hauser
People for Process Automation

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

# Table of contents


1 About this document . . . . . 6
1.1 Document function . . . . . 6
1.2 Symbols used . . . . . 6
1.2.1 Safety symbols . . . . . 6
1.2.2 Electrical symbols . . . . . 6
1.2.3 Communication symbols . . . . . 6
1.2.4 Tool symbols . . . . . 7
1.2.5 Symbols for certain types of information . . . . . 7
1.2.6 Symbols in graphics . . . . . 7
1.3 Documentation . . . . . 8
1.3.1 Standard documentation . . . . . 8
1.3.2 Supplementary device-dependent documentation . . . . . 8
1.4 Registered trademarks . . . . . 8

2 Basic safety instructions . . . . . 9
2.1 Requirements for the personnel . . . . . 9
2.2 Designated use . . . . . 9
2.3 Workplace safety . . . . . 10
2.4 Operational safety . . . . . 10
2.5 Product safety . . . . . 10
2.6 IT security . . . . . 11
2.7 Device-specific IT security . . . . . 11
2.7.1 Protecting access via hardware write protection . . . . . 11
2.7.2 Protecting access via a password . . . . 11
2.7.3 Access via fieldbus . . . . . 12
2.7.4 Access via Web server . . . . . 12
2.7.5 Access via CDI-RJ45 service interface . . . . . 12

3 Product description . . . . . 14
3.1 Product design . . . . . 14

4 Incoming acceptance and product identification . . . . . 15
4.1 Incoming acceptance . . . . . 15
4.2 Product identification . . . . . 15
4.2.1 Transmitter nameplate . . . . . 16
4.2.2 Sensor nameplate . . . . . 17
4.2.3 Symbols on measuring device . . . . . 18

5 Storage and transport . . . . . 19
5.1 Storage conditions . . . . . 19
5.2 Transporting the product . . . . . 19
5.2.1 Measuring devices without lifting lugs . . . . . 19
5.2.2 Measuring devices with lifting lugs . . 20
5.2.3 Transporting with a fork lift . . . . . 20
5.3 Packaging disposal . . . . . 20

6 Installation . . . . . 21
6.1 Installation conditions . . . . . 21
6.1.1 Mounting position . . . . . 21
6.1.2 Requirements from environment and process . . . . . 23
6.1.3 Special mounting instructions . . . . . 26
6.2 Mounting the measuring device . . . . . 26
6.2.1 Required tools . . . . . 26
6.2.2 Preparing the measuring device . . . . . 26
6.2.3 Mounting the sensor . . . . . 26
6.2.4 Turning the transmitter housing . . . . 31
6.2.5 Turning the display module . . . . . 31
6.3 Post-installation check . . . . . 32

7 Electrical connection . . . . . 33
7.1 Connection conditions . . . . . 33
7.1.1 Required tools . . . . . 33
7.1.2 Requirements for connecting cable . . . 33
7.1.3 Terminal assignment . . . . . 36
7.1.4 Device plugs available . . . . . 36
7.1.5 Pin assignment of device plug . . . . . 36
7.1.6 Preparing the measuring device . . . . . 36
7.2 Connecting the measuring device . . . . . 37
7.2.1 Connecting the transmitter . . . . . 37
7.2.2 Integrating the transmitter into a network . . . . . 41
7.2.3 Connecting the remote display and operating module DKX001 . . . . . 43
7.3 Ensure potential equalization . . . . . 43
7.3.1 Requirements . . . . . 43
7.3.2 Connection example, standard scenario . . . . . 43
7.3.3 Connection example in special situations . . . . . 44
7.4 Special connection instructions . . . . . 45
7.4.1 Connection examples . . . . . 45
7.5 Hardware settings . . . . . 48
7.5.1 Setting the device address . . . . . 48
7.5.2 Activating the default IP address . . . . 49
7.6 Ensuring the degree of protection . . . . . 50
7.7 Post-connection check . . . . . 50

8 Operation options . . . . . 52
8.1 Overview of operation options . . . . . 52
8.2 Structure and function of the operating menu . . . . . 53
8.2.1 Structure of the operating menu . . . . 53
8.2.2 Operating philosophy . . . . . 54
8.3 Access to the operating menu via the local display . . . . . 55
8.3.1 Operational display . . . . . 55
8.3.2 Navigation view . . . . . 56
8.3.3 Editing view . . . . . 58
8.3.4 Operating elements . . . . . 60

8.3.5 Opening the context menu . . . . . 60
8.3.6 Navigating and selecting from list . . . 62
8.3.7 Calling the parameter directly . . . . . 62
8.3.8 Calling up help text . . . . . 63
8.3.9 Changing the parameters . . . . . 63
8.3.10 User roles and related access authorization . . . . . 64
8.3.11 Disabling write protection via access code . . . . . 64
8.3.12 Enabling and disabling the keypad lock . . . . . 65
8.4 Access to the operating menu via the Web browser . . . . . 65
8.4.1 Function range . . . . . 65
8.4.2 Prerequisites . . . . . 66
8.4.3 Establishing a connection . . . . . 67
8.4.4 Logging on . . . . . 70
8.4.5 User interface . . . . . 71
8.4.6 Disabling the Web server . . . . . 72
8.4.7 Logging out . . . . . 72
8.5 Access to the operating menu via the operating tool . . . . . 73
8.5.1 Connecting the operating tool . . . . . 73
8.5.2 FieldCare . . . . . 76
8.5.3 DeviceCare . . . . . 77

**9 System integration . . . . . 79**
9.1 Overview of device description files . . . . . 79
9.1.1 Current version data for the device . . . 79
9.1.2 Operating tools . . . . . 79
9.2 Overview of system files . . . . . 79
9.3 Integrating the measuring device in the system . . . . . 80
9.4 Cyclic data transmission . . . . . 80
9.4.1 Block model . . . . . 80
9.4.2 Input and output groups . . . . . 81
9.5 Diagnostic information via EtherNet/IP . . . . . 87

**10 Commissioning . . . . . 90**
10.1 Function check . . . . . 90
10.2 Switching on the measuring device . . . . . 90
10.3 Connecting via FieldCare . . . . . 90
10.4 Setting the operating language . . . . . 90
10.5 Configuring the measuring device . . . . . 91
10.5.1 Defining the tag name . . . . . 92
10.5.2 Setting the system units . . . . . 92
10.5.3 Configuring the communication interface . . . . . 94
10.5.4 Displaying the I/O configuration . . . . 95
10.5.5 Configuring the current input . . . . . 96
10.5.6 Configuring the status input . . . . . 97
10.5.7 Configuring the current output . . . . . 97
10.5.8 Configuring the pulse/frequency/switch output . . . . . 100
10.5.9 Configuring the relay output . . . . . 106
10.5.10 Configuring the local display . . . . . 107
10.5.11 Configuring the low flow cut off . . . . 110
10.5.12 Configuring empty pipe detection . . 111
10.6 Advanced settings . . . . . 112
10.6.1 Using the parameter to enter the access code . . . . . 113
10.6.2 Carrying out a sensor adjustment . . . 113
10.6.3 Configuring the totalizer . . . . . 113
10.6.4 Carrying out additional display configurations . . . . . 115
10.6.5 Performing electrode cleaning . . . . . 118
10.6.6 WLAN configuration . . . . . 119
10.6.7 Configuration management . . . . . 121
10.6.8 Using parameters for device administration . . . . . 122
10.7 Simulation . . . . . 124
10.8 Protecting settings from unauthorized access . . . . . 127
10.8.1 Write protection via access code . . . 127
10.8.2 Write protection via write protection switch . . . . . 128

**11 Operation . . . . . 130**
11.1 Reading the device locking status . . . . . 130
11.2 Adjusting the operating language . . . . . 130
11.3 Configuring the display . . . . . 130
11.4 Reading measured values . . . . . 130
11.4.1 "Process variables" submenu . . . . . 131
11.4.2 "Totalizer" submenu . . . . . 132
11.4.3 "Input values" submenu . . . . . 132
11.4.4 Output values . . . . . 134
11.5 Adapting the measuring device to the process conditions . . . . . 136
11.6 Performing a totalizer reset . . . . . 136
11.6.1 Function scope of the "Control Totalizer" parameter . . . . . 136
11.6.2 Function scope of the "Reset all totalizers" parameter . . . . . 137
11.7 Showing data logging . . . . . 137

**12 Diagnostics and troubleshooting . . 140**
12.1 General troubleshooting . . . . . 140
12.2 Diagnostic information via light emitting diodes . . . . . 142
12.2.1 Transmitter . . . . . 142
12.3 Diagnostic information on local display . . . . . 144
12.3.1 Diagnostic message . . . . . 144
12.3.2 Calling up remedial measures . . . . . 146
12.4 Diagnostic information in the Web browser . 146
12.4.1 Diagnostic options . . . . . 146
12.4.2 Calling up remedy information . . . . 147
12.5 Diagnostic information in DeviceCare or FieldCare . . . . . 147
12.5.1 Diagnostic options . . . . . 147
12.5.2 Calling up remedy information . . . . 148
12.6 Diagnostic information via communication interface . . . . . 149
12.6.1 Reading out diagnostic information 149
12.7 Adapting the diagnostic information . . . . . 149
12.7.1 Adapting the diagnostic behavior . . . 149

12.8 Overview of diagnostic information . . . . . 150
12.8.1 Diagnostic of sensor . . . . . 150
12.8.2 Diagnostic of electronic . . . . . 151
12.8.3 Diagnostic of configuration . . . . . 155
12.8.4 Diagnostic of process . . . . . 160
12.9 Pending diagnostic events . . . . . 162
12.10 Diagnostic list . . . . . 163
12.11 Event logbook . . . . . 163
12.11.1 Reading out the event logbook . . . . . 163
12.11.2 Filtering the event logbook . . . . . 164
12.11.3 Overview of information events . . . . 164
12.12 Resetting the measuring device . . . . . 165
12.12.1 Function scope of the "Device reset" parameter . . . . . 166
12.13 Device information . . . . . 166
12.14 Firmware history . . . . . 167

**13 Maintenance . . . . . 168**
13.1 Maintenance tasks . . . . . 168
13.1.1 Exterior cleaning . . . . . 168
13.1.2 Interior cleaning . . . . . 168
13.1.3 Replacing seals . . . . . 168
13.2 Measuring and test equipment . . . . . 168
13.3 Endress+Hauser services . . . . . 168

**14 Repairs . . . . . 169**
14.1 General notes . . . . . 169
14.1.1 Repair and conversion concept . . . . . 169
14.1.2 Notes for repair and conversion . . . . 169
14.2 Spare parts . . . . . 169
14.3 Endress+Hauser services . . . . . 169
14.4 Return . . . . . 169
14.5 Disposal . . . . . 170
14.5.1 Removing the measuring device . . . . 170
14.5.2 Disposing of the measuring device . . 170

**15 Accessories . . . . . 171**
15.1 Device-specific accessories . . . . . 171
15.1.1 For the transmitter . . . . . 171
15.1.2 For the sensor . . . . . 172
15.2 Communication-specific accessories . . . . . 172
15.3 Service-specific accessories . . . . . 172
15.4 System components . . . . . 173

**16 Technical data . . . . . 174**
16.1 Application . . . . . 174
16.2 Function and system design . . . . . 174
16.3 Input . . . . . 174
16.4 Output . . . . . 177
16.5 Power supply . . . . . 181
16.6 Performance characteristics . . . . . 182
16.7 Installation . . . . . 183
16.8 Environment . . . . . 183
16.9 Process . . . . . 184
16.10 Mechanical construction . . . . . 188
16.11 Operability . . . . . 192
16.12 Certificates and approvals . . . . . 196
16.13 Application packages . . . . . 198
16.14 Accessories . . . . . 198
16.15 Supplementary documentation . . . . . 199

**Index . . . . . 201**

# 1 About this document

## 1.1 Document function

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

## 1.2 Symbols used

### 1.2.1 Safety symbols

| Symbol | Meaning |
|---|---|
| DANGER | **DANGER!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury. |
| WARNING | **WARNING!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
| CAUTION | **CAUTION!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury. |
| NOTICE | **NOTE!**<br>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. |
| ⊕ | **Protective Earth (PE)**<br>A terminal which must be connected to ground prior to establishing any other connections.<br>The ground terminals are situated inside and outside the device:<br>▪ Inner ground terminal: Connects the protectiv earth to the mains supply.<br>▪ Outer ground terminal: Connects the device to the plant grounding system. |

### 1.2.3 Communication 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. |
| | **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 |
| | Hazardous area |

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

## 1.3 Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

For a detailed list of the individual documents along with the documentation code → 199

### 1.3.1 Standard documentation

| Document type | Purpose and content of the document |
|---|---|
| Technical Information | **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. |
| Sensor Brief Operating Instructions | **Guides you quickly to the 1st measured value - Part 1**<br>The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device.<br>▪ Incoming acceptance and product identification<br>▪ Storage and transport<br>▪ Installation |
| Transmitter Brief Operating Instructions | **Guides you quickly to the 1st measured value - Part 2**<br>The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value).<br>▪ Product description<br>▪ Installation<br>▪ Electrical connection<br>▪ Operation options<br>▪ System integration<br>▪ Commissioning<br>▪ Diagnostic information |
| Description of Device Parameters | **Reference for your parameters**<br>The document provides a detailed explanation of each individual parameter in the Expert operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations. |

### 1.3.2 Supplementary device-dependent documentation

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

## 1.4 Registered trademarks

**EtherNet/IP™**
Trademark of ODVA, Inc.

# 2 Basic safety instructions

## 2.1 Requirements for the personnel

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

The operating personnel must fulfill the following requirements:
- Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

## 2.2 Designated use

**Application and media**
The measuring device described in these Brief Operating Instructions is intended only for flow measurement of liquids with a minimum conductivity of 5 µS/cm.

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

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

To ensure that the measuring device remains in proper condition for the operation time:
- Keep within the specified pressure and temperature range.
- Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area (e.g. explosion protection, pressure vessel safety).
- Use the measuring device only for media to which the process-wetted materials are sufficiently resistant.
- If the measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential: "Documentation" section→ 🖹 8.
- Protect the measuring device permanently against corrosion from environmental influences.

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

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

NOTICE

**Verification for borderline cases:**

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

**Residual risks**

WARNING

**The electronics and the medium may cause the surfaces to heat up. This presents a burn hazard!**

- For elevated fluid temperatures, ensure protection against contact to prevent burns.

## 2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

- Do not ground the welding unit via the measuring device.

If working on and with the device with wet hands:

- Due to the increased risk of electric shock, gloves must be worn.

## 2.4 Operational safety

Risk of injury.

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

**Conversions to the device**

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

- If, despite this, modifications are required, consult with Endress+Hauser.

**Repair**

To ensure continued operational safety and reliability,

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

## 2.5 Product safety

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

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

## 2.6 IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

## 2.7 Device-specific IT security

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

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

### 2.7.1 Protecting access via hardware write protection

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

Hardware write protection is disabled when the device is delivered → 🖹 128.

### 2.7.2 Protecting access via a password

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

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

**User-specific access code**

Write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code (→ 127).

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

**WLAN passphrase**

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface (→ 75) which can be ordered as an option is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter (→ 121).

**General notes on the use of passwords**

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, see the "Write protection via access code" section → 127

### 2.7.3 Access via fieldbus

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

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

For detailed information, see the "Description of Device Parameters" document pertaining to the device → 199

### 2.7.4 Access via Web server

The device can be operated and configured via a Web browser with the integrated Web server (→ 65). The connection is via the service interface (CDI-RJ45), the connection for EtherNet/IP signal transmission (RJ45 connector) or the WLAN interface.

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

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

For detailed information, see the "Description of Device Parameters" document pertaining to the device → 199

### 2.7.5 Access via CDI-RJ45 service interface

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

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

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

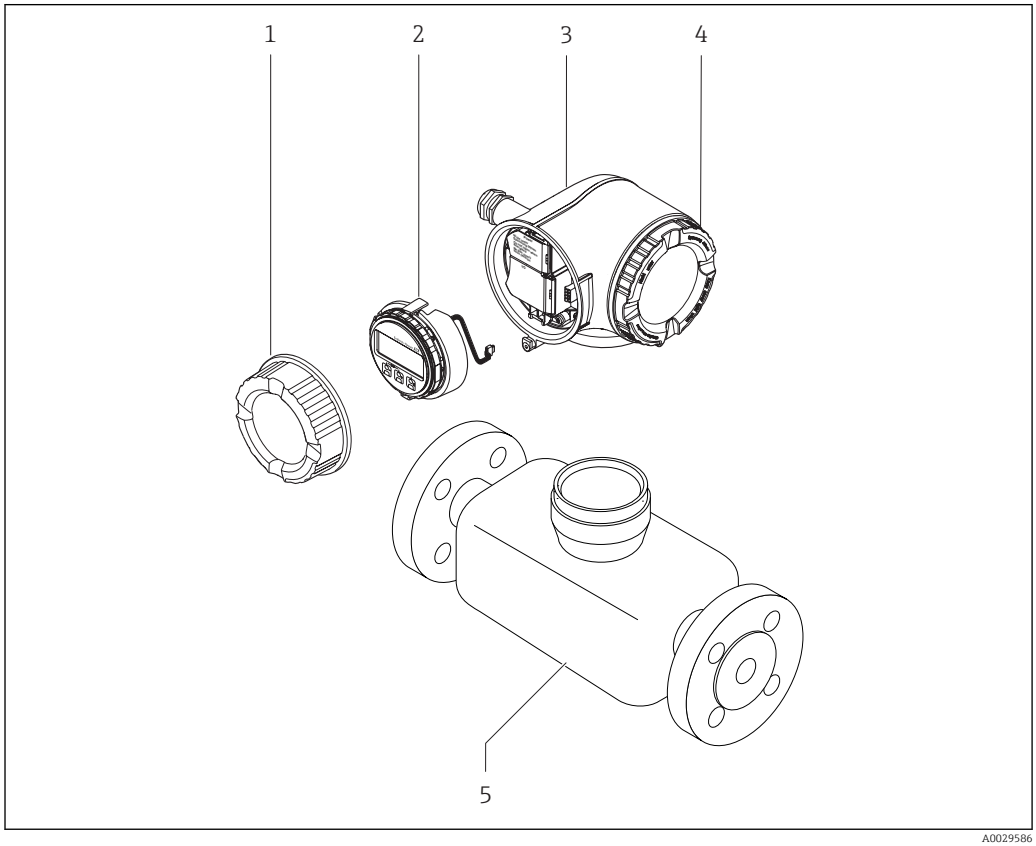
The device can be integrated in a ring topology. The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45) → 42.

# 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

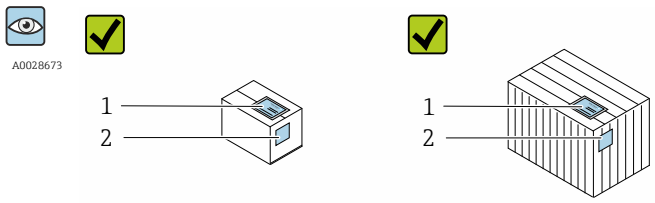



*1 Important components of a measuring device*

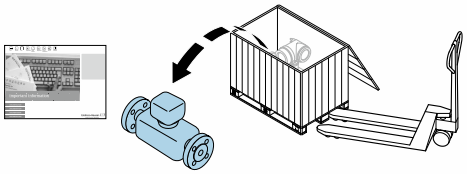
1 *Connection compartment cover*
2 *Display module*
3 *Transmitter housing*
4 *Electronics compartment cover*
5 *Sensor*

# 4 Incoming acceptance and product identification

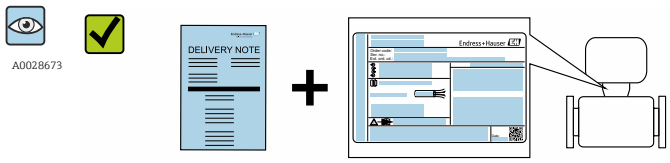
## 4.1 Incoming acceptance



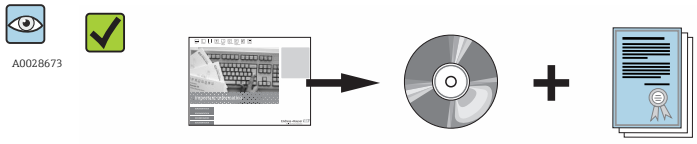

Are the order codes on the delivery note (1) and the product sticker (2) identical?



Are the goods undamaged?




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




Is the CD-ROM with the Technical Documentation (depends on device version) and documents present?

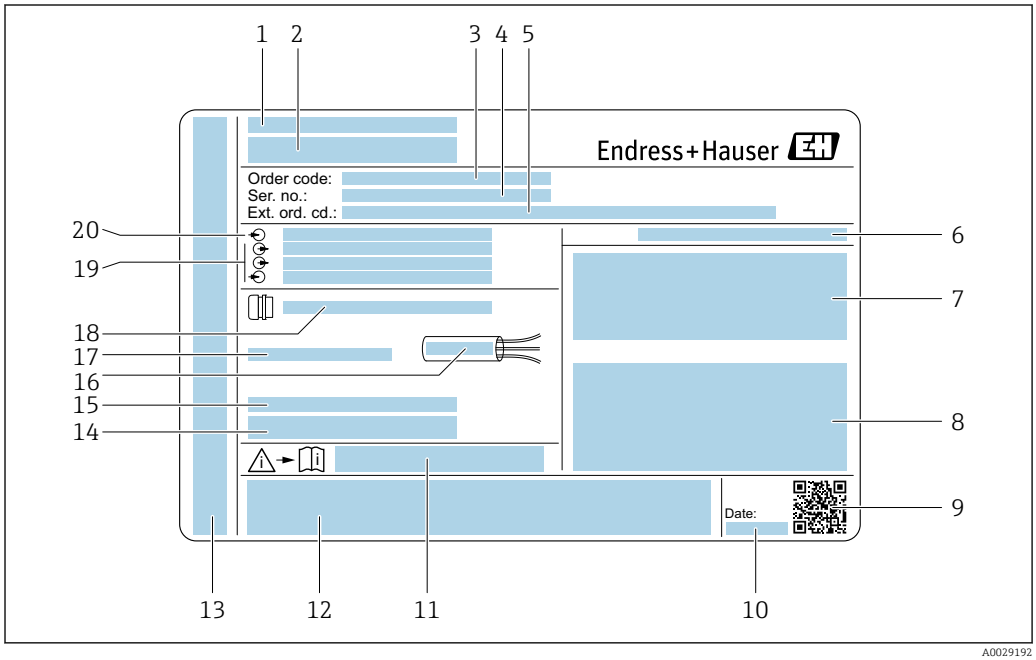
- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 16.

## 4.2 Product identification

The following options are available for identification of the measuring device:
- Nameplate specifications
- Order code with breakdown of the device features on the delivery note
- Enter serial numbers from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the measuring device is displayed.
- Enter the serial number from the nameplates into the *Endress+Hauser Operations App* or scan the 2-D matrix code (QR code) on the nameplate with the *Endress+Hauser Operations App*: all the information for the measuring device is displayed.

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The chapters "Additional standard documentation on the device" → 8 and "Supplementary device-dependent documentation" → 8
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

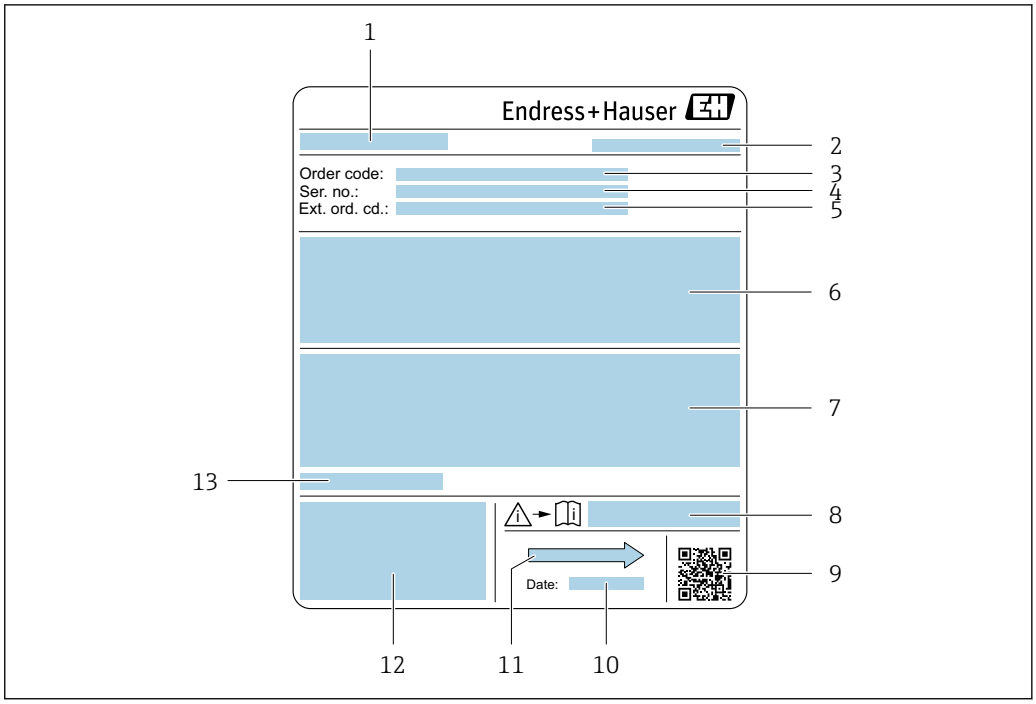
### 4.2.1 Transmitter nameplate




2 *Example of a transmitter nameplate*

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

### 4.2.2 Sensor nameplate




3 *Example of sensor nameplate*

1 *Name of the sensor*
2 *Manufacturing location*
3 *Order code*
4 *Serial number (ser. no.)*
5 *Extended order code (Ext. ord. cd.)*
6 *Flow; nominal diameter of the sensor; pressure rating; nominal pressure; system pressure; fluid temperature range; material of liner and electrodes*
7 *Approval information for explosion protection, Pressure Equipment Directive and degree of protection*
8 *Document number of safety-related supplementary documentation → 199*
9 *2-D matrix code*
10 *Manufacturing date: year-month*
11 *Flow direction*
12 *CE mark, C-Tick*
13 *Permitted ambient temperature ($T_a$)*

**Order code**

The measuring device is reordered using the order code.

**Extended order code**

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

### 4.2.3 Symbols on measuring device

| Symbol | Meaning |
|---|---|
| | **WARNING!**<br>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury. |
| | **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

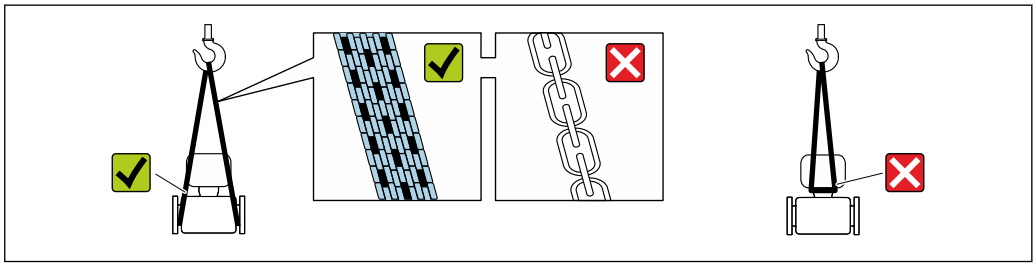
## 5.1 Storage conditions

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 tube.
- Protect from direct sunlight to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus and bacteria infestation can damage the lining.
- Store in a dry and dust-free place.
- Do not store outdoors.

Storage temperature→ 184

## 5.2 Transporting the product

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



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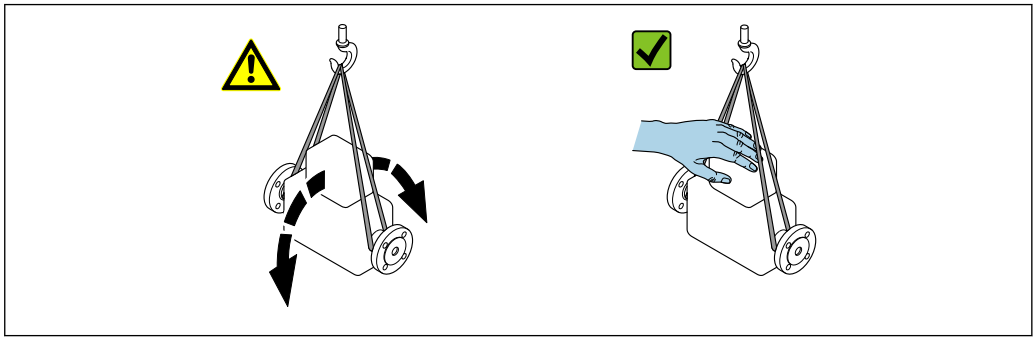
Do not remove protective covers or caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring tube.

### 5.2.1 Measuring devices without lifting lugs

**WARNING**

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

Risk of injury if the measuring device slips.
- Secure the measuring device against slipping or turning.
- Observe the weight specified on the packaging (stick-on label).



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### 5.2.2 Measuring devices with lifting lugs

**⚠ CAUTION**

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

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

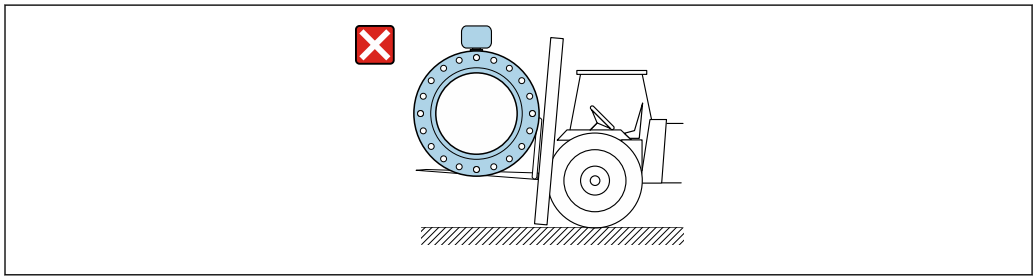
### 5.2.3 Transporting with a fork lift

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

**⚠ CAUTION**

**Risk of damaging the magnetic coil**

- ▶ If transporting by forklift, do not lift the sensor by the metal casing.
- ▶ This would buckle the casing and damage the internal magnetic coils.



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## 5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

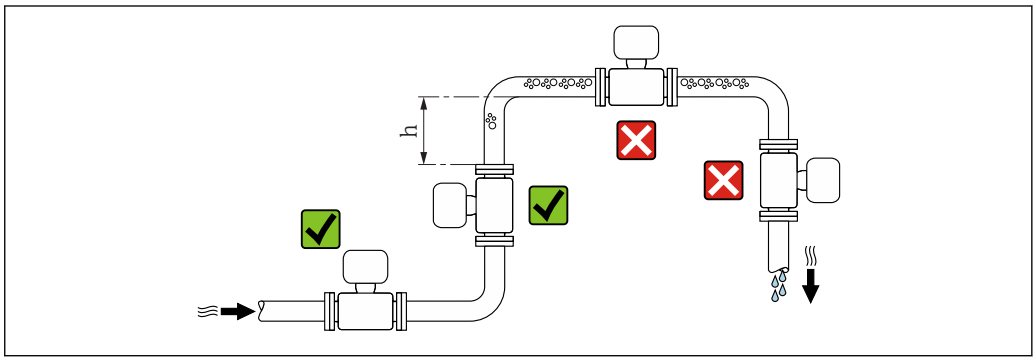
- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
  - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
    or
  - Carton in accordance with European Packaging Directive 94/62EC; recyclability is confirmed by the affixed RESY symbol.
- Seaworthy packaging (optional): Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
- Carrying and mounting hardware:
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Dunnage: Paper cushion

# 6 Installation

## 6.1 Installation conditions

### 6.1.1 Mounting position

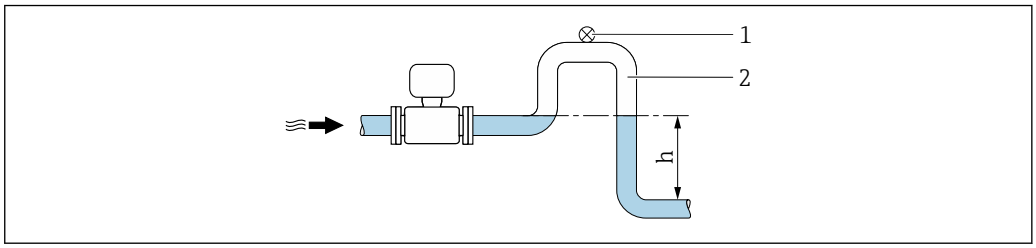
#### Mounting location




Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: h ≥ 2 × DN

*Installation in down pipes*

Install a siphon with a vent valve downstream of the sensor in down pipes whose length h ≥ 5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.

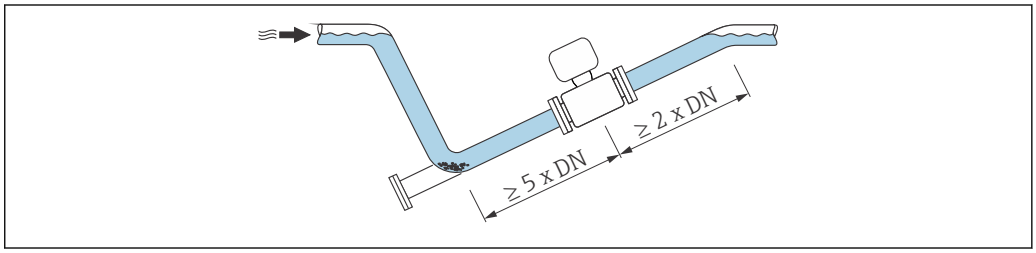



4 *Installation in a down pipe*

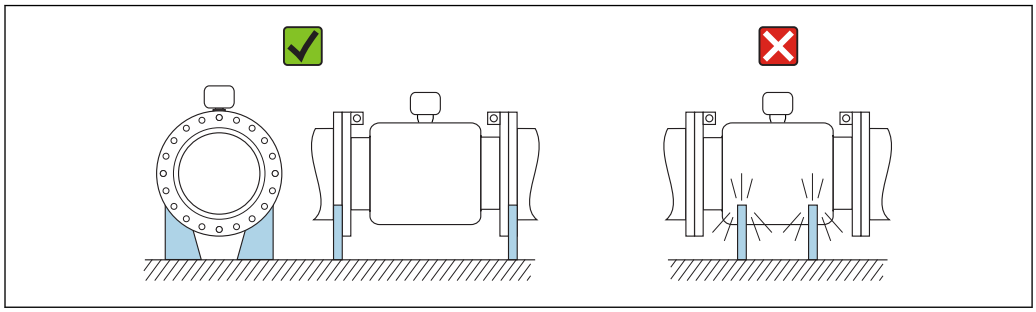
*1 Vent valve*
*2 Pipe siphon*
*h Length of down pipe*

*Installation in partially filled pipes*

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



*For heavy sensors DN ≥ 350 (14")*



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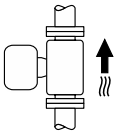
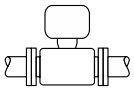
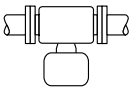
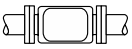
## Orientation

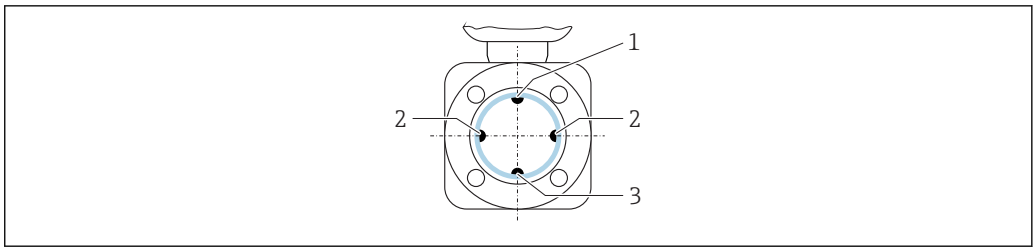
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

| Orientation | | | Recommendation |
|---|---|---|---|
| A | Vertical orientation |  A0015591 | ✓✓ |
| B | Horizontal orientation, transmitter at top |  A0015589 | ✓✓ 1) |
| C | Horizontal orientation, transmitter at bottom |  A0015590 | ✓✓ 2) 3) |
| D | Horizontal orientation, transmitter at side |  A0015592 | ✗ |

1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics module from overheating in the case of a sharp rise in temperature (e.g. CIP- or SIP processes), install the device with the transmitter component pointing downwards.

*Horizontal*

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



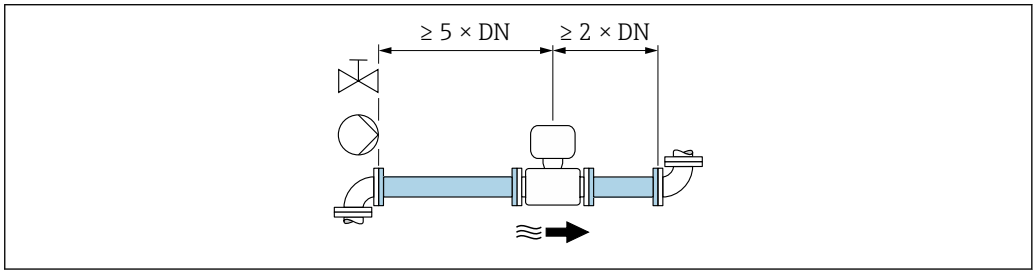

1 *EPD electrode for empty pipe detection*
2 *Measuring electrodes for signal detection*
3 *Reference electrode for potential equalization*

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

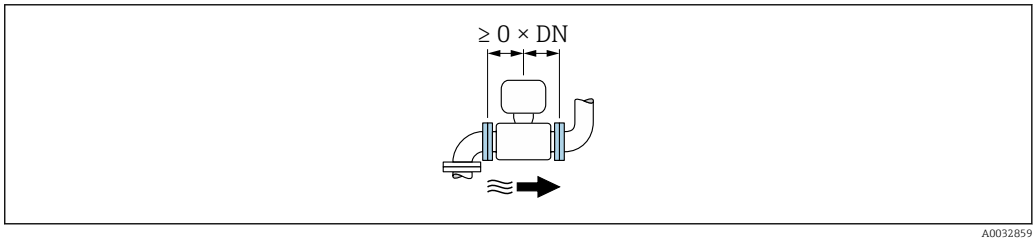
### Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows.

Observe the following inlet and outlet runs to comply with accuracy specifications:




5 *Order code for "Design", option A "Insertion length short, ISO/DVGW until DN400, DN450-2000 1:1" and order code for "Design", option B "Insertion length long, ISO/DVGW until DN400, DN450-2000 1:1.3"*




6 *Order code for "Design", option C "Insertion length short ISO/DVGW until DN300, w/o inlet and outlet runs, constricted meas.tube"*

*Installation dimensions*

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

## 6.1.2 Requirements from environment and process

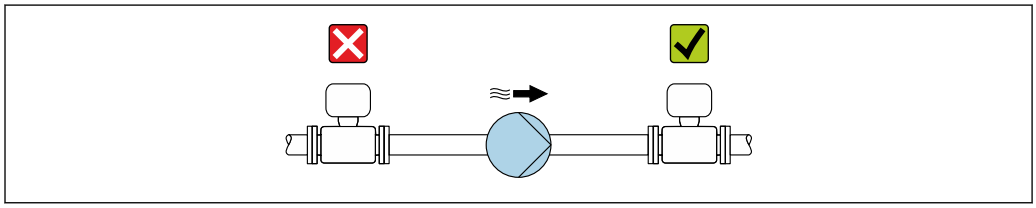
### Ambient temperature range

| | |
|---|---|
| Transmitter | Standard: −40 to +60 °C (−40 to +140 °F) |
| Local display | −20 to +60 °C (−4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range. |

| | |
|---|---|
| Sensor | ▪ Process connection material, carbon steel: −10 to +60 °C (+14 to +140 °F)<br>▪ Process connection material, stainless steel: −40 to +60 °C (−40 to +140 °F) |
| Liner | Do not exceed or fall below the permitted temperature range of the liner . |

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

### System pressure



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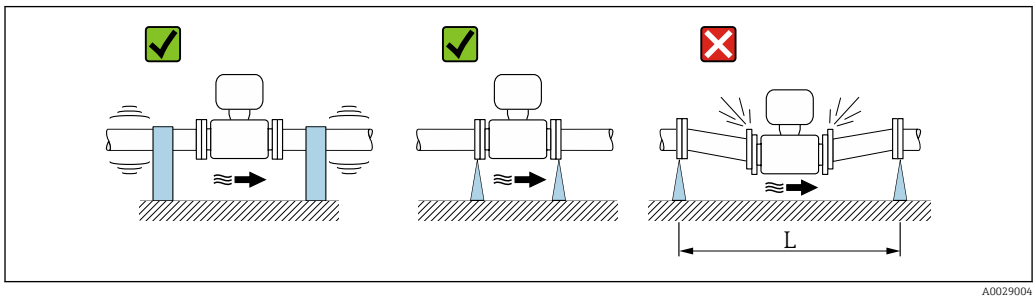
Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

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

- Information on the liner's resistance to partial vacuum → 186
- Information on the shock resistance of the measuring system → 184
- Information on the vibration resistance of the measuring system → 184

### Vibrations

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7 *Measures to avoid device vibrations (L > 10 m (33 ft))*

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

- Information on the shock resistance of the measuring system → 184
- Information on the vibration resistance of the measuring system → 184

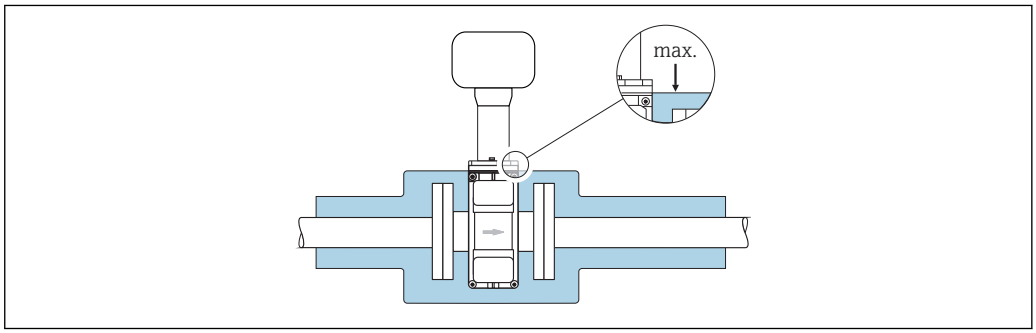
### Thermal insulation

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

**⚠ WARNING**

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

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

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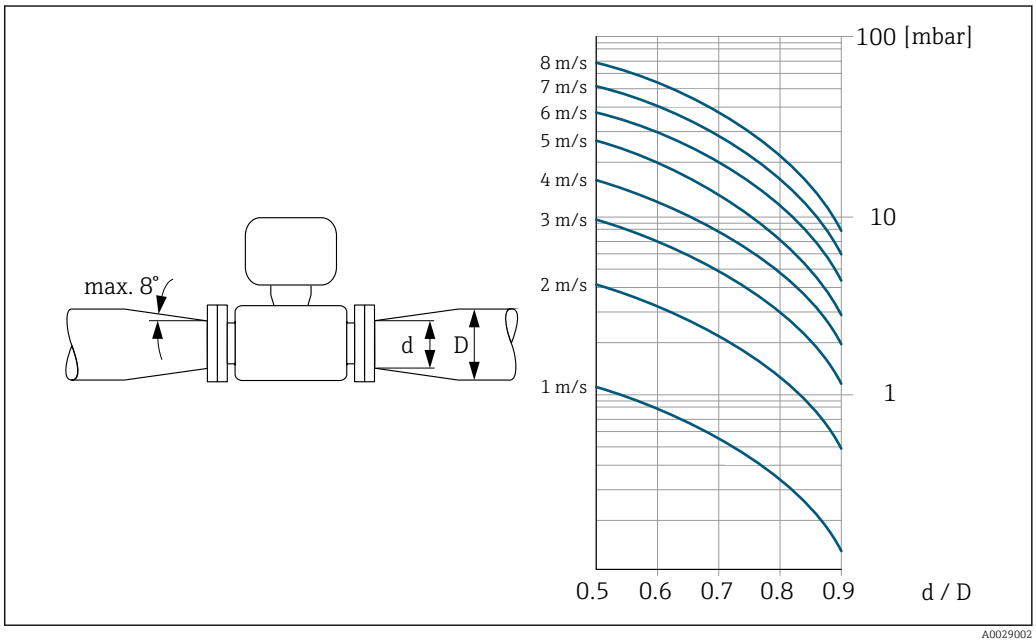
## Adapters

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

The nomogram only applies to liquids with a viscosity similar to that of water.

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

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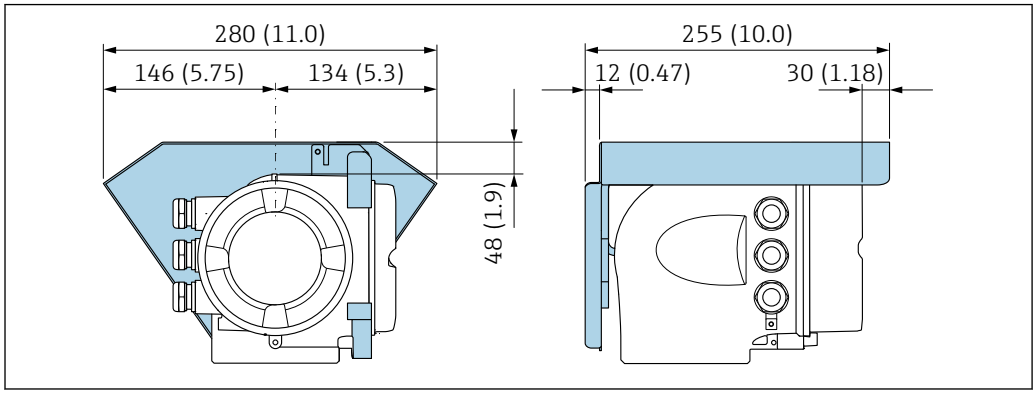
### 6.1.3 Special mounting instructions

**Protective cover**




## 6.2 Mounting the measuring device

### 6.2.1 Required tools

**For sensor**

For flanges and other process connections: Corresponding mounting tools

### 6.2.2 Preparing the measuring device

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

### 6.2.3 Mounting the sensor

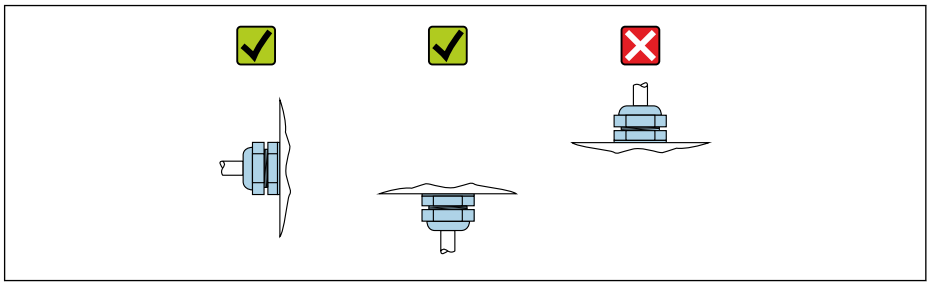
**⚠ WARNING**

**Danger due to improper process sealing!**

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

1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.
3. If using ground disks, comply with the Installation Instructions provided.
4. Observe required screw tightening torques → 🖹 27.

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



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### Mounting the seals

**CAUTION**

**An electrically conductive layer could form on the inside of the measuring tube!**
Risk of measuring signal short circuit.
- ▶ Do not use electrically conductive sealing compounds such as graphite.

Comply with the following instructions when installing seals:

1. For DIN flanges: only use seals according to DIN EN 1514-1.
2. For "PFA" lining: generally additional seals are **not** required.
3. For "PTFE" lining: generally additional seals are **not** required.

### Mounting the ground cable/ground disks

Comply with the information on potential equalization and detailed mounting instructions for the use of ground cables/ground disks .

### Screw tightening torques

Please note the following:
- The screw tightening torques listed below apply only to lubricated threads and to pipes not subjected to tensile stress.
- Tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing faces or damage the seals.

*Screw tightening torques for EN 1092-1 (DIN 2501), PN 10/16/25/40*

| Nominal diameter | Pressure rating | Screws | Flange thickness | Max. screw tightening torque [Nm] | |
|---|---|---|---|---|---|
| [mm] | [bar] | [mm] | [mm] | PTFE | PFA |
| 15 | PN 40 | 4 × M12 | 16 | 11 | – |
| 25 | PN 40 | 4 × M12 | 18 | 26 | 20 |
| 32 | PN 40 | 4 × M16 | 18 | 41 | 35 |
| 40 | PN 40 | 4 × M16 | 18 | 52 | 47 |
| 50 | PN 40 | 4 × M16 | 20 | 65 | 59 |
| 65 [1)] | PN 16 | 8 × M16 | 18 | 43 | 40 |
| 65 | PN 40 | 8 × M16 | 22 | 43 | 40 |
| 80 | PN 16 | 8 × M16 | 20 | 53 | 48 |
| 80 | PN 40 | 8 × M16 | 24 | 53 | 48 |
| 100 | PN 16 | 8 × M16 | 20 | 57 | 51 |
| 100 | PN 40 | 8 × M20 | 24 | 78 | 70 |
| 125 | PN 16 | 8 × M16 | 22 | 75 | 67 |

| Nominal diameter [mm] | Pressure rating [bar] | Screws [mm] | Flange thickness [mm] | Max. screw tightening torque [Nm] | |
|---|---|---|---|---|---|
| | | | | PTFE | PFA |
| 125 | PN 40 | 8 × M24 | 26 | 111 | 99 |
| 150 | PN 16 | 8 × M20 | 22 | 99 | 85 |
| 150 | PN 40 | 8 × M24 | 28 | 136 | 120 |
| 200 | PN 10 | 8 × M20 | 24 | 141 | 101 |
| 200 | PN 16 | 12 × M20 | 24 | 94 | 67 |
| 200 | PN 25 | 12 × M24 | 30 | 138 | 105 |
| 250 | PN 10 | 12 × M20 | 26 | 110 | – |
| 250 | PN 16 | 12 × M24 | 26 | 131 | – |
| 250 | PN 25 | 12 × M27 | 32 | 200 | – |
| 300 | PN 10 | 12 × M20 | 26 | 125 | – |
| 300 | PN 16 | 12 × M24 | 28 | 179 | – |
| 300 | PN 25 | 16 × M27 | 34 | 204 | – |
| 350 | PN 10 | 16 × M20 | 26 | 188 | – |
| 350 | PN 16 | 16 × M24 | 30 | 254 | – |
| 350 | PN 25 | 16 × M30 | 38 | 380 | – |
| 400 | PN 10 | 16 × M24 | 26 | 260 | – |
| 400 | PN 16 | 16 × M27 | 32 | 330 | – |
| 400 | PN 25 | 16 × M33 | 40 | 488 | – |
| 450 | PN 10 | 20 × M24 | 28 | 235 | – |
| 450 | PN 16 | 20 × M27 | 40 | 300 | – |
| 450 | PN 25 | 20 × M33 | 46 | 385 | – |
| 500 | PN 10 | 20 × M24 | 28 | 265 | – |
| 500 | PN 16 | 20 × M30 | 34 | 448 | – |
| 500 | PN 25 | 20 × M33 | 48 | 533 | – |
| 600 | PN 10 | 20 × M27 | 28 | 345 | – |
| 600 [1)] | PN 16 | 20 × M33 | 36 | 658 | – |
| 600 | PN 25 | 20 × M36 | 58 | 731 | – |

1) Designed acc. to EN 1092-1 (not to DIN 2501)

*Screw tightening torques for EN 1092-1 (DIN 2501), PN 10/16/25, P245GH/stainless; calculated according to EN 1591-1:2014 for flanges as per EN 1092-1:2013*

| Nominal diameter [mm] | Pressure rating [bar] | Screws [mm] | Flange thickness [mm] | Nom. screw tightening torque [Nm] PTFE |
|---|---|---|---|---|
| 350 | PN 10 | 16 × M20 | 26 | 60 |
| 350 | PN 16 | 16 × M24 | 30 | 115 |
| 350 | PN 25 | 16 × M30 | 38 | 220 |
| 400 | PN 10 | 16 × M24 | 26 | 90 |
| 400 | PN 16 | 16 × M27 | 32 | 155 |
| 400 | PN 25 | 16 × M33 | 40 | 290 |
| 450 | PN 10 | 20 × M24 | 28 | 90 |

| Nominal diameter [mm] | Pressure rating [bar] | Screws [mm] | Flange thickness [mm] | Nom. screw tightening torque [Nm] PTFE |
|---|---|---|---|---|
| 450 | PN 16 | 20 × M27 | 34 | 155 |
| 450 | PN 25 | 20 × M33 | 46 | 290 |
| 500 | PN 10 | 20 × M24 | 28 | 100 |
| 500 | PN 16 | 20 × M30 | 36 | 205 |
| 500 | PN 25 | 20 × M33 | 48 | 345 |
| 600 | PN 10 | 20 × M27 | 30 | 150 |
| 600 | PN 16 | 20 × M33 | 40 | 310 |
| 600 | PN 25 | 20 × M36 | 48 | 500 |

*Screw tightening torques for ASME B16.5, Class 150/300*

| Nominal diameter | | Pressure rating | Screws | Max. screw tightening torque [Nm] ([lbf · ft]) | |
|---|---|---|---|---|---|
| [mm] | [in] | [psi] | [in] | PTFE | PFA |
| 15 | ½ | Class 150 | 4 × ½ | 6 (4) | – (–) |
| 15 | ½ | Class 300 | 4 × ½ | 6 (4) | – (–) |
| 25 | 1 | Class 150 | 4 × ½ | 11 (8) | 10 (7) |
| 25 | 1 | Class 300 | 4 × 5/8 | 14 (10) | 12 (9) |
| 40 | 1 ½ | Class 150 | 4 × ½ | 24 (18) | 21 (15) |
| 40 | 1 ½ | Class 300 | 4 × ¾ | 34 (25) | 31 (23) |
| 50 | 2 | Class 150 | 4 × 5/8 | 47 (35) | 44 (32) |
| 50 | 2 | Class 300 | 8 × 5/8 | 23 (17) | 22 (16) |
| 80 | 3 | Class 150 | 4 × 5/8 | 79 (58) | 67 (49) |
| 80 | 3 | Class 300 | 8 × ¾ | 47 (35) | 42 (31) |
| 100 | 4 | Class 150 | 8 × 5/8 | 56 (41) | 50 (37) |
| 100 | 4 | Class 300 | 8 × ¾ | 67 (49) | 59 (44) |
| 150 | 6 | Class 150 | 8 × ¾ | 106 (78) | 86 (63) |
| 150 | 6 | Class 300 | 12 × ¾ | 73 (54) | 67 (49) |
| 200 | 8 | Class 150 | 8 × ¾ | 143 (105) | 109 (80) |
| 250 | 10 | Class 150 | 12 × 7/8 | 135 (100) | – (–) |
| 300 | 12 | Class 150 | 12 × 7/8 | 178 (131) | – (–) |
| 350 | 14 | Class 150 | 12 × 1 | 260 (192) | – (–) |
| 400 | 16 | Class 150 | 16 × 1 | 246 (181) | – (–) |
| 450 | 18 | Class 150 | 16 × 1 1/8 | 371 (274) | – (–) |
| 500 | 20 | Class 150 | 20 × 1 1/8 | 341 (252) | – (–) |
| 600 | 24 | Class 150 | 20 × 1 ¼ | 477 (352) | – (–) |

*Screw tightening torques for JIS B2220, 10/20K*

| Nominal diameter | Pressure rating | Screws | Max. screw tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | [mm] | PTFE | PFA |
| 25 | 10K | 4 × M16 | 32 | 27 |
| 25 | 20K | 4 × M16 | 32 | 27 |
| 32 | 10K | 4 × M16 | 38 | – |
| 32 | 20K | 4 × M16 | 38 | – |
| 40 | 10K | 4 × M16 | 41 | 37 |
| 40 | 20K | 4 × M16 | 41 | 37 |
| 50 | 10K | 4 × M16 | 54 | 46 |
| 50 | 20K | 8 × M16 | 27 | 23 |
| 65 | 10K | 4 × M16 | 74 | 63 |
| 65 | 20K | 8 × M16 | 37 | 31 |
| 80 | 10K | 8 × M16 | 38 | 32 |
| 80 | 20K | 8 × M20 | 57 | 46 |
| 100 | 10K | 8 × M16 | 47 | 38 |
| 100 | 20K | 8 × M20 | 75 | 58 |
| 125 | 10K | 8 × M20 | 80 | 66 |
| 125 | 20K | 8 × M22 | 121 | 103 |
| 150 | 10K | 8 × M20 | 99 | 81 |
| 150 | 20K | 12 × M22 | 108 | 72 |
| 200 | 10K | 12 × M20 | 82 | 54 |
| 200 | 20K | 12 × M22 | 121 | 88 |
| 250 | 10K | 12 × M22 | 133 | – |
| 250 | 20K | 12 × M24 | 212 | – |
| 300 | 10K | 16 × M22 | 99 | – |
| 300 | 20K | 16 × M24 | 183 | – |

*Screw tightening torques for JIS B2220, 10/20K*

| Nominal diameter | Pressure rating | Screws | Nom. screw tightening torque [Nm] | |
|---|---|---|---|---|
| [mm] | [bar] | [mm] | PUR | HG |
| 350 | 10K | 16 × M22 | 109 | 109 |
| 350 | 20K | 16 × M30×3 | 217 | 217 |
| 400 | 10K | 16 × M24 | 163 | 163 |
| 400 | 20K | 16 × M30×3 | 258 | 258 |
| 450 | 10K | 16 × M24 | 155 | 155 |
| 450 | 20K | 16 × M30×3 | 272 | 272 |
| 500 | 10K | 16 × M24 | 183 | 183 |
| 500 | 20K | 16 × M30×3 | 315 | 315 |
| 600 | 10K | 16 × M30 | 235 | 235 |
| 600 | 20K | 16 × M36×3 | 381 | 381 |
| 700 | 10K | 16 × M30 | 300 | 300 |
| 750 | 10K | 16 × M30 | 339 | 339 |

*Screw tightening torques for AS 2129, Table E*

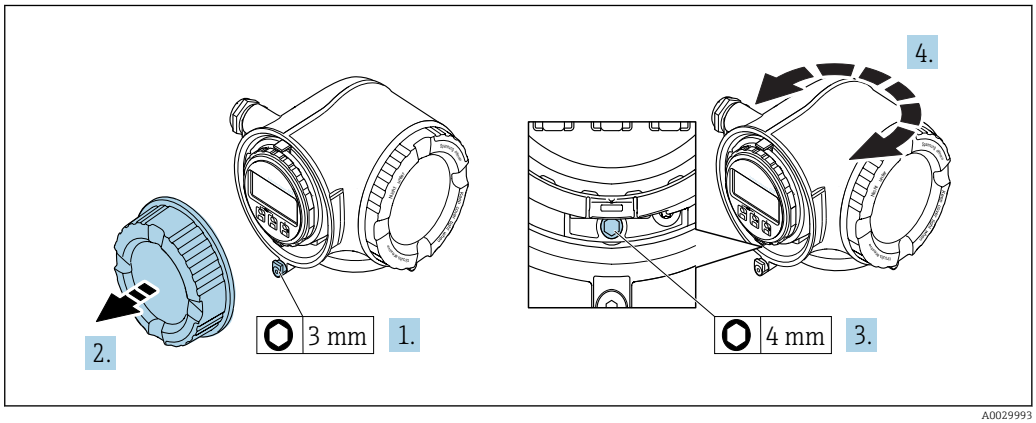
| Nominal diameter [mm] | Screws [mm] | Max. screw tightening torque [Nm] PTFE |
|---|---|---|
| 25 | 4 × M12 | 21 |
| 50 | 4 × M16 | 42 |

*Screw tightening torques for AS 4087, PN 16*

| Nominal diameter [mm] | Screws [mm] | Max. screw tightening torque [Nm] PTFE |
|---|---|---|
| 50 | 4 × M16 | 42 |

### 6.2.4 Turning the transmitter housing

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

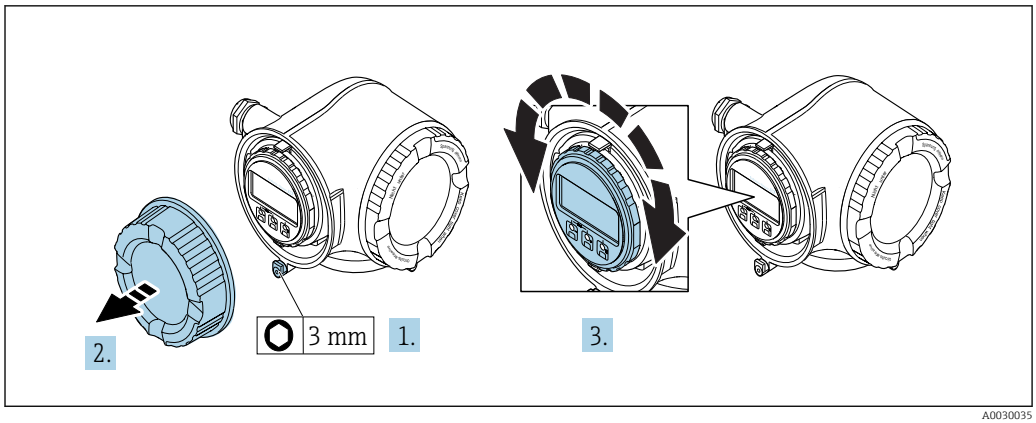



A0029993

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

### 6.2.5 Turning the display module

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




A0030035

1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Turn the display module to the desired position: max. 8 × 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><br>For example:<br>▪ Process temperature<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><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 ? | ❑ |
| Are the measuring point identification and labeling correct (visual inspection)? | ❑ |
| Is the device adequately protected from precipitation and direct sunlight? | ❑ |
| Have the fixing screws been tightened with the correct tightening torque? | ❑ |

# 7 Electrical connection

NOTICE

**The measuring device does not have an internal circuit breaker.**

- ▶ For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.
- ▶ Although the measuring device is equipped with a fuse, additional overcurrent protection (maximum 10 A) should be integrated into the system installation.

## 7.1 Connection conditions

### 7.1.1 Required tools

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

### 7.1.2 Requirements for connecting cable

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

**Electrical safety**

In accordance with applicable federal/national regulations.

**Protective ground cable**

Cable: 2.1 $mm^2$ (14 AWG)

The grounding impedance must be less than 1 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**

Standard installation cable is sufficient.

**Signal cable**

*EtherNet/IP*

The standard ANSI/TIA/EIA-568-B.2 Annex specifies CAT 5 as the minimum category for a cable used for EtherNet/IP. CAT 5e and CAT 6 are recommended.

For more information on planning and installing EtherNet/IP networks, please refer to the "Media Planning and Installation Manual. EtherNet/IP" of ODVA Organization

*Current output 0/4 to 20 mA*

Standard installation cable is sufficient.

*Pulse/frequency/switch output*

Standard installation cable is sufficient.

*Relay output*

Standard installation cable is sufficient.

*Current input 0/4 to 20 mA*

Standard installation cable is sufficient.

*Status input*

Standard installation cable is sufficient.

### Cable diameter

- Cable glands supplied:
  M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring-loaded terminals: Suitable for strands and strands with ferrules.
  Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

### Requirements for the connecting cable

*Optionally available connecting cable*

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

| | |
|---|---|
| **Standard cable** | 2 × 2 × 0.34 mm² (22 AWG) PVC cable with common shield (2 pairs, pair-stranded) |
| **Flame resistance** | According to DIN EN 60332-1-2 |
| **Oil-resistance** | According to DIN EN 60811-2-1 |
| **Shielding** | 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*

No cable is supplied, and it must be provided by the customer (up to max. 300 m (1 000 ft)) for the following order option:
Order code for DKX001: Order code **040** for "Cable", option **1** "None, provided by customer, max 300 m"

A standard cable can be used as the connecting cable.

| | |
|---|---|
| **Standard cable** | 4 cores (2 pairs); pair-stranded with common shield |
| **Shielding** | Tin-plated copper-braid, optical cover ≥ 85 % |
| **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 |
| **Cable length** | Maximum 300 m (1 000 ft), see the following table |

| Cross-section | Max. cable length for use in<br>Non-hazardous area,<br>Ex Zone 2, Class I, Division 2<br>Ex Zone 1, Class I, Division 1 |
|---|---|
| 0.34 $mm^2$ (22 AWG) | 80 m (270 ft) |
| 0.50 $mm^2$ (20 AWG) | 120 m (400 ft) |
| 0.75 $mm^2$ (18 AWG) | 180 m (600 ft) |
| 1.00 $mm^2$ (17 AWG) | 240 m (800 ft) |
| 1.50 $mm^2$ (15 AWG) | 300 m (1000 ft) |

### 7.1.3 Terminal assignment

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

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

| Supply voltage | | Input/output 1 | Input/output 2 | | Input/output 3 | |
|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | EtherNet/IP (RJ45 connector) | 24 (+) | 25 (–) | 22 (+) | 23 (–) |
| | | | Device-specific terminal assignment: adhesive label in terminal cover. | | | |

Terminal assignment of the remote display and operating module → 43.

### 7.1.4 Device plugs available

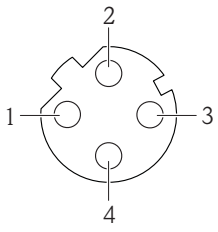
Device plugs may not be used in hazardous areas!

**Order code for "Input; output 1", option NA "EtherNet/IP"**

| Order code for "Electrical connection" | Cable entry/connection | |
|---|---|---|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | – |
| R [1) 2)], S [1) 2)], T [1) 2)], V [1) 2)] | Connector M12 × 1 | Connector M12 × 1 |

1) Cannot be combined with an external WLAN antenna (order code for "Enclosed accessories", option P8) of an RJ45 M12 adapter for the service interface (order code for "Accessories mounted", option NB) or of the remote display and operating module DKX001
2) Suitable for integrating the device in a ring topology.

### 7.1.5 Pin assignment of device plug




| Pin | | Assignment |
|---|---|---|
| 1 | + | Tx |
| 2 | + | Rx |
| 3 | - | Tx |
| 4 | - | Rx |
| **Coding** | | **Plug/socket** |
| D | | Socket |

### 7.1.6 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 → 📄 33.

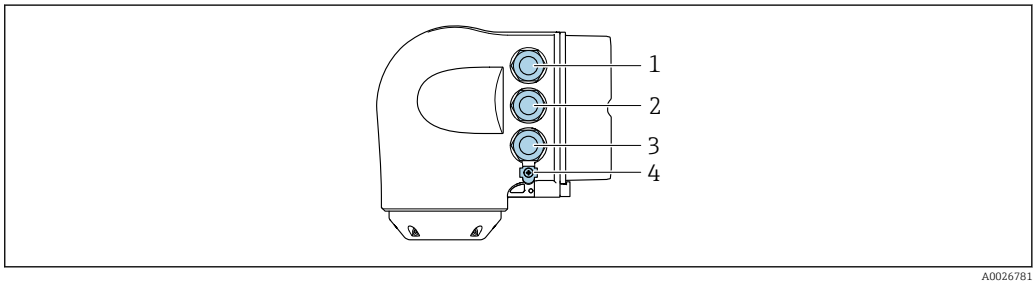
## 7.2 Connecting the measuring device

NOTICE

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

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

### 7.2.1 Connecting the transmitter

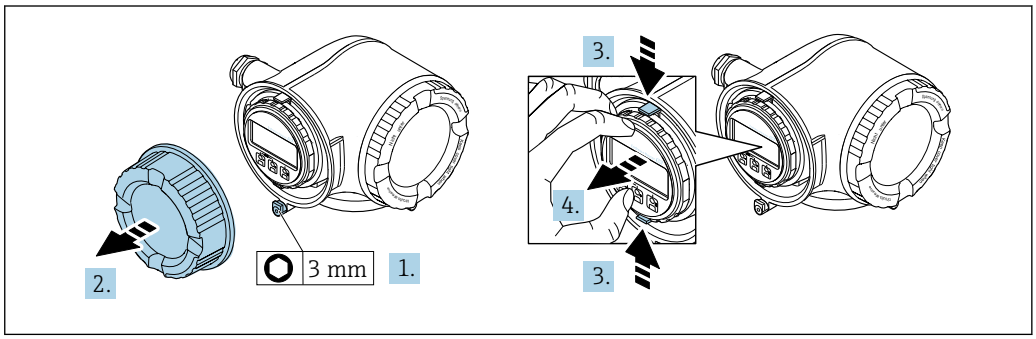



A0026781

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

In addition to connecting the device via EtherNet/IP and the available inputs/outputs, additional connection options are also available:
- Integrate into a network via the service interface (CDI-RJ45) → 📄 41.
- Integrate the device into a ring topology → 📄 42.

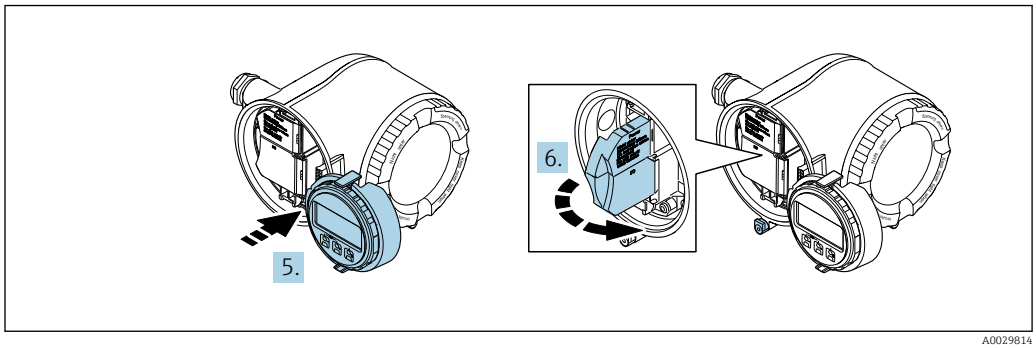
**Connecting the EtherNet/IP connector**




A0029813

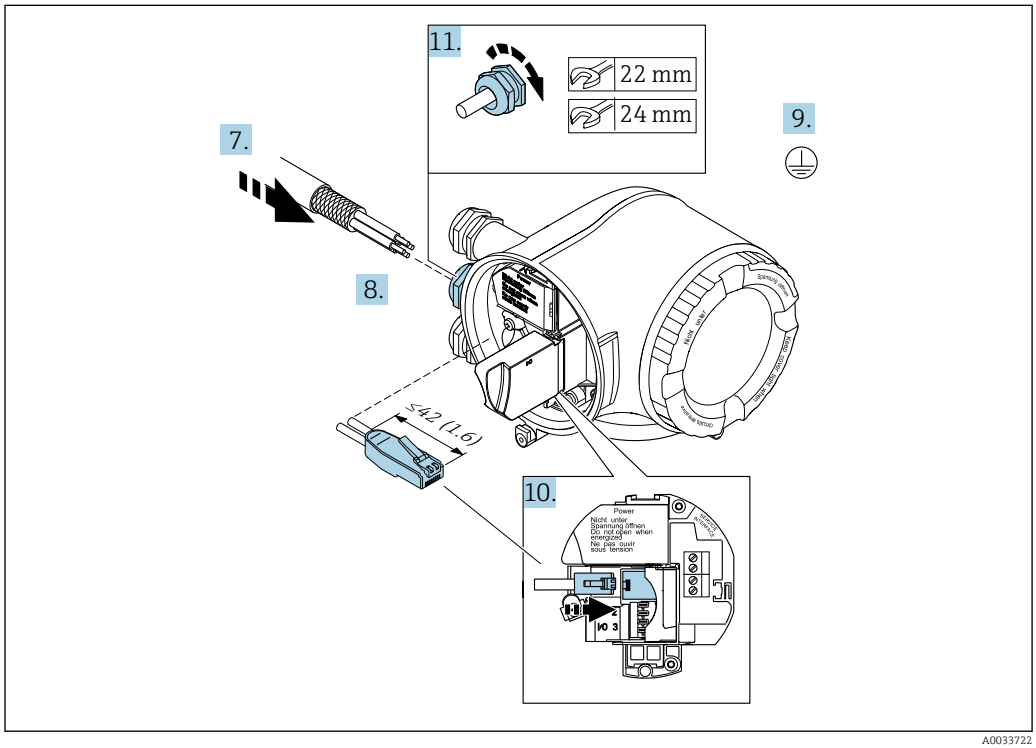
1. Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Squeeze the tabs of the display module holder together.

4. Remove the display module holder.




A0029814

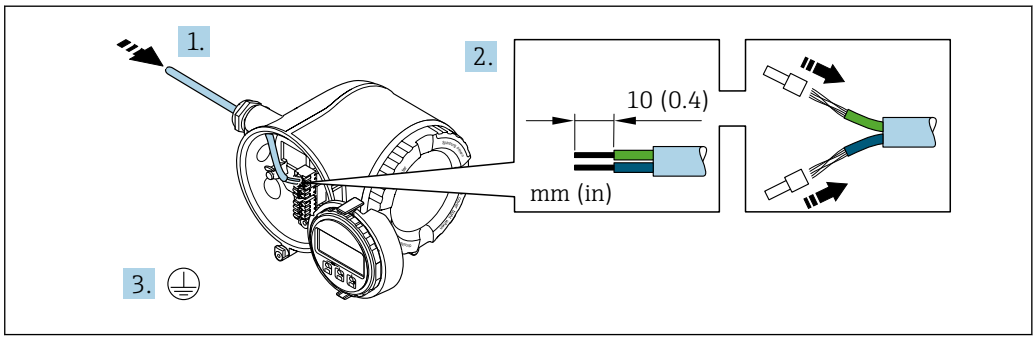
5. Attach the holder to the edge of the electronics compartment.
6. Open the terminal cover.




A0033722

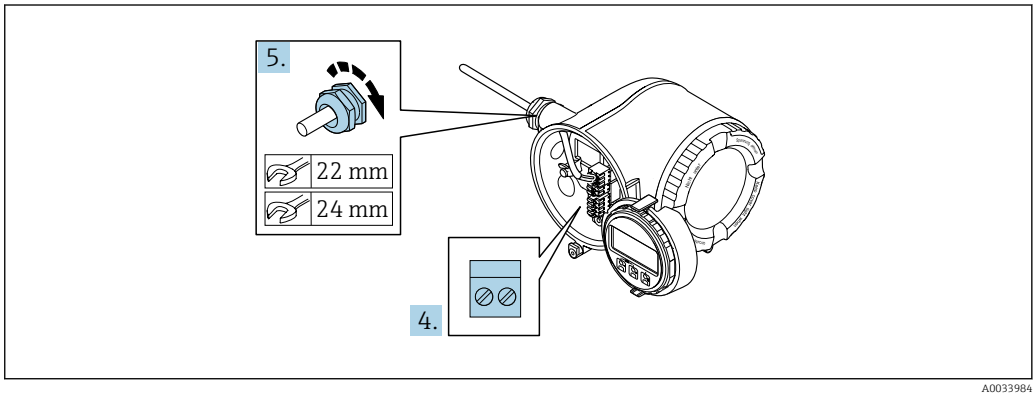
7. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
8. Strip the cable and cable ends and connect to the RJ45 connector.
9. Connect the protective ground.
10. Plug in the RJ45 connector.
11. Firmly tighten the cable glands.
    ↳ This concludes the EtherNet/IP connection process.

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




A0033983

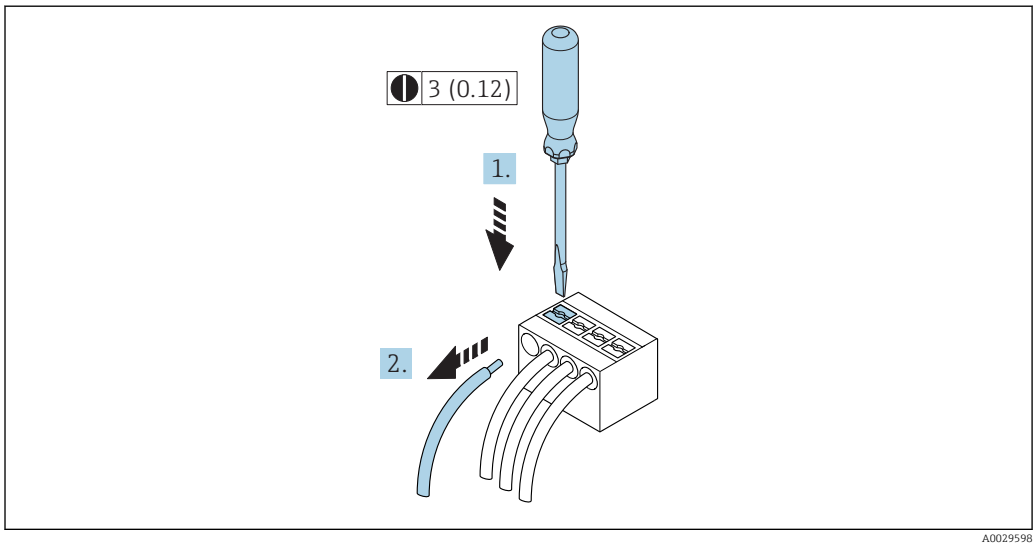
1. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
2. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
3. Connect the protective ground.




A0033984

4. Connect the cable in accordance with the terminal assignment .
   ↳ **Signal cable terminal assignment:** The device-specific terminal assignment is documented on an adhesive label in the terminal cover.
   **Supply voltage terminal assignment:** Adhesive label in the terminal cover or → 📄 36.
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




*8 Engineering unit mm (in)*

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

### 7.2.2 Integrating the transmitter into a network

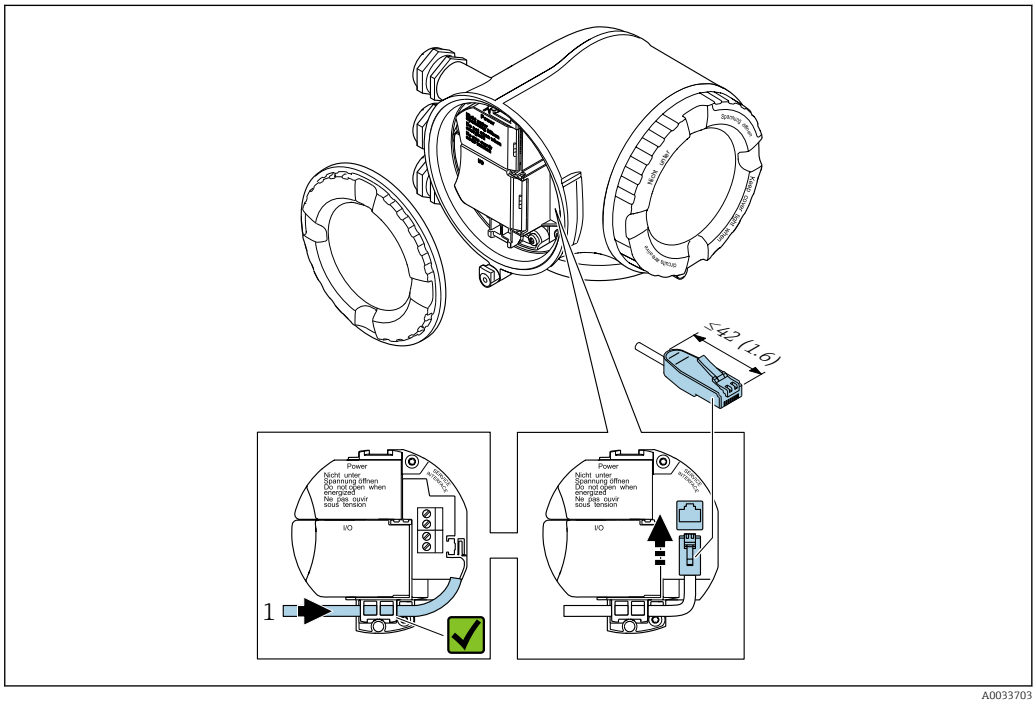
This section only presents the basic options for integrating the device into a network.

For information on the procedure to follow to connect the transmitter correctly → 37.

#### Integrating via the service interface

The device is integrated via the connection to the service interface (CDI-RJ45).

Note the following when connecting:
- Recommended cable: CAT 5e, CAT 6 or CAT 7, with shielded connector
- Maximum cable thickness: 6 mm
- Length of connector including bend protection: 42 mm
- Bending radius: 5 x cable thickness




*1 Service interface (CDI-RJ45)*

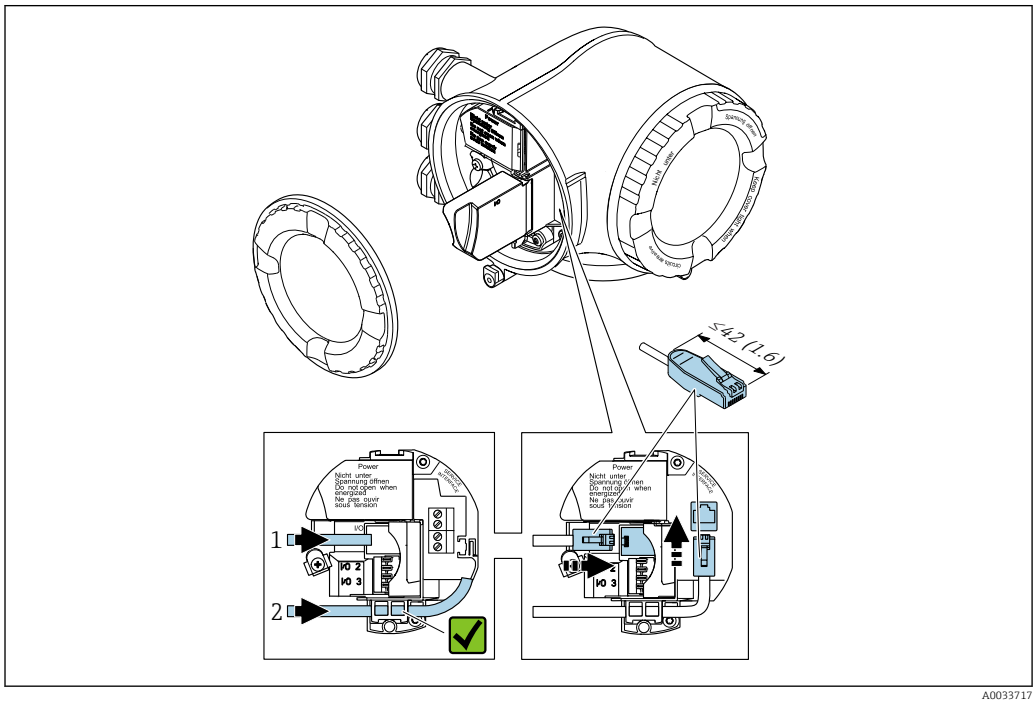
An adapter for RJ45 and the M12 connector is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

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

### Integrating into a ring topology

The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45).

Note the following when connecting:
- Recommended cable: CAT5e, CAT6 or CAT7, with shielded connector
- Maximum cable thickness: 6 mm
- Length of connector including bend protection: 42 mm
- Bending radius: 2.5 x cable thickness




1 *EtherNet/IP connection*
2 *Service interface (CDI-RJ45)*

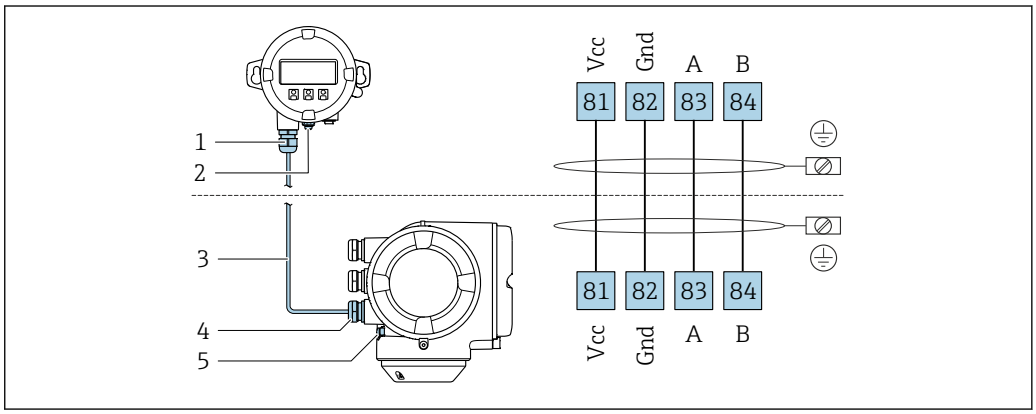
An adapter for RJ45 and the M12 connector is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

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

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

The remote display and operating module DKX001 is available as an optional extra → 171.

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




A0027518

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

## 7.3 Ensure potential equalization

### 7.3.1 Requirements

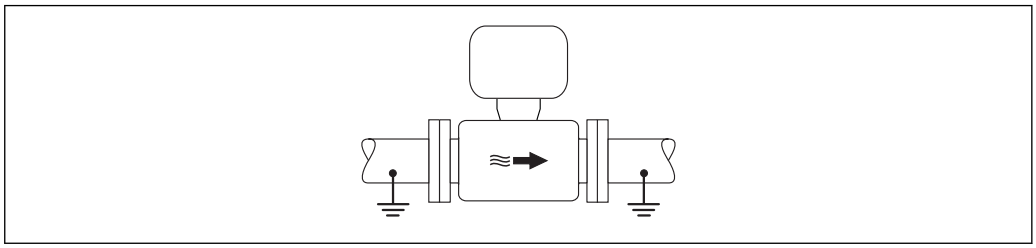
**CAUTION**

**Electrode damage can result in the complete failure of the device!**

- ▶ Same electrical potential for the medium and sensor
- ▶ Company-internal grounding concepts
- ▶ Pipe material and grounding

### 7.3.2 Connection example, standard scenario

**Metal, grounded pipe**



A0016315

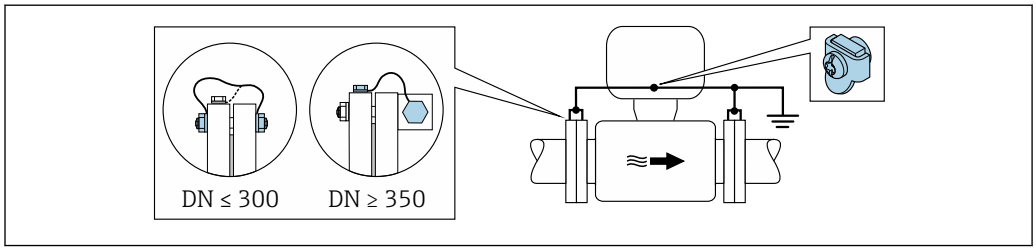
9 *Potential equalization via measuring tube*

### 7.3.3 Connection example in special situations

#### Unlined and ungrounded metal pipe

This connection method also applies in situations where:
- The customary potential equalization is not used
- Equalizing currents are present

| | |
|---|---|
| **Ground cable** | Copper wire, at least 6 mm² (0.0093 in²) |



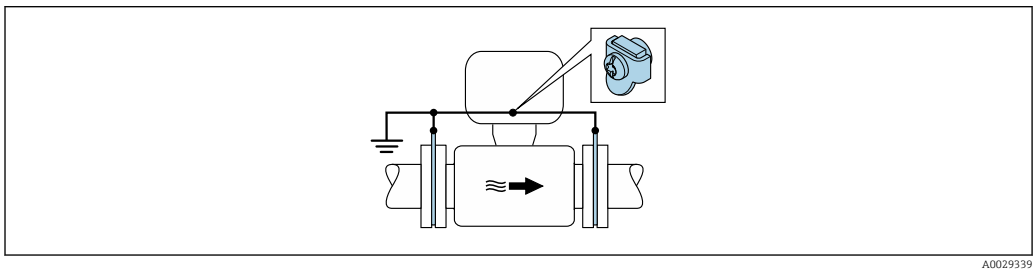

10 *Potential equalization via ground terminal and pipe flanges*

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

#### Plastic pipe or pipe with insulating liner

This connection method also applies in situations where:
- The customary potential equalization is not used
- Equalizing currents are present

| | |
|---|---|
| **Ground cable** | Copper wire, at least 6 mm² (0.0093 in²) |



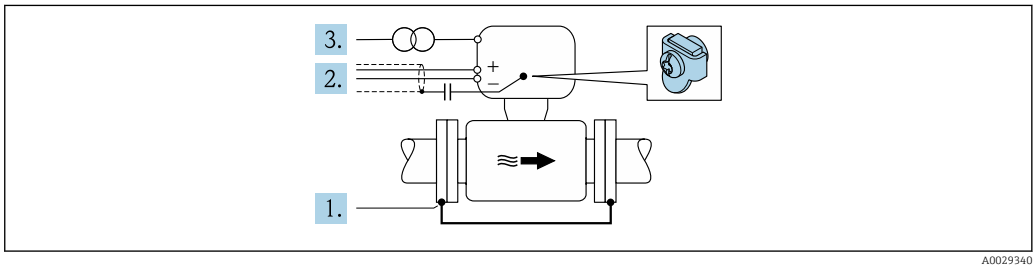

11 *Potential equalization via ground terminal and ground disks*

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

#### Pipe with a cathodic protection unit

This connection method is only used if the following two conditions are met:
- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

| | |
|---|---|
| **Ground cable** | Copper wire, at least 6 mm² (0.0093 in²) |



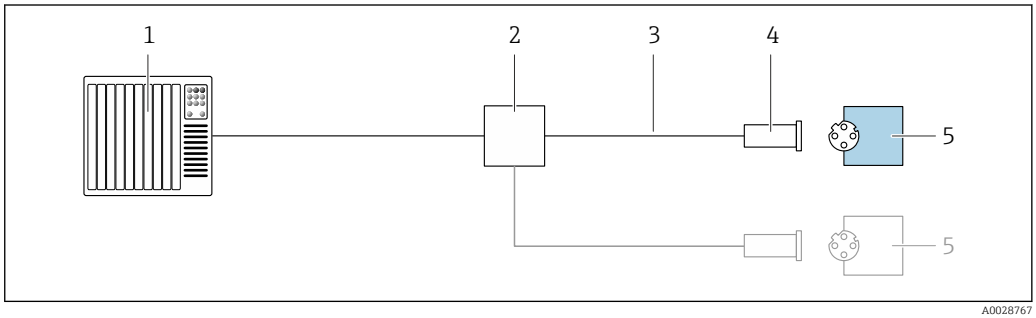

Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

1. Connect the two flanges of the pipe to one another via a ground cable.
2. Guide the shield of the signal lines through a capacitor.
3. Connect the measuring device to the power supply such that it is floating in relation to the protective ground (isolation transformer).

## 7.4 Special connection instructions

### 7.4.1 Connection examples

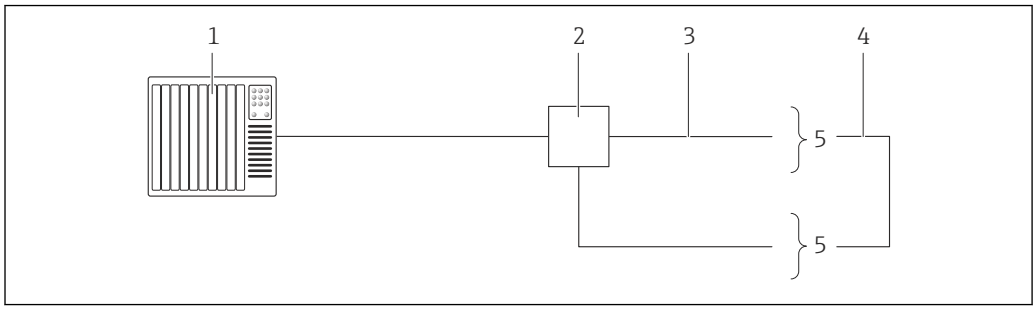
#### EtherNet/IP




12 *Connection example for EtherNet/IP*

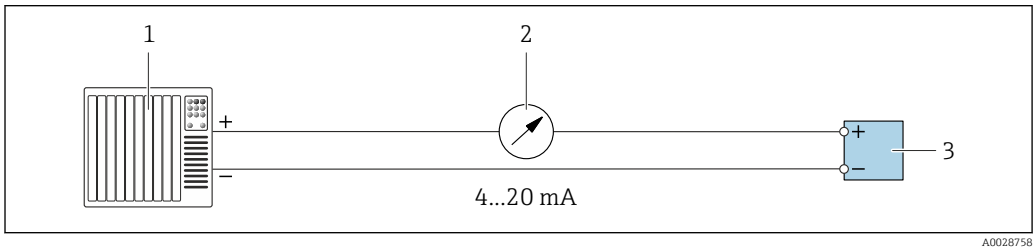
1 *Control system (e.g. PLC)*
2 *Ethernet switch*
3 *Observe cable specifications*
4 *Device plug*
5 *Transmitter*

### EtherNet/IP: DLR (Device Level Ring)



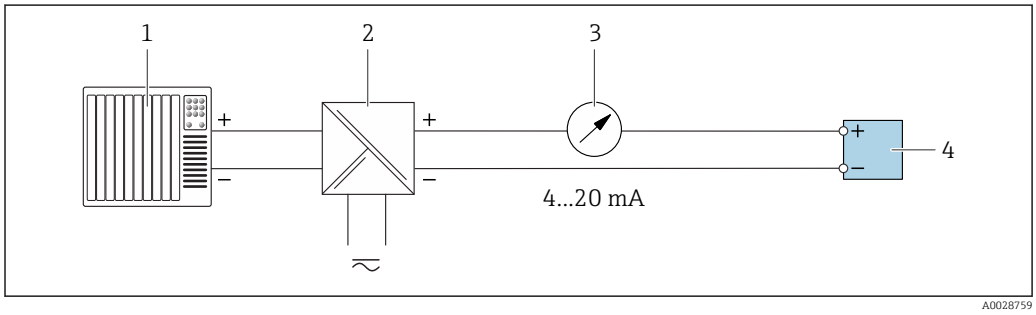

*1 Control system (e.g. PLC)*
*2 Ethernet switch*
*3 Observe cable specifications → 33*
*4 Connecting cable between the two transmitters*
*5 Transmitter*

### Current output 4-20 mA




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

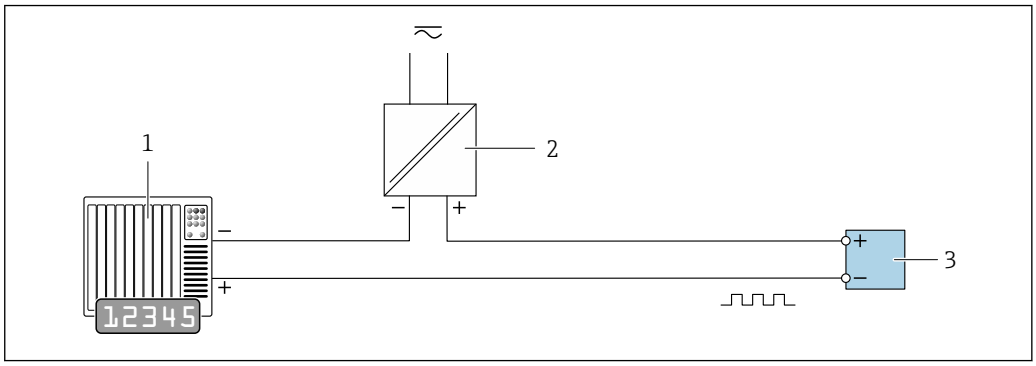
*1 Automation system with current input (e.g. PLC)*
*2 Analog display unit: observe maximum load*
*3 Transmitter*




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

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

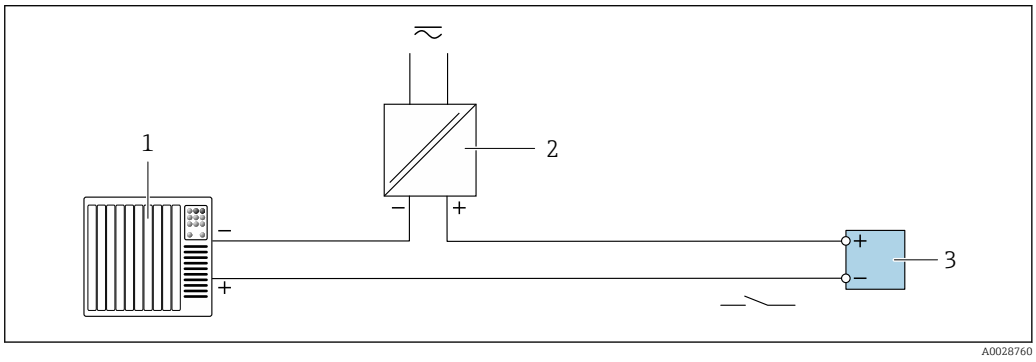
### Pulse/frequency output




15 *Connection example for pulse/frequency output (passive)*

1 *Automation system with pulse/frequency input (e.g. PLC)*
2 *Power supply*
3 *Transmitter: Observe input values → 177*

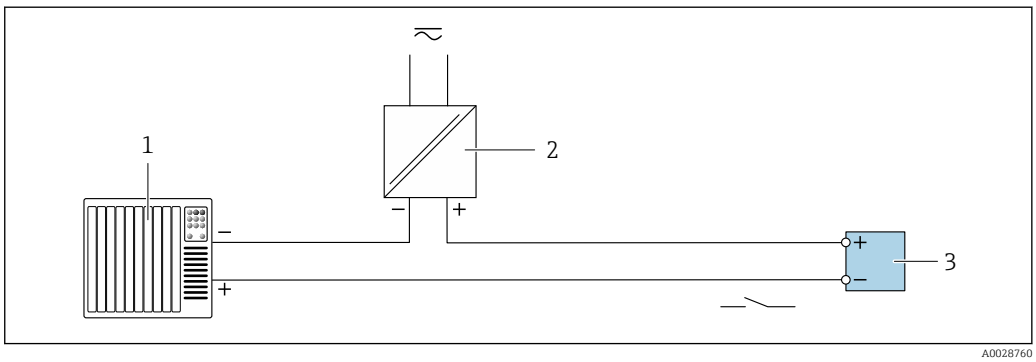
### Switch output




16 *Connection example for switch output (passive)*

1 *Automation system with switch input (e.g. PLC)*
2 *Power supply*
3 *Transmitter: Observe input values → 177*

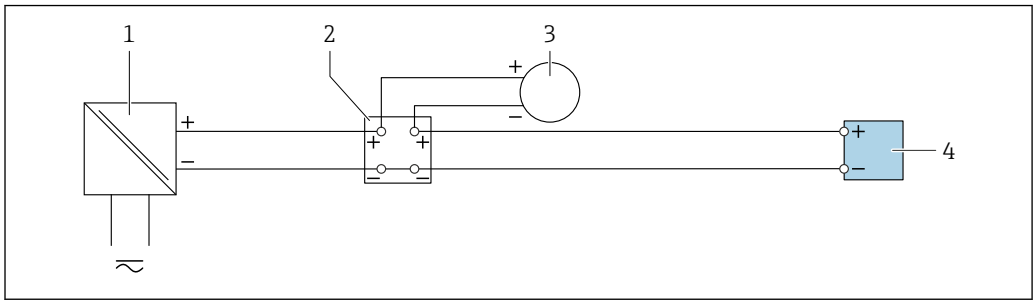
### Relay output




17 *Connection example for relay output (passive)*

1 *Automation system with relay input (e.g. PLC)*
2 *Power supply*
3 *Transmitter: Observe input values → 178*

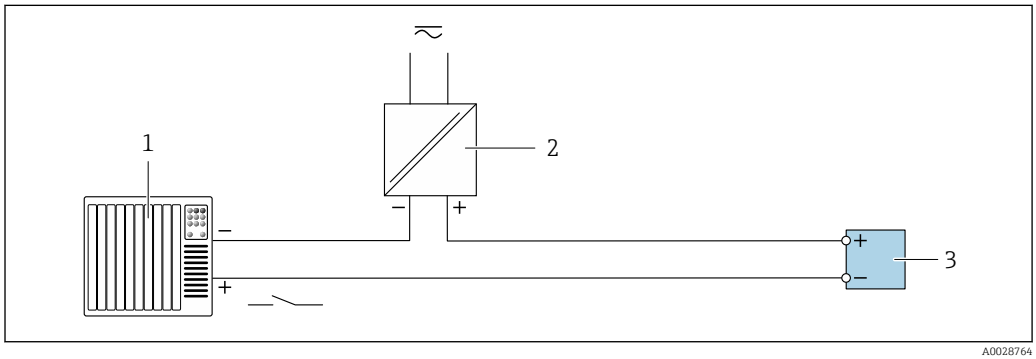
### Current input




18 *Connection example for 4 to 20 mA current input*

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

### Status input




19 *Connection example for status input*

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

## 7.5 Hardware settings

### 7.5.1 Setting the device address

The IP address of the measuring device can be configured for the network via DIP switches.

#### Addressing data

| IP address and configuration options | | | |
|---|---|---|---|
| 1st octet | 2nd octet | 3rd octet | 4th octet |
| **192.** | **168.** | **1.** | **XXX** |
| | ↓ | | ↓ |
| | Can only be configured via software addressing | | Can be configured via software addressing and hardware addressing |

| | |
|---|---|
| **IP address range** | 1 to 254 (4th octet) |
| **IP address broadcast** | 255 |

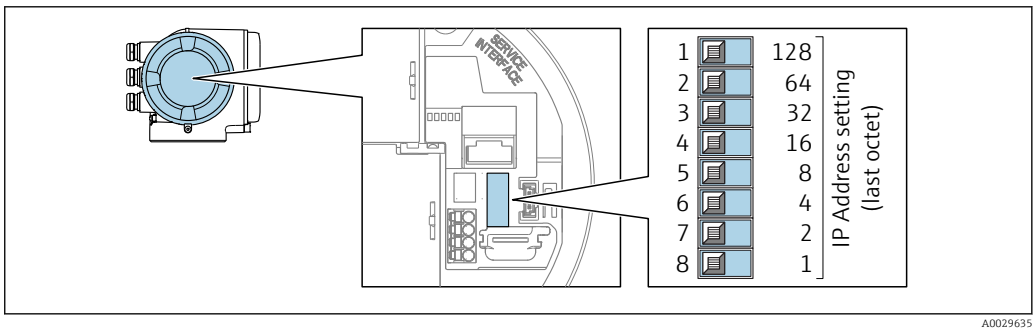
| | |
|---|---|
| **Addressing mode ex works** | Software addressing; all DIP switches for hardware addressing are set to OFF. |
| **IP address ex works** | DHCP server active |

Software addressing: The IP address is entered via the **IP address** parameter (→ 95) .

### Setting the IP address

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 → 49.



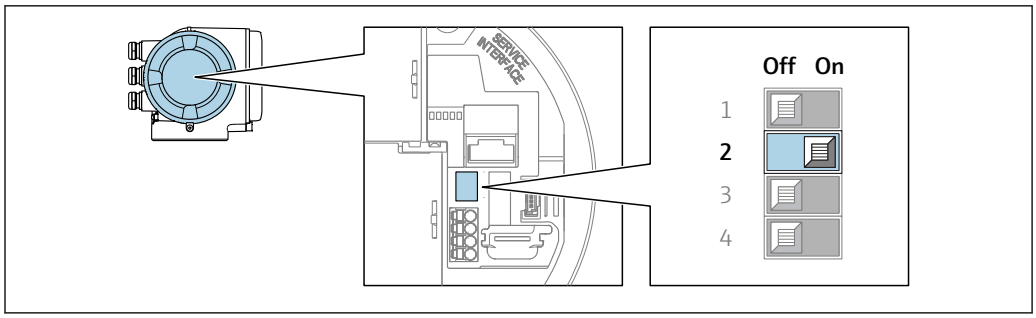

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary.
3. Set the desired IP address using the corresponding DIP switches on the I/O electronics module.
4. Reverse the removal procedure to reassemble the transmitter.
5. Reconnect the device to the power supply.
   ↳ The configured device address is used once the device is restarted.

## 7.5.2 Activating the default IP address

The DHCP function is enabled in the device at the factory, i.e. the device expects an IP address to be assigned by the network. This function can be disabled and the device can be set to the default IP address 192.168.1.212 by DIP switch.

### Activating the default IP address via the DIP switch

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




A0034499

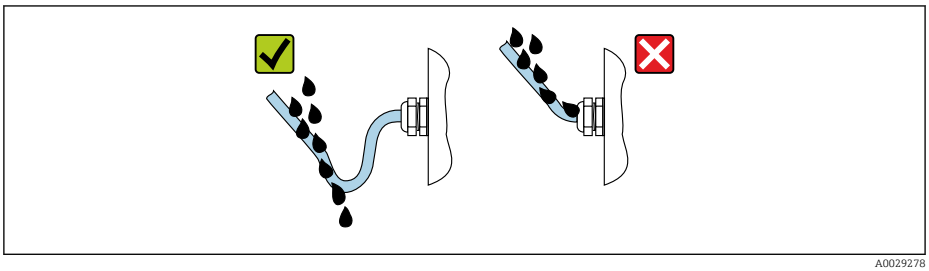
1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary .
3. Set DIP switch No. 2 on the I/O electronics module from **OFF** → **ON**.
4. Reverse the removal procedure to reassemble the transmitter.
5. Reconnect the device to the power supply.
   ↳ The default IP address is used once the device is restarted.

## 7.6 Ensuring the degree of protection

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

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

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



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6. Insert dummy plugs into unused cable entries.

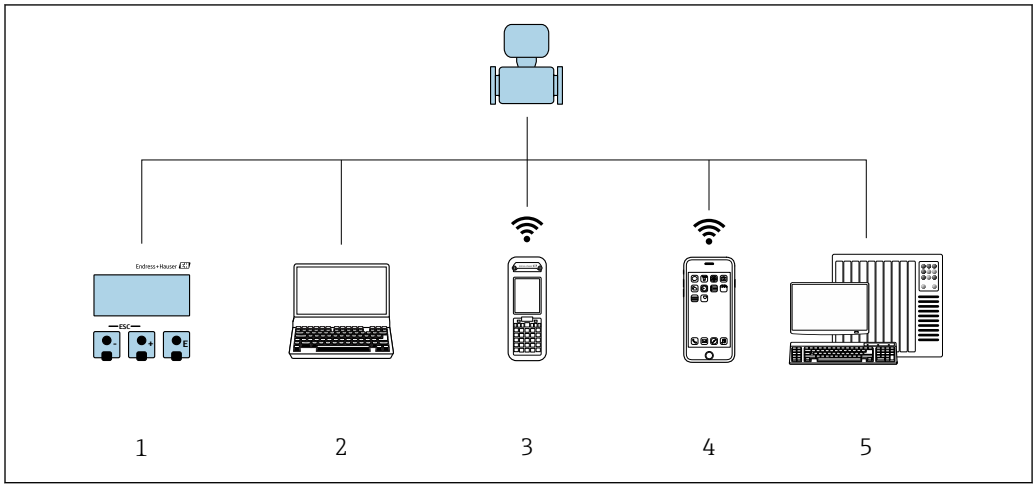
## 7.7 Post-connection check

| | |
|---|---|
| Are cables or the device undamaged (visual inspection)? | ❑ |
| Do the cables used meet the requirements? | ❑ |
| Do the cables have adequate strain relief? | ❑ |
| Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 🖹 50 ? | ❑ |

| | |
|---|---|
| If supply voltage is present, do values appear on the display module? | ❑ |
| Is the potential equalization established correctly ? | ❑ |

# 8 Operation options

## 8.1 Overview of operation options

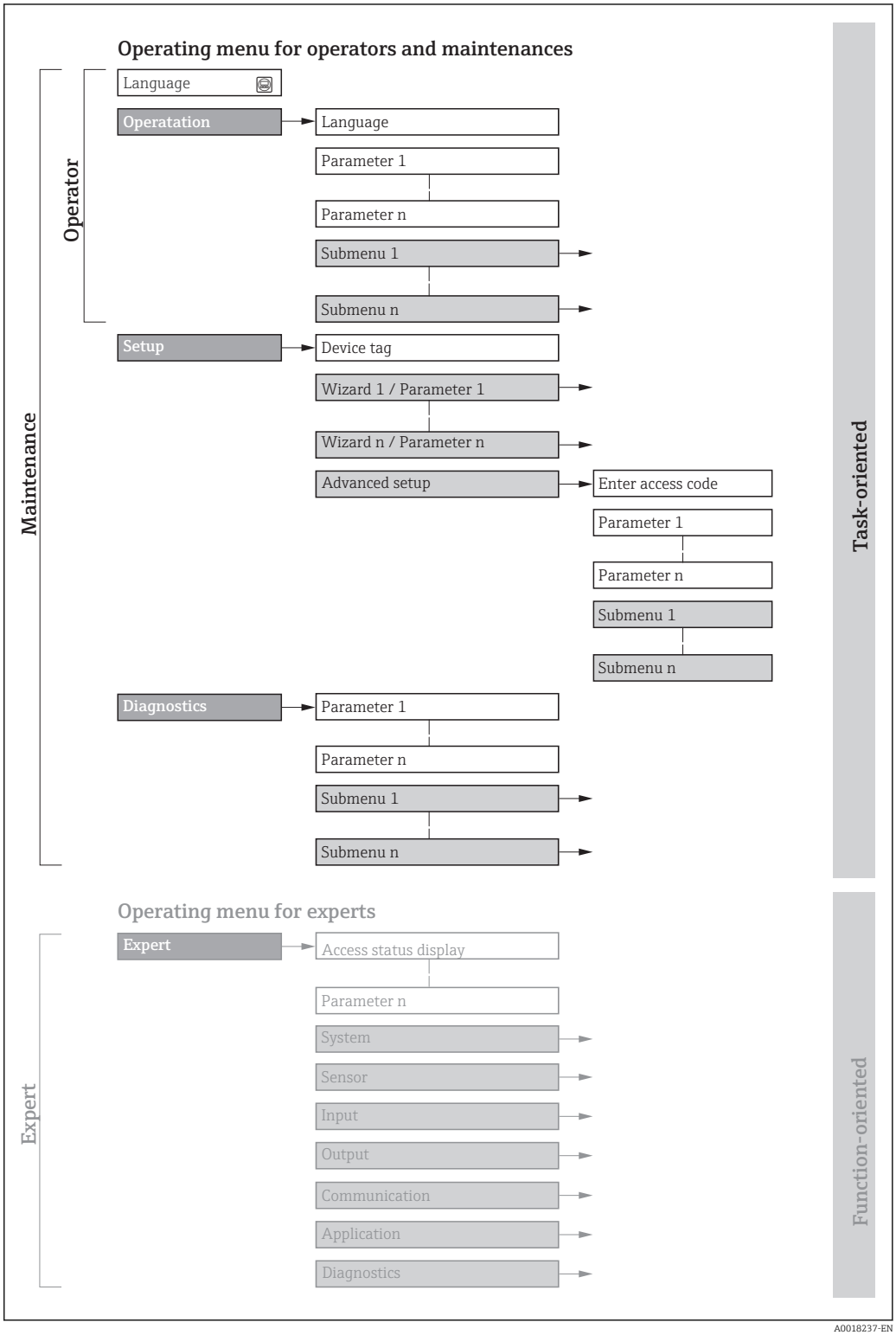



*1 Local operation via display module*
*2 Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)*
*3 Field Xpert SFX350 or SFX370*
*5 Mobile handheld terminal*
*6 Control system (e.g. PLC)*

## 8.2 Structure and function of the operating menu

### 8.2.1 Structure of the operating menu

For an overview of the operating menu for experts: "Description of Device Parameters" document supplied with the device→ 199




20 *Schematic structure of the operating menu*

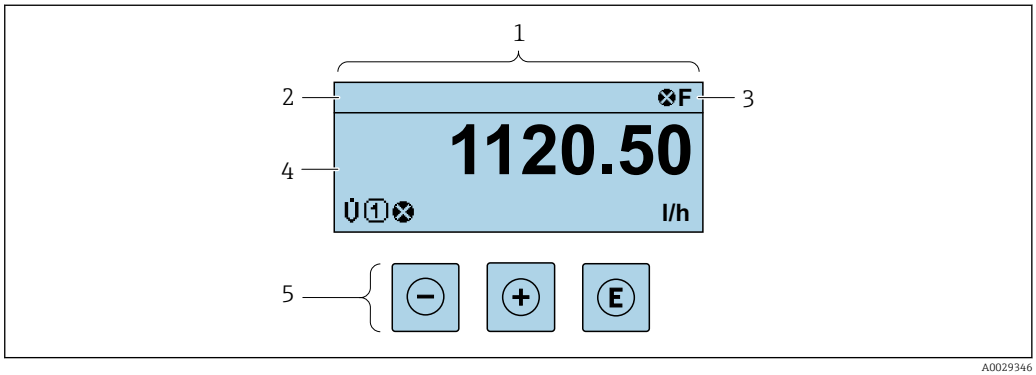
### 8.2.2 Operating philosophy

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>▪ Configuring 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 fast commissioning:<br>▪ Set the system units<br>▪ Display I/O/configuration<br>▪ Configure the inputs<br>▪ Configure the outputs<br>▪ Configuring the operational display<br>▪ Define the output conditioning<br>▪ Set the low flow cut off<br>▪ Configure empty pipe detection<br><br>Advanced setup<br>▪ For more customized configuration of the measurement (adaptation to special measuring conditions)<br>▪ Configuration of totalizers<br>▪ Configuration of electrode cleaning (optional)<br>▪ Configure the WLAN settings<br>▪ Administration (define access code, reset measuring device) |
| Diagnostics | | **"Maintenance" role**<br>Fault elimination:<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 "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-order device parameters which do not concern the measurement or the communication interface.<br>▪ Sensor<br>Configuration of the measurement.<br>▪ Input<br>Configuring the status input.<br>▪ Output<br>Configuring 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>Configure 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



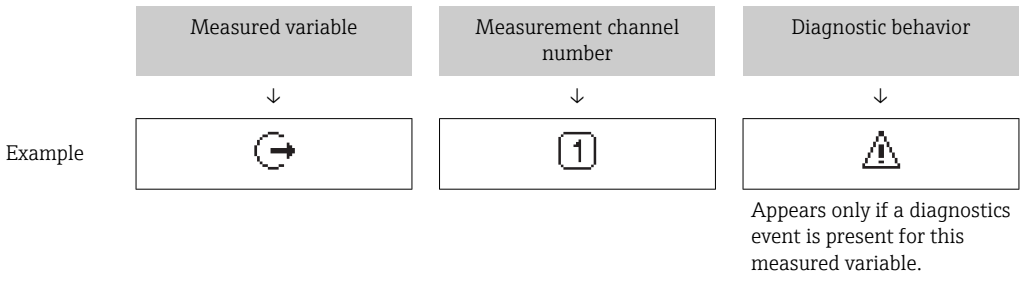

1 *Operational display*
2 *Device tag* → 🖹 92
3 *Status area*
4 *Display area for measured values (4-line)*
5 *Operating elements* → 🖹 60

#### Status area

The following symbols appear in the status area of the operational display at the top right:
- Status signals → 🖹 144
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior → 🖹 145
  - ⊗: Alarm
  - ⚠: Warning
- 🔒: Locking (the device is locked via the hardware )
- ⇆: Communication (communication via remote operation is active)

#### Display area

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




*Measured values*

| Symbol | Meaning |
|---|---|
| $\dot{V}$ | Volume flow |
| G | Conductivity |

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

*Measurement channel numbers*

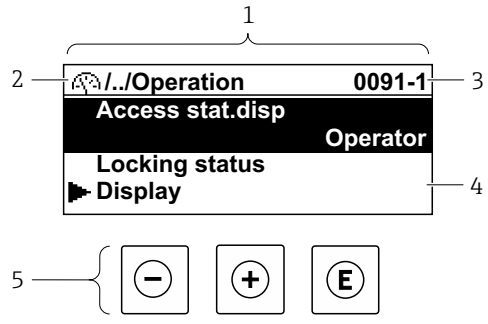
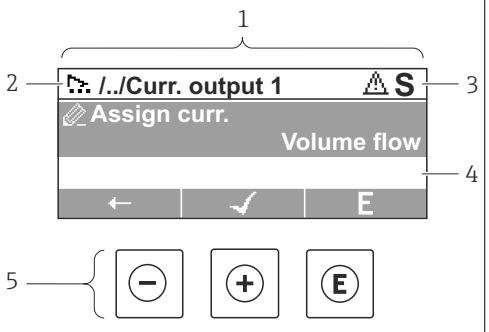
| Symbol | Meaning |
|---|---|
| 1 ... 4 | Measurement channel 1 to 4 |
| The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. Totalizer 1 to 3). | |

*Diagnostic behavior*

| |
|---|
| The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable.<br>For information on the symbols → 145 |

The number and display format of the measured values can be configured via the **Format display** parameter (→ 108).

## 8.3.2 Navigation view

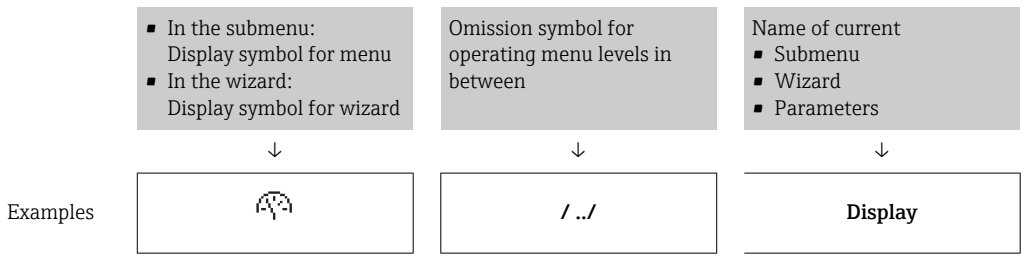
| In the submenu | In the wizard |
|---|---|
|  |  |

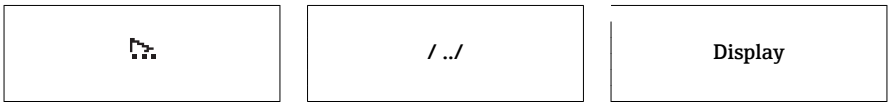


*1 Navigation view*
*2 Navigation path to current position*
*3 Status area*
*4 Display area for navigation*
*5 Operating elements → 60*

### Navigation path

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






For more information about the icons in the menu, refer to the "Display area" section → 57

### 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 → 144
- For information on the function and entry of the direct access code → 62

### 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>No display symbol exists for parameters in submenus. |

*Locking*

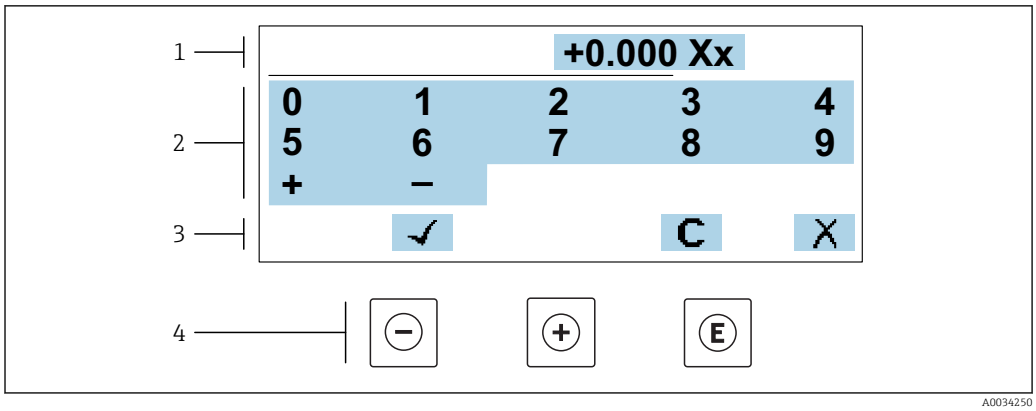
| Symbol | Meaning |
|---|---|
| | **Parameter locked**<br>When displayed in front of a parameter name, indicates that the parameter is locked.<br>▪ By a user-specific access code<br>▪ By the hardware write protection switch |

*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

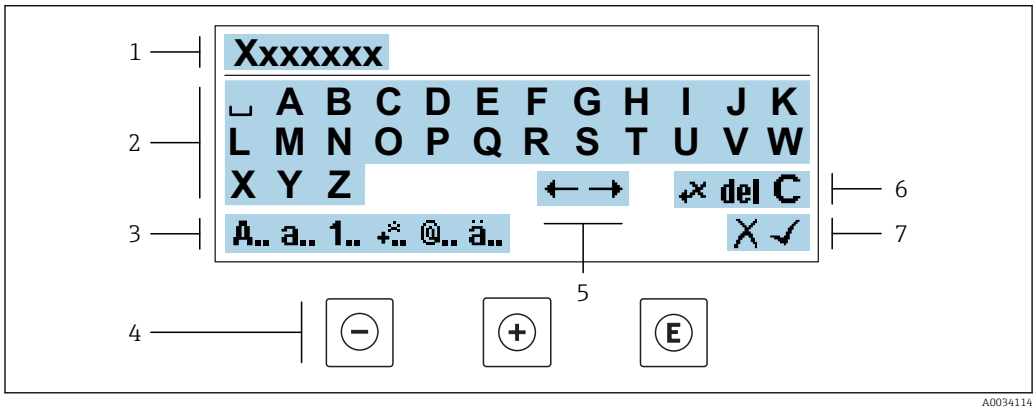
### Numeric editor




21 *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*

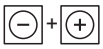
### Text editor




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

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

*Using the operating elements in the editing view*

| Operating key(s) | Meaning |
|---|---|
| | **Minus key**<br>Move the entry position to the left. |
| | **Plus key**<br>Move the entry position to the right. |
| | **Enter key**<br>▪ Press the key briefly: confirm your selection.<br>▪ Press the key for 2 s: confirm the entry. |
|  | **Escape key combination (press keys simultaneously)**<br>Close the editing view without accepting the changes. |

*Input screens*

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

### 8.3.4 Operating elements

| Operating key(s) | Meaning |
|---|---|
| ⊖ | **Minus key**<br>*In a menu, submenu*<br>Moves the selection bar upwards in a choose list.<br>*With a Wizard*<br>Confirms the parameter value and goes to the previous parameter.<br>*With a text and numeric editor*<br>Move the entry position to the left. |
| ⊕ | **Plus key**<br>*In a menu, submenu*<br>Moves the selection bar downwards in a choose list.<br>*With a Wizard*<br>Confirms the parameter value and goes to the next parameter.<br>*With a 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>▪ Pressing the key for 2 s opens the context menu including the option for activating the keypad lock.<br>*In a 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 for 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>*With a text and numeric editor*<br>▪ Press the key briefly: confirm your selection.<br>▪ Press the key for 2 s: confirm the entry. |
| ⊖ + ⊕ | **Escape key combination (press keys simultaneously)**<br>*In a menu, submenu*<br>▪ Pressing the key briefly:<br>– Exits the current menu level and takes you to the next higher level.<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 higher level.<br>*With a text and numeric editor*<br>Close the editing view without accepting the changes. |
| ⊖ + Ⓔ | **Minus/Enter key combination (press the keys simultaneously)**<br>Press the key for 3 s: deactivate the keypad lock. |

### 8.3.5 Opening the context menu

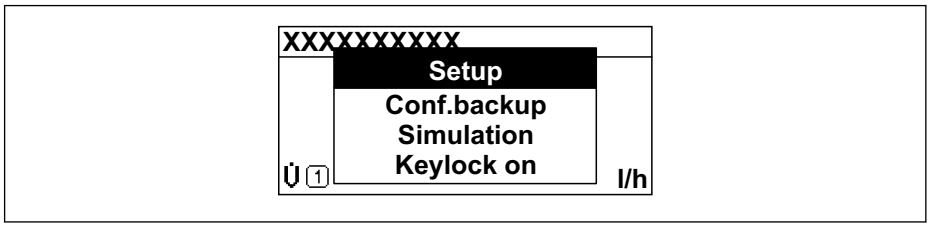
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

### Calling up and closing the context menu

The user is in the operational display.

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




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

### Calling up the menu via the context menu

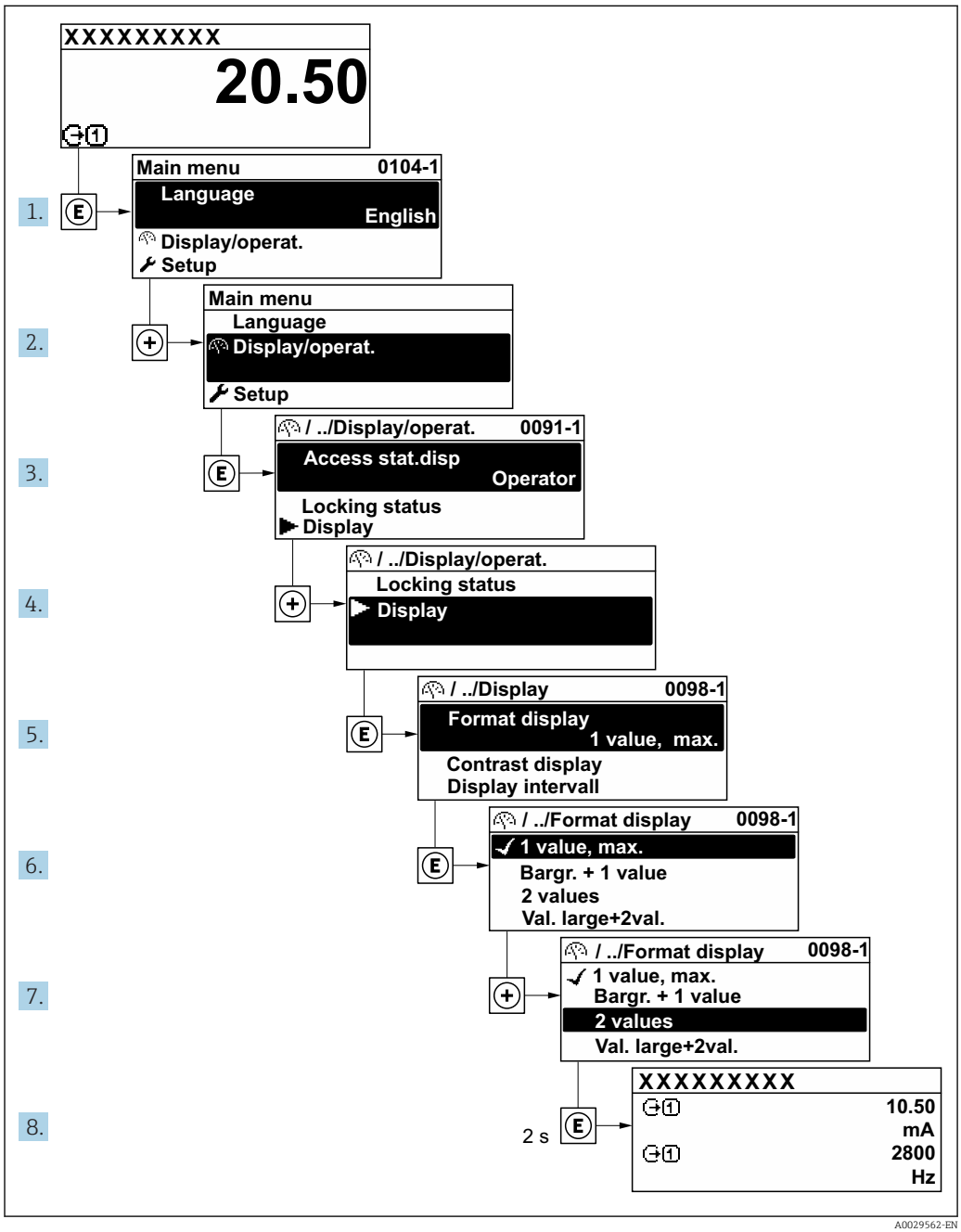
1. Open the context menu.
2. Press + to navigate to the desired menu.
3. Press E to confirm the selection.
   ↳ The selected menu opens.

### 8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements
→ 56

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

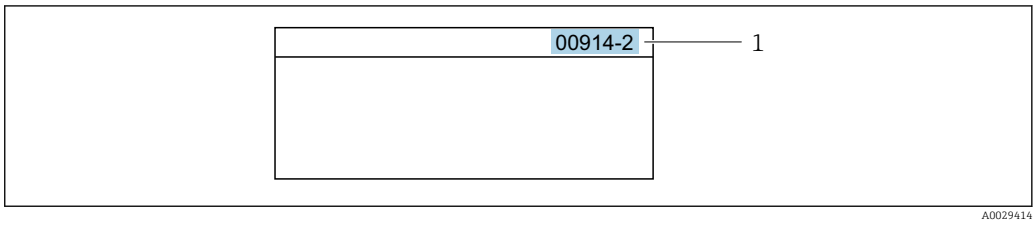



### 8.3.7 Calling the parameter directly

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

**Navigation path**
Expert → Direct access

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




*1 Direct access code*

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

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

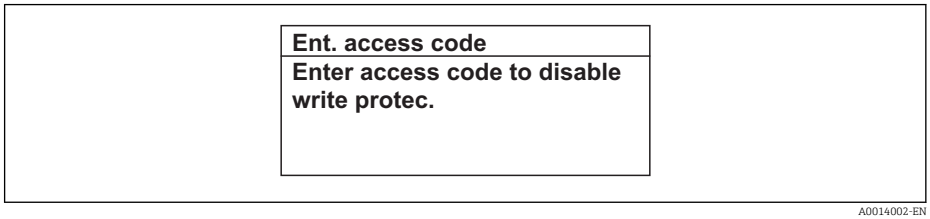
## 8.3.8 Calling up help text

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

### Calling up and closing the help text

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

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



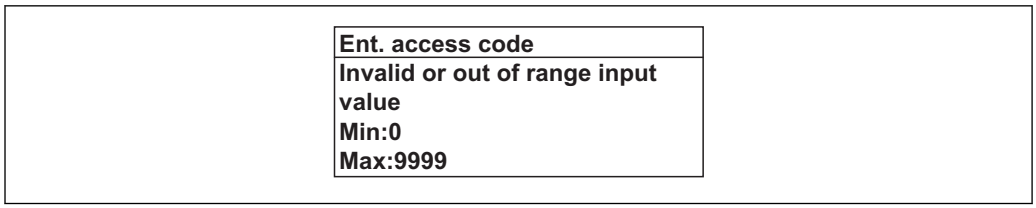

*23 Example: Help text for parameter "Enter access code"*

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.

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For a description of the editing view - consisting of the text editor and numeric editor - with symbols → 58, for a description of the operating elements → 60

## 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 → 127.

### 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 excepted from the write protection, as they do not affect the measurement. Refer to the "Write protection via access code" section

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

## 8.3.11 Disabling write protection via access code

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using local operation → 127.

Parameter write protection via local operation can be disabled by entering the user-specific access code in the **Enter access code** parameter (→ 113) via the respective access option.

1. After you press 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

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

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

#### Switching off the keypad lock

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

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

### 8.4.1 Function range

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

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

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

### 8.4.2 Prerequisites

*Computer hardware*

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

*Computer software*

| Software | Interface | |
|---|---|---|
| | CDI-RJ45 | WLAN |
| Recommended operating systems | ▪ Microsoft Windows 7 or higher.<br>▪ Mobile operating systems:<br>– iOS<br>– Android<br>Microsoft Windows XP 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 a Proxy Server for Your LAN* must be **deselected** . | |
| JavaScript | JavaScript must be enabled.<br>If JavaScript cannot be enabled: enter http://192.168.1.212/basic.html in the address line of the Web browser. A fully functional but simplified version of the operating menu structure starts in the Web browser.<br>When installing a new firmware version: To enable correct data display, clear the temporary memory (cache) of the Web browser under **Internet options**. | |
| Network connections | Only the active network connections to the measuring device should be used. | |
| | Switch off all other network connections such as WLAN. | Switch off all other network connections. |

In the event of connection problems: → 141

*Measuring device: Via CDI-RJ45 service interface*

| Device | CDI-RJ45 service interface |
|---|---|
| Measuring device | The measuring device has an RJ45 interface. |
| Web server | Web server must be enabled; factory setting: ON<br>For information on enabling the Web server → 72 |
| IP address | If the IP address of the device is not known:<br>▪ The IP address can be read out via local operation: Diagnostics → Device information → IP address<br>▪ Communication with the Web server can be established via the default IP address 192.168.1.212. The DHCP function is enabled in the device at the factory, i.e. the device expects an IP address to be assigned by the network. This function can be disabled and the device can be set to the default IP address 192.168.1.212: set DIP switch No. 4 from **OFF** → **ON**.<br>Set the default IP address → 49. |

*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>For information on enabling the Web server → 72 |
| IP address | If the IP address of the device is not known:<br>▪ The IP address can be read out via local operation: Diagnostics → Device information → IP address<br>▪ Communication with the Web server can be established via the default IP address 192.168.1.212. The DHCP function is enabled in the device at the factory, i.e. the device expects an IP address to be assigned by the network. This function can be disabled and the device can be set to the default IP address 192.168.1.212: set DIP switch No. 4 from **OFF** → **ON**.<br>Set the default IP address → 49. |

## 8.4.3 Establishing a connection

### Via service interface (CDI-RJ45)

*Preparing the measuring device*

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

*Configuring the Internet protocol of the computer*

The IP address can be assigned to the measuring device in a variety of ways:
- Dynamic Host Configuration Protocol (DHCP), factory setting:
  The IP address is automatically assigned to the measuring device by the automation system (DHCP server).
- Hardware addressing:
  The IP address is set via DIP switches → 🖹 48.
- Software addressing:
  The IP address is entered via the **IP address** parameter (→ 🖹 95) .
- 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 → 🖹 49.

The measuring device works with the Dynamic Host Configuration Protocol (DHCP), on leaving the factory, i.e. the IP address of the measuring device is automatically assigned by the automation system (DHCP server).

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

1. Via DIP switch 2, activate the default IP address 192.168.1.212: → 🖹 49.
2. Switch on the measuring device.
3. Connect to the computer using a cable → 🖹 74.
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

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

*Preparing the mobile terminal*

- ▶ Enable WLAN reception on the mobile terminal.

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

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promag_300_A802000).
2. If necessary, select the WPA2 encryption method.
3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ LED on display module flashes: it is now possible to operate the measuring device with the Web browser, FieldCare or DeviceCare.

The serial number can be found on the nameplate.

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

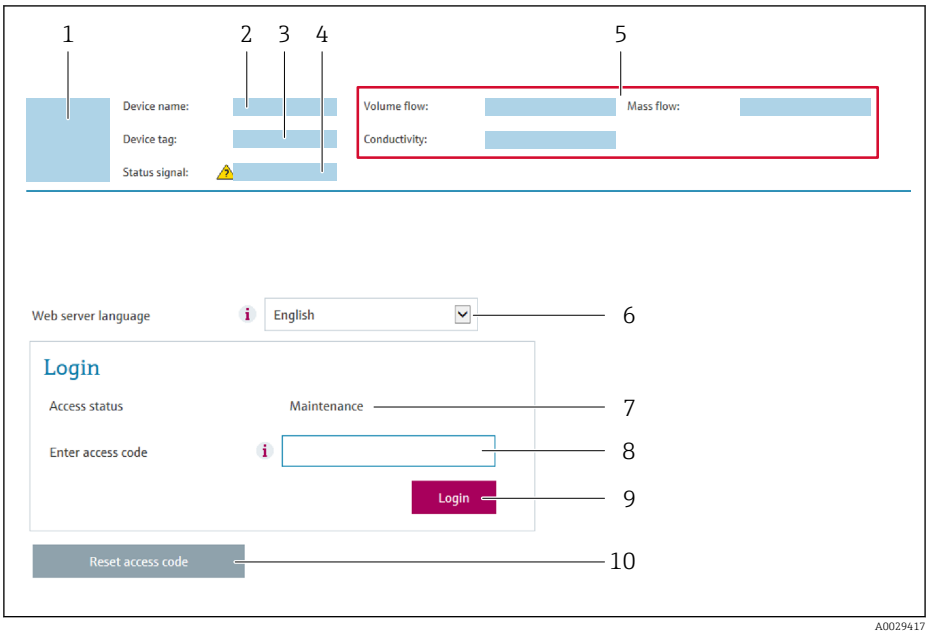
*Disconnecting*

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

**Starting the Web browser**

1. Start the Web browser on the computer.

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




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 (→ 124)*

If a login page does not appear, or if the page is incomplete → 141

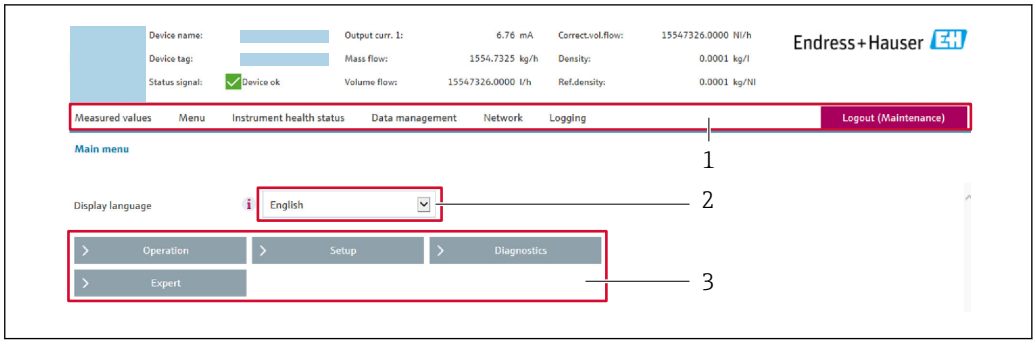
### 8.4.4 Logging on

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

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

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

## 8.4.5 User interface




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 → 147
- Current measured values

### Function row

| Functions | Meaning |
|---|---|
| Measured values | Displays the measured values of the measuring 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>For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device |
| Device status | Displays the diagnostic messages currently pending, listed in order of priority |
| Data management | Data exchange between PC and measuring device:<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>▪ File for system integration - If using fieldbuses, upload device drivers for system integration from the measuring device:<br>EtherNet/IP: EDS file<br>▪ Firmware update - Flashing a firmware version |
| Network configuration | 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

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

### Working area

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

## 8.4.6 Disabling the Web server

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

### Navigation

"Expert" menu → Communication → Web server

### Parameter overview with brief description

| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Web server functionality | Switch the Web server on and off. | ▪ Off<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. |
| On | ▪ The complete functionality of the web server 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

Before logging out, perform a data backup via the **Data management** function (upload configuration from device) if necessary.

1. Select the **Logout** entry in the function row.
   ↳ The home page with the Login box appears.
2. Close the Web browser.

3. If no longer needed:
   Reset modified properties of the Internet protocol (TCP/IP) → 68.

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

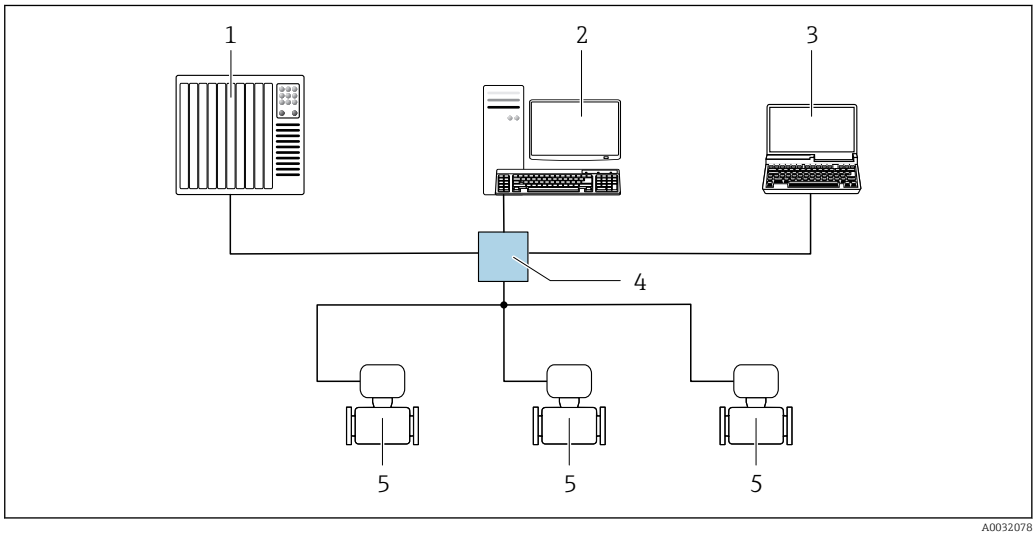
The structure of the operating menu in the operating tools is the same as for operation via the local display.

### 8.5.1 Connecting the operating tool

#### Via EtherNet/IP network

This communication interface is available in device versions with EtherNet/IP.

*Star topology*

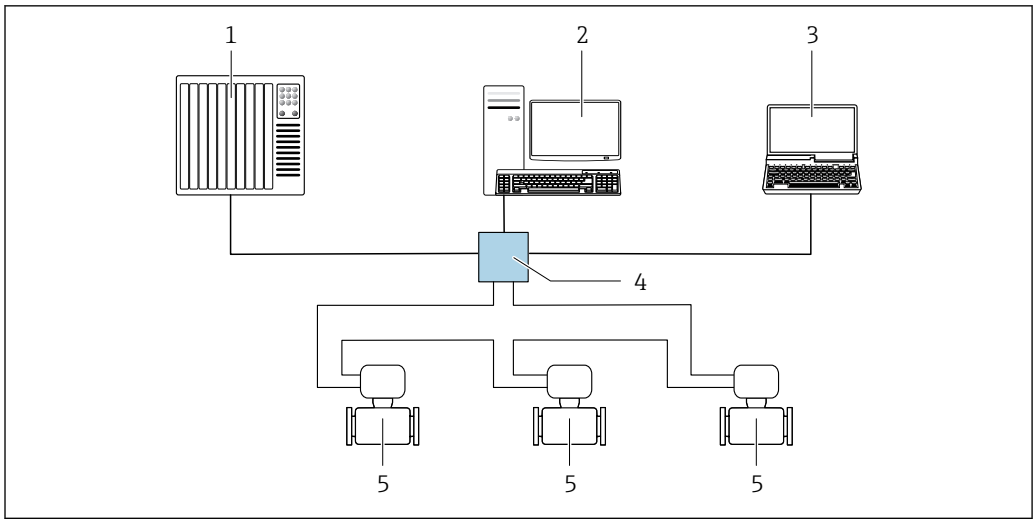



24 *Options for remote operation via EtherNet/IP network: star topology*

1 *Automation system, e.g. "RSLogix" (Rockwell Automation)*
2 *Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)*
3 *Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"*
4 *Ethernet switch*
5 *Measuring device*

*Ring topology*

The device is integrated via the terminal connection for signal transmission (output 1) and the service interface (CDI-RJ45).




25 *Options for remote operation via EtherNet/IP network: ring topology*

1 *Automation system, e.g. "RSLogix" (Rockwell Automation)*
2 *Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)*
3 *Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"*
4 *Ethernet switch*
5 *Measuring device*

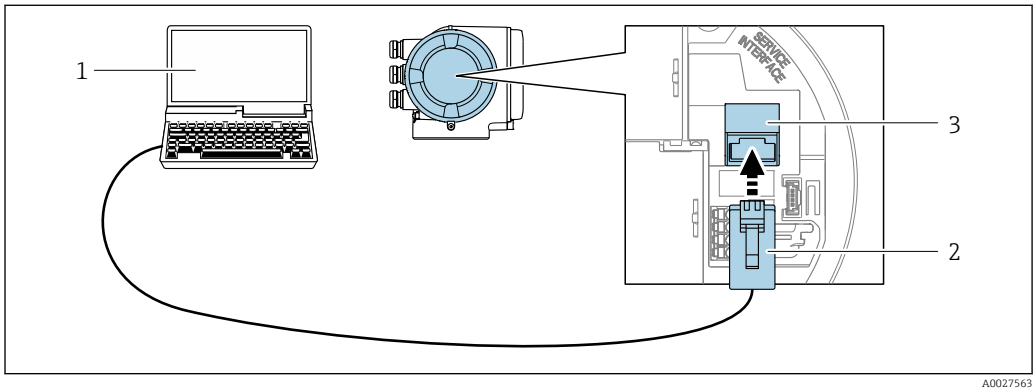
### Service interface

*Via service interface (CDI-RJ45)*

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

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

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

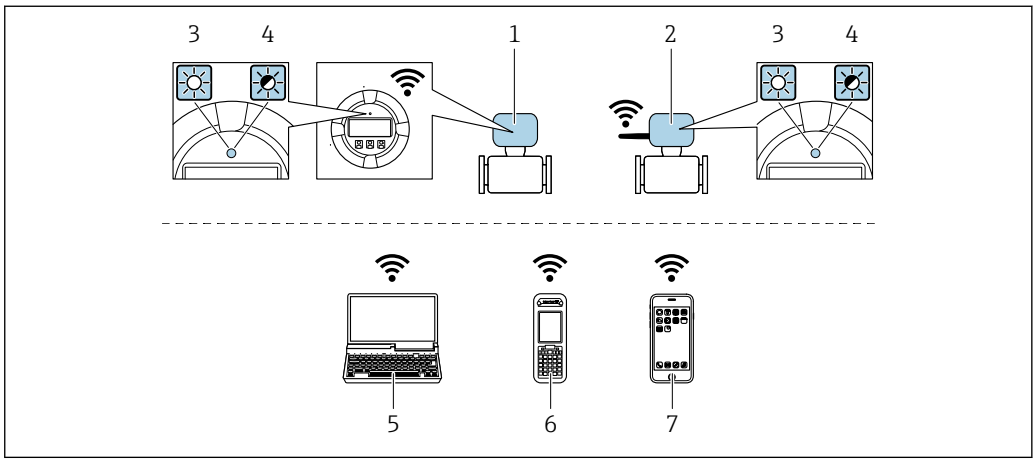



26 *Connection via service interface (CDI-RJ45)*

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

*Via WLAN interface*

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




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

| | |
|---|---|
| Function | WLAN: IEEE 802.11 b/g (2.4 GHz)<br>▪ Access point with DHCP server (default setting)<br>▪ Network |
| Encryption | WPA2-PSK/AES 128 bit |
| 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>Only one antenna active in each case! |
| Max. range | 50 m (164 ft) |
| Materials:<br>External WLAN antenna | ▪ Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass<br>▪ Adapter: Stainless steel and nickel-plated brass<br>▪ Cable: Polyethylene<br>▪ Connector: 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

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

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

*Preparing the mobile terminal*

- ▶ Enable WLAN reception on the mobile terminal.

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

1. In the WLAN settings of the mobile terminal:
   Select the measuring device using the SSID (e.g. EH_Promag_300_A802000).
2. If necessary, select the WPA2 encryption method.
3. Enter the password: serial number of the measuring device ex-works (e.g. L100A802000).
   ↳ LED on display module flashes: it is now possible to operate the measuring device with the Web browser, FieldCare or DeviceCare.

The serial number can be found on the nameplate.

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

*Disconnecting*

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

## 8.5.2 FieldCare

### Function scope

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

Access is via:
- CDI-RJ45 service interface → 74
- WLAN interface→ 75

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 → 79

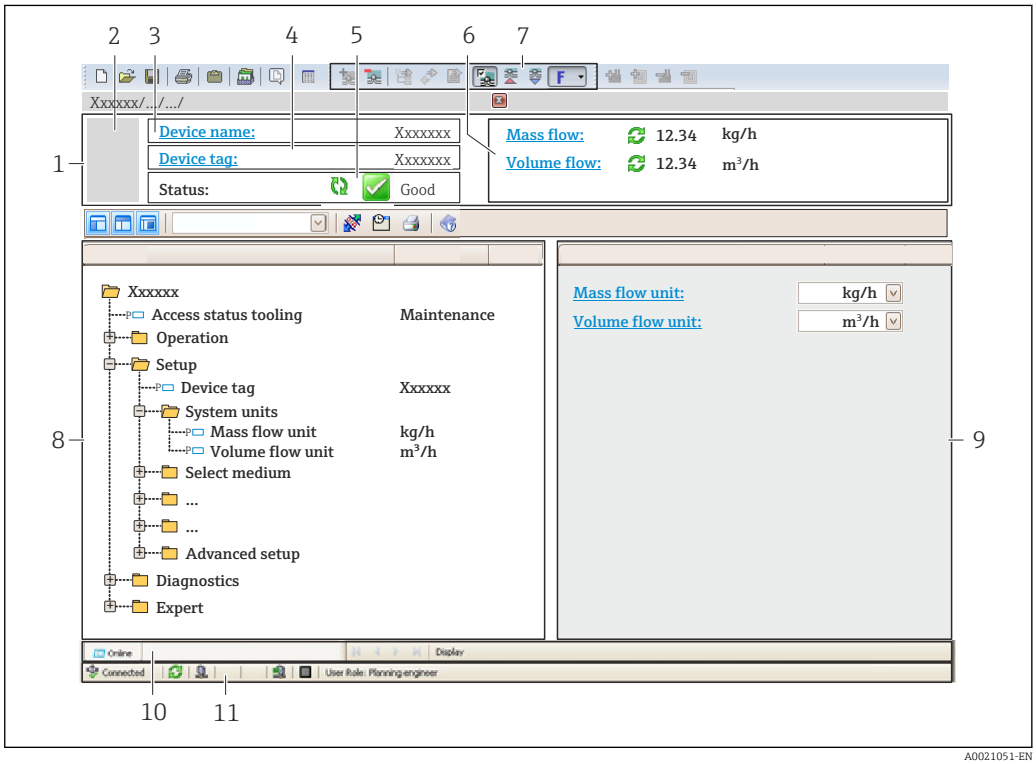
### Establishing a connection

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




1 *Header*
2 *Picture of device*
3 *Device name*
4 *Tag name*
5 *Status area with status signal→ 147*
6 *Display area for current measured values*
7 *Edit toolbar with additional functions such as save/restore, event list and create documentation*
8 *Navigation area with operating menu structure*
9 *Working area*
10 *Range of action*
11 *Status area*

## 8.5.3 DeviceCare

### Function scope

Tool to connect and configure Endress+Hauser field devices.

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

For details, see Innovation Brochure IN01047S

### Source for device description files

See information → 79

# 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<br>Diagnostics → Device information → Firmware version |
| Release date of firmware version | 10.2017 | --- |
| Manufacturer ID | 0x11 | Manufacturer ID<br>Diagnostics → Device information → Manufacturer ID |
| Device type ID | 0x103C | Device type<br>Diagnostics → Device information → Device type |
| Device revision | ▪ Major revision 1<br>▪ Minor revision 1 | ▪ On the transmitter nameplate<br>▪ Device revision<br>Diagnostics → Device information → Device revision |
| Device profile | Generic device (product type: 0x2B) | |

For an overview of the different firmware versions for the device → 167

### 9.1.2 Operating tools

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

| Operating tool via Service interface (CDI) | Sources for obtaining device descriptions |
|---|---|
| FieldCare | ▪ www.endress.com → Download Area<br>▪ CD-ROM (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) |

## 9.2 Overview of system files

| System files | Version | Description | How to acquire |
|---|---|---|---|
| Electronic Data Sheet (EDS system file) | 2.1 | Certified in accordance with the following ODVA guidelines:<br>▪ Conformance test<br>▪ Performance test<br>▪ PlugFest<br>Embedded EDS Support (File Object 0x37) | ▪ www.endress.com → Download-Area<br>▪ EDS system file integrated in the device: can be downloaded via the Web browser |
| Add-on Profile Level 3 | ▪ Major revision 1<br>▪ Minor revision 1 | System file for "Studio 5000" software (Rockwell Automation) | www.endress.com → Download-Area |

## 9.3 Integrating the measuring device in the system

A detailed description of how to integrate the device into an automation system (e.g. from Rockwell Automation) is available as a separate document: www.endress.com → Select country → Automation → Digital communication → Fieldbus device integration → EtherNet/IP

Protocol-specific data → 181.

## 9.4 Cyclic data transmission

Cyclic data transmission when using the EDS system file.

### 9.4.1 Block model

The block model shows which input and output data the measuring device makes available for implicit messaging. Cyclical data exchange is performed using an EtherNet/IP scanner, e.g. a distributed control system etc.

| Measuring device | | | | | Control system |
|---|---|---|---|---|---|
| Transducer Block | Input Assembly Fix (Assem100) 40 byte | → 82 | Permanently assigned input group | → | EtherNet/IP |
| | Volume flow fixed input assembly (Assem106) 38 byte | → 83 | Permanently assigned input group | → | |
| | Mass flow fixed input assembly (Assem107) 56 byte | → 83 | Permanently assigned input group | → | |
| | Heartbeat monitoring fixed input assembly [1] (Assem112) 50 byte | → 83 | Permanently assigned input group | → | |
| | Input assembly custom (Assem101) 88 byte | → 83 | Configurable input group | → | |
| | Output assembly fix (Assem102) 54 byte | → 84 | Permanently assigned output group | ← | |
| | Config assembly (Assem104) 1512 byte | → 85 | Permanently assigned configuration | → | |

1) Only available with the Heartbeat Verification application package.

## 9.4.2 Input and output groups

### Possible configurations

*Configuration 1: Exclusive Owner Multicast*

| Input Assembly Fix | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 64 | 398 | – |
| Output Assembly Fix | O → T Configuration | 0 x 66 | 64 | 5 |
| Input Assembly Fix | T → O Configuration | 0 x 64 | 44 | 5 |

*Configuration 2: Input Only Multicast*

| Input Assembly Fix | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 68 | 398 | – |
| Output Assembly Fix | O → T Configuration | 0 x C7 | – | – |
| Input Assembly Fix | T → O Configuration | 0 x 64 | 44 | 5 |

*Configuration 3: Exclusive Owner Multicast*

| Input Assembly Configurable | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 68 | 398 | – |
| Output Assembly Fix | O → T Configuration | 0 x 66 | 64 | 5 |
| Input Assembly Fix | T → O Configuration | 0 x 65 | 88 | 5 |

*Configuration 4: Input Only Multicast*

| Input Assembly Configurable | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 68 | 398 | – |
| Output Assembly Fix | O → T Configuration | 0 x C7 | – | – |
| Input Assembly Fix | T → O Configuration | 0 x 64 | 88 | 5 |

*Configuration 5: Exclusive Owner Multicast*

| Input Assembly Fix | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 69 | – | – |
| Output Assembly Fix | O → T Configuration | 0 x 66 | 64 | 5 |
| Input Assembly Fix | T → O Configuration | 0 x 64 | 44 | 5 |

*Configuration 6: Input Only Multicast*

| Input Assembly Fix | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 69 | – | – |
| Output Assembly Fix | O → T Configuration | 0 x C7 | – | – |
| Input Assembly Fix | T → O Configuration | 0 x 65 | 44 | 5 |

*Configuration 7: Exclusive Owner Multicast*

| Input Assembly Configurable | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 69 | – | – |
| Output Assembly Fix | O → T Configuration | 0 x 66 | 64 | 5 |
| Input Assembly Fix | T → O Configuration | 0 x 64 | 88 | 5 |

*Configuration 8: Input Only Multicast*

| Input Assembly Configurable | | Instance | Size (byte) | Min. RPI (ms) |
|---|---|---|---|---|
| Input Assembly Configurable | Configuration | 0 x 69 | – | – |
| Output Assembly Fix | O → T Configuration | 0 x C7 | – | – |
| Input Assembly Fix | T → O Configuration | 0 x 65 | 88 | 5 |

## Possible connections

| No. | #1 | #2 | #3 | #4 | #5 |
|---|---|---|---|---|---|
| **Number of connections** | **1** | **1** | **1** | **1** | **1** |
| Input assembly fixed (Assem100) | X | | | | |
| Volume flow fixed input assembly (Assem106) | | X | | | |
| Mass flow fixed input assembly (Assem107) | | | X | | |
| Input assembly custom (Assem101) | | | | X | |
| Heartbeat monitoring fixed input assembly (Assem112) | | | | | X |

## Permanently assigned input group

*Input assembly fixed (Assem100), 40 byte*

| Description | | Byte |
|---|---|---|
| 1. | File header (not visible) | 1-4 |
| 2. | Current diagnosis [1)] | 5-8 |
| 3. | Volume flow | 9-12 |
| 4. | Mass flow | 13-16 |
| 5. | Corrected volume flow | 17-20 |
| 6. | Conductivity | 21-24 |
| 7. | Temperature | 25-28 |
| 8. | Totalizer 1 | 29-32 |
| 9. | Totalizer 2 | 33-36 |
| 10. | Totalizer 3 | 37-40 |

1) Diagnostic information via EtherNet/IP → 🖹 87

*Volume flow fixed input assembly (Assem106), 40 byte*

| Description | Byte |
|---|---|
| 1. File header (not visible) | 1-4 |
| 2. Current diagnosis [1)] | 5-8 |
| 3. Volume flow | 9-12 |
| 4. Corrected volume flow | 13-16 |
| 5. Conductivity | 17-20 |
| 6. Temperature | 21-24 |
| 7. Totalizer 1 | 25-28 |
| 8. Volume flow unit | 29-30 |
| 9. Corrected volume flow unit | 31-32 |
| 10. Conductivity unit | 33-34 |
| 11. Temperature unit | 35-36 |
| 12. Totalizer 1 unit | 37-38 |
| 13. Padding byte | 39-40 |

1) Diagnostic information via EtherNet/IP → 🖹 87

*Mass flow fixed input assembly (Assem107), 58 byte*

| Description | Byte |
|---|---|
| 1. Volume flow fixed input assembly | 1-40 |
| 2. Mass flow | 41-44 |
| 3. Totalizer 2 | 45-48 |
| 4. Totalizer 3 | 49-52 |
| 5. Mass flow unit | 53-54 |
| 6. Totalizer 2 unit | 55-56 |
| 7. Totalizer 3 unit | 57-58 |

*Heartbeat monitoring fixed input assembly (Assem112), 56 byte [1)]*

| Description | Byte |
|---|---|
| 1. Volume flow fixed input assembly | 1-40 |
| 2. Noise | 41-44 |
| 3. Coil current shot time | 45-48 |
| 4. Reference electrode potential against PE | 49-52 |
| 5. Verification status | 53-54 |
| 6. Verification result | 55-56 |

1) Only available with the Heartbeat Verification application package.

### Configurable input group

*Input assembly custom (Assem101), 88 byte*

| Description | Format |
|---|---|
| 1. - 10. Input values 1 to 10 | Real |
| 11. - 20. Input values 11 to 20 | Double integer |

*Possible input values*

| Possible input values 1 to 10: | | |
|---|---|---|
| ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | ▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Temperature | ▪ Electronic temperature<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3 |

| Possible input values 11 to 20: | | |
|---|---|---|
| ▪ Off<br>▪ Actual diagnostics<br>▪ Previous diagnosis<br>▪ Mass flow unit<br>▪ Volume flow unit<br>▪ Corrected volume flow unit | ▪ Temperature unit<br>▪ Conductivity unit<br>▪ Totalizer 1 unit<br>▪ Totalizer 2 unit<br>▪ Totalizer 3 unit | ▪ Verification results [1]<br>▪ Verification status |

1) Only available with the Heartbeat Verification application package.

## Permanently assigned output group

*Output assembly fix (Assem102), 30 byte*

| Description (format) | Byte | Bit | Value |
|---|---|---|---|
| 1. Totalizer 1 | 1 | 0 | ▪ 0: Enable<br>▪ 1: Disable |
| 2. Totalizer 2 | | 1 | |
| 3. Totalizer 3 | | 2 | |
| 4. External density | | 3 | |
| 5. Compensation, temperature | | 4 | |
| 6. Verification | | 5 | |
| 7. Flow override | | 6 | |
| 8. Not used | | 7 | |
| 9. Not used | 2 | 8 | – |
| 10. Not used | 3-4 | 16 | – |
| 11. Control totalizer 1 (integer) | 5-6 | 16 | ▪ 32226 (0): Add<br>▪ 32490 (1): Reset and stop<br>▪ 32228 (2): Default value and stop<br>▪ 198 (3): Reset and add<br>▪ 199 (4): Default value and add<br>▪ 32928 (3): Stop |
| 12. Control totalizer 2 (integer) | 7-8 | 16 | |
| 13. Control totalizer 3 (integer) | 9-10 | 16 | |
| 14. Not used | 11-12 | 16 | – |
| 15. External density (real) | 13-16 | 32 | Data format:<br>Byte 1 to 4: External density<br>Floating-point number (IEEE754) |

| Description (format) | Byte | Bit | Value |
|---|---|---|---|
| 16. External density unit (integer) | 17-18 | 16 | ▪ 1100 (91) : g/cm³<br>▪ 1101 (204) : g/m³<br>▪ 1103 (96) : kg/l<br>▪ 1099 (240) : kg/dm³<br>▪ 1097 (92) : kg/m³<br>▪ 1628 (240) : SD4°C<br>▪ 1629 (240) : SD15°C<br>▪ 1630 (240) : SD20°C<br>▪ 32833 (240) : SG4°C<br>▪ 32832 (240) : SG15°C<br>▪ 32831 (240) : SG20°C<br>▪ 1107 (94) : lb/ft³<br>▪ 1108 (93) : lb/gal (us)<br>▪ 32836 (240) : lb/bbl (us;liq.)<br>▪ 32835 (240) : lb/bbl (us;beer)<br>▪ 32837 (240) : lb/bbl (us;oil)<br>▪ 32834 (240) : lb/bbl (us;tank)<br>▪ 1430 (240) : lb/gal (imp)<br>▪ 32838 (240) : lb/bbl (imp;beer)<br>▪ 32839 (240) : lb/bbl (imp;oil) |
| 17. Not used | 19-20 | 16 | – |
| 18. External temperature (real) | 21-24 | 32 | Data format:<br>Byte 1 to 4: External temperature<br>Floating-point number (IEEE754) |
| 19. External temperature unit (integer) | 25-26 | 16 | ▪ 1001 (32): °C<br>▪ 1002 (33): °F<br>▪ 1000 (35): K<br>▪ 1003 (34): °R |
| 20. Start verification (integer) | 27-28 | 16 | ▪ 32823 (0): Cancel<br>▪ 33158 (1): Start |
| 21. Flow override monitoring | 29-30 | 16 | ▪ 33004 (0): Off<br>▪ 33006 (1): On |

### Permanently assigned configuration group

*Config assembly (Assem104), 1512 byte*

| Description (format) | | | | Bits | Byte | Offset |
|---|---|---|---|---|---|---|
| 1. | None | | | 32 | 4 | 0 |
| 2. | Parameter 28 | – | Write protection | 8 | 4 | 4 |
| 3. | None | | | 8 | 4 | 5 |
| 4. | Parameter 74 | System units | Mass flow unit | 16 | 4 | 6 |
| 5. | Parameter 73 | System units | Mass unit | 16 | 4 | 8 |
| 6. | Parameter 77 | System units | Volume flow unit | 16 | 4 | 10 |
| 7. | Parameter 76 | System units | Volume unit | 16 | 4 | 12 |
| 8. | Parameter 71 | System units | Corrected volume flow unit | 16 | 4 | 14 |
| 9. | Parameter 72 | System units | Density unit | 16 | 4 | 16 |
| 10. | Parameter 75 | System units | Temperature unit | 16 | 4 | 18 |
| 11. | Parameter 69 | System units | Conductivity unit | 16 | 4 | 20 |
| 12. | None | | | 192 | 4 | 22 |
| 13. | Parameter 147 | – | Enter access code | 16 | 4 | 46 |
| 14. | Parameter 78 | Totalizer 1 | Assign process variable | 16 | 4 | 48 |
| 15. | Parameter 90 | Totalizer 1 | Unit totalizer | 16 | 4 | 50 |
| 16. | Parameter 87 | Totalizer 1 | Totalizer operation mode | 16 | 4 | 52 |

| Description (format) | | | | Bits | Byte | Offset |
|---|---|---|---|---|---|---|
| 17. | Parameter 84 | Totalizer 1 | Failure mode | 16 | 4 | 54 |
| 18. | Parameter 149 | Totalizer operation | Preset value tot. 1 | 32 | 4 | 56 |
| 19. | Parameter 81 | Totalizer operation | Control totalizer 1 | 16 | 4 | 60 |
| 20. | Parameter 79 | Totalizer 2 | Assign process variable | 16 | 4 | 62 |
| 21. | Parameter 91 | Totalizer 2 | Unit totalizer | 16 | 4 | 64 |
| 22. | Parameter 88 | Totalizer 2 | Totalizer operation mode | 16 | 4 | 66 |
| 23. | Parameter 85 | Totalizer 2 | Failure mode | 16 | 4 | 68 |
| 24. | Parameter 82 | Totalizer operation | Control totalizer 2 | 16 | 4 | 70 |
| 25. | Parameter 150 | Totalizer operation | Preset value tot. 2 | 32 | 4 | 72 |
| 26. | Parameter 80 | Totalizer 3 | Assign process variable | 16 | 4 | 76 |
| 27. | Parameter 92 | Totalizer 3 | Unit totalizer | 16 | 4 | 78 |
| 28. | Parameter 89 | Totalizer 3 | Totalizer operation mode | 16 | 4 | 80 |
| 29. | Parameter 86 | Totalizer 3 | Failure mode | 16 | 4 | 82 |
| 30. | Parameter 130 | Totalizer operation | Preset value tot. 3 | 32 | 4 | 84 |
| 31. | Parameter 83 | Totalizer operation | Control totalizer 3 | 16 | 4 | 88 |
| 32. | Parameter 8 | Configurable input assembly | Input assembly position 1 | 16 | 4 | 90 |
| 33. | Parameter 19 | Configurable input assembly | Input assembly position 2 | 16 | 4 | 92 |
| 34. | Parameter 21 | Configurable input assembly | Input assembly position 3 | 16 | 4 | 94 |
| 35. | Parameter 22 | Configurable input assembly | Input assembly position 4 | 16 | 4 | 96 |
| 36. | Parameter 23 | Configurable input assembly | Input assembly position 5 | 16 | 4 | 98 |
| 37. | Parameter 24 | Configurable input assembly | Input assembly position 6 | 16 | 4 | 100 |
| 38. | Parameter 25 | Configurable input assembly | Input assembly position 7 | 16 | 4 | 102 |
| 39. | Parameter 26 | Configurable input assembly | Input assembly position 8 | 16 | 4 | 104 |
| 40. | Parameter 27 | Configurable input assembly | Input assembly position 9 | 16 | 4 | 106 |
| 41. | Parameter 9 | Configurable input assembly | Input assembly position 10 | 16 | 4 | 108 |
| 42. | Parameter 10 | Configurable input assembly | Input assembly position 11 | 16 | 4 | 110 |
| 43. | Parameter 11 | Configurable input assembly | Input assembly position 12 | 16 | 4 | 112 |
| 44. | Parameter 12 | Configurable input assembly | Input assembly position 13 | 16 | 4 | 114 |
| 45. | Parameter 13 | Configurable input assembly | Input assembly position 14 | 16 | 4 | 116 |
| 46. | Parameter 14 | Configurable input assembly | Input assembly position 15 | 16 | 4 | 118 |
| 47. | Parameter 15 | Configurable input assembly | Input assembly position 16 | 16 | 4 | 120 |
| 48. | Parameter 16 | Configurable input assembly | Input assembly position 17 | 16 | 4 | 122 |
| 49. | Parameter 17 | Configurable input assembly | Input assembly position 18 | 16 | 4 | 124 |
| 50. | Parameter 18 | Configurable input assembly | Input assembly position 19 | 16 | 4 | 126 |
| 51. | Parameter 20 | Configurable input assembly | Input assembly position 20 | 16 | 4 | 128 |
| 52. | Parameter 30 | Sensor adjustment | Flow direction | 16 | 4 | 130 |
| 53. | Parameter 29 | Low flow cut off | Assign process variable | 16 | 4 | 132 |
| 54. | Parameter 31 | Empty pipe detection | Assign process variable | 16 | 4 | 134 |
| 55. | Parameter 110 | Low flow cut off | On value low flow cut off | 32 | 4 | 136 |
| 56. | Parameter 109 | Low flow cut off | Off value low flow cutoff | 32 | 4 | 140 |
| 57. | Parameter 118 | Low flow cut off | Pressure shock suppression | 32 | 4 | 144 |
| 58. | Parameter 111 | Empty pipe detection | Response time part. filled pipe detect. | 32 | 4 | 148 |
| 59. | Parameter 106 | Process parameter | Conductivity damping | 32 | 4 | 152 |

| Description (format) | | | | Bits | Byte | Offset |
|---|---|---|---|---|---|---|
| 60. | Parameter 32 | Process parameter | Flow override | 16 | 4 | 156 |
| 61. | Parameter 45 | Empty pipe detection | New adjustment | 16 | 4 | 158 |
| 62. | Parameter 42 | External compensation | Density source | 16 | 4 | 160 |
| 63. | Parameter 49 | External compensation | Temperature source | 16 | 4 | 162 |
| 64. | Parameter 138 | Empty pipe detection | Switch point empty pipe detection | 32 | 4 | 164 |
| 65. | Parameter 140 | External compensation | Fixed density | 32 | 4 | 168 |
| 66. | Parameter 48 | Process parameter | Filter options | 16 | 4 | 172 |
| 67. | Parameter 141 | Process parameter | Flow damping | 8 | 4 | 174 |
| 68. | None | | | 8 | 4 | 175 |
| 69. | Parameter 146 | Diagnostic settings | Alarm delay | 32 | 4 | 176 |
| 70. | Parameter 53 | Diagnostic behavior | Assign behavior for diagnostic information 832 | 8 | 4 | 180 |
| 71. | Parameter 54 | Diagnostic behavior | Assign behavior for diagnostic information 833 | 8 | 4 | 181 |
| 72. | Parameter 55 | Diagnostic behavior | Assign behavior for diagnostic information 834 | 8 | 4 | 182 |
| 73. | Parameter 56 | Diagnostic behavior | Assign behavior for diagnostic information 835 | 8 | 4 | 183 |
| 74. | Parameter 57 | Diagnostic behavior | Assign behavior for diagnostic information 962 | 8 | 4 | 184 |
| 75. | Parameter 52 | Diagnostic behavior | Assign behavior for diagnostic information 531 | 8 | 4 | 185 |
| 76. | Parameter 58 | Diagnostic behavior | Assign behavior for diagnostic information 937 | 8 | 4 | 186 |
| 77. | Parameter 51 | Diagnostic behavior | Assign behavior for diagnostic information 302 | 8 | 4 | 187 |

## 9.5 Diagnostic information via EtherNet/IP

| Status signal | No. | Short text | Value |
|---|---|---|---|
| | 000 | – | 0 |
| F | 882 | Input signal | 16777265 |
| F | 281 | Electronic initialization | 16777276 |
| F | 437 | Configuration incompatible | 16777312 |
| F | 242 | Software incompatible | 16777319 |
| F | 252 | Modules incompatible | 16777323 |
| F | 272 | Main electronic failure | 16777337 |
| F | 270 | Main electronic failure | 16777340 |
| F | 271 | Main electronic failure | 16777341 |
| F | 270 | Main electronic failure | 16777343 |
| F | 270 | Main electronic failure | 16777344 |
| F | 410 | Data transfer | 16777355 |
| F | 273 | Main electronic failure | 16777368 |
| F | 270 | Main electronic failure | 16777375 |
| F | 083 | Memory content | 16777376 |

| Status signal | No. | Short text | Value |
|---|---|---|---|
| F | 833 | Electronic temperature too low | 16777409 |
| F | 832 | Electronic temperature too high | 16777411 |
| F | 834 | Process temperature too high | 16777413 |
| F | 835 | Process temperature too low | 16777414 |
| F | 022 | Sensor temperature | 16777429 |
| F | 022 | Sensor temperature | 16777430 |
| F | 311 | Electronic failure | 16777441 |
| F | 273 | Main electronic failure | 16777445 |
| F | 082 | Data storage | 16777447 |
| F | 190 | Special event 1 | 16777450 |
| F | 273 | Main electronic failure | 16777483 |
| F | 390 | Special event 2 | 16777490 |
| F | 222 | Electronic drift | 16777497 |
| F | 938 | EMC interference | 16777499 |
| F | 062 | Sensor connection | 16777500 |
| F | 590 | Special event 3 | 16777508 |
| F | 990 | Special event 4 | 16777509 |
| F | 262 | Module connection | 16777545 |
| F | 537 | Configuration | 16777546 |
| F | 201 | Device failure | 16777547 |
| F | 937 | EMC interference | 16777556 |
| F | 500 | Electrode 1 potential exceeded | 16777563 |
| F | 500 | Electrode 2 potential exceeded | 16777564 |
| F | 500 | Electrode difference voltage too high | 16777565 |
| F | 382 | Data storage | 16777581 |
| F | 383 | Memory content | 16777582 |
| F | 283 | Memory content | 16777583 |
| C | 411 | Up-/download active | 33554536 |
| C | 411 | Up-/download active | 33554537 |
| C | 411 | Up-/download active | 33554540 |
| C | 484 | Simulation failure mode | 33554576 |
| C | 485 | Simulation measured variable | 33554579 |
| C | 453 | Flow override | 33554580 |
| C | 833 | Electronic temperature too low | 33554625 |
| C | 832 | Electronic temperature too high | 33554627 |
| C | 834 | Process temperature too high | 33554629 |
| C | 835 | Process temperature too low | 33554630 |
| C | 937 | EMC interference | 33554772 |
| C | 530 | Electrode cleaning is running | 33554778 |
| C | 495 | Simulation diagnostic event | 33554782 |
| C | 302 | Device verification active | 33554926 |
| M | 438 | Dataset | 67108970 |
| M | 833 | Electronic temperature too low | 67109057 |

| Status signal | No. | Short text | Value |
|---|---|---|---|
| M | 832 | Electronic temperature too high | 67109059 |
| M | 834 | Process temperature too high | 67109061 |
| M | 835 | Process temperature too low | 67109062 |
| M | 311 | Electronic failure | 67109090 |
| M | 937 | EMC interference | 67109204 |
| S | 842 | Process limit | 134217873 |
| S | 862 | Empty pipe | 134217874 |
| S | 833 | Electronic temperature too low | 134217921 |
| S | 832 | Electronic temperature too high | 134217923 |
| S | 834 | Process temperature too high | 134217925 |
| S | 835 | Process temperature too low | 134217926 |
| S | 004 | Sensor | 134218013 |
| S | 043 | Sensor short circuit | 134218067 |
| S | 937 | EMC interference | 134218068 |
| S | 322 | Electronic drift | 134218071 |
| S | 322 | Electronic drift | 134218072 |
| S | 531 | Empty pipe detection | 134218091 |

# 10 Commissioning

## 10.1 Function check

Before commissioning the measuring device:

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

- "Post-installation check" checklist→ 📄 32
- "Post-connection check" checklist → 📄 50

## 10.2 Switching on the measuring device

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

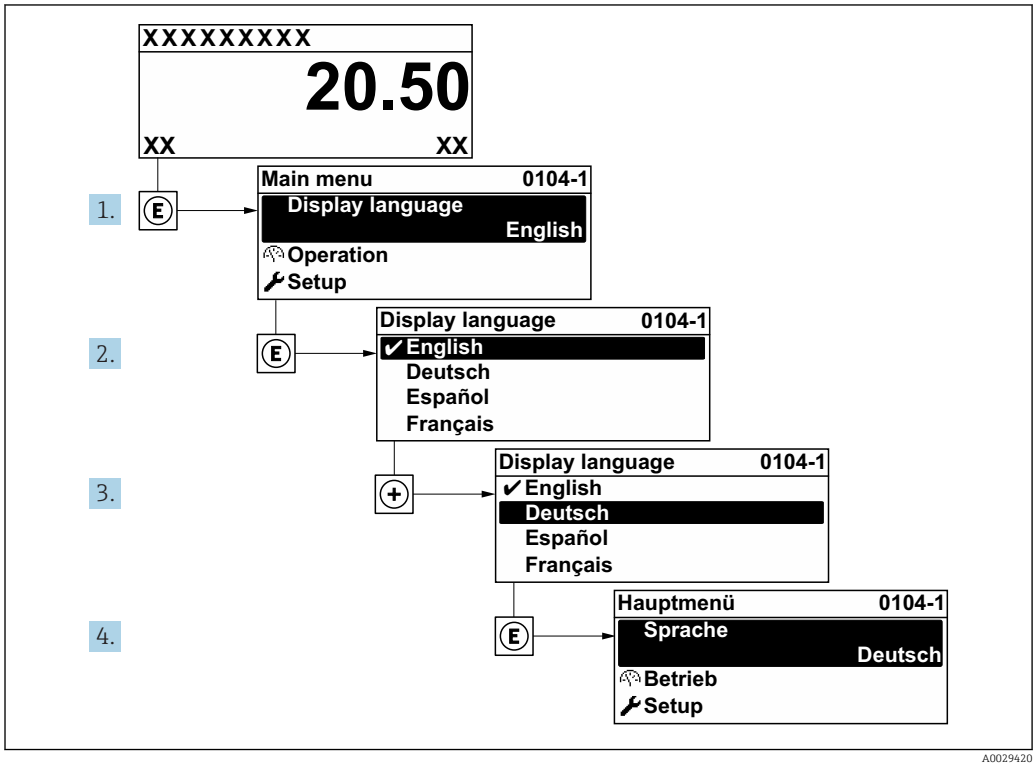
If nothing appears on the local display or a diagnostic message is displayed, refer to the section on "Diagnostics and troubleshooting" → 📄 140.

## 10.3 Connecting via FieldCare

- For FieldCare → 📄 74 connection
- For connecting via FieldCare → 📄 76
- For the FieldCare → 📄 77 user interface

## 10.4 Setting the operating language

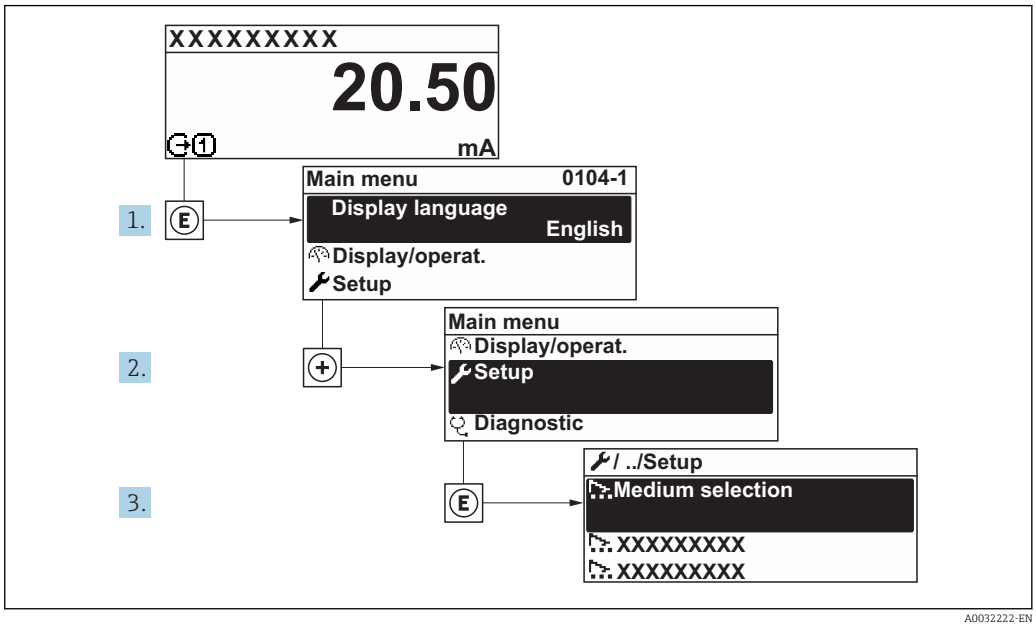
Factory setting: English or ordered local language




27 *Taking the example of the local display*

## 10.5 Configuring the measuring device

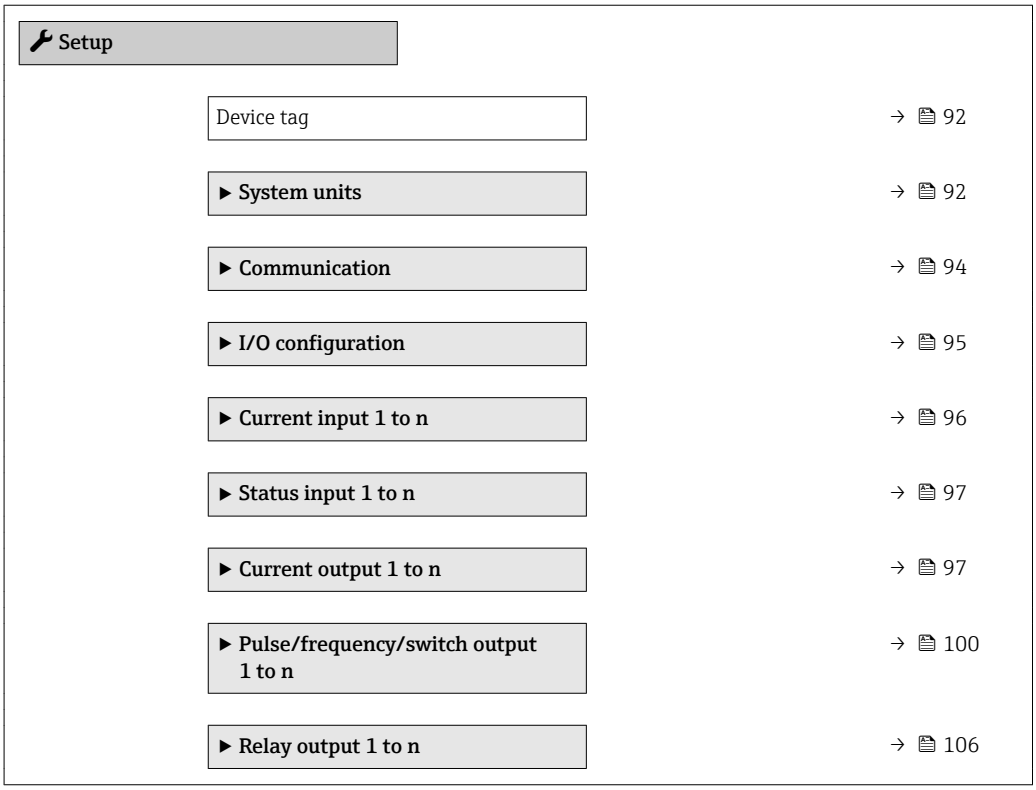
- The **Setup** menu with its guided wizards contains all the parameters needed for standard operation.
- Navigation to the **Setup** menu

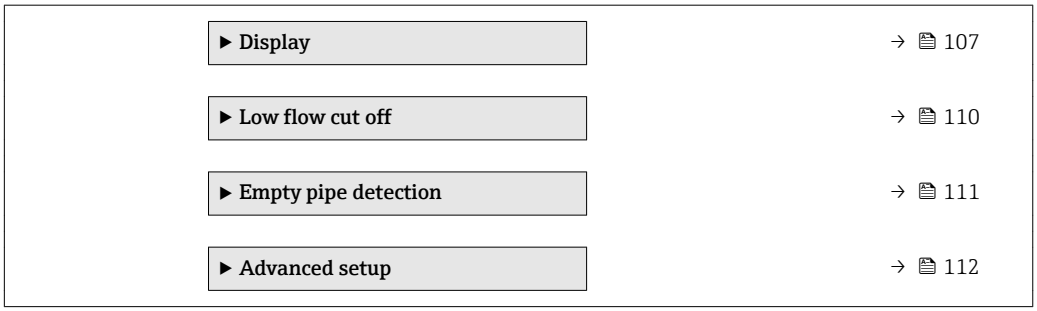



28 *Taking the example of the local display*

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

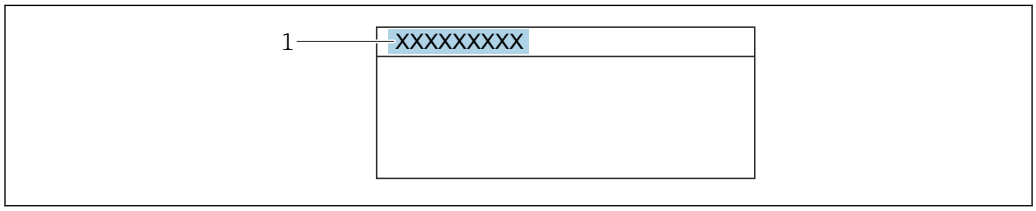
**Navigation**
"Setup" menu






## 10.5.1 Defining the tag name

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




*29 Header of the operational display with tag name*

*1 Tag name*

Enter the tag name in the "FieldCare" operating tool → 77

### Navigation

"Setup" menu → Device tag

### Parameter overview with brief description

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

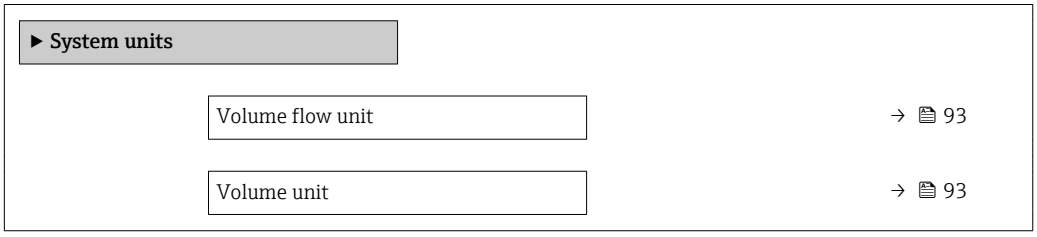
## 10.5.2 Setting the system units

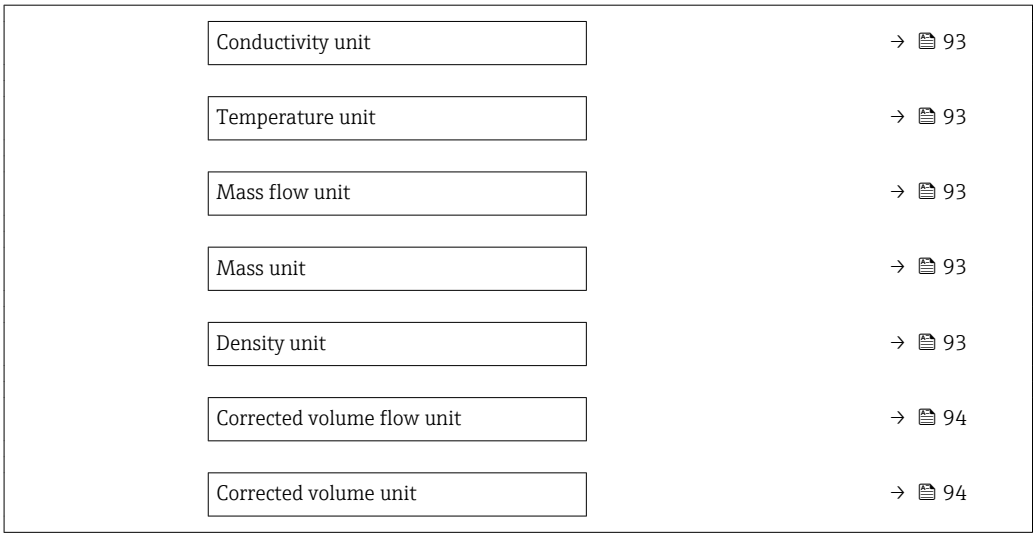
In the **System units** submenu the units of all the measured values can be set.

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

### Navigation

"Setup" menu → System units






## Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection | Factory setting |
|---|---|---|---|---|
| Volume flow unit | – | Select volume flow unit.<br>*Result*<br>The selected unit applies for:<br>▪ Output<br>▪ Low flow cut off<br>▪ Simulation process variable | Unit choose list | Country-specific:<br>▪ l/h<br>▪ gal/min (us) |
| Volume unit | – | Select volume unit. | Unit choose list | Country-specific:<br>▪ $m^3$<br>▪ gal (us) |
| Conductivity unit | The **On** option is selected in the **Conductivity measurement** parameter parameter. | Select conductivity unit.<br>*Effect*<br>The selected unit applies for:<br>Simulation process variable | Unit choose list | µS/cm |
| Temperature unit | – | Select temperature unit.<br>*Result*<br>The selected unit applies for:<br>▪ **Temperature** parameter<br>▪ **Maximum value** parameter<br>▪ **Minimum value** parameter<br>▪ **External temperature** parameter<br>▪ **Maximum value** parameter<br>▪ **Minimum value** parameter | Unit choose list | Country-specific:<br>▪ °C<br>▪ °F |
| Mass flow unit | – | Select mass flow unit.<br>*Result*<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 |
| Density unit | – | Select density unit.<br>*Result*<br>The selected unit applies for:<br>▪ Output<br>▪ Simulation process variable | Unit choose list | Country-specific:<br>▪ kg/l<br>▪ $lb/ft^3$ |

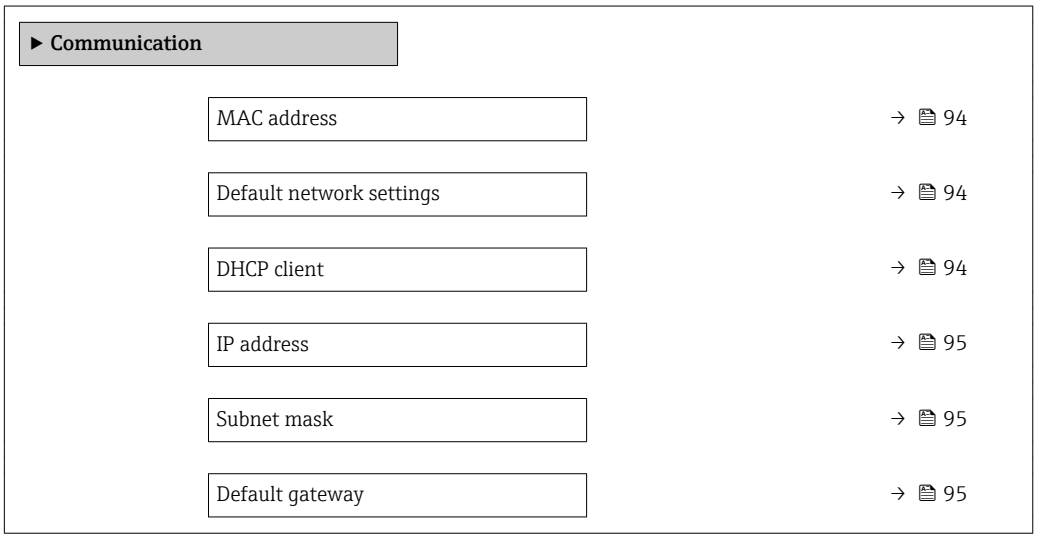
| Parameter | Prerequisite | Description | Selection | Factory setting |
|---|---|---|---|---|
| Corrected volume flow unit | – | Select corrected volume flow unit.<br>*Result*<br>The selected unit applies for: **Corrected volume flow** parameter (→ 131) | Unit choose list | Country-specific:<br>▪ Nl/h<br>▪ Sft³/h |
| Corrected volume unit | – | Select corrected volume unit. | Unit choose list | Country-specific:<br>▪ Nm³<br>▪ Sft³ |

## 10.5.3 Configuring the communication interface

The **Communication** submenu guides you systematically through all the parameters that have to be configured for selecting and setting the communication interface.

### Navigation

"Setup" menu → Communication




### Parameter overview with brief description

| Parameter | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|
| MAC address | Displays the MAC address of the measuring device.<br>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. |
| Default network settings | Select whether to restore network settings. | ▪ Off<br>▪ On | Off |
| DHCP client | Select to activate/deactivate DHCP client functionality.<br>**Result**<br>If the DHCP client functionality of the Web server is activated, the IP address, Subnet mask and Default gateway are set automatically.<br>Identification is via the MAC address of the measuring device. | ▪ Off<br>▪ On | Off |

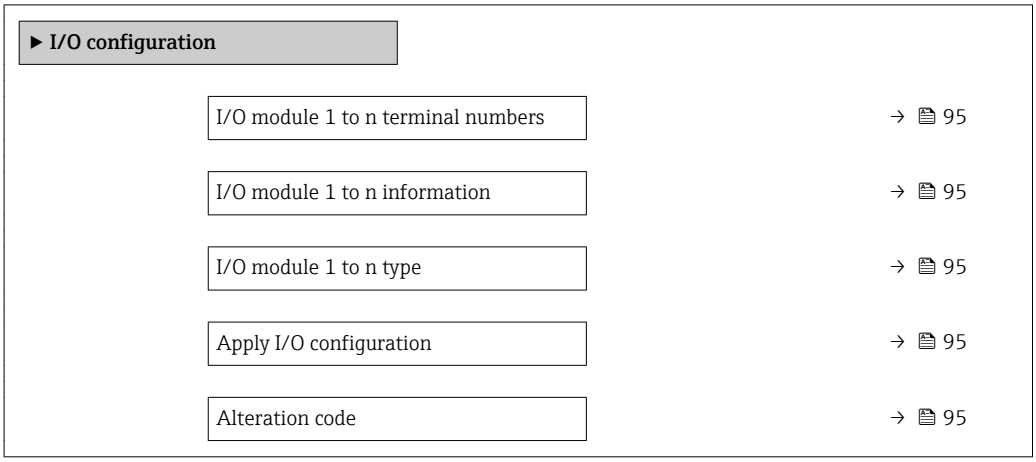
| Parameter | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|
| IP address | Displays the IP address of the Web server of the measuring device. | 4 octet: 0 to 255 (in the particular octet) | 192.168.1.212 |
| Subnet mask | Displays the subnet mask. | 4 octet: 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 |

## 10.5.4 Displaying the I/O configuration

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

### Navigation

"Setup" menu → I/O configuration




### Parameter overview with brief description

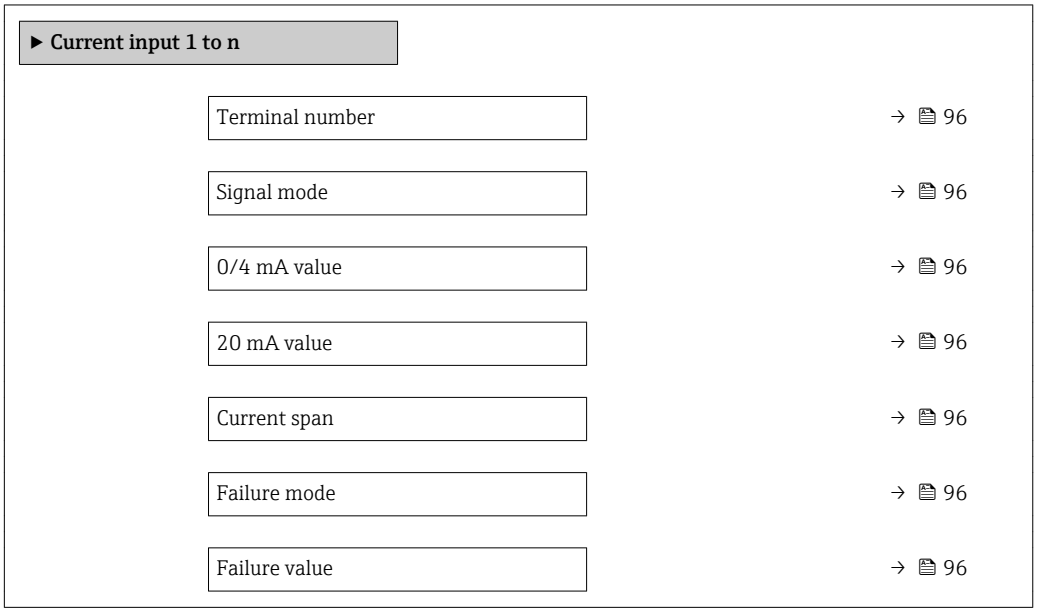
| Parameter | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|
| I/O module 1 to n terminal numbers | Shows the terminal numbers used by the I/O module. | ▪ Not used<br>▪ 26-27 (I/O 1)<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| I/O module 1 to n information | Shows information of the plugged I/O module. | ▪ Not plugged<br>▪ Invalid<br>▪ Not configurable<br>▪ Configurable<br>▪ EtherNet/IP | – |
| 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 * | Off |
| Apply I/O configuration | Apply parameterization of the freely configurable I/O module. | ▪ No<br>▪ Yes | No |
| Alteration code | Enter the code in order to change the I/O configuration. | Positive integer | 0 |

* Visibility depends on order options or device settings

### 10.5.5 Configuring the current input

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

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



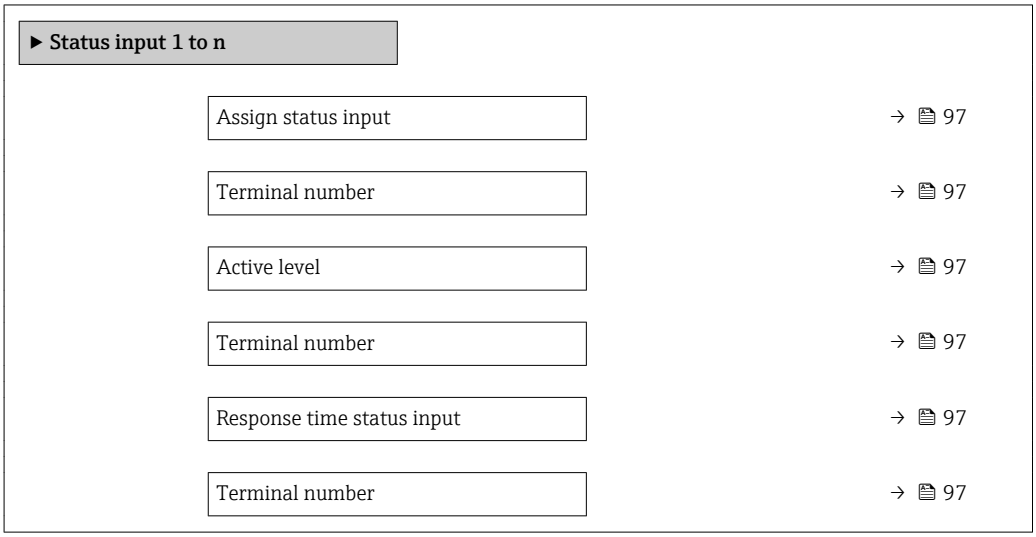

**Parameter overview with brief description**

| 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<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US<br>▪ 0...20 mA | Country-specific:<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US |
| 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 |

### 10.5.6 Configuring the status input

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

**Navigation**
"Setup" menu → Status input



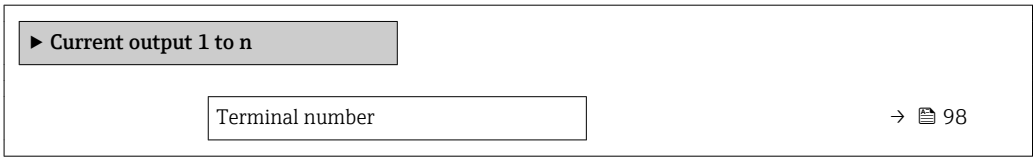

**Parameter overview with brief description**

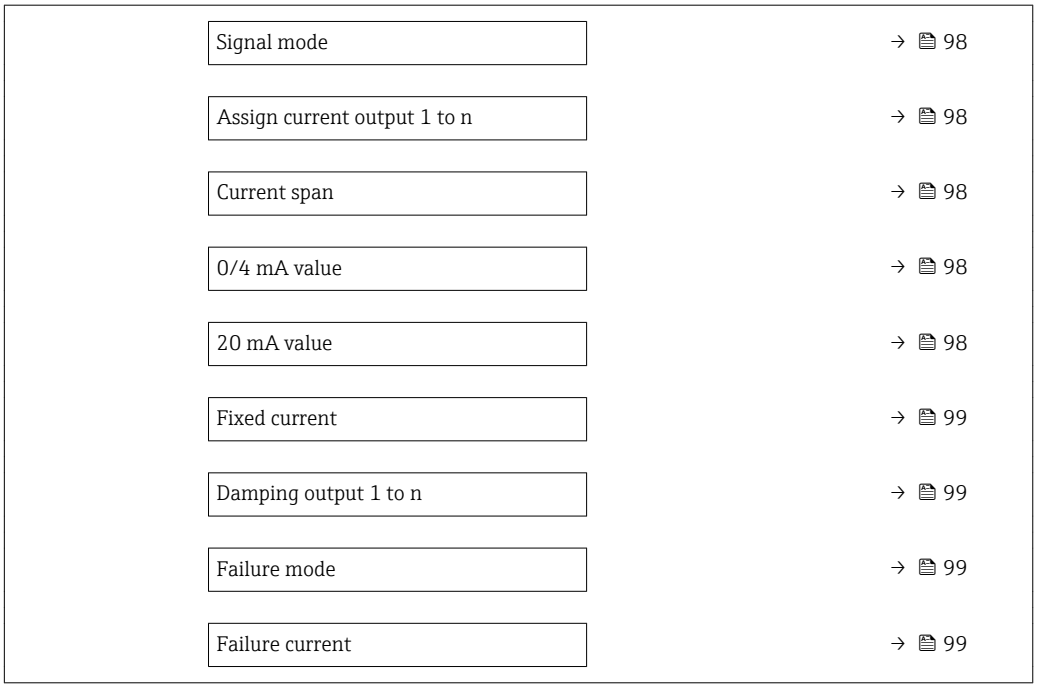
| Parameter | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|
| Terminal number | Shows the terminal numbers used by the status input module. | ▪ Not used<br>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Assign status input | Select function for the status input.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

### 10.5.7 Configuring the current output

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

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






## 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>▪ 24-25 (I/O 2)<br>▪ 22-23 (I/O 3) | – |
| Signal mode | – | Select the signal mode for the current output. | ▪ Passive<br>▪ Active | Active |
| Assign current output 1 to n | – | Select process variable for current output. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity*<br>▪ Electronic temperature | Volume flow |
| Current span | – | Select current range for process value output and upper/lower level for alarm signal. | ▪ 4...20 mA NAMUR<br>▪ 4...20 mA US<br>▪ 4...20 mA<br>▪ 0...20 mA<br>▪ Fixed current | Country-specific:<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US |
| 0/4 mA value | One of the following options is selected in the **Current span** parameter (→ 98):<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US<br>▪ 4...20 mA<br>▪ 0...20 mA | Enter 4 mA value. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 20 mA value | One of the following options is selected in the **Current span** parameter (→ 98):<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US<br>▪ 4...20 mA<br>▪ 0...20 mA | Enter 20 mA value. | Signed floating-point number | Depends on country and nominal diameter |

| Parameter | Prerequisite | Description | User interface / Selection / User entry | Factory setting |
|---|---|---|---|---|
| Fixed current | The **Fixed current** option is selected in the **Current span** parameter (→ 🖹 98). | Defines the fixed output current. | 0 to 22.5 mA | 22.5 mA |
| Damping output 1 to n | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity*<br>▪ Electronic temperature<br>One of the following options is selected in the **Current span** parameter (→ 🖹 98):<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US<br>▪ 4...20 mA<br>▪ 0...20 mA | Set reaction time for output signal to fluctuations in the measured value. | 0.0 to 999.9 s | 1.0 s |
| Failure mode | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity*<br>▪ Electronic temperature<br>One of the following options is selected in the **Current span** parameter (→ 🖹 98):<br>▪ 4...20 mA NAMUR<br>▪ 4...20 mA US<br>▪ 4...20 mA<br>▪ 0...20 mA | Define output behavior in alarm condition. | ▪ Min.<br>▪ Max.<br>▪ Last valid value<br>▪ Actual value<br>▪ Defined 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 |

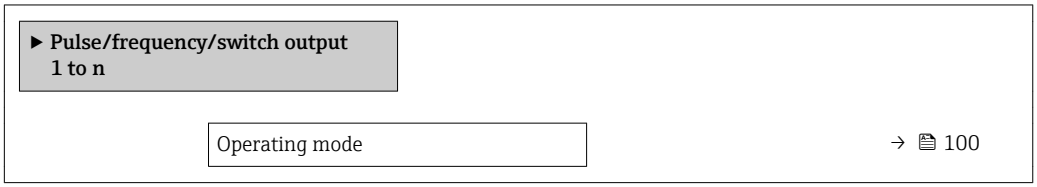
* Visibility depends on order options or device settings

## 10.5.8 Configuring the pulse/frequency/switch output

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

### Navigation

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



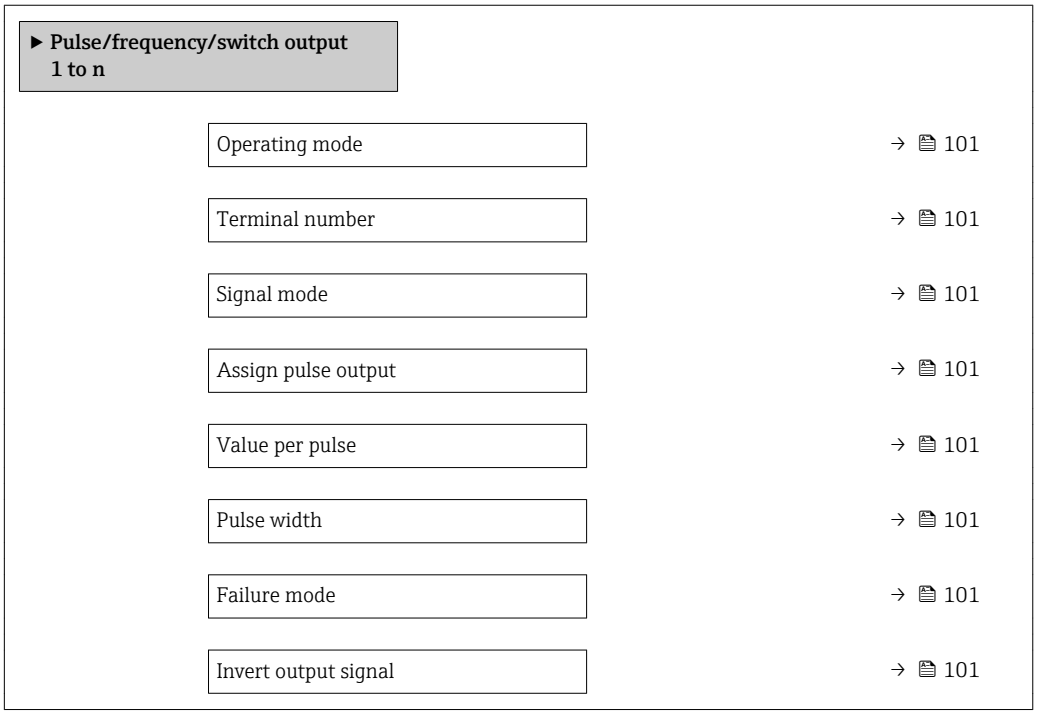

### Parameter overview with brief description

| Parameter | Description | Selection | 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



### 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 | Passive |
| Assign pulse output 1 to n | The **Pulse** option is selected in the **Operating mode** parameter. | Select process variable for pulse output. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Off |
| Value per pulse | In the **Operating mode** parameter, the **Pulse** option is selected, and one of the following options is selected in the **Assign pulse output** parameter (→ 🖹 101):<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow | Enter measured value at which a pulse is output. | Signed floating-point number | Depends on country and nominal diameter |
| Pulse width | In the **Operating mode** parameter, the **Pulse** option is selected, and one of the following options is selected in the **Assign pulse output** parameter (→ 🖹 101):<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow | Define time width of the output pulse. | 0.05 to 2 000 ms | 100 ms |
| Failure mode | In the **Operating mode** parameter, the **Pulse** option is selected, and one of the following options is selected in the **Assign pulse output** parameter (→ 🖹 101):<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow | Define output behavior in alarm condition. | ▪ Actual value<br>▪ No pulses | No pulses |
| Invert output signal | – | Invert the output signal. | ▪ No<br>▪ Yes | No |

### Configuring the frequency output

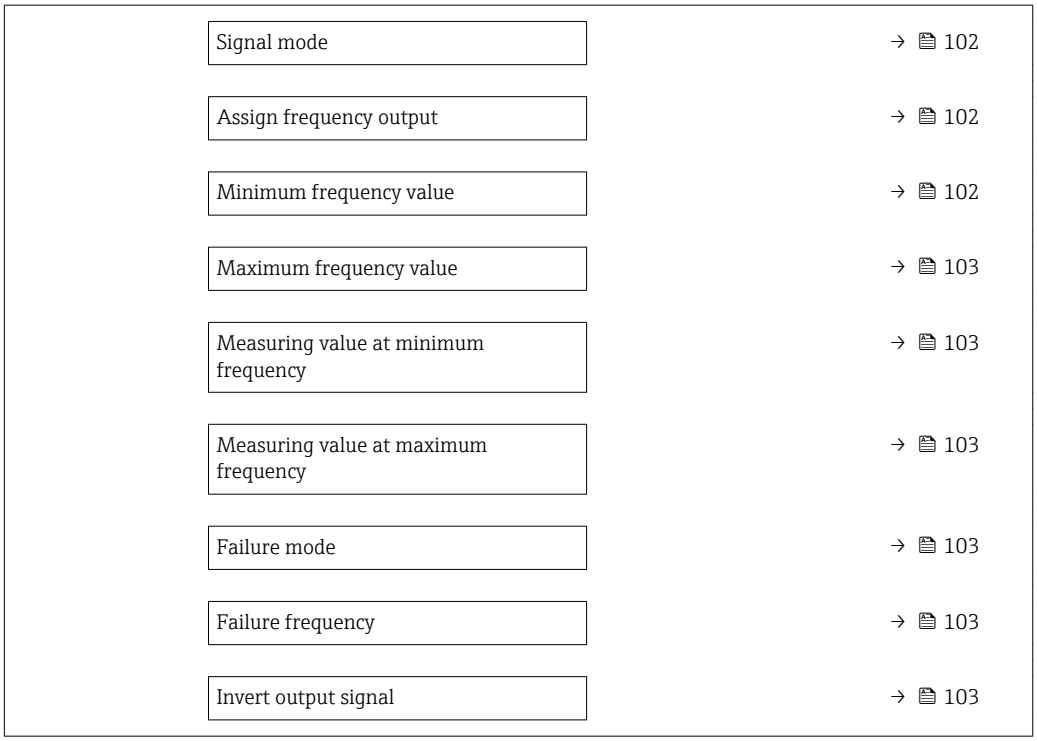
#### Navigation

"Setup" menu → Pulse/frequency/switch output

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

Operating mode → 🖹 102

Terminal number → 🖹 102




### 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 | Passive |
| Assign frequency output | The **Frequency** option is selected in the **Operating mode** parameter (→ 100). | Select process variable for frequency output. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | Off |
| Minimum frequency value | One of the following options is selected in the **Assign current output** parameter (→ 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | Enter minimum frequency. | 0.0 to 10 000.0 Hz | 0.0 Hz |

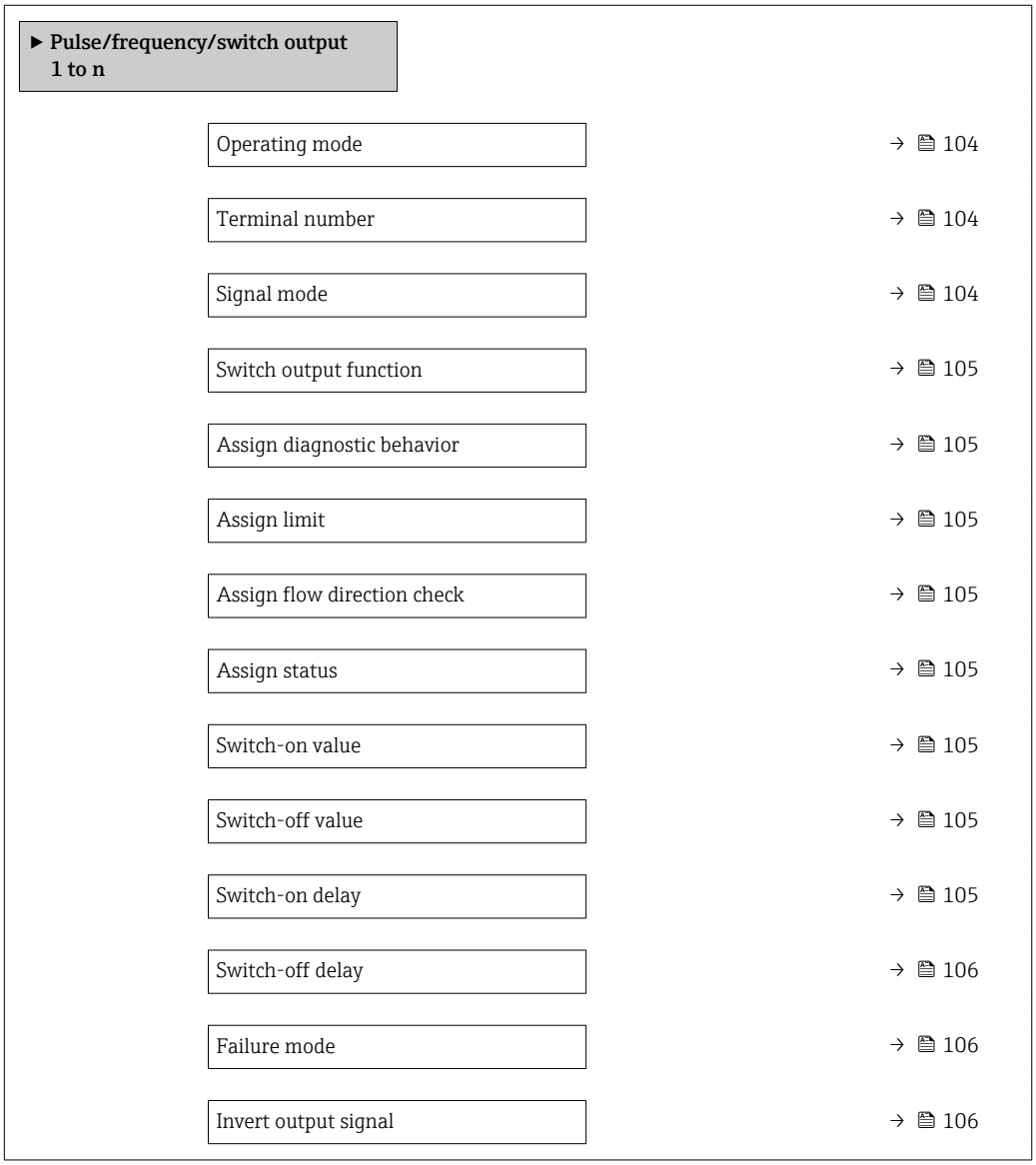
| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Maximum frequency value | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | Enter maximum frequency. | 0.0 to 10 000.0 Hz | 10 000.0 Hz |
| Measuring value at minimum frequency | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | Enter measured value for minmum frequency. | Signed floating-point number | Depends on country and nominal diameter |
| Measuring value at maximum frequency | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | Enter measured value for maximum frequency. | Signed floating-point number | Depends on country and nominal diameter |
| Failure mode | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | Define output behavior in alarm condition. | ▪ Actual value<br>▪ Defined value<br>▪ 0 Hz | 0 Hz |
| Failure frequency | One of the following options is selected in the **Assign current output** parameter (→ 🖹 98):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Electronic temperature | 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




### 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 | 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 |
| Assign limit | ▪ The **Switch** option is selected in the **Operating mode** parameter.<br>▪ The **Limit** option is selected in the **Switch output function** parameter. | Select process variable for limit function. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Electronic temperature | 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 | Volume flow |
| 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. | ▪ Empty pipe detection<br>▪ Low flow cut off | Empty pipe detection |
| Switch-on value | ▪ In the **Operating mode** parameter, the **Switch** option is selected.<br>▪ In the **Switch output function** parameter, the **Limit** option is selected. | Enter measured value for the switch-on point. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| Switch-off value | ▪ In the **Operating mode** parameter, the **Switch** option is selected.<br>▪ In the **Switch output function** parameter, the **Limit** option is selected. | Enter measured value for the switch-off point. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 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 |

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| 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 |

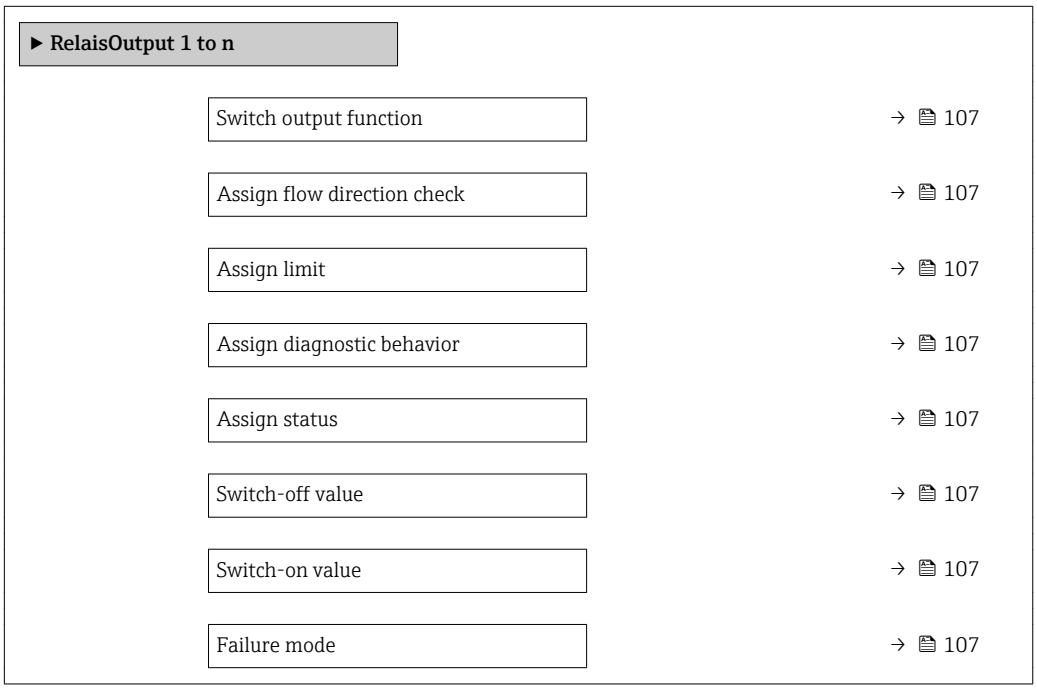
* Visibility depends on order options or device settings

## 10.5.9 Configuring the relay output

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

### Navigation

"Setup" menu → Relay output 1 to n



**Parameter overview with brief description**

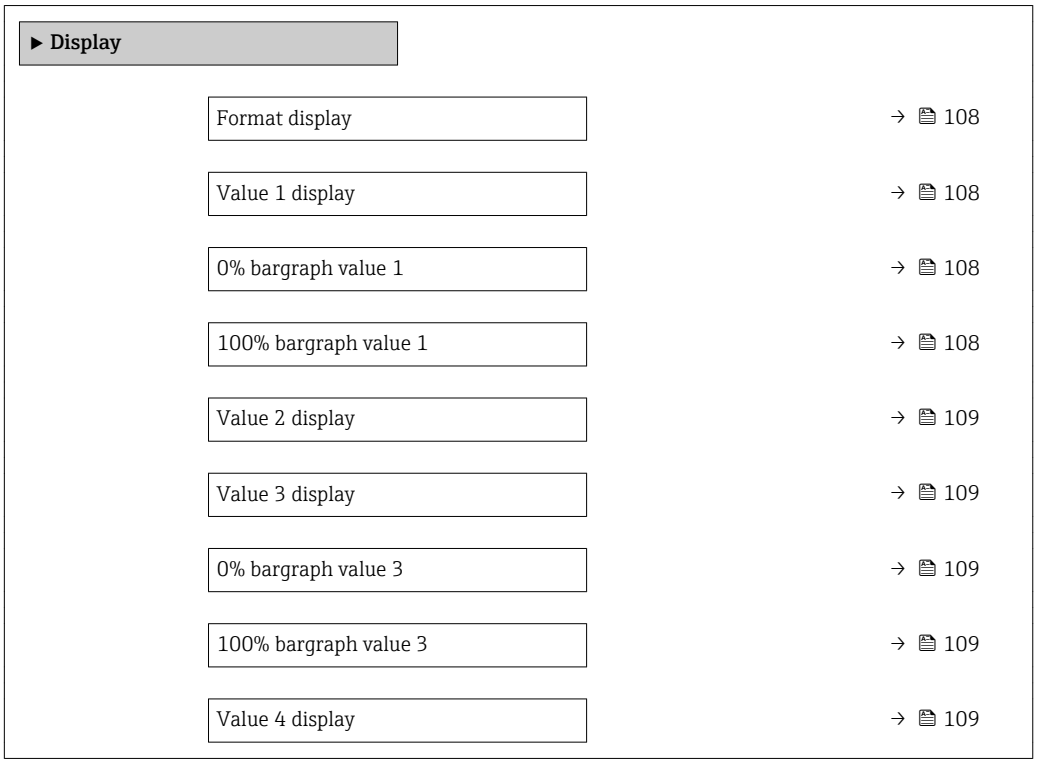
| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Relay output function | – | Select the function for the relay output. | ▪ Closed<br>▪ Open<br>▪ Diagnostic behavior<br>▪ Limit<br>▪ Flow direction check<br>▪ Digital Output | Closed |
| 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) | – |
| Assign flow direction check | In the **Relay output function** parameter, the **Flow direction check** option is selected. | Select process variable for flow direction monitoring. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Volume flow |
| Assign limit | In the **Relay output function** parameter, the **Limit** option is selected. | Select process variable for limit function. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Electronic temperature | Volume 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 | 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 l/h<br>▪ 0 gal(us)/min |
| Switch-off delay | In the **Relay output function** parameter, the **Limit** option is selected. | Define delay for the switch-off of status output. | 0.0 to 100.0 s | 0.0 s |
| Switch-on value | In the **Relay output function** parameter, the **Limit** option is selected. | Enter measured value for the switch-on point. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal(us)/min |
| Switch-on delay | In the **Relay output function** parameter, the **Limit** option is selected. | Define delay for the switch-on of status output. | 0.0 to 100.0 s | 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

## 10.5.10 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




## 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 |
| Value 1 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Electronic temperature | Volume flow |
| 0% bargraph value 1 | A local display is provided. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ None<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature<br>▪ Electronic temperature | None |
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ None<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature<br>▪ Electronic temperature | 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 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 0 |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ None<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature<br>▪ Electronic temperature | None |

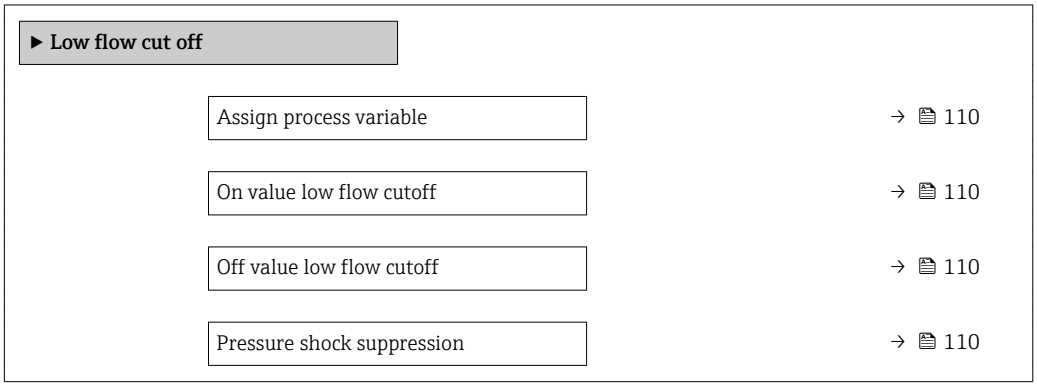
* Visibility depends on order options or device settings

## 10.5.11 Configuring the low flow cut off

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

### Navigation

"Setup" menu → Low flow cut off




### Parameter overview with brief description

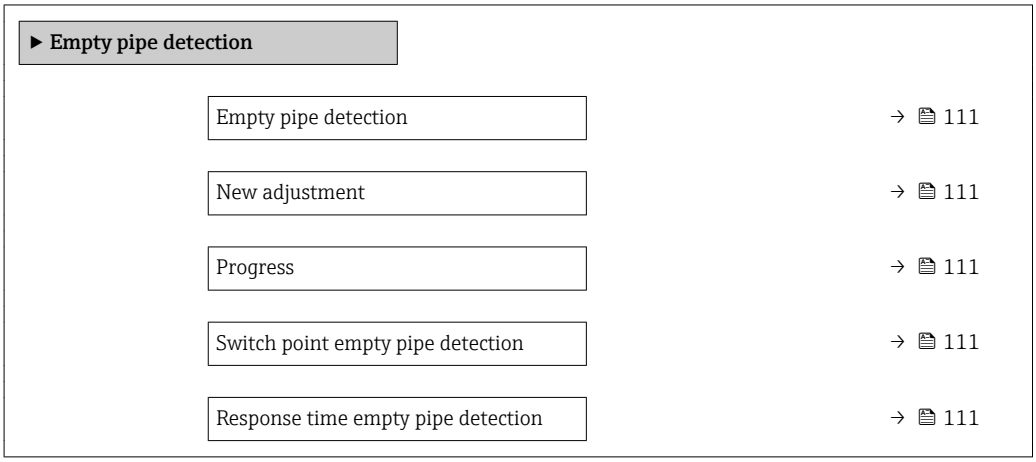
| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for low flow cut off. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Volume flow |
| On value low flow cutoff | One of the following options is selected in the **Assign process variable** parameter (→ 110):<br>▪ Volume flow<br>▪ Mass flow | Enter on value for low flow cut off. | Positive floating-point number | Depends on country and nominal diameter |
| Off value low flow cutoff | One of the following options is selected in the **Assign process variable** parameter (→ 110):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Enter off value for low flow cut off. | 0 to 100.0 % | 50 % |
| Pressure shock suppression | One of the following options is selected in the **Assign process variable** parameter (→ 110):<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Enter time frame for signal suppression (= active pressure shock suppression). | 0 to 100 s | 0 s |

## 10.5.12 Configuring empty pipe detection

The **Empty pipe detection** submenu contains parameters that must be configured for the configuration of empty pipe detection.

### Navigation

"Setup" menu → Empty pipe detection



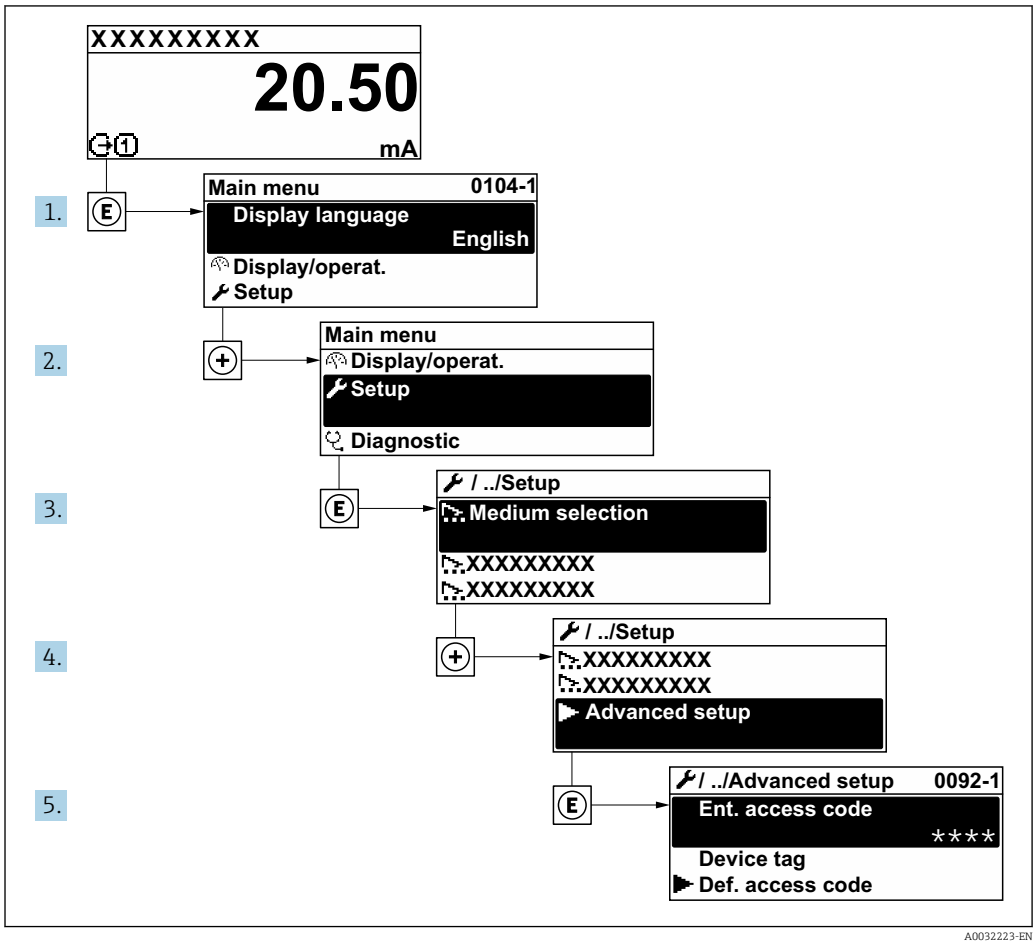

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User interface / User entry | Factory setting |
|---|---|---|---|---|
| Empty pipe detection | – | Switch empty pipe detection on and off. | ▪ Off<br>▪ On | Off |
| New adjustment | The **On** option is selected in the **Empty pipe detection** parameter. | Select type of adjustment. | ▪ Cancel<br>▪ Empty pipe adjust<br>▪ Full pipe adjust | Cancel |
| Progress | The **On** option is selected in the **Empty pipe detection** parameter. | Shows the progress. | ▪ Ok<br>▪ Busy<br>▪ Not ok | – |
| Switch point empty pipe detection | The **On** option is selected in the **Empty pipe detection** parameter. | Enter hysteresis in %, below this value the measuring tube will detected as empty. | 0 to 100 % | 10 % |
| Response time empty pipe detection | In the **Empty pipe detection** parameter (→ 111), the **On** option is selected. | Enter the time before diagnostic message S862 "Pipe empty" is displayed for empty pipe detection. | 0 to 100 s | 1 s |

## 10.6 Advanced settings

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

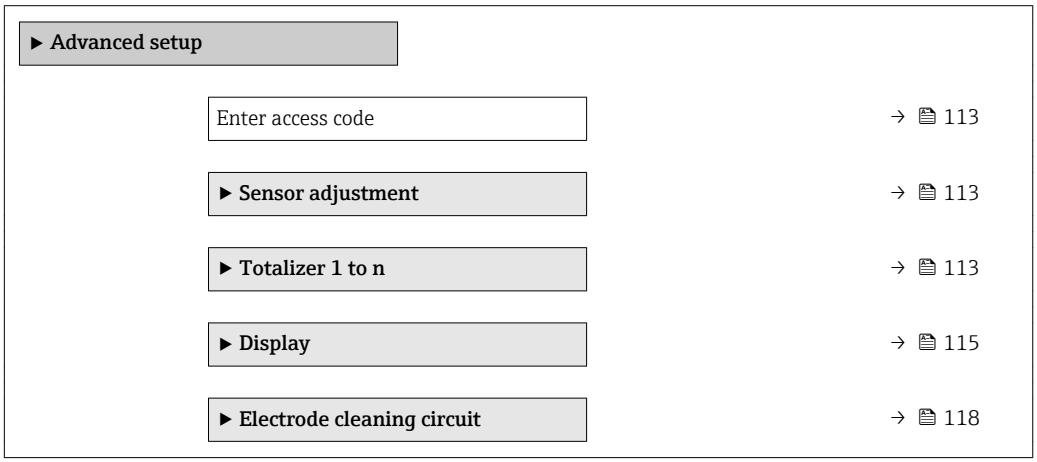
*Navigation to the "Advanced setup" submenu*

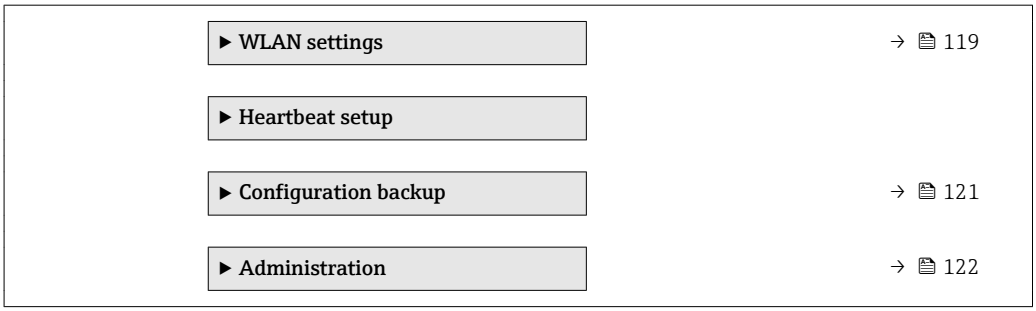



The number of submenus can vary depending on the device version. Some submenus are not dealt with in the Operating Instructions. These submenus and the parameters they contain are explained in the Special Documentation for the device.

### Navigation

"Setup" menu → Advanced setup






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

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

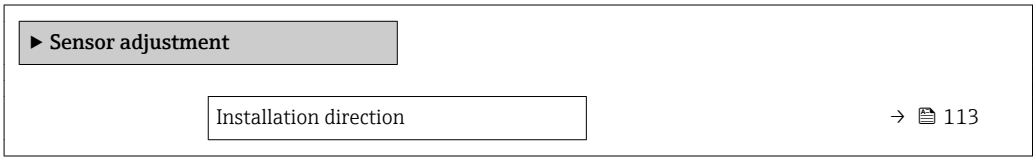
**Parameter overview with brief description**

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

### 10.6.2 Carrying out a sensor adjustment

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

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



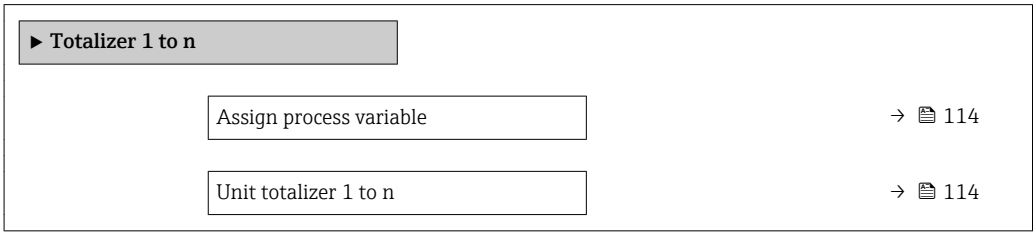

**Parameter overview with brief description**

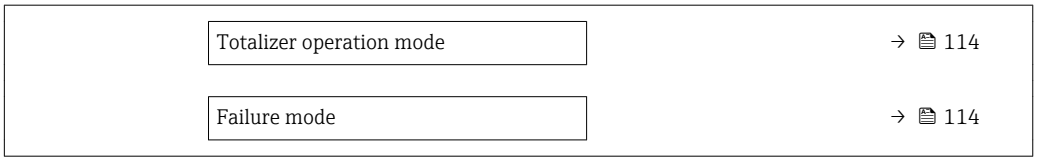
| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Installation direction | Set sign of flow direction to match the direction of the arrow on the sensor. | ▪ Flow in arrow direction<br>▪ Flow against arrow direction | Flow in arrow direction |

### 10.6.3 Configuring the totalizer

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

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





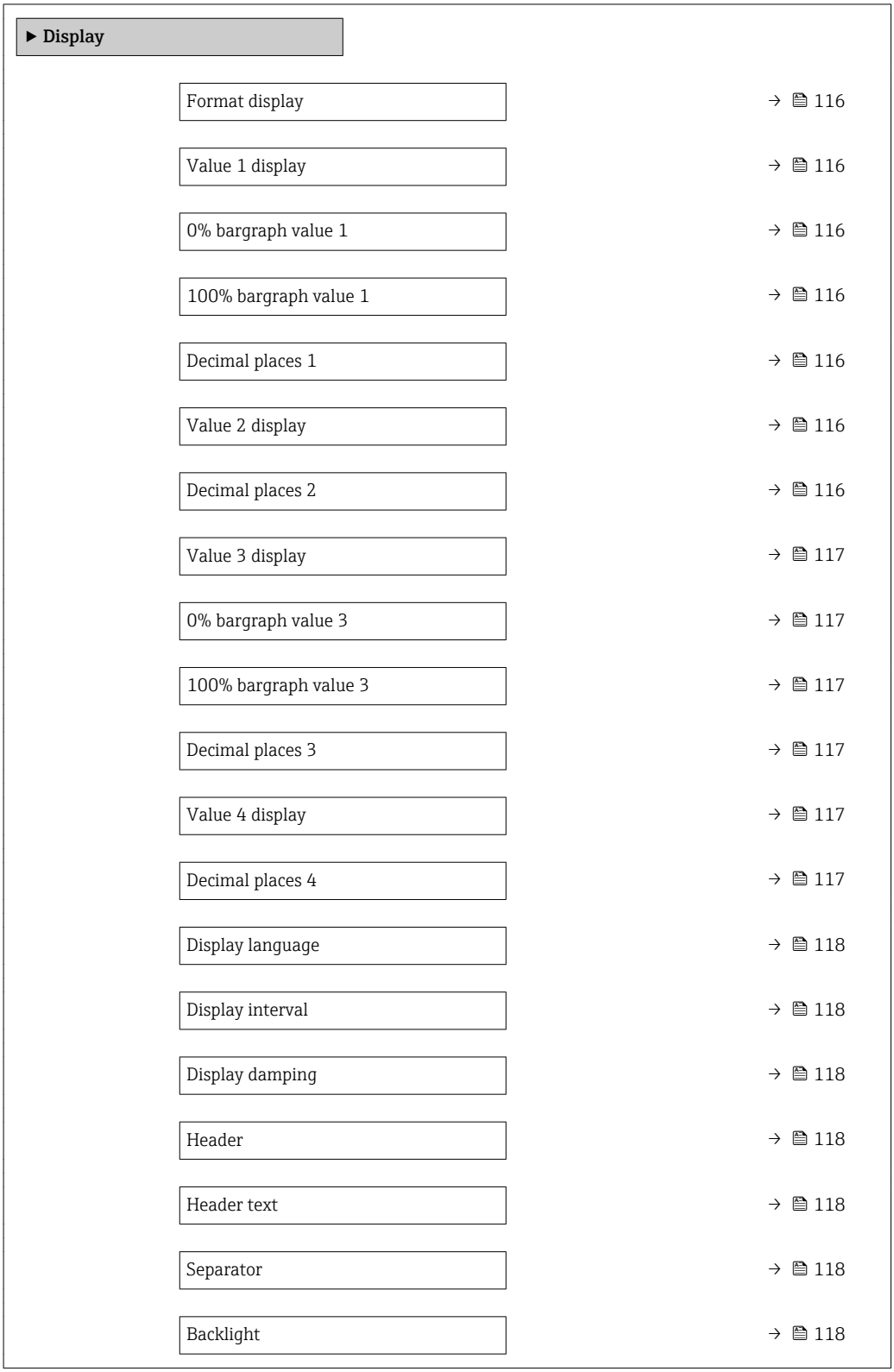

### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection | Factory setting |
|---|---|---|---|---|
| Assign process variable | – | Select process variable for totalizer. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Volume flow |
| Unit totalizer 1 to n | One of the following options is selected in the **Assign process variable** parameter (→ 114) of the **Totalizer 1 to n** submenu:<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow | Select process variable totalizer unit. | Unit choose list | l |
| Totalizer operation mode | – | Select totalizer calculation mode. | ▪ Net flow total<br>▪ Forward flow total<br>▪ Reverse flow total | Net flow total |
| Failure mode | – | Define totalizer behavior in alarm condition. | ▪ Stop<br>▪ Actual value<br>▪ Last valid value | Stop |

### 10.6.4 Carrying out additional display configurations

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

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



## 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 |
| Value 1 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Electronic temperature | Volume flow |
| 0% bargraph value 1 | A local display is provided. | Enter 0% value for bar graph display. | Signed floating-point number | Country-specific:<br>▪ 0 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 1 | A local display is provided. | Enter 100% value for bar graph display. | Signed floating-point number | Depends on country and nominal diameter |
| Decimal places 1 | A measured value is specified in the **Value 1 display** parameter. | Select the number of decimal places for the display value. | ▪ x<br>▪ x.x<br>▪ x.xx<br>▪ x.xxx<br>▪ x.xxxx | x.xx |
| Value 2 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ None<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature<br>▪ Electronic temperature | 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 | x.xx |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Value 3 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ None<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature<br>▪ Electronic temperature | 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 l/h<br>▪ 0 gal/min (us) |
| 100% bargraph value 3 | A selection was made in the **Value 3 display** parameter. | Enter 100% value for bar graph display. | Signed floating-point number | 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 | x.xx |
| Value 4 display | A local display is provided. | Select the measured value that is shown on the local display. | ▪ None<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature<br>▪ Electronic temperature | None |
| 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 | x.xx |

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| 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>▪ العَرَبيّة (Arabic) *<br>▪ Bahasa Indonesia *<br>▪ ภาษาไทย (Thai) *<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 | In the **Header** parameter, the **Free text** option is selected. | 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** "Separate 4-line display, illum.; 10m/30ft cable; touch control" | Switch the local display backlight on and off. | ▪ Disable<br>▪ Enable | Enable |

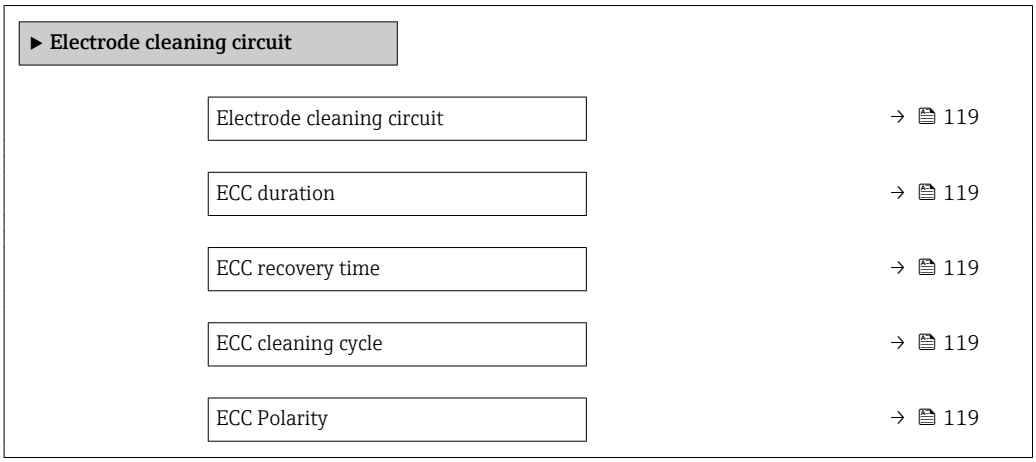
* Visibility depends on order options or device settings

### 10.6.5 Performing electrode cleaning

The **Electrode cleaning circuit** submenu contains parameters that must be configured for the configuration of electrode cleaning.

The submenu is only available if the device was ordered with electrode cleaning.

**Navigation**
"Setup" menu → Advanced setup → Electrode cleaning circuit



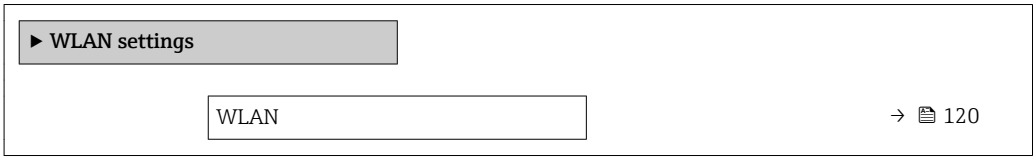

**Parameter overview with brief description**

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Electrode cleaning circuit | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Enable the cyclic electrode cleaning circuit. | ▪ Off<br>▪ On | Off |
| ECC duration | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Enter the duration of electrode cleaning in seconds. | 0.01 to 30 s | 2 s |
| ECC recovery time | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Define recovery time after electrode cleaning. During this time the current output values will be held at last valid value. | 1 to 600 s | 60 s |
| ECC cleaning cycle | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Enter the pause duration between electrode cleaning cycles. | 0.5 to 168 h | 0.5 h |
| ECC Polarity | For the following order code: "Application package", option **EC** "ECC electrode cleaning" | Select the polarity of the electrode cleaning circuit. | ▪ Positive<br>▪ Negative | Depends on the electrode material:<br>▪ Platinum: **Negative** option<br>▪ Tantalum, Alloy C22, stainless steel: **Positive** option |

## 10.6.6 WLAN configuration

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

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



### 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). | – | – |
| 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. | ▪ Root 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 device WLAN interface. | 4 octet: 0 to 255 (in the particular octet) | 192.168.1.212 |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| WLAN passphrase | The **WPA2-PSK** option is selected in the **Security type** parameter. | Enter the network key (8 to 32 characters).<br>The network key supplied with the device should be changed during commissioning for security reasons. | 8 to 32-digit character string comprising numbers, letters and special characters | Serial number of the measuring device (e.g. L100A802000) |
| Assign SSID name | – | Select which name will be used for SSID: device tag or user-defined name. | ▪ 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>The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another. | Max. 32-digit character string comprising numbers, letters and special characters | EH_device designation_last 7 digits of the serial number (e.g. EH_Promag_300_A802000) |
| 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 |

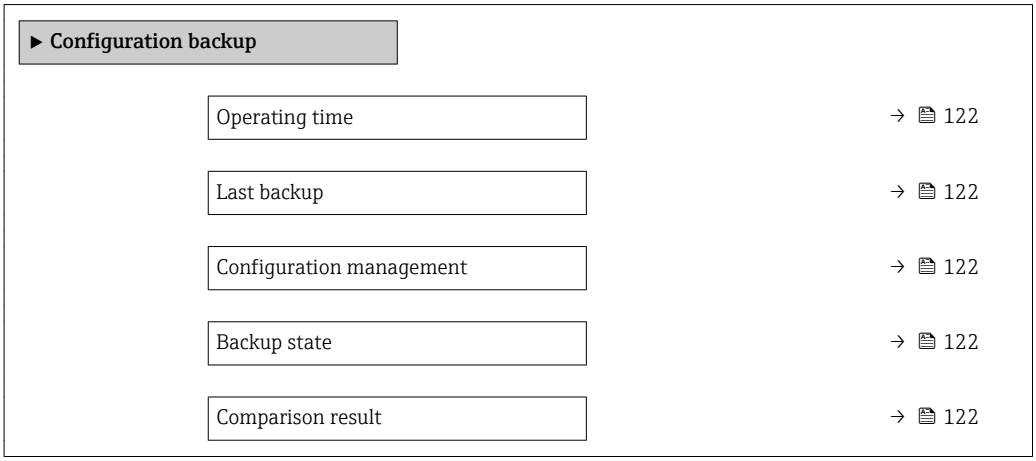
## 10.6.7 Configuration management

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

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

### Navigation

"Setup" menu → Advanced setup → Configuration backup



### Parameter overview with brief description

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

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

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

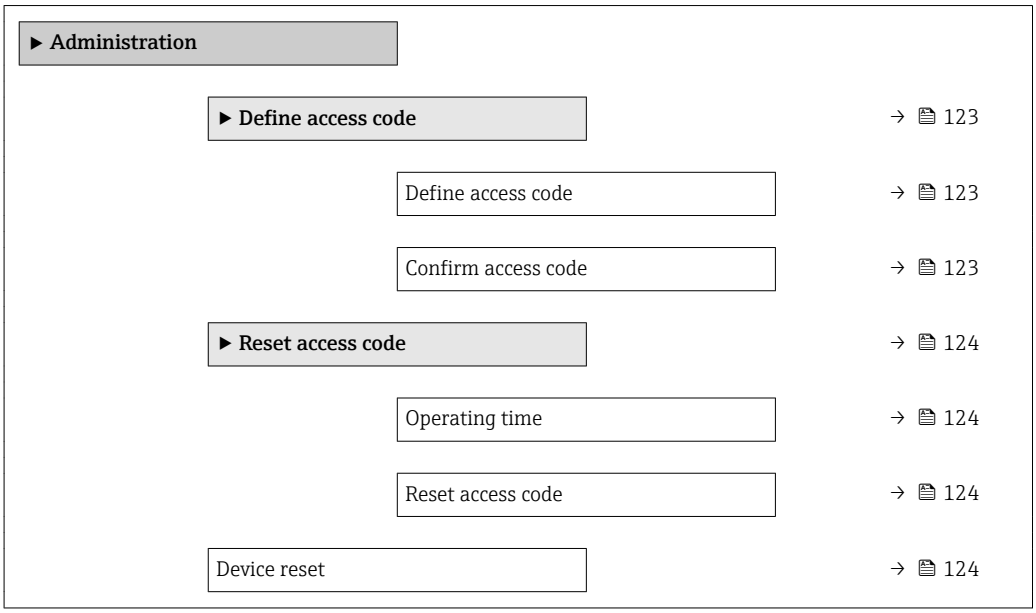
*HistoROM backup*
A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

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

## 10.6.8 Using parameters for device administration

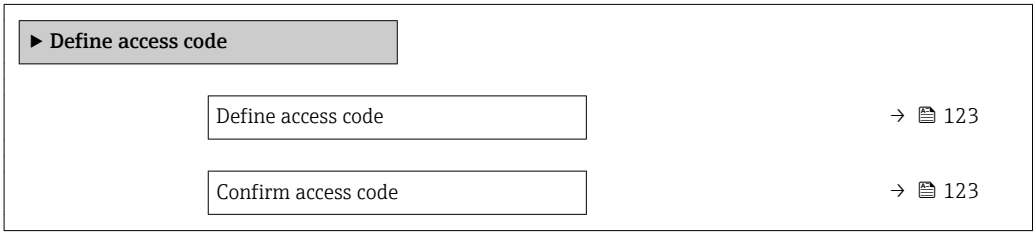
The **Administration** submenu systematically guides the user through all the parameters that can be used for device administration purposes.

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




### Using the parameter to define the access code

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

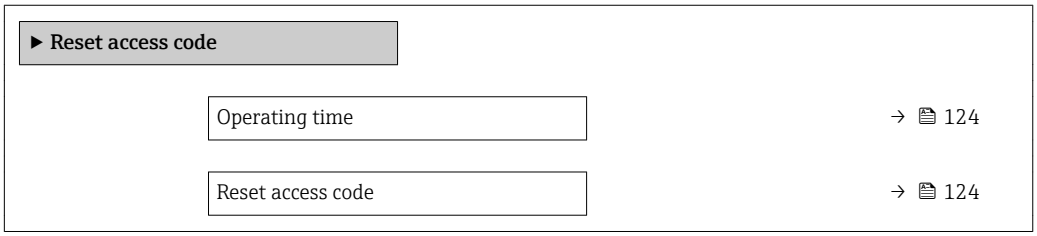



### Parameter overview with brief description

| 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




### 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>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 service interface CDI-RJ45)<br>▪ Fieldbus | Character string comprising numbers, letters and special characters | 0x00 |

### Using the parameter to reset the device

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

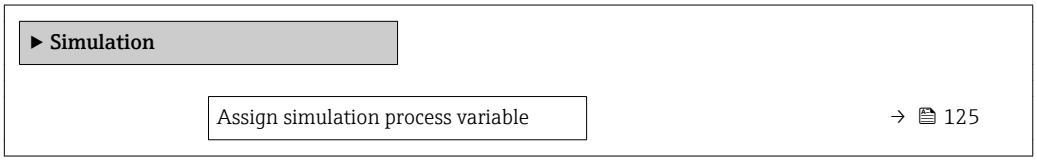
### Parameter overview with brief description

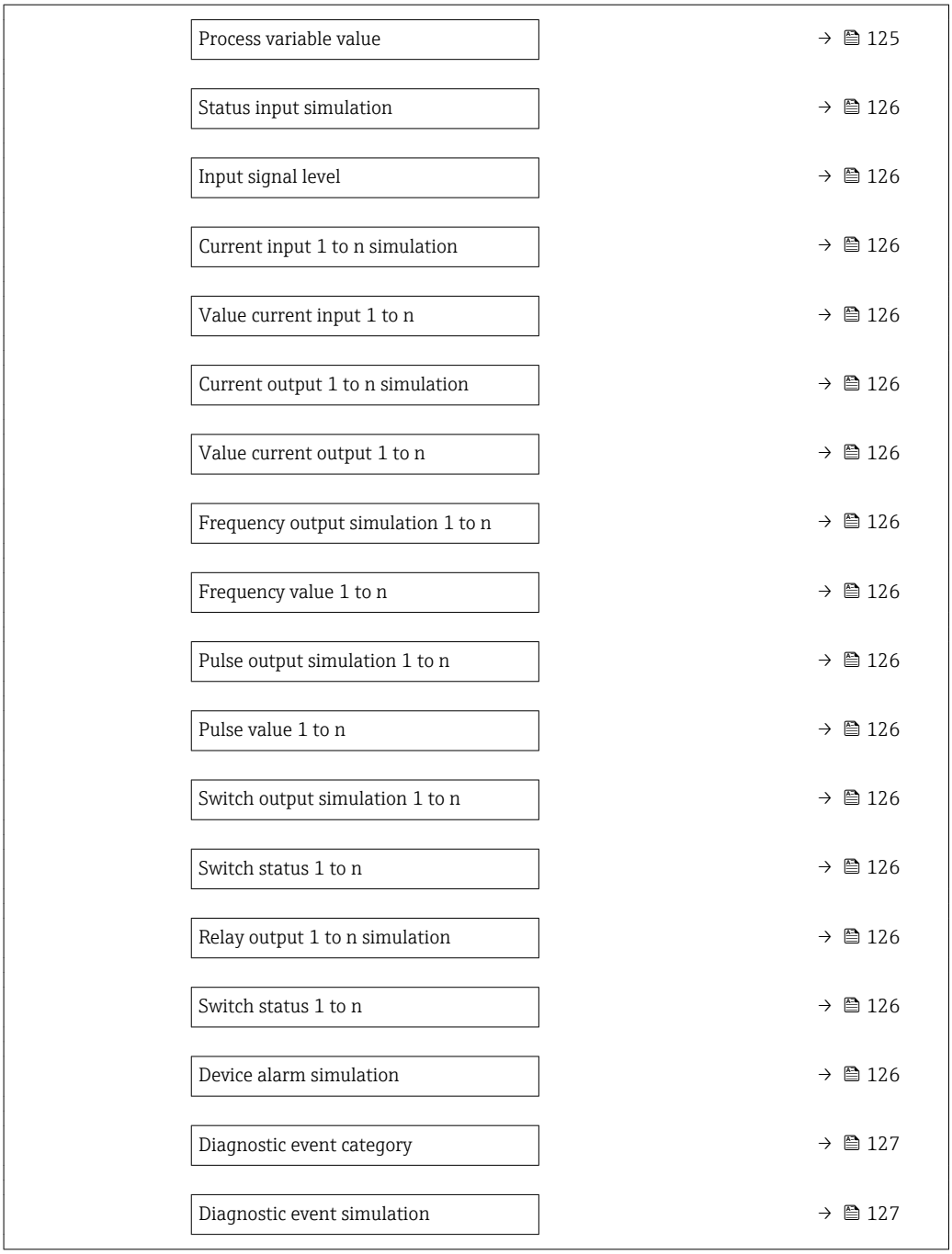
| Parameter | Description | Selection | Factory setting |
|---|---|---|---|
| Device reset | Reset the device configuration - either entirely or in part - to a defined state. | ▪ Cancel<br>▪ To delivery settings<br>▪ Restart device<br>▪ Restore S-DAT backup | Cancel |

## 10.7 Simulation

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

**Navigation**
"Diagnostics" menu → Simulation






## Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Assign simulation process variable | – | Select a process variable for the simulation process that is activated. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity * | Off |
| Process variable value | – | Enter the simulation value for the selected process variable. | Depends on the process variable selected | 0 |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Status input simulation | – | Switch simulation of the status input on and off. | ▪ Off<br>▪ On | Off |
| Input signal level | In the **Status input simulation** parameter, the **On** option is selected. | Select the signal level for the simulation of the status input. | ▪ High<br>▪ Low | High |
| 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 |
| Current output 1 to n simulation | – | Switch the simulation of the current output on and off. | ▪ Off<br>▪ On | Off |
| Value current output 1 to n | 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 simulation 1 to n | 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 value 1 to n | In the **Frequency output simulation 1 to n** parameter, the **On** option is selected. | Enter the frequency value for the simulation. | 0.0 to 12 500.0 Hz | 0.0 Hz |
| Pulse output simulation 1 to n | In the **Operating mode** parameter, the **Pulse** option is selected. | Set and switch off the pulse output simulation.<br>For **Fixed value** option: **Pulse width** parameter (→ 101) 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 status 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 status 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 |
| Pulse output simulation | – | Set and switch off the pulse output simulation.<br>For **Fixed value** option: **Pulse width** parameter defines the pulse width of the pulses output. | ▪ Off<br>▪ Fixed value<br>▪ Down-counting value | Off |
| Pulse value | In the **Pulse output simulation** parameter, the **Down-counting value** option is selected. | Set and switch off the pulse output simulation. | 0 to 65 535 | 0 |
| Device alarm simulation | – | Switch the device alarm on and off. | ▪ Off<br>▪ On | Off |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| 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 |
| Logging interval | – | Define the logging interval tlog for data logging. This value defines the time interval between the individual data points in the memory. | 1.0 to 3 600.0 s | – |

* Visibility depends on order options or device settings

## 10.8 Protecting settings from unauthorized access

The following write protection options exist in order to protect the configuration of the measuring device from unintentional modification:
- Protect access to parameters via access code → 🖹 127
- Protect access to local operation via key locking → 🖹 65
- Protect access to measuring device via write protection switch → 🖹 128

### 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

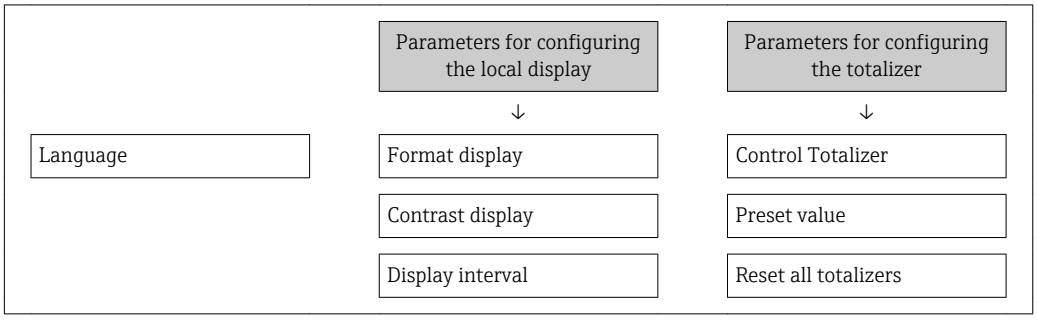
1. Navigate to the **Define access code** parameter (→ 🖹 123).
2. Define a max. 16-digit character string comprising numbers, letters and special characters as the access code.
3. Enter the access code again in the **Confirm access code** parameter (→ 🖹 123) to confirm the code.
   ↳ The 🔒-symbol appears in front of all write-protected parameters.

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

- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 🖹 64.
- The user role with which the user is currently logged on via the local display is indicated by the → 🖹 64 **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 (→ 123).
2. Define a max. 16-digit numeric code as an access code.
3. Enter the access code again in the **Confirm access code** parameter (→ 123) to confirm the code.
   ↳ The Web browser switches to the login page.

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

- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 64.
- The user role with which the user is currently logged on via Web browser is indicated by the **Access status** parameter. Navigation path: Operation → Access status

### Resetting the access code

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

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

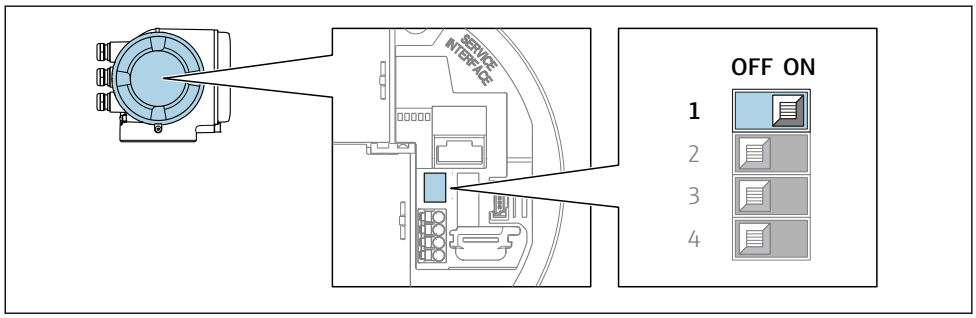
For a reset code, contact your Endress+Hauser service organization.

1. Navigate to the **Reset access code** parameter (→ 124).
2. Enter the reset code.
   ↳ The access code has been reset to the factory setting **0000**. It can be redefined → 127.

## 10.8.2 Write protection via write protection switch

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

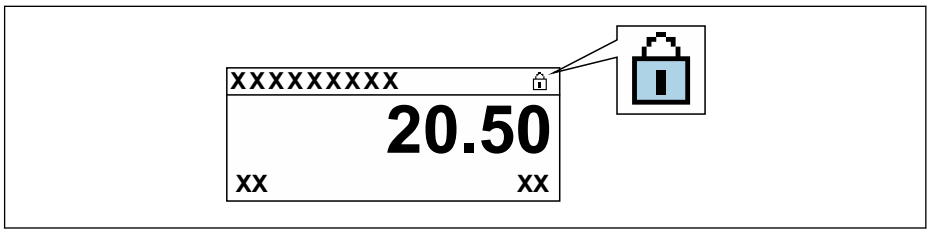
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):
- Via local display
- Via EtherNet/IP protocol

1. 


A0029630

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

↳ In the **Locking status** parameter the **Hardware locked** option is displayed → 130. In addition, on the local display the -symbol appears in front of the parameters in the header of the operational display and in the navigation view.




A0029425

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

↳ No option is displayed in the **Locking status** parameter → 130. On the local display, the -symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

# 11 Operation

## 11.1 Reading the device locking status

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

Operation → Locking status

*Function scope of the "Locking status" parameter*

| Options | Description |
|---|---|
| None | The access status displayed in the **Access status** parameter applies → 64. Only appears on local display. |
| Hardware locked | The DIP switch for hardware locking is activated on the PCB board. This locks write access to the parameters (e.g. via local display or operating tool) . |
| Temporarily locked | Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again. |

## 11.2 Adjusting the operating language

Detailed information:
- To configure the operating language → 90
- For information on the operating languages supported by the measuring device → 192

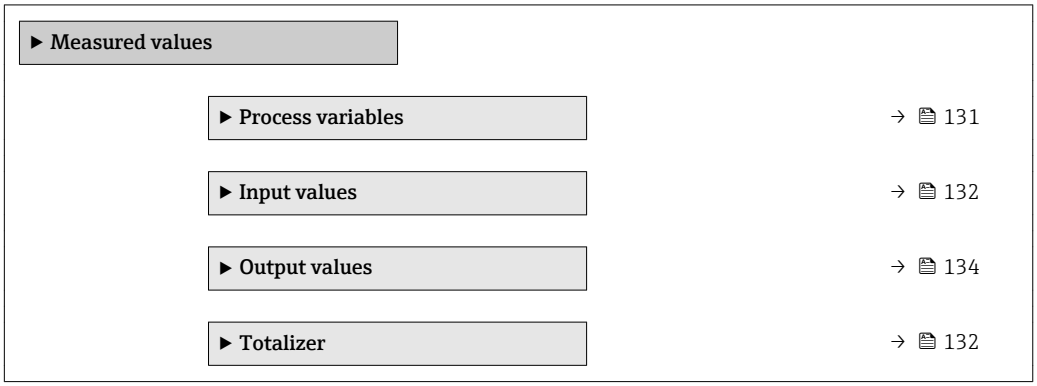
## 11.3 Configuring the display

Detailed information:
- On the basic settings for the local display → 107
- On the advanced settings for the local display → 115

## 11.4 Reading measured values

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

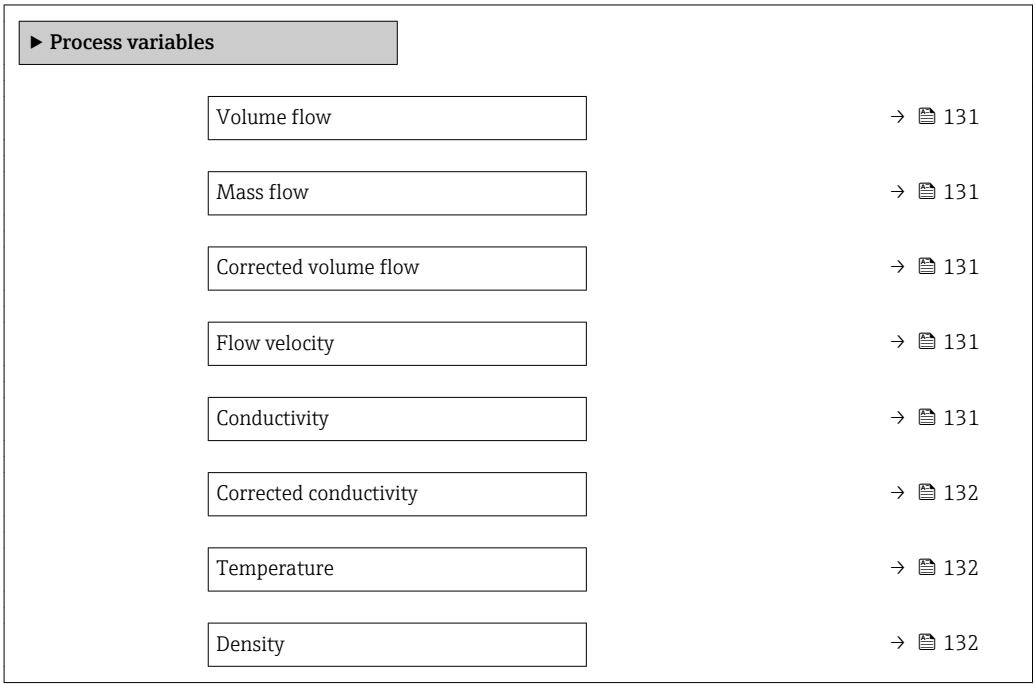
**Navigation**
"Diagnostics" menu → Measured values



### 11.4.1 "Process variables" submenu

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

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




**Parameter overview with brief description**

| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Volume flow | – | Displays the volume flow currently measured.<br>*Dependency*<br>The unit is taken from the **Volume flow unit** parameter (→ 93). | Signed floating-point number |
| Mass flow | – | Displays the mass flow currently calculated.<br>*Dependency*<br>The unit is taken from the **Mass flow unit** parameter (→ 93). | Signed floating-point number |
| Corrected volume flow | – | Displays the corrected volume flow currently calculated.<br>*Dependency*<br>The unit is taken from the **Corrected volume flow unit** parameter (→ 94). | Signed floating-point number |
| Flow velocity | – | Displays the flow velocity currently calculated. | Signed floating-point number |
| Conductivity | – | Displays the conductivity currently measured.<br>*Dependency*<br>The unit is taken from the **Conductivity unit** parameter (→ 93). | Signed floating-point number |

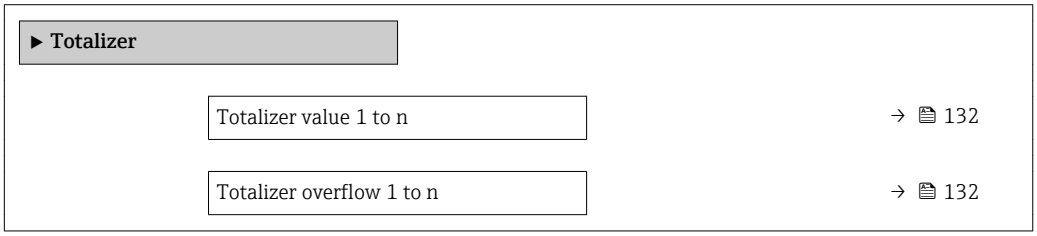
| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Corrected conductivity | One of the following conditions is met:<br>▪ Order code for "Sensor option", option **CI** "Medium temperature measurement"<br>or<br>▪ The temperature is read into the flowmeter from an external device. | Displays the conductivity currently corrected.<br>*Dependency*<br>The unit is taken from the **Conductivity unit** parameter (→ 🖹 93). | Positive floating-point number |
| Temperature | One of the following conditions is met:<br>▪ Order code for "Sensor option", option **CI** "Medium temperature measurement"<br>or<br>▪ The temperature is read into the flowmeter from an external device. | Displays the temperature currently calculated.<br>*Dependency*<br>The unit is taken from the **Temperature unit** parameter (→ 🖹 93). | Positive floating-point number |
| Density | – | Displays the current fixed density or density read in from an external device.<br>*Dependency*<br>The unit is taken from the **Density unit** parameter. | Signed floating-point number |

## 11.4.2 "Totalizer" submenu

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

### Navigation

"Diagnostics" menu → Measured values → Totalizer



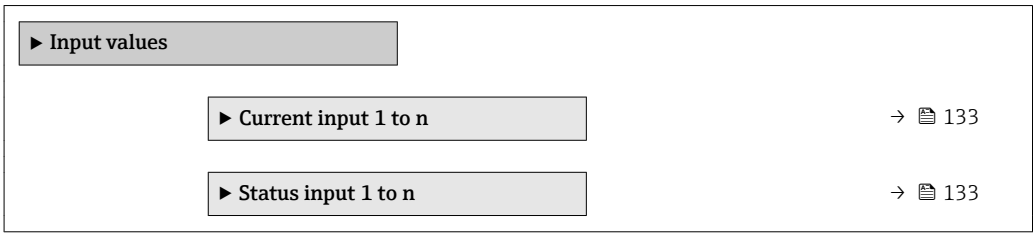

### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Totalizer value 1 to n | A process variable is selected in the **Assign process variable** parameter (→ 🖹 114) of the **Totalizer 1 to n** submenu. | Displays the current totalizer counter value. | Signed floating-point number |
| Totalizer overflow 1 to n | A process variable is selected in the **Assign process variable** parameter (→ 🖹 114) of the **Totalizer 1 to n** submenu. | Displays the current totalizer overflow. | Integer with sign |

## 11.4.3 "Input values" submenu

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

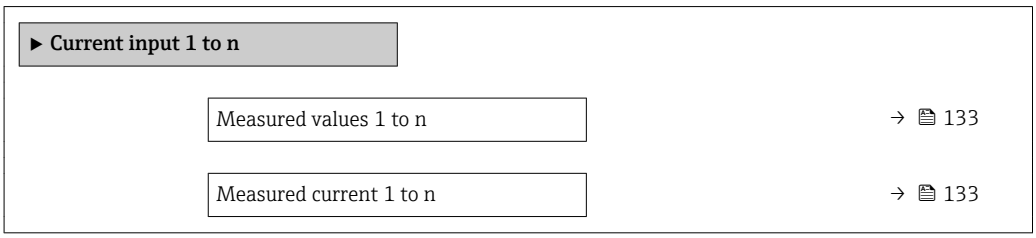
### Navigation
"Diagnostics" menu → Measured values → Input values




### Input values of current input

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

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



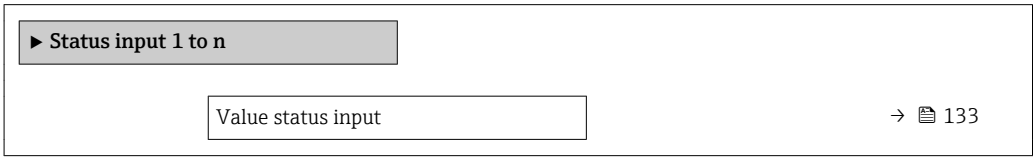

### Parameter overview with brief description

| Parameter | Description | User interface |
|---|---|---|
| Measured values 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



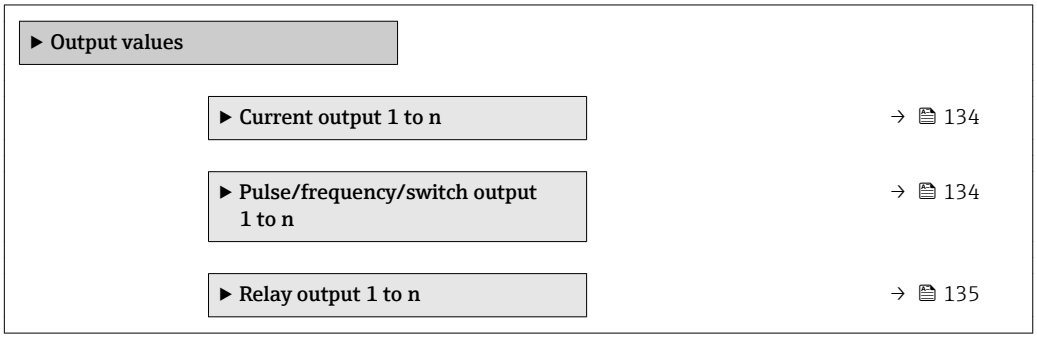

### Parameter overview with brief description

| 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.

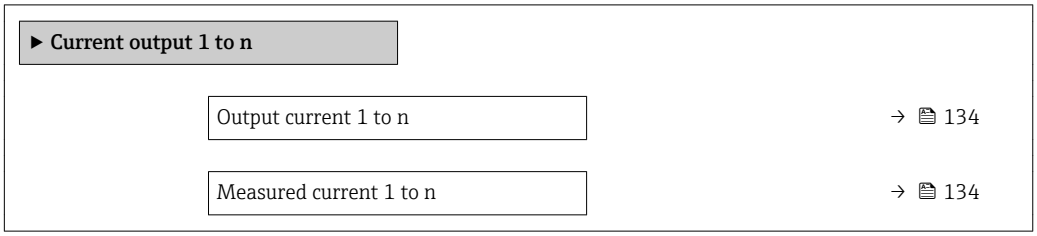
**Navigation**
"Diagnostics" menu → Measured values → Output values




#### Output values of current output

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

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



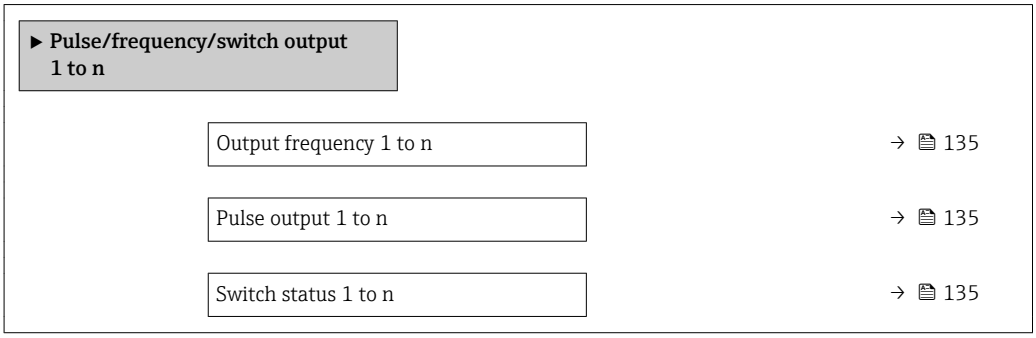

#### Parameter overview with brief description

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

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

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

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



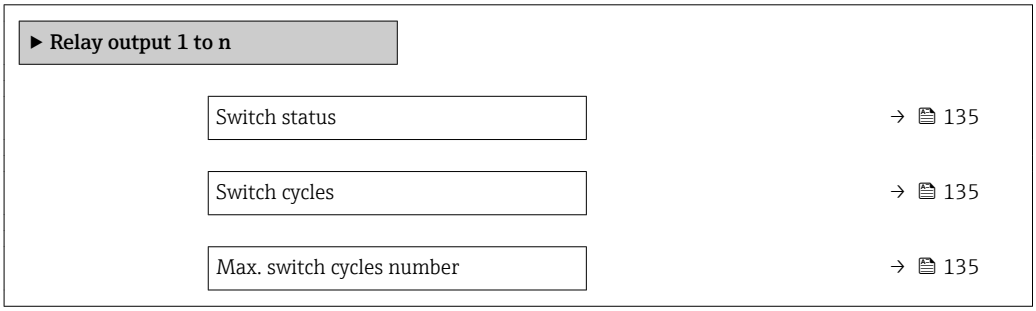

### Parameter overview with brief description

| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Output frequency 1 to n | 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 | In the **Operating mode** parameter, the **Pulse** option is selected. | Displays the pulse frequency currently output. | Positive floating-point number |
| Switch status 1 to n | 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




### Parameter overview with brief description

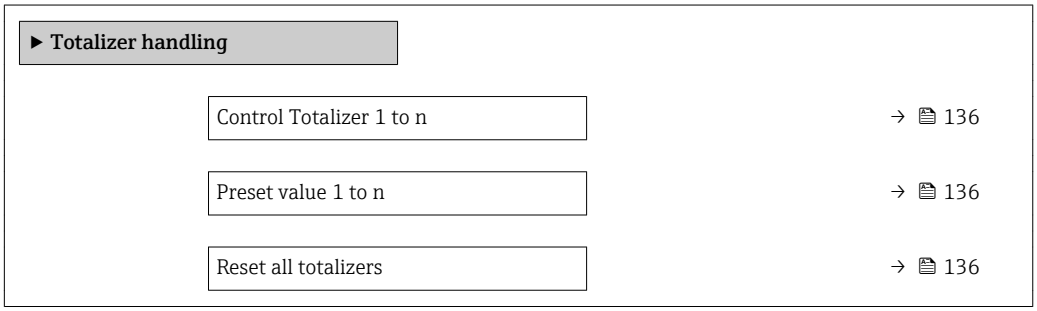
| Parameter | Description | User interface |
|---|---|---|
| Switch status | Shows the current relay switch status. | ▪ Open<br>▪ Closed |
| Switch cycles | Shows number of all performed switch cycles. | Positive integer |
| Max. switch cycles number | Shows the maximal number of guaranteed switch cycles. | 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 (→ 📖 91)
- Advanced settings using the**Advanced setup** submenu (→ 📖 112)

## 11.6 Performing a totalizer reset

### Navigation
"Operation" menu → Totalizer handling




### Parameter overview with brief description

| Parameter | Prerequisite | Description | Selection / User entry | Factory setting |
|---|---|---|---|---|
| Control Totalizer 1 to n | One of the following options is selected in the **Assign process variable** parameter (→ 📖 114) of the **Totalizer 1 to n** submenu: Volume flow | Control totalizer value. | ▪ Totalize<br>▪ Reset + hold<br>▪ Preset + hold<br>▪ Reset + totalize<br>▪ Preset + totalize<br>▪ Hold | Totalize |
| Preset value 1 to n | One of the following options is selected in the **Assign process variable** parameter (→ 📖 114) of the **Totalizer 1 to n** submenu: Volume flow | Specify start value for totalizer.<br>*Dependency*<br>The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 📖 114). | Signed floating-point number | 0 l |
| Reset all totalizers | – | Reset all totalizers to 0 and start. | ▪ Cancel<br>▪ Reset + totalize | Cancel |

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

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

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

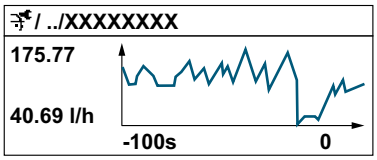
| Options | Description |
|---|---|
| Cancel | No action is executed and the user exits the parameter. |
| Reset + totalize | Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totalized. |

## 11.7 Showing 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 → 76.
- Web browser

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

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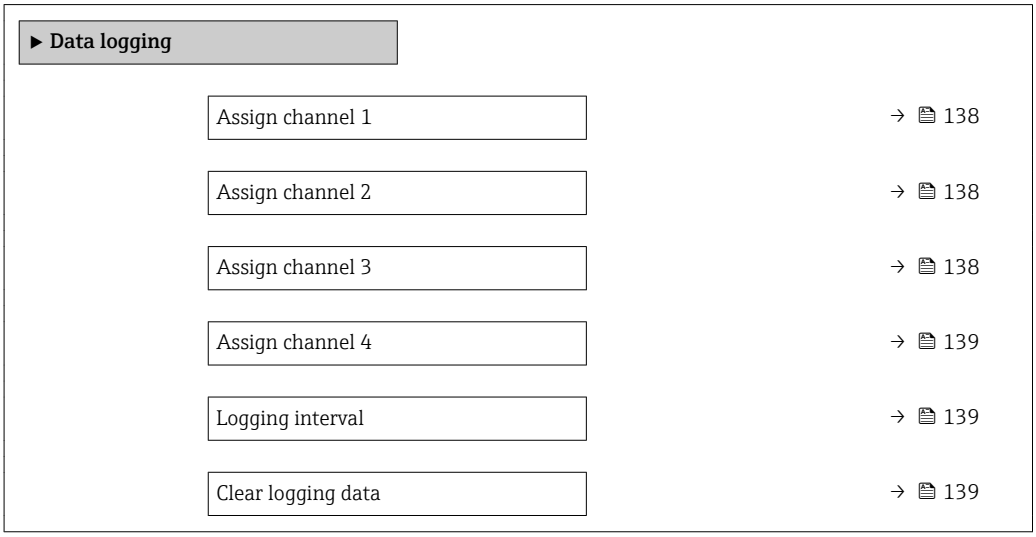
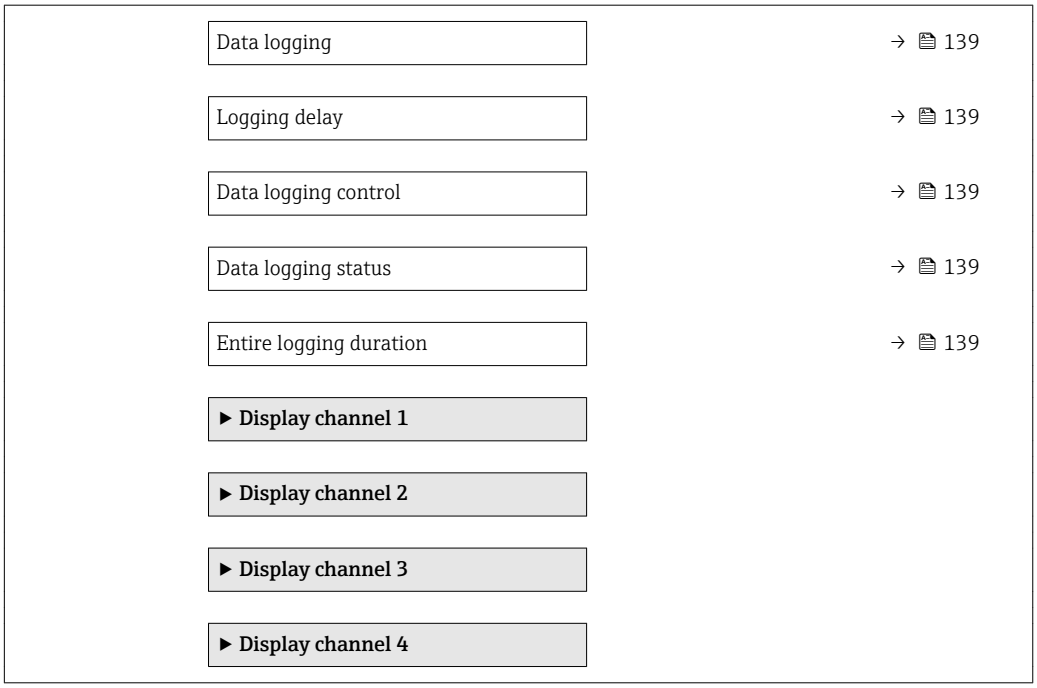
- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

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

**Navigation**
"Diagnostics" menu → Data logging






## 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.<br>The software options currently enabled are displayed in the **Software option overview** parameter. | Assign a process variable to logging channel. | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity *<br>▪ Corrected conductivity *<br>▪ Current output 1<br>▪ Current output 2 *<br>▪ Current output 3 *<br>▪ Current output 4 *<br>▪ Temperature *<br>▪ Electronic temperature | Off |
| Assign channel 2 | The **Extended HistoROM** application package is available.<br>The software options currently enabled are displayed in the **Software option overview** parameter. | Assign process variable to logging channel. | Picklist, see **Assign channel 1** parameter (→ 138) | Off |
| Assign channel 3 | The **Extended HistoROM** application package is available.<br>The software options currently enabled are displayed in the **Software option overview** parameter. | Assign process variable to logging channel. | Picklist, see **Assign channel 1** parameter (→ 138) | Off |

| Parameter | Prerequisite | Description | Selection / User entry / User interface | Factory setting |
|---|---|---|---|---|
| Assign channel 4 | The **Extended HistoROM** application package is available.<br>The software options currently enabled are displayed in the **Software option overview** parameter. | Assign process variable to logging channel. | Picklist, see **Assign channel 1** parameter (→ 138) | 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 data logging method. | ▪ 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 |
| 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

# 12 Diagnostics and troubleshooting

## 12.1 General troubleshooting

*For local display*

| Error | Possible causes | Solution |
|---|---|---|
| Local display dark and no output signals | Supply voltage does not match the value indicated on the nameplate. | Apply the correct supply voltage . |
| Local display dark and no output signals | The polarity of the supply voltage is wrong. | Correct the polarity. |
| Local display dark and no output signals | No contact between connecting cables and terminals. | Check the connection of the cables and correct if necessary. |
| Local display dark and no output signals | Terminals are not plugged into the I/O electronics module correctly. Terminals are not plugged into the main electronics module correctly. | Check terminals. |
| Local display dark and no output signals | I/O electronics module is defective. Main electronics module is defective. | Order spare part → 169. |
| 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 → 169. |
| Backlighting of local display is red | Diagnostic event with "Alarm" diagnostic behavior has occurred. | Take remedial measures |
| Text on local display appears in a foreign language and cannot be understood. | Incorrect operating language is configured. | 1. Press ⊟ + ⊞ for 2 s ("home position").<br>2. Press Ⓔ.<br>3. Set the desired language in the **Display language** parameter (→ 118). |
| 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 → 169. |

*For output signals*

| Error | Possible causes | Solution |
|---|---|---|
| Signal output outside the valid range | Main electronics module is defective. | Order spare part → 169. |
| Device shows correct value on local display, but signal output is incorrect, though in the valid range. | Configuration error | Check and correct the parameter configuration. |
| Device measures incorrectly. | Configuration error or device is operated outside the application. | 1. Check and correct parameter configuration.<br>2. Observe limit values specified in the "Technical Data". |

*For access*

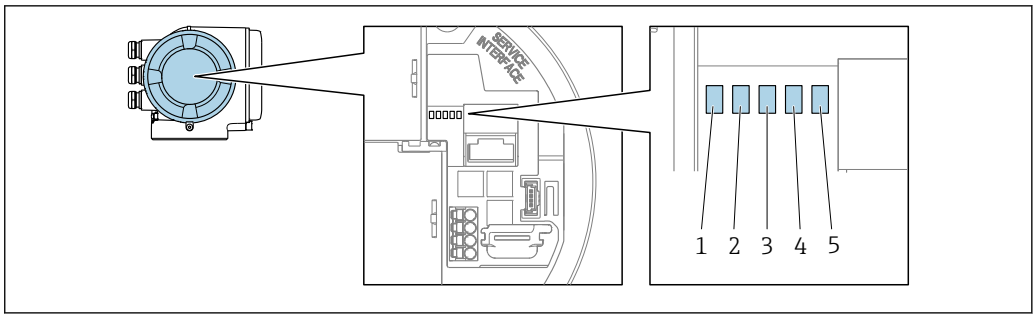
| Error | Possible causes | Solution |
|---|---|---|
| No write access to parameters | Hardware write protection enabled | Set the write protection switch on main electronics module to the **OFF** position → 🖹 128. |
| No write access to parameters | Current user role has limited access authorization | 1. Check user role → 🖹 64.<br>2. Enter correct customer-specific access code → 🖹 64. |
| No connection via EtherNet/IP | Device plug connected incorrectly | Check the pin assignment of the connector . |
| Not connecting to Web server | Web server disabled | Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary→ 🖹 72. |
| | Incorrect setting for the Ethernet interface of the computer | 1. Check the properties of the Internet protocol (TCP/IP) → 🖹 68.<br>2. Check the network settings with the IT manager. |
| Not connecting to Web server | ▪ Incorrect IP address<br>▪ IP address is not known | 1. If addressing via hardware: open the transmitter and check the IP address configured (last octet).<br>2. Check the IP address of the measuring device with the network manager.<br>3. If the IP address is not known, set DIP switch no. 10 to ON, restart the device and enter the factory IP address 192.168.1.212.<br>EtherNet/IP communication is interrupted by enabling the DIP switch. |
| | Web browser setting "Use a Proxy Server for Your LAN" is enabled | Disable the use of the proxy server in the Web browser settings of the computer.<br>Using the example of MS Internet Explorer:<br>1. Under *Control Panel* open *Internet options*.<br>2. Select the *Connections* tab and then double-click *LAN settings*.<br>3. In the *LAN settings* disable the use of the proxy server and select *OK* to confirm. |
| | Apart from the active network connection to the measuring device, other network connections are also being used. | ▪ Make sure that no other network connections are established by the computer (also no WLAN) and close other programs with network access to the computer.<br>▪ If using a docking station for notebooks, make sure that a network connection to another network is not active. |
| Not connecting to Web server | Incorrect WLAN access data | ▪ Check WLAN network status.<br>▪ Log on to the device again using WLAN access data.<br>▪ Verify that WLAN is enabled on the measuring device and operating device . |
| | WLAN communication disabled | – |

| Error | Possible causes | Solution |
|---|---|---|
| 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 frozen and operation no longer possible | Data transfer active | Wait until data transfer or current action is finished. |
| | Connection lost | 1. Check cable connection and power supply.<br>2. Refresh the Web browser and restart if necessary. |
| Content of Web browser incomplete or difficult to read | Not using optimum version of Web server. | 1. Use the correct Web browser version .<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 not enabled<br>▪ JavaScript cannot be enabled | 1. Enable JavaScript.<br>2. Enter http://XXX.XXX.X.XXX/basic.html as the IP address. |
| Operation with FieldCare or DeviceCare via CDI-RJ45 service interface (port 8000) | Firewall of computer or network is preventing communication | Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access. |
| Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports) | Firewall of computer or network is preventing communication | Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access. |

## 12.2 Diagnostic information via light emitting diodes

### 12.2.1 Transmitter

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

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1 *Supply voltage*
2 *Device status*
3 *network status*
4 *Port 1 active: EtherNet/IP*
5 *Port 2 active: EtherNet/IP and service interface (CDI)*

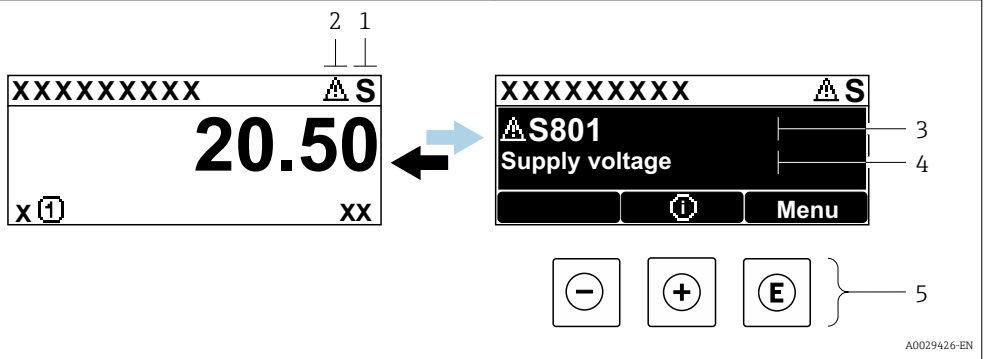
| LED | | Color | Meaning |
|---|---|---|---|
| 1 | Supply voltage | Off | Supply voltage is off or too low. |
| | | Green | Supply voltage is ok. |
| 2 | Device status/module status | Off | Firmware error. |
| | | Green | Device status is ok. |
| | | Flashing green | Device is not configured. |
| | | 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 | Network status | Off | The device does not have an EtherNet/IP address. |
| | | Green | EtherNet/IP connection is active. |
| | | Flashing green | The device has an Ethernet/IP address but no EtherNet/IP connection is active. |
| | | Red | The EtherNet/IP address of the device has been assigned twice. |
| | | Flashing red | EtherNet/IP connection is in the "time out" mode. |
| | | Flashing red/green | The device restarts/self-test. |
| 4 | Port 1 active: Ethernet/IP | Off | Not connected or no connection established. |
| | | White | Connected and connection established. |
| | | Flashing white | Communication not active. |
| 5 | Port 2 active: Ethernet/IP and service interface (CDI) | Off | Not connected or no connection established. |
| | | Yellow | Connected and connection established. |
| | | Flashing yellow | Communication not active. |

## 12.3 Diagnostic information on local display

### 12.3.1 Diagnostic message

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

| Operational display in alarm condition | Diagnostic message |
|---|---|




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

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

Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
- Via parameter
- Via submenus → 163

#### 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

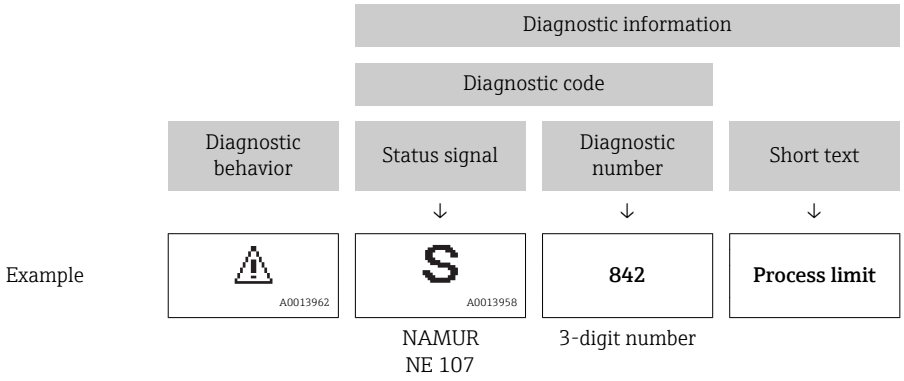
| Symbol | Meaning |
|---|---|
| F | **Failure**<br>A device error has occurred. The measured value is no longer valid. |
| C | **Function check**<br>The device is in service mode (e.g. during a simulation). |
| S | **Out of specification**<br>The device is operated:<br>Outside its technical specification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

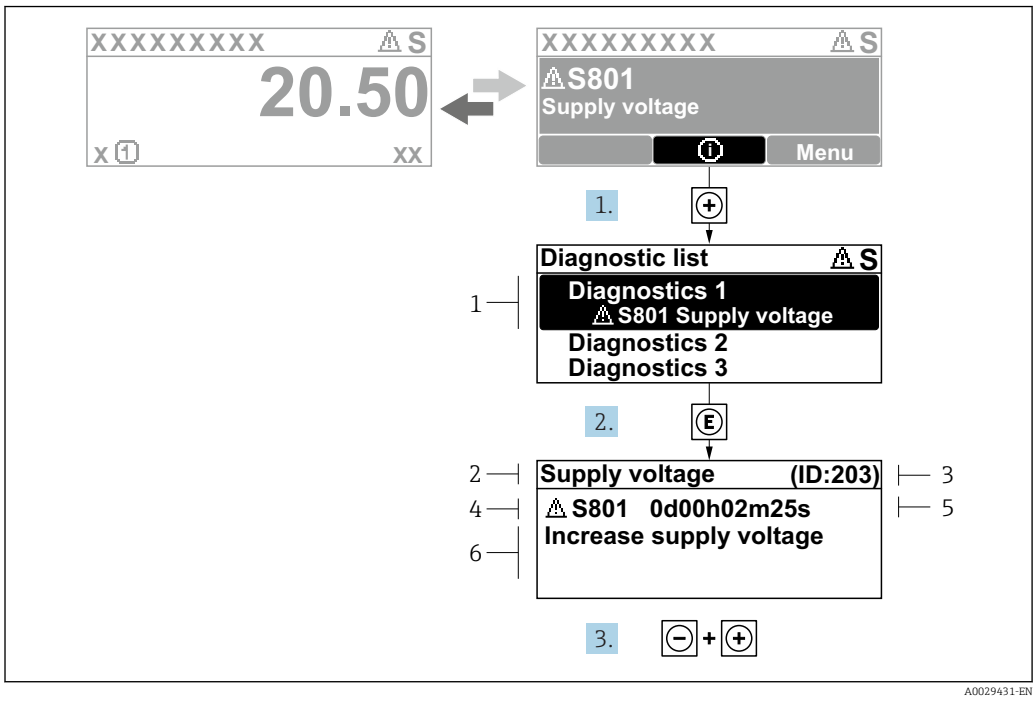
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.




### 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




30 *Message about remedial measures*

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

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

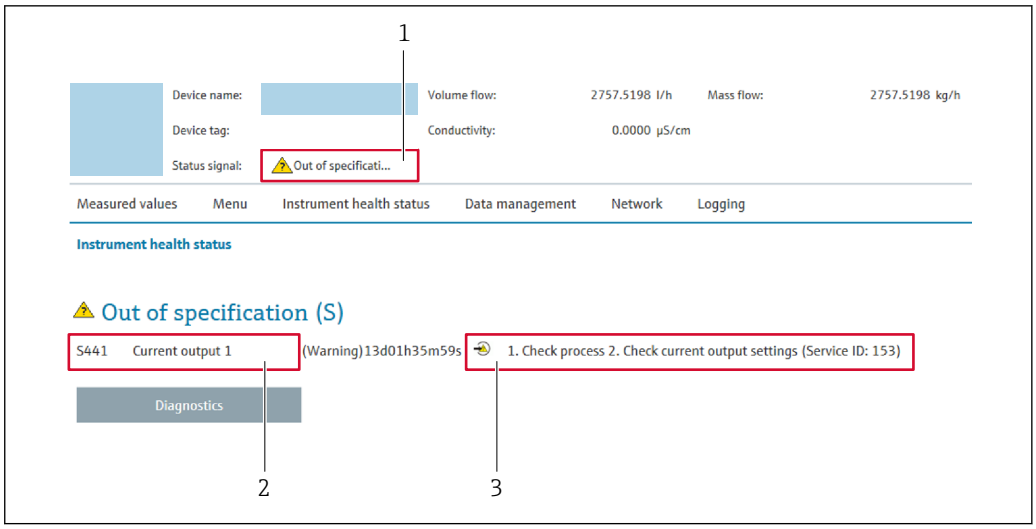
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

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

## 12.4 Diagnostic information in the Web browser

### 12.4.1 Diagnostic options

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




1 *Status area with status signal*
2 *Diagnostic information → 145*
3 *Remedy information with Service ID*

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter
- Via submenu → 163

### 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 service mode (e.g. during a simulation). |
| | **Out of specification**<br>The device is 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.

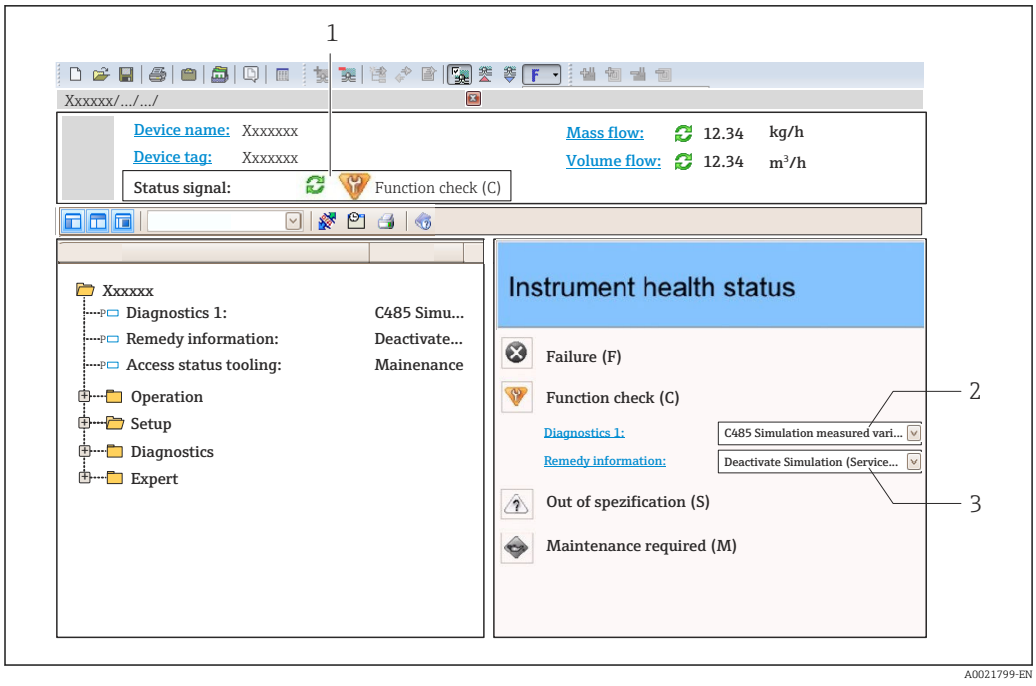
## 12.4.2 Calling up remedy information

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 DeviceCare or FieldCare

## 12.5.1 Diagnostic options

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

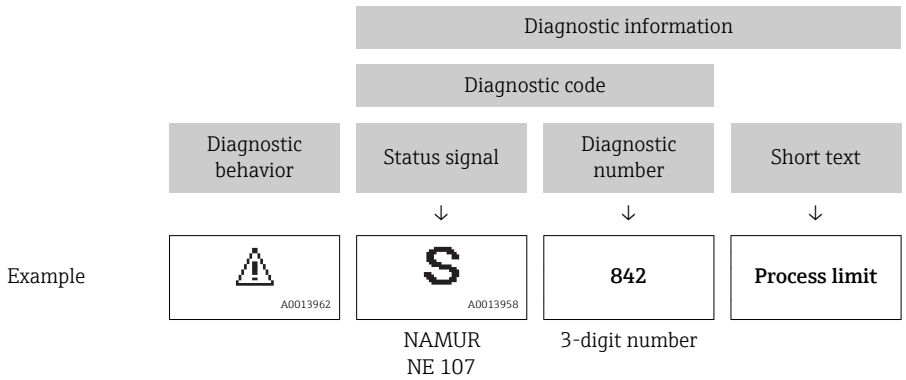



1 *Status area with status signal*→ 🖹 *144*
2 *Diagnostic information*→ 🖹 *145*
3 *Remedy information with Service ID*

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter
- Via submenu → 🖹 163

### Diagnostic information

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




## 12.5.2 Calling up remedy information

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

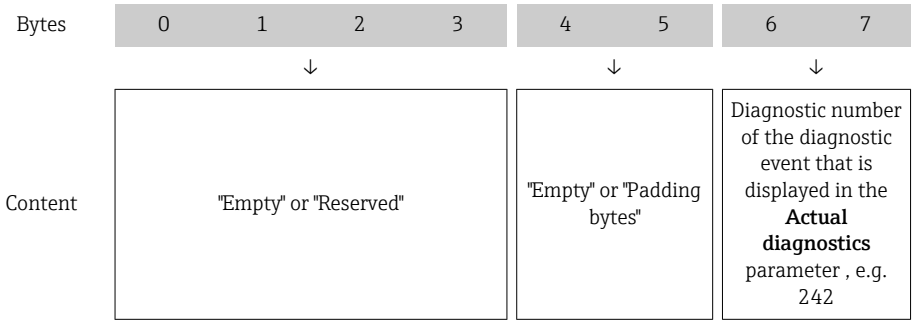
The user is in the **Diagnostics** menu.

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

## 12.6 Diagnostic information via communication interface

### 12.6.1 Reading out diagnostic information

The current diagnostic event and associated diagnostic information can be read out via the input assembly (fix assembly):




For the content of bytes 8 to 16

## 12.7 Adapting the diagnostic information

### 12.7.1 Adapting the diagnostic behavior

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

Expert → System → Diagnostic handling → Diagnostic behavior

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

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

## 12.8 Overview of diagnostic information

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

In the case of some items of diagnostic information, the diagnostic behavior can be changed. Change the diagnostic information → 149

### 12.8.1 Diagnostic of sensor

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 043 | Sensor short circuit | | 1. Check sensor cable and sensor<br>2. Execute Heartbeat Verification<br>3. Replace sensor cable or sensor | 0x8000153 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 082 | Data storage | | 1. Check module connections<br>2. Contact service | 0x10000E7 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 083 | Memory content | | 1. Restart device<br>2. Restore HistoROM S-DAT backup ('Device reset' parameter)<br>3. Replace HistoROM S-DAT | 0x10000A0 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 169 | Conductivity measurement failed | | 1. Check grounding conditions<br>2. Deactivate conductivity measurement | 0x400038A |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 170 | Coil resistance | | Check ambient and process temperature | ▪ 0x10002D8<br>▪ 0x10002D9 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 180 | Temperature sensor defective | | 1. Check sensor connections<br>2. Replace sensor cable or sensor<br>3. Turn off temperature measurement | ▪ 0x10000D5<br>▪ 0x10000D6 |
| | Status signal | F | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 181 | Sensor connection | | 1. Check sensor cable and sensor<br>2. Execute Heartbeat Verification<br>3. Replace sensor cable or sensor | ▪ 0x100011C<br>▪ 0x10002E0 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

## 12.8.2 Diagnostic of electronic

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 201 | Device failure | | 1. Restart device<br>2. Contact service | 0x100014B |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 242 | Software incompatible | | 1. Check software<br>2. Flash or change main electronics module | 0x1000067 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 252 | Modules incompatible | | 1. Check electronic modules<br>2. Change electronic modules | 0x100006B |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 252 | Modules incompatible | | 1. Check if correct electronic modul is plugged<br>2. Replace electronic module | 0x10002C0 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 262 | Sensor electronic connection faulty | | 1. Check or replace connection cable between sensor electronic module (ISEM) and main electronics<br>2. Check or replace ISEM or main electronics | 0x1000149 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 270 | Main electronic failure | | Change main electronic module | ▪ 0x1000078<br>▪ 0x100007C<br>▪ 0x1000080<br>▪ 0x100009F<br>▪ 0x10002D7 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 271 | Main electronic failure | | 1. Restart device<br>2. Change main electronic module | 0x100007D |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 272 | Main electronic failure | | 1. Restart device<br>2. Contact service | 0x1000079 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 273 | Main electronic failure | | Change electronic | ▪ 0x1000098<br>▪ 0x10000E5 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 275 | I/O module 1 to n defective | | Change I/O module | 0x100007A |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 276 | I/O module 1 to n faulty | | 1. Restart device<br>2. Change I/O module | ▪ 0x100007B<br>▪ 0x1000081 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 283 | Memory content | | 1. Reset device<br>2. Contact service | ▪ 0x10000E1<br>▪ 0x100016F |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 302 | Device verification active | | Device verification active, please wait. | 0x20001EE |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 311 | Electronic failure | | 1. Do not reset device<br>2. Contact service | 0x40000E2 |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 332 | Writing in HistoROM backup failed | | Replace user interface board<br>Ex d/XP: replace transmitter | 0x10002C7 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 361 | I/O module 1 to n faulty | | 1. Restart device<br>2. Check electronic modules<br>3. Change I/O Modul or main electronics | 0x1000095 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 372 | Sensor electronic (ISEM) faulty | | 1. Restart device<br>2. Check if failure recurs<br>3. Replace sensor electronic module (ISEM) | ▪ 0x10002CB<br>▪ 0x10002CC<br>▪ 0x10002CD<br>▪ 0x10002CE<br>▪ 0x10002CF<br>▪ 0x10002D0 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 373 | Sensor electronic (ISEM) faulty | | 1. Transfer data or reset device<br>2. Contact service | 0x10002D1 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| 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 | 0x1000107 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 376 | Sensor electronic (ISEM) faulty | | 1. Replace sensor electronic module (ISEM)<br>2. Turn off diagnostic message | ▪ 0x8000119<br>▪ 0x800016A<br>▪ 0x80002DA<br>▪ 0x80002DB<br>▪ 0x80002DC<br>▪ 0x80002DD<br>▪ 0x80002DF |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 377 | Sensor electronic (ISEM) faulty | | 1. Check sensor cable and sensor<br>2. Perform Heartbeat Verification<br>3. Replace sensor cable or sensor | 0x80002DE |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 382 | Data storage | | 1. Insert T-DAT<br>2. Replace T-DAT | 0x100016D |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 383 | Memory content | | 1. Restart device<br>2. Delete T-DAT via 'Reset device' parameter<br>3. Replace T-DAT | 0x100016E |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 387 | HistoROM backup failed | | Contact service organization | 0x1000288 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 512 | Sensor electronic (ISEM) faulty | | 1. Check ECC recovery time<br>2. Turn off ECC | 0x1000120 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

### 12.8.3 Diagnostic of configuration

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 303 | I/O 1 to n configuration changed | | 1. Apply I/O module configuration (parameter 'Apply I/O configuration')<br>2. Afterwards reload device description and check wiring | 0x400026C |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 330 | Flash file invalid | | 1. Update firmware of device<br>2. Restart device | 0x40002C9 |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 331 | Firmware update failed | | 1. Update firmware of device<br>2. Restart device | 0x10002CA |
| | Status signal | F | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 410 | Data transfer | | 1. Check connection<br>2. Retry data transfer | 0x100008B |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 412 | Processing download | | Download active, please wait | 0x2000204 |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 431 | Trim 1 to n | | Carry out trim | 0x2000004 |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 437 | Configuration incompatible | | 1. Restart device<br>2. Contact service | 0x1000060 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 438 | Dataset | | 1. Check data set file<br>2. Check device configuration<br>3. Up- and download new configuration | 0x400006A |
| | Status signal | M | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 441 | Current output 1 to n | | 1. Check process<br>2. Check current output settings | ▪ 0x8000099<br>▪ 0x80000B6 |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 442 | Frequency output 1 to n | | 1. Check process<br>2. Check frequency output settings | ▪ 0x800008A<br>▪ 0x8000122 |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 443 | Pulse output 1 to n | | 1. Check process<br>2. Check pulse output settings | ▪ 0x800008C<br>▪ 0x8000121 |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 444 | Current input 1 to n | | 1. Check process<br>2. Check current input settings | 0x80001EB |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 453 | Flow override | | Deactivate flow override | 0x2000094 |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 484 | Failure mode simulation | | Deactivate simulation | 0x2000090 |
| | Status signal | C | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 485 | Measured variable simulation | | Deactivate simulation | 0x2000093 |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 486 | Current input 1 to n simulation | | Deactivate simulation | 0x20001EC |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 491 | Current output 1 to n simulation | | Deactivate simulation | 0x200000E |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 492 | Simulation frequency output 1 to n | | Deactivate simulation frequency output | 0x200008D |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 493 | Simulation pulse output 1 to n | | Deactivate simulation pulse output | 0x200008E |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 494 | Switch output simulation 1 to n | | Deactivate simulation switch output | 0x200008F |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 495 | Diagnostic event simulation | | Deactivate simulation | 0x200015E |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 496 | Status input simulation | | Deactivate simulation status input | 0x2000170 |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 511 | ISEM settings faulty | | 1. Check measuring period and integration time<br>2. Check sensor properties | 0x200031C |
| | Status signal | C | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 520 | I/O 1 to n hardware configuration invalid | | 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 | 0x1000276 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 530 | Electrode cleaning is running | | Turn off ECC | 0x200015A |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 531 | Empty pipe adjustment faulty | | Execute EPD adjustment | 0x800016B |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 537 | Configuration | | 1. Check IP addresses in network<br>2. Change IP address | 0x100014A |
| | Status signal | F | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 594 | Relay output simulation | | Deactivate simulation switch output | 0x20002BA |
| | Status signal | C | | |
| | Diagnostic behavior | Warning | | |

### 12.8.4 Diagnostic of process

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 803 | Current loop | | 1. Check wiring<br>2. Change I/O module | 0x10000AD |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 832 | Electronic temperature too high | | Reduce ambient temperature | ▪ 0x80000C3<br>▪ 0x80002D4 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 833 | Electronic temperature too low | | Increase ambient temperature | ▪ 0x80000C1<br>▪ 0x80002D3 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 834 | Process temperature too high | | Reduce process temperature | 0x80000C5 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 835 | Process temperature too low | | Increase process temperature | 0x80000C6 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 842 | Process limit | | Low flow cut off active!<br>1. Check low flow cut off configuration | 0x8000091 |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 882 | Input signal | | 1. Check input configuration<br>2. Check external device or process conditions | 0x1000031 |
| | Status signal | F | | |
| | Diagnostic behavior | Alarm | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 937 | Sensor symmetry | | 1. Eliminate external magnetic field near sensor<br>2. Turn off diagnostic message | 0x8000154 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 938 | EMC interference | | 1. Check ambient conditions regarding EMC influence<br>2. Turn off diagnostic message | 0x100011B |
| | Status signal | F | | |
| | Diagnostic behavior [from the factory] [1] | Alarm | | |

1) Diagnostic behavior can be changed.

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 961 | Electrode potential out of specification | | 1. Check process conditions<br>2. Check ambient conditions | 0x8000155 |
| | Status signal | S | | |
| | Diagnostic behavior | Warning | | |

| Diagnostic information | | | Remedy instructions | Coding of diagnostic information (hex) |
|---|---|---|---|---|
| No. | Short text | | | |
| 962 | Pipe empty | | 1. Perform full pipe adjustment<br>2. Perform empty pipe adjustment<br>3. Turn off empty pipe detection | 0x8000092 |
| | Status signal | S | | |
| | Diagnostic behavior [from the factory] [1] | Warning | | |

1) Diagnostic behavior can be changed.

## 12.9 Pending diagnostic events

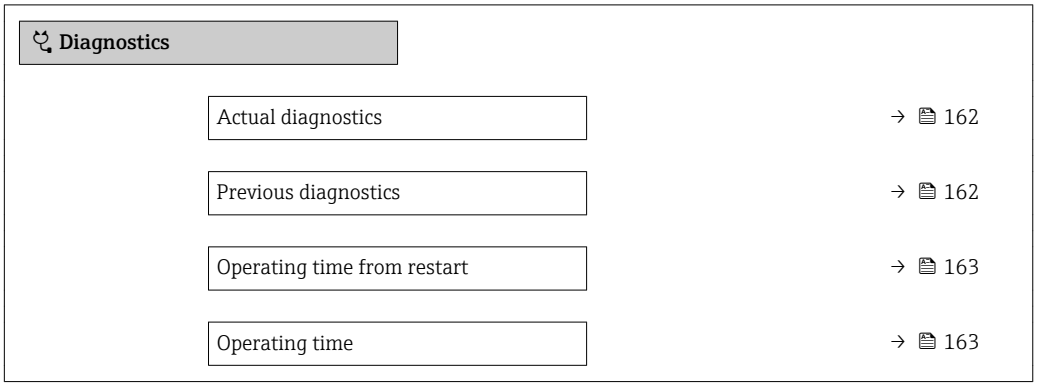
The **Diagnostics** menu allows the user to view the current diagnostic event and the previous diagnostic event separately.

To call up the measures to rectify a diagnostic event:
- Via local display → 146
- Via Web browser → 147
- Via "FieldCare" operating tool → 148
- Via "DeviceCare" operating tool → 148

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 163

### Navigation

"Diagnostics" menu




### Parameter overview with brief description

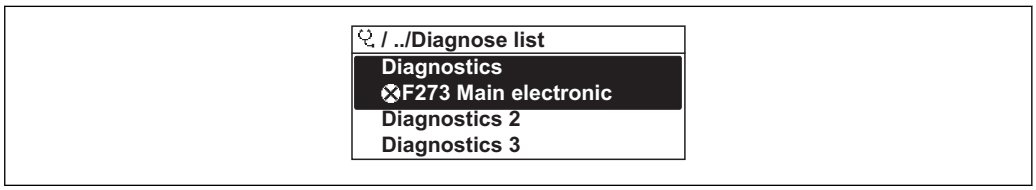
| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Actual diagnostics | A diagnostic event has occurred. | Shows the current occured diagnostic event along with its diagnostic information.<br>If two or more messages occur simultaneously, the message with the highest priority 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. |

| Parameter | Prerequisite | Description | User interface |
|---|---|---|---|
| Operating time from restart | – | Shows the time the device has been in operation since the last device restart. | Days (d), hours (h), minutes (m) and seconds (s) |
| Operating time | – | Indicates how long the device has been in operation. | Days (d), hours (h), minutes (m) and seconds (s) |

## 12.10 Diagnostic list

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

**Navigation path**
Diagnostics → Diagnostic list




*31 Taking the example of the local display*

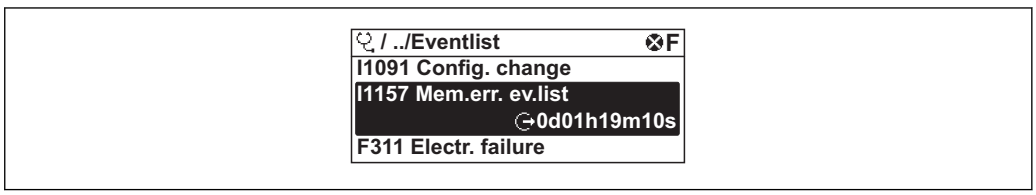
To call up the measures to rectify a diagnostic event:
- Via local display → 146
- Via Web browser → 147
- Via "FieldCare" operating tool → 148
- Via "DeviceCare" operating tool → 148

## 12.11 Event logbook

### 12.11.1 Reading out the event logbook

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

**Navigation path**
**Diagnostics** menu → **Event logbook** submenu → Event list




*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 → 150
- Information events → 164

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

To call up the measures to rectify a diagnostic event:
- Via local display → 146
- Via Web browser → 147
- Via "FieldCare" operating tool → 148
- Via "DeviceCare" operating tool → 148

For filtering the displayed event messages → 164

## 12.11.2 Filtering the event logbook

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

**Navigation path**
Diagnostics → Event logbook → Filter options

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

## 12.11.3 Overview of information events

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

| Info number | Info name |
|---|---|
| I1000 | --------(Device ok) |
| I1079 | Sensor changed |
| I1089 | Power on |
| I1090 | Configuration reset |
| I1091 | Configuration changed |
| I1092 | HistoROM backup deleted |
| I1137 | Electronic changed |
| I1151 | History reset |
| I1155 | Reset electronic temperature |
| I1156 | Memory error trend |
| I1157 | Memory error event list |
| I1184 | Display connected |
| I1256 | Display: access status changed |
| I1278 | I/O module reset detected |
| I1335 | Firmware changed |
| I1351 | Empty pipe detection adjustment failure |

| Info number | Info name |
|---|---|
| I1353 | Empty pipe detection adjustment ok |
| I1361 | Web server: login failed |
| I1397 | Fieldbus: access status changed |
| I1398 | CDI: access status changed |
| I1443 | Coating thickness not determined |
| I1444 | Device verification passed |
| I1445 | Device verification failed |
| I1457 | Measured error verification failed |
| I1459 | I/O module verification failed |
| I1461 | Sensor verification failed |
| I1462 | Sensor electronic module verific. failed |
| I1512 | Download started |
| 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 | Reset all totalizers |
| I1625 | Write protection activated |
| I1626 | Write protection deactivated |
| I1627 | Web server: login successful |
| I1628 | Display: login successful |
| I1629 | CDI: login successful |
| I1631 | Web server access changed |
| I1632 | Display: login failed |
| I1633 | CDI: login failed |
| I1634 | Reset to factory settings |
| I1635 | Reset to delivery settings |
| I1639 | Max. switch cycles number reached |
| I1649 | Hardware write protection activated |
| I1650 | Hardware write protection deactivated |
| I1712 | New flash file received |
| I1725 | Sensor electronic module (ISEM) changed |
| I1726 | Configuration backup failed |

## 12.12 Resetting the measuring device

Using the**Device reset** parameter (→ 🖹 124) it is possible to reset the entire device configuration or some of the configuration to a defined state.

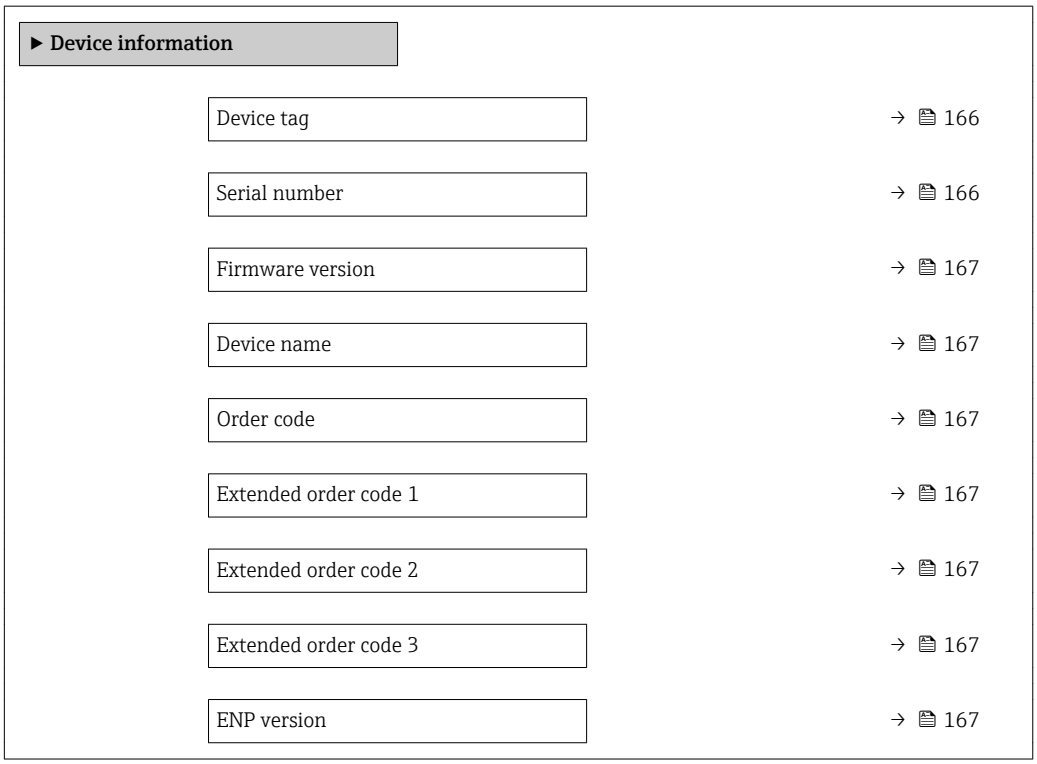
### 12.12.1 Function scope of the "Device reset" parameter

| Options | Description |
|---|---|
| Cancel | No action is executed and the user exits the parameter. |
| To delivery settings | Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting. |
| Restart device | The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged. |
| Restore S-DAT backup | Restore the data that are saved on the S-DAT. The data record is restored from the electronics memory to the S-DAT. |

## 12.13 Device information

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

**Navigation**
"Diagnostics" menu → Device information




**Parameter overview with brief description**

| Parameter | Description | User interface | Factory setting |
|---|---|---|---|
| Device tag | Shows name of measuring point. | Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /). | Promag |
| Serial number | Shows the serial number of the measuring device. | A maximum of 11-digit character string comprising letters and numbers. | – |

| Parameter | Description | User interface | Factory setting |
|---|---|---|---|
| Firmware version | Shows the device firmware version installed. | Character string in the format xx.yy.zz | – |
| Device name | Shows the name of the transmitter.<br>The name can be found on the nameplate of the transmitter. | Promag300/500 | – |
| Order code | Shows the device order code.<br>The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field. | Character string composed of letters, numbers and certain punctuation marks (e.g. /). | – |
| Extended order code 1 | Shows the 1st part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| Extended order code 2 | Shows the 2nd part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| Extended order code 3 | Shows the 3rd part of the extended order code.<br>The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field. | Character string | – |
| ENP version | Shows the version of the electronic nameplate (ENP). | Character string | 2.02.00 |

## 12.14 Firmware history

| Release date | Firmware version | Order code for "Firmware version" | Firmware changes | Documentation type | Documentation |
|---|---|---|---|---|---|
| 10.2017 | 01.00.zz | Option **77** | Original firmware | Operating Instructions | BA01717D |

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

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

The manufacturer's information is available:
- In the Download Area of the Endress+Hauser web site: www.endress.com → Downloads
- Specify the following details:
  - Product root: e.g. 5P3B
    The product root is the first part of the order code: see the nameplate on the device.
  - Text search: Manufacturer's information
  - Media type: Documentation – Technical Documentation

# 13 Maintenance

## 13.1 Maintenance tasks

No special maintenance work is required.

### 13.1.1 Exterior cleaning

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

### 13.1.2 Interior cleaning

No interior cleaning is planned for the device.

### 13.1.3 Replacing seals

The sensor's seals (particularly aseptic molded seals) must be replaced periodically.

The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature.

Replacement seals (accessory part) → 198

## 13.2 Measuring and test equipment

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

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

List of some of the measuring and testing equipment: → 171

## 13.3 Endress+Hauser services

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

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

# 14 Repairs

## 14.1 General notes

### 14.1.1 Repair and conversion concept

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

### 14.1.2 Notes for repair and conversion

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

## 14.2 Spare parts

*W@M Device Viewer* (www.endress.com/deviceviewer):
All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.

Measuring device serial number:
- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→ 166) in the **Device information** submenu.

## 14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

## 14.4 Return

The measuring device must be returned if it is need of repair or a factory calibration, or if the wrong measuring device has been delivered or ordered. Legal specifications require Endress+Hauser, as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at http://www.endress.com/support/return-material

## 14.5 Disposal

### 14.5.1 Removing the measuring device

1. Switch off the device.

**⚠ WARNING**

**Danger to persons from process conditions.**

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

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

### 14.5.2 Disposing of the measuring device

**⚠ WARNING**

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

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

Observe the following notes during disposal:

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

# 15 Accessories

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

## 15.1 Device-specific accessories

### 15.1.1 For the transmitter

| Accessories | Description |
|---|---|
| Transmitter Promag 300 | 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>Order code: 5X3BXX<br>For details, see Installation Instructions EA01150 |
| Remote display and operating module DKX001 | ▪ If ordered directly with the measuring device:<br>Order code for "Display; operation", option **O** "Separate 4-line display, illum.; 10 m (30 ft)Cable; touch control".<br>▪ If ordered separately:<br>– Measuring device: order code for "Display; operation", option **M** "None, prepared for separate 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>▪ Ordered directly with the DKX001:<br>Order code for "Enclosed accessories", option **RA** "Mounting bracket, 1"/2" pipe".<br>▪ If ordered subsequently: order number: 71340960<br>**Connecting cable (replacement cable)**<br>Via the separate product structure: DKX002<br>Further information on display and operating module DKX001→ 193.<br>For details, see Special Documentation SD01763D |
| External WLAN antenna | External WLAN antenna with 2 m (6.6 ft)connecting cable and two angle brackets.<br>Order code for "Enclosed accessories", option **P8** "Wireless antenna wide area".<br>Further information on the WLAN interface → 75. |
| Protective cover | Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.<br>Order number: 71343505<br>For details, see Installation Instructions EA01160 |
| Ground cable | Set, consisting of two ground cables for potential equalization. |

### 15.1.2 For the sensor

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

## 15.2 Communication-specific accessories

| Accessories | Description |
|---|---|
| Field Xpert SFX350 | Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for and can be used in non-hazardous areas.<br>For details, see Operating Instructions BA01202S |
| Field Xpert SFX370 | Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for and can be used in the non-hazardous area and in the hazardous area.<br>For details, see Operating Instructions BA01202S |

## 15.3 Service-specific accessories

| Accessories | Description |
|---|---|
| Applicator | Software for selecting and sizing Endress+Hauser measuring devices:<br>▪ Choice of measuring devices for 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://wapps.endress.com/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, visit www.endress.com/lifecyclemanagement |
| 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>For details, see Operating Instructions BA00027S and BA00059S |
| DeviceCare | Tool for connecting and configuring Endress+Hauser field devices.<br>For details, see 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>For details, see "Technical Information" TI00133R and Operating Instructions BA00247R |

# 16 Technical data

## 16.1 Application

The measuring device is only suitable for flow measurement of liquids with a minimum conductivity of 5 µS/cm.

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

To ensure that the device remains in proper operating condition for its service life, use the measuring device only for media against which the process-wetted materials are sufficiently resistant.

## 16.2 Function and system design

**Measuring principle**

Electromagnetic flow measurement on the basis of *Faraday's law of magnetic induction*.

**Measuring system**

The device consists of a transmitter and a sensor.

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

For information on the structure of the device → 📄 14

## 16.3 Input

**Measured variable**

**Direct measured variables**

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

**Calculated measured variables**

- Mass flow
- Corrected volume flow

**Measuring range**

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

*Flow characteristic values in SI units*

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [mm] | [in] | [dm³/min] | [dm³/min] | [dm³] | [dm³/min] |
| 15 | ½ | 4 to 100 | 25 | 0.2 | 0.5 |
| 25 | 1 | 9 to 300 | 75 | 0.5 | 1 |
| 32 | – | 15 to 500 | 125 | 1 | 2 |
| 40 | 1 ½ | 25 to 700 | 200 | 1.5 | 3 |
| 50 | 2 | 35 to 1 100 | 300 | 2.5 | 5 |
| 65 | – | 60 to 2 000 | 500 | 5 | 8 |

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

*Flow characteristic values in US units*

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [in] | [mm] | [gal/min] | [gal/min] | [gal] | [gal/min] |
| ½ | 15 | 1.0 to 27 | 6 | 0.1 | 0.15 |
| 1 | 25 | 2.5 to 80 | 18 | 0.2 | 0.25 |
| 1 ½ | 40 | 7 to 190 | 50 | 0.5 | 0.75 |
| 2 | 50 | 10 to 300 | 75 | 0.5 | 1.25 |
| 3 | 80 | 24 to 800 | 200 | 2 | 2.5 |
| 4 | 100 | 40 to 1 250 | 300 | 2 | 4 |
| 6 | 150 | 90 to 2 650 | 600 | 5 | 12 |
| 8 | 200 | 155 to 4 850 | 1200 | 10 | 15 |
| 10 | 250 | 250 to 7 500 | 1500 | 15 | 30 |
| 12 | 300 | 350 to 10 600 | 2400 | 25 | 45 |
| 14 | 350 | 500 to 15 000 | 3600 | 30 | 60 |
| 16 | 400 | 600 to 19 000 | 4800 | 50 | 60 |
| 18 | 450 | 800 to 24 000 | 6000 | 50 | 90 |
| 20 | 500 | 1 000 to 30 000 | 7500 | 75 | 120 |
| 24 | 600 | 1 400 to 44 000 | 10500 | 100 | 180 |

### Recommended measuring range

"Flow limit" section → 187

Operable flow range Over 1000 : 1

Input signal

### External measured values

To increase the accuracy of certain measured variables or to calculate the corrected volume flow, the automation system can continuously write different measured values to the measuring device:
- Medium temperature to increase the accuracy of the electrical conductivity (e.g. iTEMP)
- Reference density for calculating the corrected volume flow

Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 173

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

*Current input*

The measured values are written from the automation system to the measuring device via the current input → 176.

*Digital communication*

The measured values are written from the automation system to the measuring device via EtherNet/IP.

### 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** | Adjustable: 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

## EtherNet/IP

| | |
|---|---|
| **Standards** | In accordance with IEEE 802.3 |

## Current output 0/4 to 20 mA

| | |
|---|---|
| **Current output** | 0/4 to 20 mA |
| **Maximum output values** | 22.5 mA |
| **Current span** | Can be set to:<br>▪ 4 to 20 mA (active)<br>▪ 0/4 to 20 mA (passive)<br>Ex-i, passive |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Maximum input voltage** | DC 30 V (passive) |
| **Load** | 0 to 700 Ω |
| **Resolution** | 0.38 µA |
| **Damping** | Adjustable: 0.07 to 999 s |
| **Assignable measured variables** | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Temperature<br>▪ Electronic temperature |

## Pulse/frequency/switch output

| | |
|---|---|
| **Function** | Can be set to pulse, frequency or switch output |
| **Version** | Open collector<br>Can be set to:<br>▪ Active<br>▪ Passive<br>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** | Adjustable: 0.05 to 2 000 ms |
| **Maximum pulse rate** | 10 000 Impulse/s |
| **Pulse value** | Adjustable |
| **Assignable measured variables** | ▪ Volume flow<br>▪ Mass 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** | Adjustable: end value frequency 2 to 10 000 Hz ($f_{max}$ = 12 500 Hz) |
| **Damping** | Adjustable: 0 to 999 s |
| **Pulse/pause ratio** | 1:1 |
| **Assignable measured variables** | ▪ Volume flow<br>▪ Mass flow<br>▪ Corrected volume flow<br>▪ Flow velocity<br>▪ Conductivity<br>▪ Corrected conductivity<br>▪ Temperature<br>▪ Electronic temperature |
| **Switch output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Switching behavior** | Binary, conductive or non-conductive |
| **Switching delay** | Adjustable: 0 to 100 s |
| **Number of switching cycles** | Unlimited |
| **Assignable functions** | ▪ Off<br>▪ On<br>▪ Diagnostic behavior<br>▪ Limit value:<br>– Off<br>– Volume flow<br>– Mass flow<br>– Corrected volume flow<br>– Flow velocity<br>– Conductivity<br>– Corrected conductivity<br>– Totalizer 1-3<br>– Temperature<br>– Electronic temperature<br>▪ Flow direction monitoring<br>▪ Status<br>– Empty pipe detection<br>– Low flow cut off |

## 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>– Off<br>– Volume flow<br>– Mass flow<br>– Corrected volume flow<br>– Flow velocity<br>– Conductivity<br>– Corrected conductivity<br>– Totalizer 1-3<br>– Temperature<br>– Electronic temperature<br>▪ Flow direction monitoring<br>▪ Status<br>– Empty pipe detection<br>– Low flow cut off |

### User configurable input/output

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

The following inputs and outputs are available for assignment:
- Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Pulse/frequency/switch output
- Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Status input

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

## Signal on alarm

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

### EtherNet/IP

| | |
|---|---|
| **Device diagnostics** | Device condition can be read out in Input Assembly |

### 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>▪ Freely 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>▪ Freely 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>▪ Defined value ($f_{max}$ 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 backlighting indicates a device error. |

Status signal as per NAMUR recommendation NE 107

### Interface/protocol

- Via digital communication:
  EtherNet/IP
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

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

### Web server

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

### Light emitting diodes (LED)

| | |
|---|---|
| **Status information** | 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>▪ EtherNet/IP network available<br>▪ EtherNet/IP connection established<br>Diagnostic information via light emitting diodes |

Low flow cut off

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

Galvanic isolation

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

Protocol-specific data

| | |
|---|---|
| **Protocol** | ▪ The CIP Networks Library Volume 1: Common Industrial Protocol<br>▪ The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP |
| **Communication type** | ▪ 10Base-T<br>▪ 100Base-TX |
| **Device profile** | Generic device (product type: 0x2B) |
| **Manufacturer ID** | 0x11 |
| **Device type ID** | 0x103C |
| **Baud rates** | Automatic $^{10}/_{100}$ Mbit with half-duplex and full-duplex detection |
| **Polarity** | Auto-polarity for automatic correction of crossed TxD and RxD pairs |
| **Supported CIP connections** | Max. 3 connections |
| **Explicit connections** | Max. 6 connections |
| **I/O connections** | Max. 6 connections (scanner) |
| **Configuration options for measuring device** | ▪ DIP switches on the electronics module for IP addressing<br>▪ Manufacturer-specific software (FieldCare)<br>▪ Add-on Profile Level 3 for Rockwell Automation control systems<br>▪ Web browser<br>▪ Electronic Data Sheet (EDS) integrated in the measuring device |
| **Configuration of the EtherNet interface** | ▪ Speed: 10 MBit, 100 MBit, auto (factory setting)<br>▪ Duplex: half-duplex, full-duplex, auto (factory setting) |
| **Configuration of the device address** | ▪ DIP switches on the electronics module for IP addressing (last octet)<br>▪ DHCP<br>▪ Manufacturer-specific software (FieldCare)<br>▪ Add-on Profile Level 3 for Rockwell Automation control systems<br>▪ Web browser<br>▪ EtherNet/IP tools, e.g. RSLinx (Rockwell Automation) |
| **Device Level Ring (DLR)** | Yes |
| **System integration** | Information regarding system integration → 📄 80.<br>▪ Cyclic data transmission<br>▪ Block model<br>▪ Input and output groups |

## 16.5 Power supply

Terminal assignment

→ 📄 36

Device plugs available → 36

Pin assignment, device plug → 36

Supply voltage

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

Power consumption

**Transmitter**

Max. 10 W (active power)

Current consumption

**Transmitter**

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

Power supply failure

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

Electrical connection → 37

Potential equalization → 43

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 ⌀ 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20
- Device plug for digital communication: M12

Cable specification → 33

## 16.6 Performance characteristics

Reference operating conditions

- Error limits following DIN EN 29104, in future ISO 20456
- Water, typically +15 to +45 °C (+59 to +113 °F); 0.5 to 7 bar (73 to 101 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

Maximum measured error

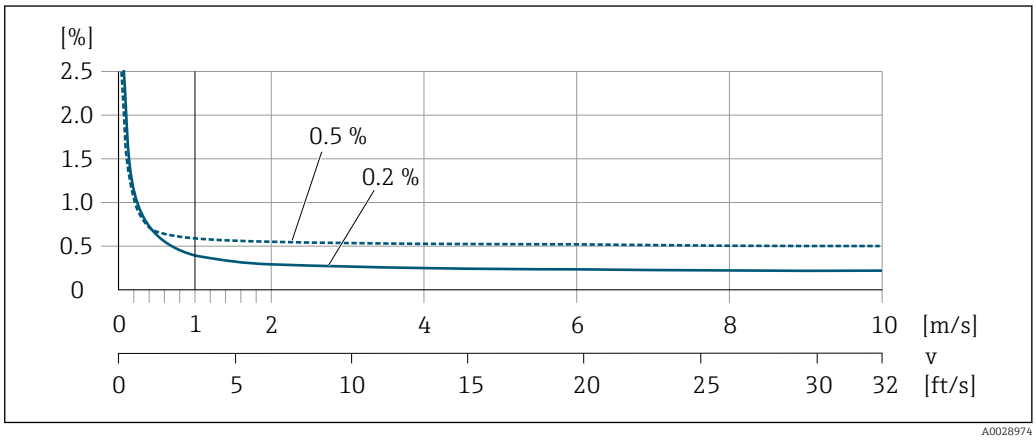
**Error limits under reference operating conditions**

o.r. = of reading

**Volume flow**

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

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




33 *Maximum measured error in % o.r.*

**Electrical conductivity**

Max. measured error not specified.

Repeatability

o.r. = of reading

**Volume flow**

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

**Electrical conductivity**

Max. ±5 % o.r.

Influence of ambient temperature

**Current output**

| | |
|---|---|
| **Temperature coefficient** | Max. 1 µA/°C |

**Pulse/frequency output**

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

## 16.7 Installation

"Mounting requirements"

## 16.8 Environment

Ambient temperature range

→ 23

**Temperature tables**

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

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

Storage temperature

−50 to +80 °C (−58 to +176 °F)

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

Degree of protection

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

**External WLAN antenna**
IP67

Vibration resistance

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

Shock resistance

Shock, half-sine according to IEC 60068-2-27
6 ms 50 g

Impact resistance

Rough handling shocks according to IEC 60068-2-31

Mechanical load

- Protect the transmitter housing against mechanical effects, such as shock or impact.
- Never use the transmitter housing as a ladder or climbing aid.

Electromagnetic compatibility (EMC)

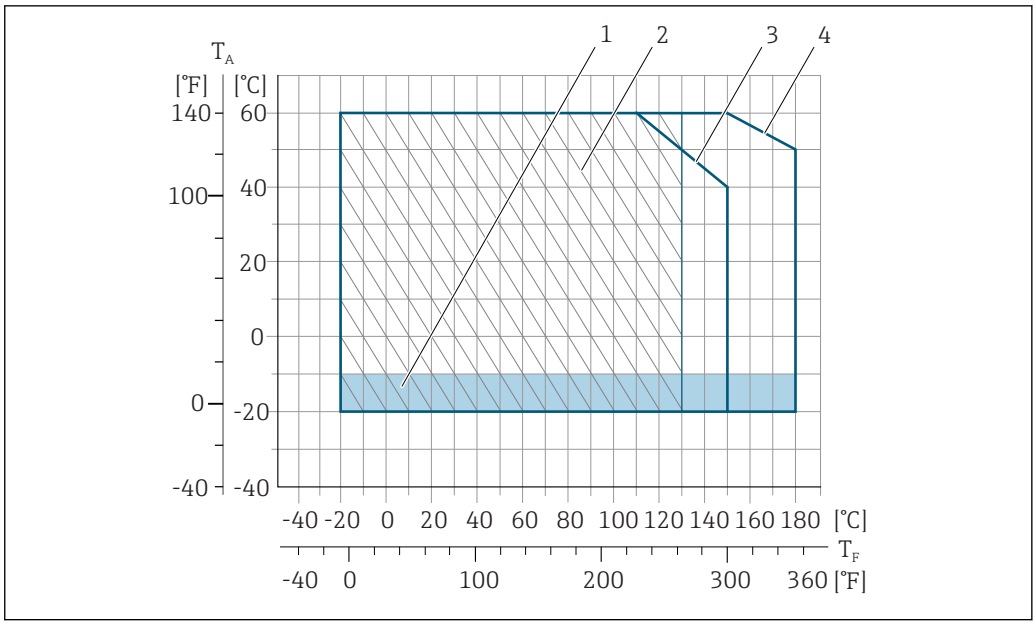
As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)

Details are provided in the Declaration of Conformity.

## 16.9 Process

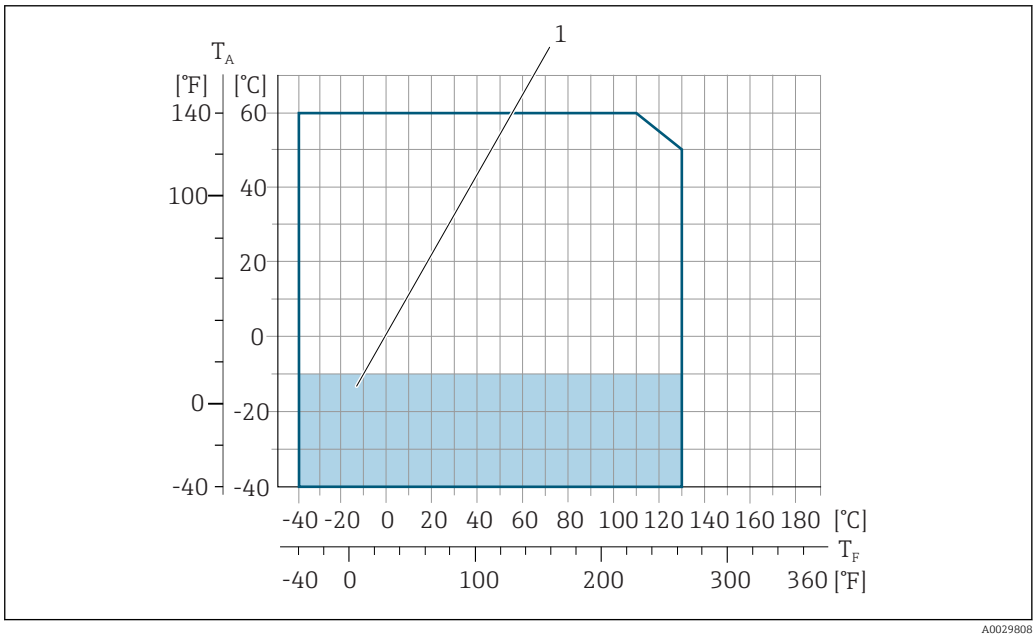
Medium temperature range

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




34 *PFA*

$T_A$ *Ambient temperature range*
$T_F$ *Fluid temperature*
1 *Colored area: the ambient temperature range −10 to −20 °C (+14 to −4 °F) applies to stainless flanges only*
2 *Hatched area: harsh environment only for fluid temperature range −20 to +130 °C (−4 to +266 °F)*
3 *−20 to +150 °C (−4 to +302 °F) for PFA, DN 25 to 200 (1 to 8")*
4 *−20 to +180 °C (−4 to +356 °F) for PFA high-temperature, DN 25 to 200 (1 to 8")*




35 *PTFE*

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

| | |
|---|---|
| Conductivity | ≥ 5 µS/cm for liquids in general. Stronger filter damping is required for very low conductivity values. |

Pressure-temperature ratings

An overview of the pressure-temperature ratings for the process connections is provided in the "Technical Information" document

Pressure tightness

"–" = no specifications possible

*Liner: PFA*

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

*Liner: PTFE*

| Nominal diameter | | Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures: | | | |
|---|---|---|---|---|---|
| [mm] | [in] | +25 °C (+77 °F) | +80 °C (+176 °F) | +100 °C (+212 °F) | +130 °C (+266 °F) |
| 15 | ½ | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 25 | 1 | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 32 | – | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 40 | 1 ½ | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 50 | 2 | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 65 | – | 0 (0) | – | 40 (0.58) | 130 (1.89) |
| 80 | 3 | 0 (0) | – | 40 (0.58) | 130 (1.89) |
| 100 | 4 | 0 (0) | – | 135 (1.96) | 170 (2.47) |
| 125 | – | 135 (1.96) | – | 240 (3.48) | 385 (5.58) |
| 150 | 6 | 135 (1.96) | – | 240 (3.48) | 385 (5.58) |
| 200 | 8 | 200 (2.90) | – | 290 (4.21) | 410 (5.95) |
| 250 | 10 | 330 (4.79) | – | 400 (5.80) | 530 (7.69) |
| 300 | 12 | 400 (5.80) | – | 500 (7.25) | 630 (9.14) |
| 350 | 14 | 470 (6.82) | – | 600 (8.70) | 730 (10.6) |
| 400 | 16 | 540 (7.83) | – | 670 (9.72) | 800 (11.6) |
| 450 | 18 | No negative pressure permitted! | | | |
| 500 | 20 | | | | |
| 600 | 24 | | | | |

Flow limit

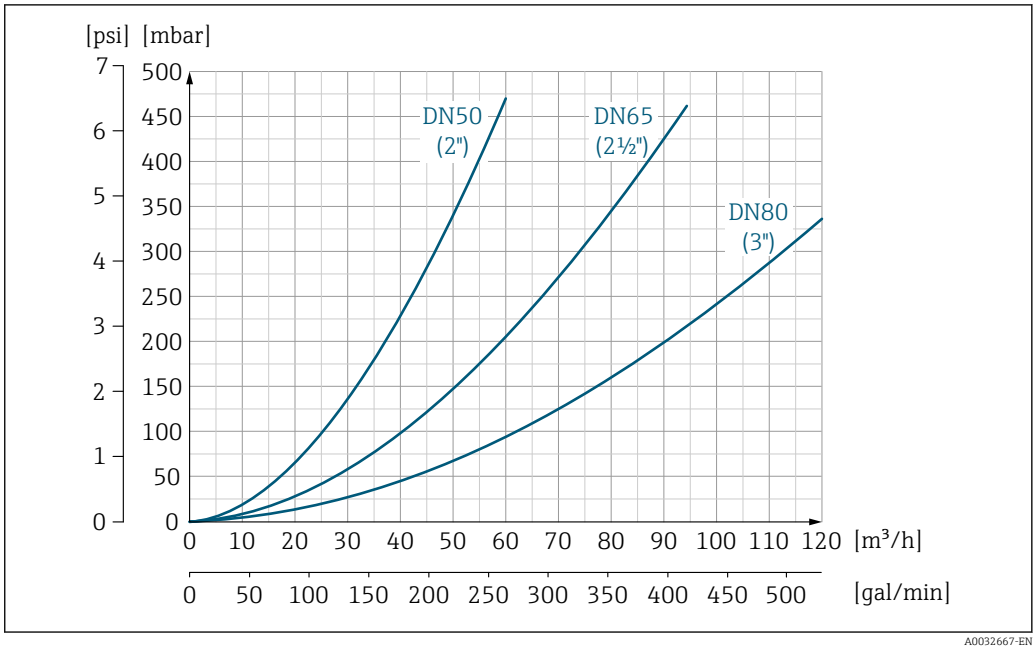
The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:
- v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludge)

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

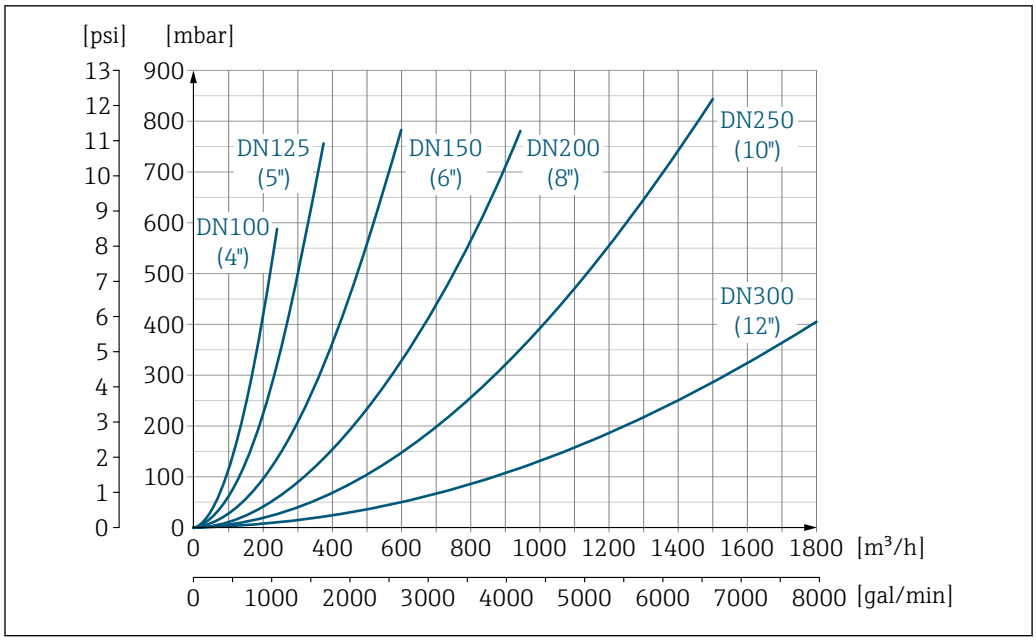
For an overview of the full scale values for the measuring range, see the "Measuring range" section → 174

Pressure loss

- No pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → 25




36 *Pressure loss DN 50 to 80 (2 to 3") in the case of order code for "Design", option C "Insertion length short ISO/DVGW to DN300, without inlet/outlet runs, constricted meas.tube"*




37 *Pressure loss DN 100 to 300 (4 to 12") in the case of order code for "Design", option C "Insertion length short ISO/DVGW to DN300, without inlet/outlet runs, constricted meas.tube"*

System pressure → 24

Vibrations → 24

## 16.10 Mechanical construction

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

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

Different values due to different transmitter versions:
Transmitter version for the hazardous area
(Order code for "Housing", option A "Aluminum, coated"; Ex d): +2 kg (+4.4 lbs)

**Weight in SI units**

| Nominal diameter | | EN (DIN), AS [1)] | | ASME | | JIS | |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | Pressure rating | [kg] | Pressure rating | [kg] | Pressure rating | [kg] |
| 15 | ½ | PN 40 | 7.2 | Class 150 | 7.2 | 10K | 4.5 |
| 25 | 1 | PN 40 | 8.0 | Class 150 | 8.0 | 10K | 5.3 |
| 32 | – | PN 40 | 8.7 | Class 150 | – | 10K | 5.3 |
| 40 | 1 ½ | PN 40 | 10.1 | Class 150 | 10.1 | 10K | 6.3 |
| 50 | 2 | PN 40 | 11.3 | Class 150 | 11.3 | 10K | 7.3 |
| 65 | – | PN 16 | 12.7 | Class 150 | – | 10K | 9.1 |
| 80 | 3 | PN 16 | 14.7 | Class 150 | 14.7 | 10K | 10.5 |

| Nominal diameter | | EN (DIN), AS [1] | | ASME | | JIS | |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | Pressure rating | [kg] | Pressure rating | [kg] | Pressure rating | [kg] |
| 100 | 4 | PN 16 | 16.7 | Class 150 | 16.7 | 10K | 12.7 |
| 125 | – | PN 16 | 22.2 | Class 150 | – | 10K | 19 |
| 150 | 6 | PN 16 | 26.2 | Class 150 | 26.2 | 10K | 22.5 |
| 200 | 8 | PN 10 | 45.7 | Class 150 | 45.7 | 10K | 39.9 |
| 250 | 10 | PN 10 | 65.7 | Class 150 | 75.7 | 10K | 67.4 |
| 300 | 12 | PN 10 | 70.7 | Class 150 | 111 | 10K | 70.3 |
| 350 | 14 | PN 10 | 105.7 | Class 150 | 176 | 10K | 79 |
| 400 | 16 | PN 10 | 120.7 | Class 150 | 206 | 10K | 100 |
| 450 | 18 | PN 10 | 161.7 | Class 150 | 256 | 10K | 128 |
| 500 | 20 | PN 10 | 156.7 | Class 150 | 286 | 10K | 142 |
| 600 | 24 | PN 10 | 208.7 | Class 150 | 406 | 10K | 188 |

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

### Weight in US units

| Nominal diameter | | ASME | |
|---|---|---|---|
| [mm] | [in] | Pressure rating | [lbs] |
| 15 | ½ | Class 150 | 15.9 |
| 25 | 1 | Class 150 | 17.6 |
| 40 | 1 ½ | Class 150 | 22.3 |
| 50 | 2 | Class 150 | 24.9 |
| 80 | 3 | Class 150 | 32.4 |
| 100 | 4 | Class 150 | 36.8 |
| 150 | 6 | Class 150 | 57.7 |
| 200 | 8 | Class 150 | 101 |
| 250 | 10 | Class 150 | 167 |
| 300 | 12 | Class 150 | 244 |
| 350 | 14 | Class 150 | 387 |
| 400 | 16 | Class 150 | 454 |
| 450 | 18 | Class 150 | 564 |
| 500 | 20 | Class 150 | 630 |
| 600 | 24 | Class 150 | 895 |

## Measuring tube specification

| Nominal diameter | | Pressure rating | | | | | Process connection internal diameter | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | EN (DIN) | ASME | AS 2129 | AS 4087 | JIS | PFA | | PTFE | |
| [mm] | [in] | [bar] | [psi] | [bar] | [bar] | [bar] | [mm] | [in] | [mm] | [in] |
| 15 | ½ | PN 40 | Class 150 | – | – | 20K | – | – | 15 | 0.59 |
| 25 | 1 | PN 40 | Class 150 | Table E | – | 20K | 23 | 0.91 | 26 | 1.02 |
| 32 | – | PN 40 | – | – | – | 20K | 32 | 1.26 | 35 | 1.38 |
| 40 | 1 ½ | PN 40 | Class 150 | – | – | 20K | 36 | 1.42 | 41 | 1.61 |

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

## Materials

### Transmitter housing

Order code for "Housing":
Option **A** "Aluminum, coated": aluminum, AlSi10Mg, coated

*Window material*

Order code for "Housing":
Option **A** "Aluminum, coated": glass

### Cable entries/cable glands

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

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

| Cable entry/cable gland | Material |
|---|---|
| Cable gland M20 × 1.5 | Plastic/nickel-plated brass |
| Adapter for cable entry with internal thread G ½" | Nickel-plated brass |
| Adapter for cable entry with internal thread NPT ½" | |
| Device plug connectors | Plug M12 × 1<br>▪ Socket: Stainless steel, 1.4404 (316L)<br>▪ Contact housing: Polyamide<br>▪ Contacts: Gold-plated brass |

### Sensor housing

- DN 15 to 300 (½ to 12"): coated aluminum AlSi10Mg
- DN 350 to 600 (14 to 24"): carbon steel with protective varnish

**Measuring tubes**

Stainless steel, 1.4301/304/1.4306/304L; for flanges made of carbon with Al/Zn protective coating (DN 15 to 300 (½ to 12")) or protective varnish (DN 350 to 600 (14 to 24"))

*Liner*

- PFA
- PTFE

**Process connections**

EN 1092-1 (DIN 2501)
Stainless steel, 1.4571 (F316L); carbon steel, E250C [1]/S235JRG2/P245GH

ASME B16.5
Stainless steel, F316L; carbon steel, A105 [1]

JIS B2220
Stainless steel, 1.0425 (F316L) [1]; carbon steel, A105/A350 LF2

AS 2129 Table E
- DN 25 (1"): carbon steel, A105/S235JRG2
- DN 40 (1 ½"): carbon steel, A105/S275JR

AS 4087 PN 16
Carbon steel, A105/S275JR

**Electrodes**

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

**Seals**

As per DIN EN 1514-1, form IBC

**Accessories**

*Protective cover*

Stainless steel, 1.4404 (316L)

*External WLAN antenna*

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

*Ground disks*

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

| | |
|---|---|
| Fitted electrodes | Measuring electrodes, reference electrodes and electrodes for empty pipe detection:<br>- Standard: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum, titanium<br>- Optional: only platinum measuring electrodes |

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

Surface roughness

Stainless steel electrodes, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); platinum; tantalum; titanium:
≤ 0.3 to 0.5 µm (11.8 to 19.7 µin)
(All data relate to parts in contact with fluid)

Liner with PFA:
≤ 0.4 µm (15.7 µin)
(All data relate to parts in contact with fluid)

## 16.11 Operability

Languages

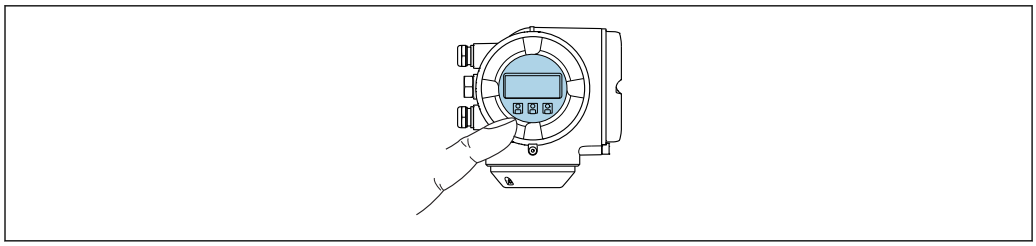
Can be operated in the following languages:
- Via local operation
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech, Swedish
- Via Web browser
  English, German, French, Spanish, Italian, Dutch,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

Local operation

**Via display module**

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

Information about WLAN interface → 75



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38 *Operation with touch control*

*Display elements*

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

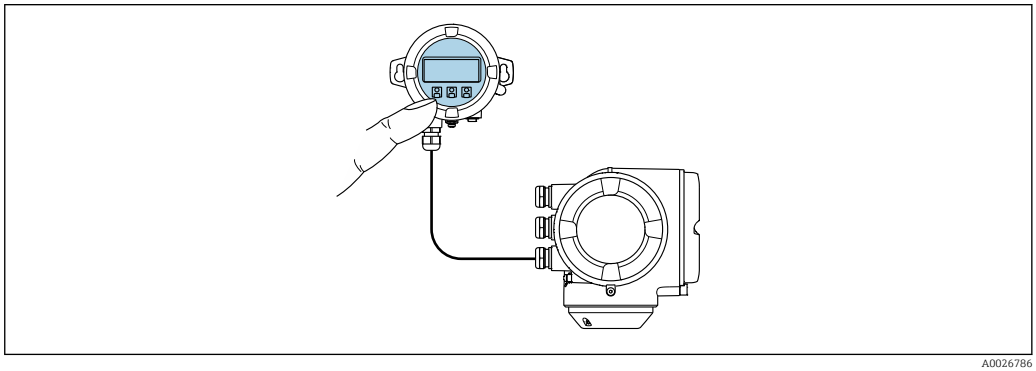
*Operating elements*

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

### Via remote display and operating module DKX001

The remote display and operating module DKX001 is available as an optional extra → 171.

- 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.



A0026786

39 *Operation via remote display and operating module DKX001*

*Display and operating elements*

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

*Material*

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

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

*Cable entry*

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

*Connecting cable*

*Dimensions*

Information on the dimensions:

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

Remote operation → 73

Service interface → 74

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<br>▪ Ethernet-based fieldbus (EtherNet/IP, PROFINET) | Special Documentation for device |
| DeviceCare SFE100 | Notebook, PC or tablet with Microsoft Windows system | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Fieldbus protocol | → 172 |
| FieldCare SFE500 | Notebook, PC or tablet with Microsoft Windows system | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Fieldbus protocol | → 172 |

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

- Field Device Manager (FDM) by Honeywell → www.honeywellprocess.com
- FieldMate by Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The associated device description files are available at: www.endress.com → Downloads

### Web server

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

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

*Supported functions*
Data exchange between the operating unit (such as a notebook for example) and the measuring device:
- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package → 198)

Webserver special documentation → 200

HistoROM data management

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

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

### Additional information on the data storage concept

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

| | Device memory | T-DAT | S-DAT |
|---|---|---|---|
| **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.:<br>EDS for EtherNet/IP | ▪ Measured value logging ("Extended HistoROM" order option)<br>▪ Current parameter data record (used by firmware at run time)<br>▪ Maximum indicators (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 transfer

#### Manual

- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.:
  EDS for EtherNet/IP

**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 1000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

## 16.12 Certificates and approvals

| | |
|---|---|
| CE mark | The measuring system is in conformity with the statutory requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.<br>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark. |
| C-Tick symbol | The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)". |
| Ex approval | The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate. |
| Pharmaceutical compatibility | ▪ FDA<br>▪ USP Class VI<br>▪ TSE/BSE certificate of suitability |
| EtherNet/IP certification | The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:<br>▪ Certified in accordance with the ODVA Conformance Test<br>▪ EtherNet/IP Performance Test<br>▪ EtherNet/IP PlugFest compliance<br>▪ The device can also be operated with certified devices of other manufacturers (interoperability) |
| Radio approval | The measuring device has radio approval.<br>For detailed information on the radio approval, see the Special Documentation |

| | |
|---|---|
| Pressure Equipment Directive | ▪ With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EC.<br>▪ Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art. 4, Par. 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EC. |
| Measuring instrument approval | The measuring device is qualified to OIML R117 and has an OIML Certificate of Conformity (optional). |
| Additional certification | **PWIS-free**<br>PWIS = paint-wetting impairment substances<br>Order code for "Service":<br>▪ Option **HC**: PWIS-free (version A)<br>▪ Option **HD**: PWIS-free (version B)<br>▪ Option **HE**: PWIS-free (version C)<br>For more information on PWIS-free certification, see "Test specification" document TS01028D |
| Other standards and guidelines | ▪ EN 60529<br>Degrees of protection provided by enclosures (IP code)<br>▪ EN 61010-1<br>Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements<br>▪ IEC/EN 61326<br>Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).<br>▪ NAMUR NE 21<br>Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment<br>▪ NAMUR NE 32<br>Data retention in the event of a power failure in field and control instruments with microprocessors<br>▪ NAMUR NE 43<br>Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.<br>▪ NAMUR NE 53<br>Software of field devices and signal-processing devices with digital electronics<br>▪ NAMUR NE 105<br>Specifications for integrating fieldbus devices in engineering tools for field devices<br>▪ NAMUR NE 107<br>Self-monitoring and diagnosis of field devices<br>▪ NAMUR NE 131<br>Requirements for field devices for standard applications<br>▪ ETSI EN 300 328<br>Guidelines for 2.4 GHz radio components.<br>▪ EN 301489<br>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.

Diagnostics functions

| Package | Description |
|---|---|
| Extended HistoROM | Comprises extended functions concerning the event log and the activation of the measured value memory.<br><br>Event log:<br>Memory volume is extended from 20 message entries (standard version) to up to 100 entries.<br><br>Data logging (line recorder):<br>▪ Memory capacity for up to 1000 measured values is activated.<br>▪ 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.<br>▪ Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server. |

Heartbeat Technology

| Package | Description |
|---|---|
| Heartbeat Verification +Monitoring | **Heartbeat Verification**<br>Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".<br>▪ Functional testing in the installed state without interrupting the process.<br>▪ Traceable verification results on request, including a report.<br>▪ Simple testing process via local operation or other operating interfaces.<br>▪ Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.<br>▪ Extension of calibration intervals according to operator's risk assessment.<br><br>**Heartbeat Monitoring**<br>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:<br>▪ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time.<br>▪ Schedule servicing in time.<br>▪ Monitor the process or product quality, e.g. gas pockets. |

Cleaning

| Package | Description |
|---|---|
| Electrode cleaning circuit (ECC) | The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite ($Fe_3O_4$) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to AVOID build up of highly conductive matter and thin layers (typical of magnetite). |

## 16.14 Accessories

Overview of accessories available for order → 171

## 16.15 Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

Standard documentation

### Brief Operating Instructions

*Brief Operating Instructions for the sensor*

| Measuring device | Documentation code |
|---|---|
| Proline Promag P | KA01290D |

*Brief Operating Instructions for transmitter*

| Measuring device | Documentation code |
|---|---|
| Proline 300 | KA01338D |

### Technical Information

| Measuring device | Documentation code |
|---|---|
| Promag P 300 | TI01224D |

### Description of device parameters

| Measuring device | Documentation code |
|---|---|
| Promag 300 | GP01113D |

Device-dependent additional documentation

### Safety instructions

Safety instructions for electrical equipment for hazardous areas.

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

*Remote display and operating module DKX001*

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

## Special Documentation

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

| Contents | Documentation code |
|---|---|
| Heartbeat Technology | SD01980D |
| Web server | SD01976D |

## Installation Instructions

| Contents | Comment |
|---|---|
| Installation instructions for spare part sets and accessories | ▪ Access the overview of all the available spare part sets via *W@M Device Viewer* → 169<br>▪ Accessories available for order with Installation Instructions → 171 |

# Index


## A

Access authorization to parameters
- Read access . . . 64
- Write access . . . 64

Access code . . . 64
- Incorrect input . . . 64

Adapters . . . 25
Adapting the diagnostic behavior . . . 149
Additional certification . . . 197
Ambient temperature
- Influence . . . 183

Ambient temperature range . . . 23
Application . . . 174
Applicator . . . 174
Approvals . . . 196

## C

C-Tick symbol . . . 196
Cable entries
- Technical data . . . 182

Cable entry
- Degree of protection . . . 50

CE mark . . . 10, 196
Certificates . . . 196
Checklist
- Post-connection check . . . 50
- Post-installation check . . . 32

Cleaning
- Exterior cleaning . . . 168
- Interior cleaning . . . 168

Commissioning . . . 90
- Advanced settings . . . 112
- Configuring the measuring device . . . 91

Conductivity . . . 185
Connecting cable . . . 33, 34
Connecting the measuring device . . . 37
Connecting the signal cables . . . 37
Connecting the supply voltage cables . . . 37
Connection
- see Electrical connection

Connection examples, potential equalization . . . 43, 44
Connection preparations . . . 36
Connection tools . . . 33
Context menu
- Calling up . . . 60
- Closing . . . 60
- Explanation . . . 60

Current consumption . . . 182
Cyclic data transmission . . . 80

## D

Declaration of Conformity . . . 10
Define access code . . . 127, 128
Degree of protection . . . 50, 184
Designated use . . . 9
Device components . . . 14
Device description files . . . 79
Device documentation
- Supplementary documentation . . . 8

Device locking, status . . . 130
Device name
- Sensor . . . 17
- Transmitter . . . 16

Device repair . . . 169
Device revision . . . 79
Device type ID . . . 79
DeviceCare . . . 77
- Device description file . . . 79

Diagnostic behavior
- Explanation . . . 145
- Symbols . . . 145

Diagnostic information
- Communication interface . . . 149
- Design, description . . . 145, 148
- DeviceCare . . . 147
- FieldCare . . . 147
- Light emitting diodes . . . 142
- Onsite display . . . 144
- Overview . . . 150
- Remedial measures . . . 150
- Web browser . . . 146

Diagnostic list . . . 163
Diagnostic message . . . 144
Diagnostics
- Symbols . . . 144

DIP switches
- see Write protection switch

Direct access . . . 62
Direct access code . . . 57
Disabling write protection . . . 127
Display
- see Onsite display

Display and operating module DKX001 . . . 193
Display area
- For operational display . . . 55
- In the navigation view . . . 57

Display values
- For locking status . . . 130

Disposal . . . 170
Document
- Function . . . 6
- Symbols used . . . 6

Document function . . . 6
Down pipe . . . 21

## E

ECC . . . 118
Editing view . . . 58
- Input screen . . . 59
- Using operating elements . . . 59

Electrical connection
- Degree of protection . . . 50

Measuring device . . . . . 33
Operating tools
Via Ethernet network . . . . . 73
Via service interface (CDI-RJ45) . . . . . 74
Via WLAN interface . . . . . 75
RSLogix 5000 . . . . . 73
Web server . . . . . 74
WLAN interface . . . . . 75
Electromagnetic compatibility . . . . . 184
Electronics module . . . . . 14
Enabling write protection . . . . . 127
Enabling/disabling the keypad lock . . . . . 65
Endress+Hauser services
Maintenance . . . . . 168
Repair . . . . . 169
Environment
Ambient temperature range . . . . . 23
Impact resistance . . . . . 184
Mechanical load . . . . . 184
Shock resistance . . . . . 184
Storage temperature . . . . . 184
Vibration resistance . . . . . 184
Error messages
see Diagnostic messages
EtherNet/IP
Diagnostic information . . . . . 149
EtherNet/IP certification . . . . . 196
Event list . . . . . 163
Event logbook . . . . . 163
Ex approval . . . . . 196
Extended order code
Sensor . . . . . 17
Transmitter . . . . . 16
Exterior cleaning . . . . . 168

F
FDA . . . . . 196
Field of application
Residual risks . . . . . 10
FieldCare . . . . . 76
Device description file . . . . . 79
Establishing a connection . . . . . 76
Function . . . . . 76
User interface . . . . . 77
Filtering the event logbook . . . . . 164
Firmware
Release date . . . . . 79
Version . . . . . 79
Firmware history . . . . . 167
Fitted electrodes . . . . . 191
Fix assembly . . . . . 149
Flow direction . . . . . 22
Flow limit . . . . . 187
Function check . . . . . 90
Functions
see Parameter

G
Galvanic isolation . . . . . 181

H
Hardware write protection . . . . . 128
Heavy sensors . . . . . 22
Help text
Calling up . . . . . 63
Closing . . . . . 63
Explanation . . . . . 63
HistoROM . . . . . 121

I
Identifying the measuring device . . . . . 15
Impact resistance . . . . . 184
Incoming acceptance . . . . . 15
Influence
Ambient temperature . . . . . 183
Information on the document . . . . . 6
Inlet runs . . . . . 23
Input . . . . . 174
Inspection
Installation . . . . . 32
Received goods . . . . . 15
Inspection check
Connection . . . . . 50
Installation . . . . . 21
Installation conditions
Adapters . . . . . 25
Down pipe . . . . . 21
Heavy sensors . . . . . 22
Inlet and outlet runs . . . . . 23
Installation dimensions . . . . . 23
Mounting location . . . . . 21
Orientation . . . . . 22
Partially filled pipe . . . . . 21
System pressure . . . . . 24
Thermal insulation . . . . . 24
Vibrations . . . . . 24
Installation dimensions . . . . . 23
Interior cleaning . . . . . 168

L
Languages, operation options . . . . . 192
Line recorder . . . . . 137
Local display
Navigation view . . . . . 56
see Operational display
Low flow cut off . . . . . 181

M
Main electronics module . . . . . 14
Maintenance tasks . . . . . 168
Replacing seals . . . . . 168
Managing the device configuration . . . . . 121
Manufacturer ID . . . . . 79
Manufacturing date . . . . . 16, 17
Materials . . . . . 190
Maximum measured error . . . . . 183
Measured values
Calculated . . . . . 174
Measured . . . . . 174

see Process variables
Measuring and test equipment . . . . . 168
Measuring device
Configuration . . . . . 91
Conversion . . . . . 169
Disposal . . . . . 170
Integrating via communication protocol . . . . . 79
Mounting the sensor . . . . . 26
Mounting the ground cable/ground disks . . . . . 27
Mounting the seals . . . . . 27
Screw tightening torques . . . . . 27
Preparing for electrical connection . . . . . 36
Preparing for mounting . . . . . 26
Removing . . . . . 170
Repairs . . . . . 169
Structure . . . . . 14
Switch-on . . . . . 90
Measuring instrument approval . . . . . 197
Measuring principle . . . . . 174
Measuring range . . . . . 174
Measuring system . . . . . 174
Measuring tube specification . . . . . 189
Mechanical load . . . . . 184
Medium temperature range . . . . . 184
Menu
Diagnostics . . . . . 162
Setup . . . . . 91, 92
Menus
For measuring device configuration . . . . . 91
For specific settings . . . . . 112
Mounting dimensions
see Installation dimensions
Mounting location . . . . . 21
Mounting preparations . . . . . 26
Mounting tools . . . . . 26

## N

Nameplate
Sensor . . . . . 17
Transmitter . . . . . 16
Navigation path (navigation view) . . . . . 56
Navigation view
In the submenu . . . . . 56
In the wizard . . . . . 56
Numeric editor . . . . . 58

## O

Onsite display . . . . . 192
Numeric editor . . . . . 58
see Diagnostic message
see In alarm condition
Text editor . . . . . 58
Operable flow range . . . . . 175
Operating elements . . . . . 60, 145
Operating keys
see Operating elements
Operating menu
Menus, submenus . . . . . 53
Structure . . . . . 53
Submenus and user roles . . . . . 54
Operating philosophy . . . . . 54
Operation . . . . . 130
Operation options . . . . . 52
Operational display . . . . . 55
Operational safety . . . . . 10
Order code . . . . . 16, 17
Orientation (vertical, horizontal) . . . . . 22
Outlet runs . . . . . 23
Output . . . . . 177
Output signal . . . . . 177

## P

Packaging disposal . . . . . 20
Parameter
Changing . . . . . 63
Entering values or text . . . . . 63
Parameter settings
Administration (Submenu) . . . . . 124
Advanced setup (Submenu) . . . . . 113
Communication (Submenu) . . . . . 94
Configuration backup (Submenu) . . . . . 121
Current input . . . . . 96
Current input (Wizard) . . . . . 96
Current input 1 to n (Submenu) . . . . . 133
Current output . . . . . 97
Current output (Wizard) . . . . . 97
Data logging (Submenu) . . . . . 137
Define access code (Wizard) . . . . . 123
Device information (Submenu) . . . . . 166
Diagnostics (Menu) . . . . . 162
Display (Submenu) . . . . . 115
Display (Wizard) . . . . . 107
Electrode cleaning circuit (Submenu) . . . . . 118
Empty pipe detection (Wizard) . . . . . 111
I/O configuration . . . . . 95
I/O configuration (Submenu) . . . . . 95
Low flow cut off (Wizard) . . . . . 110
Process variables (Submenu) . . . . . 131
Pulse/frequency/switch output . . . . . 100
Pulse/frequency/switch output (Wizard) 100, 101, 104
Pulse/frequency/switch output 1 to n (Submenu) 134
Relay output . . . . . 106
Relay output 1 to n (Submenu) . . . . . 135
Relay output 1 to n (Wizard) . . . . . 106
Reset access code (Submenu) . . . . . 124
Sensor adjustment (Submenu) . . . . . 113
Setup (Menu) . . . . . 92
Simulation (Submenu) . . . . . 124
Status input . . . . . 97
Status input (Submenu) . . . . . 97
Status input 1 to n (Submenu) . . . . . 133
System units (Submenu) . . . . . 92
Totalizer (Submenu) . . . . . 132
Totalizer 1 to n (Submenu) . . . . . 113
Totalizer handling (Submenu) . . . . . 136
Value current output 1 to n (Submenu) . . . . . 134
Web server (Submenu) . . . . . 72

WLAN settings (Wizard) . . . . . 119
Partially filled pipe . . . . . 21
Performance characteristics . . . . . 182
Pharmaceutical compatibility . . . . . 196
Post-connection check (checklist) . . . . . 50
Post-installation check . . . . . 90
Post-installation check (checklist) . . . . . 32
Potential equalization . . . . . 43
Power consumption . . . . . 182
Power supply failure . . . . . 182
Pressure Equipment Directive . . . . . 197
Pressure loss . . . . . 187
Pressure tightness . . . . . 186
Pressure-temperature ratings . . . . . 186
Process conditions
Conductivity . . . . . 185
Flow limit . . . . . 187
Fluid temperature . . . . . 184
Pressure loss . . . . . 187
Pressure tightness . . . . . 186
Product safety . . . . . 10
Protecting parameter settings . . . . . 127

R
Radio approval . . . . . 196
Read access . . . . . 64
Reading measured values . . . . . 130
Reading out diagnostic information, EtherNet/IP . . . 149
Recalibration . . . . . 168
Reference operating conditions . . . . . 182
Registered trademarks . . . . . 8
Remedial measures
Calling up . . . . . 146
Closing . . . . . 146
Remote operation . . . . . 193
Repair of a device . . . . . 169
Repairs . . . . . 169
Notes . . . . . 169
Repeatability . . . . . 183
Replacement
Device components . . . . . 169
Replacing seals . . . . . 168
Requirements for personnel . . . . . 9
Return . . . . . 169

S
Safety . . . . . 9
Screw tightening torques . . . . . 27
Sensor
Mounting . . . . . 26
Serial number . . . . . 16, 17
Setting the operating language . . . . . 90
Settings
Adapting the measuring device to the process conditions . . . . . 136
Administration . . . . . 122
Advanced display configurations . . . . . 115
Communication interface . . . . . 94
Current input . . . . . 96
Current output . . . . . 97
Device reset . . . . . 165
Device tag . . . . . 92
Electrode cleaning circuit (ECC) . . . . . 118
Empty pipe detection (EPD) . . . . . 111
I/O configuration . . . . . 95
Low flow cut off . . . . . 110
Managing the device configuration . . . . . 121
Onsite display . . . . . 107
Operating language . . . . . 90
Pulse output . . . . . 100
Pulse/frequency/switch output . . . . . 100, 101
Relay output . . . . . 106
Resetting the totalizer . . . . . 136
Sensor adjustment . . . . . 113
Simulation . . . . . 124
Status input . . . . . 97
Switch output . . . . . 104
System units . . . . . 92
Totalizer . . . . . 113
Totalizer reset . . . . . 136
WLAN . . . . . 119
Shock resistance . . . . . 184
Showing data logging . . . . . 137
Signal on alarm . . . . . 179
Software release . . . . . 79
Spare part . . . . . 169
Spare parts . . . . . 169
Special connection instructions . . . . . 45
Standards and guidelines . . . . . 197
Status area
For operational display . . . . . 55
In the navigation view . . . . . 57
Status signals . . . . . 144, 147
Storage conditions . . . . . 19
Storage temperature . . . . . 19
Storage temperature range . . . . . 184
Structure
Measuring device . . . . . 14
Operating menu . . . . . 53
Submenu
Administration . . . . . 122, 124
Advanced setup . . . . . 112, 113
Communication . . . . . 94
Configuration backup . . . . . 121
Current input 1 to n . . . . . 133
Data logging . . . . . 137
Device information . . . . . 166
Display . . . . . 115
Electrode cleaning circuit . . . . . 118
Event list . . . . . 163
I/O configuration . . . . . 95
Input values . . . . . 132
Measured values . . . . . 130
Output values . . . . . 134
Overview . . . . . 54
Process variables . . . . . 131
Pulse/frequency/switch output 1 to n . . . . . 134
Relay output 1 to n . . . . . 135

Reset access code . . . . . 124
Sensor adjustment . . . . . 113
Simulation . . . . . 124
Status input . . . . . 97
Status input 1 to n . . . . . 133
System units . . . . . 92
Totalizer . . . . . 132
Totalizer 1 to n . . . . . 113
Totalizer handling . . . . . 136
Value current output 1 to n . . . . . 134
Web server . . . . . 72
Supplementary documentation . . . . . 199
Supply voltage . . . . . 182
Surface roughness . . . . . 192
Switch output . . . . . 178
Symbols
Controlling data entries . . . . . 59
For communication . . . . . 55
For diagnostic behavior . . . . . 55
For locking . . . . . 55
For measured variable . . . . . 55
For measurement channel number . . . . . 55
For menus . . . . . 57
For parameters . . . . . 57
For status signal . . . . . 55
For submenu . . . . . 57
For wizard . . . . . 57
In the status area of the local display . . . . . 55
Input screen . . . . . 59
Operating elements . . . . . 59
System design
Measuring system . . . . . 174
see Measuring device design
System file
Release date . . . . . 79
Source . . . . . 79
Version . . . . . 79
System integration . . . . . 79
System pressure . . . . . 24

T
Technical data, overview . . . . . 174
Temperature range
Ambient temperature range for display . . . . . 192
Storage temperature . . . . . 19
Terminal assignment . . . . . 36
terminals . . . . . 182
Text editor . . . . . 58
Thermal insulation . . . . . 24
Tool tip
see Help text
Tools
Electrical connection . . . . . 33
For mounting . . . . . 26
Transport . . . . . 19
Totalizer
Configuration . . . . . 113
Transmitter
Turning the display module . . . . . 31
Turning the housing . . . . . 31
Transporting the measuring device . . . . . 19
Troubleshooting
General . . . . . 140
TSE/BSE certificate of suitability . . . . . 196
Turning the display module . . . . . 31
Turning the electronics housing
see Turning the transmitter housing
Turning the transmitter housing . . . . . 31

U
Use of the measuring device
Borderline cases . . . . . 9
Incorrect use . . . . . 9
see Designated use
User interface
Current diagnostic event . . . . . 162
Previous diagnostic event . . . . . 162
User roles . . . . . 54
USP Class VI . . . . . 196

V
Version data for the device . . . . . 79
Vibration resistance . . . . . 184
Vibrations . . . . . 24

W
W@M . . . . . 168, 169
W@M Device Viewer . . . . . 15, 169
Weight
Transport (notes) . . . . . 19
Wizard
Current input . . . . . 96
Current output . . . . . 97
Define access code . . . . . 123
Display . . . . . 107
Empty pipe detection . . . . . 111
Low flow cut off . . . . . 110
Pulse/frequency/switch output . . . . . 100, 101, 104
Relay output 1 to n . . . . . 106
WLAN settings . . . . . 119
WLAN settings . . . . . 119
Workplace safety . . . . . 10
Write access . . . . . 64
Write protection
Via access code . . . . . 127
Via write protection switch . . . . . 128
Write protection switch . . . . . 128

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