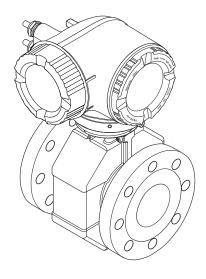
Valid as of version 01.00.zz (Device firmware) **Products** 

Solutions Services

# Operating Instructions Proline Promag P 300 PROFIBUS DP

Electromagnetic flowmeter







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

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# 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
<b>▲</b> DANGER	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
<b>A</b> WARNING	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
<b>▲</b> CAUTION	CAUTION!  This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	NOTE! 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
$\overline{\sim}$	Direct current and alternating current
±	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections.
	The ground terminals are situated inside and outside the device:  Inner ground terminal: Connects the protectiv earth to the mains supply.  Outer ground terminal: Connects the device to the plant grounding system.

# 1.2.3 Communication symbols

Symbol	Meaning
<b></b>	Wireless Local Area Network (WLAN) Communication via a wireless, local network.
•	LED Light emitting diode is off.

Symbol	Meaning
举	<b>LED</b> Light emitting diode is on.
	<b>LED</b> Light emitting diode is flashing.

# 1.2.4 Tool symbols

Symbol	Meaning
0	Flat blade screwdriver
06	Allen key
Ó	Open-ended wrench

# 1.2.5 Symbols for certain types of information

Symbol	Meaning
<b>✓</b>	Permitted Procedures, processes or actions that are permitted.
<b>✓ ✓</b>	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
<b>1</b>	Reference to documentation.
	Reference to page.
	Reference to graphic.
<b>•</b>	Notice or individual step to be observed.
1., 2., 3	Series of steps.
L	Result of a step.
?	Help in the event of a problem.
•	Visual inspection.

# 1.2.6 Symbols in graphics

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

Symbol	Meaning
×	Safe area (non-hazardous area)
≋➡	Flow direction

# 1.3 Documentation

- For an overview of the scope of the associated Technical Documentation, refer to the following:
  - *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
  - Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate
- Detailed list of the individual documents along with the documentation code  $\Rightarrow \stackrel{ riangle}{\Rightarrow} 213$

#### 1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	Planning aid for your device  The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Sensor Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 1 The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device.
	<ul> <li>Incoming acceptance and product identification</li> <li>Storage and transport</li> <li>Installation</li> </ul>
Transmitter Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 2 The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value).
	<ul> <li>Product description</li> <li>Installation</li> <li>Electrical connection</li> <li>Operation options</li> <li>System integration</li> <li>Commissioning</li> <li>Diagnostic information</li> </ul>
Description of Device Parameters	Reference for your parameters 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

#### **PROFIBUS®**

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

# 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  $\mu$ S/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 ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation.  $\rightarrow \blacksquare 8$
- ► 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.

#### **A** WARNING

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

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

## **NOTICE**

#### Verification for borderline cases:

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

#### Residual risks

#### **WARNING**

# 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.

# **A** WARNING

# Danger from medium escaping!

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

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

# 2.3 Workplace safety

For work on and with the device:

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

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

Our warranty is valid only 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 settings.

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

# 2.7 Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater inoperation 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 $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	Not enabled.	On an individual basis following risk assessment.
Access code (also applies for Web server login or FieldCare connection) → 🖺 12	Not enabled (0000).	Assign a customized access code during commissioning.
WLAN (order option in display module)	Enabled.	On an individual basis following risk assessment.
WLAN security mode	Enabled (WPA2- PSK)	Do not change.
WLAN passphrase (password) → 🖺 12	Serial number	Assign a customized access code during commissioning.
WLAN mode	Access Point	On an individual basis following risk assessment.
Web server→ 🗎 12	Enabled.	On an individual basis following risk assessment.
CDI-RJ45 service interface → 🖺 13	-	On an individual basis following risk assessment.

# 2.7.1 Protecting access via hardware write protection

Write access to the 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.

## 2.7.2 Protecting access via a password

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

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

#### User-specific access code

Write access to the device parameters via the local display, Web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code ( $\rightarrow \square$  128).

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

#### WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface ( $\rightarrow \boxminus 71$ ), which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter  $(\rightarrow \implies 122)$ .

#### Infrastructure mode

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

#### General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or network key.
- The user is responsible for the management and careful handling of the access code and network key.
- For information on configuring the access code or on what to do if you lose the password, see the "Write protection via access code" section → 🖺 128

#### 2.7.3 Access via Web server

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.

# 2.7.4 Access via service interface (CDI-RJ45)

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

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

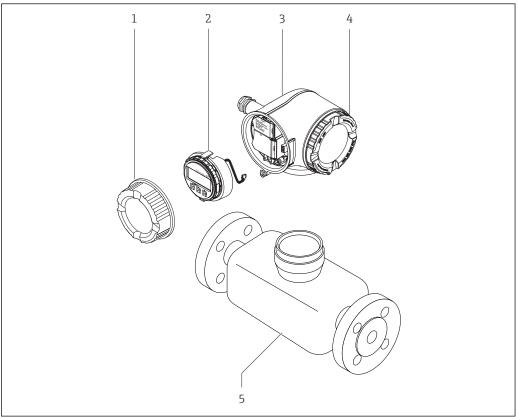
# 3 Product description

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

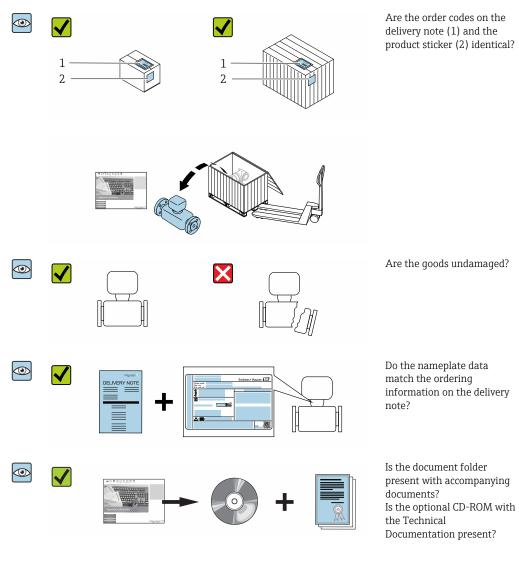


A00295

- $\blacksquare$  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



- **♀** 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

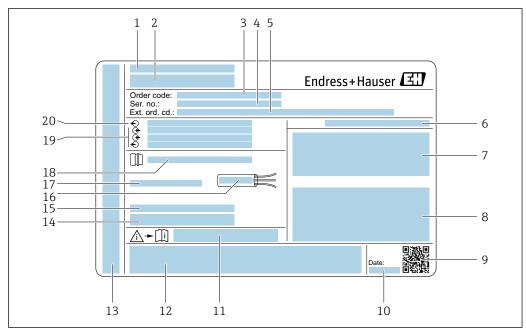
The following options are available for identification of the device:

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

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

- The "Additional standard documentation on the device" → 🖺 8 and "Supplementary device-dependent documentation" → 🖺 8 sections
- 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

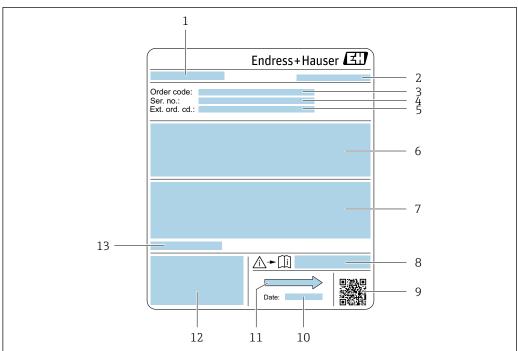


A0029

#### ■ 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
- $13 \quad \textit{Space for degree of protection of connection and electronics compartment when used in hazardous areas}$
- 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<sub>a</sub>)18 Information on cable aland
- 19 Available inputs and outputs, supply voltage
- 20 Electrical connection data: supply voltage

# 4.2.2 Sensor nameplate



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#### ■ 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  $\Rightarrow riangleq 213$
- 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 approvalrelated 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
Δ	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
<u> </u>	Reference to documentation Refers to the corresponding device documentation.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.

# 5 Storage and transport

# 5.1 Storage conditions

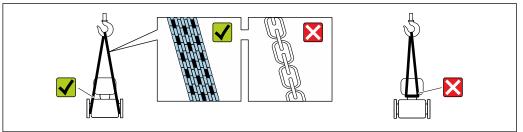
Observe the following notes for storage:

- ▶ Store in the original packaging to ensure protection from shock.
- ▶ Do not remove protective covers or protective caps installed on process connections. They prevent mechanical damage to the sealing surfaces and contamination in the measuring 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 → 🗎 197

# 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.

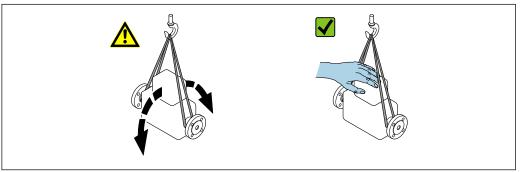
# 5.2.1 Measuring devices without lifting lugs

#### **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).



A002921

# 5.2.2 Measuring devices with lifting lugs

## **A** 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.

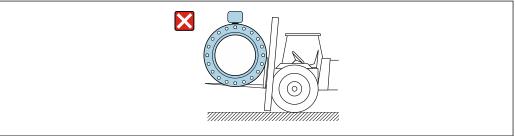
## 5.2.3 Transporting with a fork lift

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

# **A** 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:

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

Paper pads

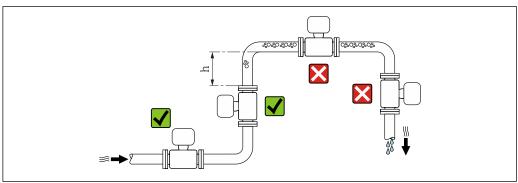
20

#### 6 Installation

#### 6.1 **Installation conditions**

#### 6.1.1 Mounting position

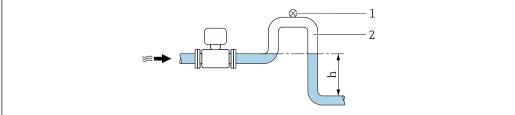
## Mounting location



Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow:  $h \ge 2 \times DN$ 

## Installation in down pipes

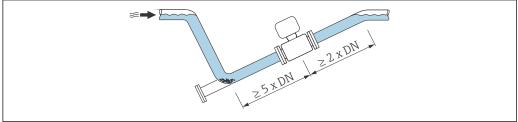
Install a siphon with a vent valve downstream of the sensor in down pipes whose length h  $\geq$  5 m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.



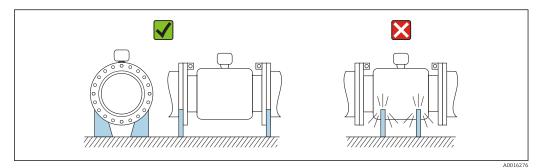
- € 4 Installation in a down pipe
- Vent valve
- 2 Pipe siphon
- Length of down pipe

## Installation in partially filled pipes

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



# For heavy sensors $DN \ge 350 (14")$



#### Orientation

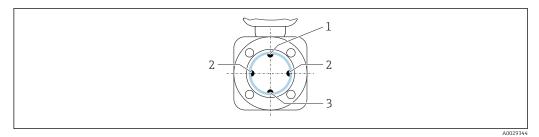
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

	Orientatio	Recommendation	
A	Vertical orientation	A0015591	
В	Horizontal orientation, transmitter at top	A0015589	<b>✓</b> ✓ 1)
С	Horizontal orientation, transmitter at bottom	A0015590	<b>√ √</b> <sup>2)</sup> 3)
D	Horizontal orientation, transmitter at side	A0015592	×

- 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.



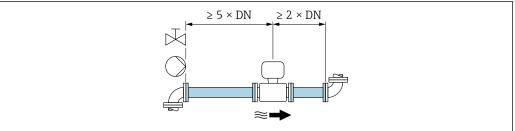
1 EPD electrode for empty pipe detection

- 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.

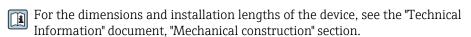
#### Inlet and outlet runs

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:



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#### Installation dimensions



# 6.1.2 Environment- and process-related requirements

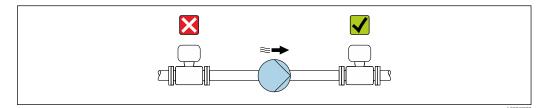
## Ambient temperature range

Transmitter	Standard: -40 to +60 °C (-40 to +140 °F)			
Local display	-20 to $+60$ °C ( $-4$ to $+140$ °F), the readability of the display may be impaired at temperatures outside the temperature range.			
Sensor	<ul> <li>Process connection material, carbon steel:         <ul> <li>10 to +60 °C (+14 to +140 °F)</li> </ul> </li> <li>Process connection material, stainless steel:         <ul> <li>40 to +60 °C (-40 to +140 °F)</li> </ul> </li> </ul>			
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.

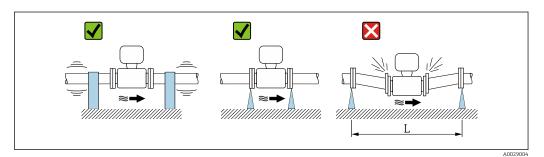
#### System pressure



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

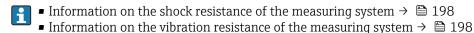
- Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.
- Information on the liner's resistance to partial vacuum  $\rightarrow$  \(\begin{aligned}
  \begin{aligned}
  \begin{aligned
  - Information on the shock resistance of the measuring system → □ 198
     Information on the vibration resistance of the measuring system → □ 198

#### **Vibrations**



■ 5 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.



#### Thermal insulation

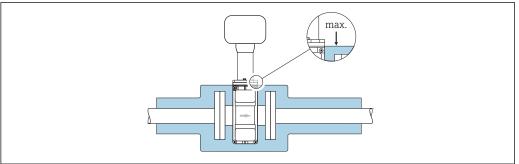
If process fluids are very hot, it is necessary to insulate pipes in order to reduce energy loss and to prevent individuals from accidentally coming into contact with hot pipes. Please observe the applicable standards and quidelines for insulating pipes.

- A housing support/an extended neck is used for heat dissipation:
  - Devices with the order code for "Lining", option **B** "PFA high-temperature" always come with a housing support.
  - In the case of all other devices, a housing support can be ordered via the order code for "Sensor option", option CG "Sensor extended neck".

## **WARNING**

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

► The housing support is used for heat dissipation and must be completely free (i.e. uncovered). At the very maximum, the sensor insulation may extend as far as the upper edge of the two sensor half-shells.

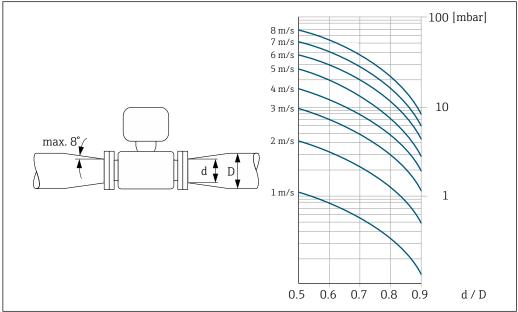


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## **Adapters**

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.

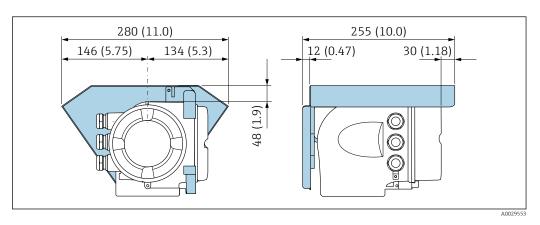
- The nomogram only applies to liquids with a viscosity similar to that of water.
- 1. Calculate the ratio of the diameters d/D.
- 2. From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



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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.

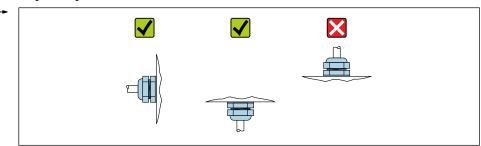
# 6.2.3 Mounting the sensor

#### **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  $\rightarrow \triangleq 27$ .

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



Mounting the seals

## **A** 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 torqu [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 <sup>1)</sup>	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	Pressure rating	Screws	Flange thickness	Max. screw tightening torqu	
[mm]	[bar]	[mm]	[mm]	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 <sup>1)</sup>	PN 16	20 × M33	36	658	-
600	PN 25	20 × M36	58	731	-

<sup>1)</sup> 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	Pressure rating	Screws	Flange thickness	Nom. screw tightening torque [Nm]
[mm]	[bar]	[mm]	[mm]	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	Pressure rating	Screws	Flange thickness	Nom. screw tightening torque [Nm]
[mm]	[bar]	[mm]	[mm]	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	rating Screws Max. screw tightening torque [N $([lbf \cdot ft])$		
[mm]	[in]	[psi]	[in]	PTFE	PFA
15	1/2	Class 150	4 × ½	6 (4)	- (-)
15	1/2	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 1/4	477 (352)	- (-)

Screw tightening torques for JIS B2220, 10/20K

Nominal diameter	Pressure rating	Screws	Max. screw tight	ening 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

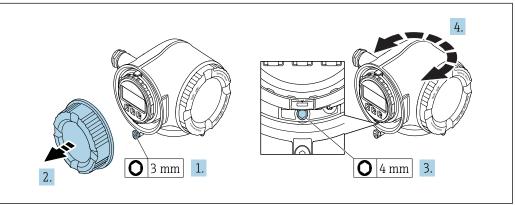
Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	PTFE	
25	4 × M12	21	
50	4 × M16	42	

Screw tightening torques for AS 4087, PN 16

Nominal diameter	Screws	Max. screw tightening torque [Nm]	
[mm]	[mm]	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.

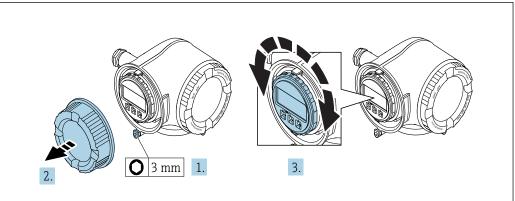


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- 1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.
- 2. Unscrew the connection compartment cover.
- 3. Release the fixing screw.
- 4. Turn the housing to the desired position.
- 5. Firmly tighten the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



A003003

- 1. Depending on the device version: Loosen the securing clamp of the connection compartment cover.
- 2. Unscrew the connection compartment cover.
- 3. Turn the display module to the desired position: max.  $8 \times 45^{\circ}$  in each direction.
- 4. Screw on the connection compartment cover.
- 5. Depending on the device version: Attach the securing clamp of the connection compartment cover.

# 6.3 Post-installation check

Is the device undamaged (visual inspection)?	
Does the measuring device conform to the measuring point specifications?  For example:  Process temperature  Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)  Ambient temperature  Measuring range	
Has the correct orientation for the sensor been selected?  According to sensor type  According to medium temperature  According to medium properties (outgassing, with entrained solids)	
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping ?	
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  $\geq 2.08 \text{ mm}^2 \text{ (14 AWG)}$ 

The grounding impedance must be less than 1  $\Omega$ .

# 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

PROFIBUS DP

The IEC 61158 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 $\Omega$ at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Wire cross-section	> 0.34 mm <sup>2</sup> (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km

Signal damping	Max. 9 dB over the entire length of the cable cross-section		
	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.		



For further information on planning and installing PROFIBUS networks see:

Operating Instructions "PROFIBUS DP/PA: Guidelines for planning and commissioning" (BA00034S)

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:

 $M20 \times 1.5$  with cable Ø 6 to 12 mm (0.24 to 0.47 in)

Spring-loaded terminals: Suitable for strands and strands with ferrules.
 Conductor cross-section 0.2 to 2.5 mm<sup>2</sup> (24 to 12 AWG).

# Requirements for the connecting cable - Remote display and operating module DKX001

Optionally available connecting cable

A cable is supplied depending on the order option

- Order code for measuring device: order code 030 for "Display; operation", option 0 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	$2\times2\times0.34~\text{mm}^2$ (22 AWG) PVC cable with common shield (2 pairs, pairstranded)		
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 μΗ/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 (1000 ft)) for the following order option:

Order code for DKX001: Order code  $\bf 040$  for "Cable", option  $\bf 1$  "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 1000 nF for Zone 1, Class I, Division 1		
L/R	Maximum 24 $\mu H/\Omega$ for Zone 1, Class I, Division 1		
Cable length	Maximum 300 m (1000 ft), see the following table		

Cross-section	Max. cable length for use in Non-hazardous area, Ex Zone 2, Class I, Division 2 Ex Zone 1, Class I, Division 1
0.34 mm <sup>2</sup> (22 AWG)	80 m (270 ft)
0.50 mm <sup>2</sup> (20 AWG)	120 m (400 ft)
0.75 mm <sup>2</sup> (18 AWG)	180 m (600 ft)
1.00 mm <sup>2</sup> (17 AWG)	240 m (800 ft)
1.50 mm <sup>2</sup> (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/o	utput 1	Input/o	utput 2	Input/o	output 3
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)
		Device-specific terminal assignment: adhesive label in terminal cover.					

# 7.1.4 Shielding and grounding

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

- To ensure an optimum EMC protective effect, connect the shield as often as possible to the reference ground.
- For reasons of explosion protection, you should refrain from grounding however.

To comply with both requirements, the fieldbus system allows three different types of shielding:

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

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding on the feed side (without capacitance termination at the field device). Appropriate measures with regard to input wiring must be taken to allow unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is thus guaranteed.

Where applicable, national installation regulations and guidelines must be observed during the installation!

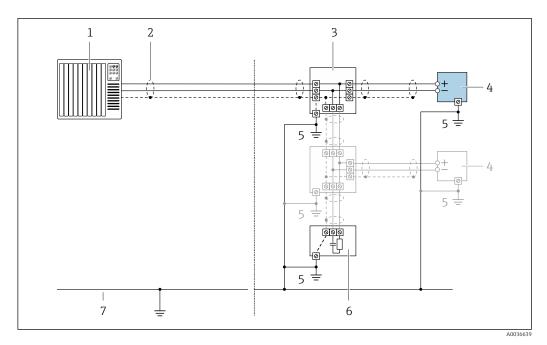
Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground. In systems without potential equalization, therefore, cable shielding of fieldbus systems should only be grounded on one side, for example at the fieldbus supply unit or at safety barriers.

#### NOTICE

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

Damage to the bus cable shield.

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



- 1 Controller (e.g. PLC)
- 2 Cable shield
- 3 T-box
- 4 Measuring device
- 5 Local grounding
- 6 Bus terminator
- 7 Potential matching line

## 7.1.5 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.

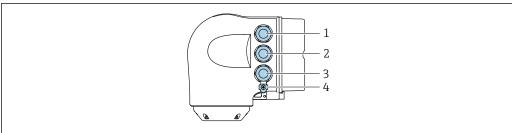
## 7.2 Connecting the measuring device

#### NOTICE

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

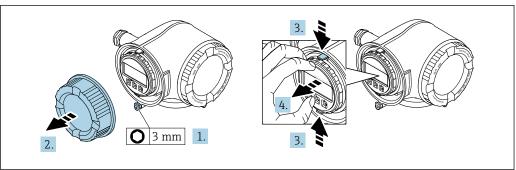
- ► Have electrical connection work carried out by appropriately trained specialists only.
- ▶ Observe applicable federal/national installation codes and regulations.
- ► Comply with local workplace safety regulations.
- ▶ Always connect the protective ground cable ⊕ before connecting additional cables.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

## 7.2.1 Connecting the transmitter



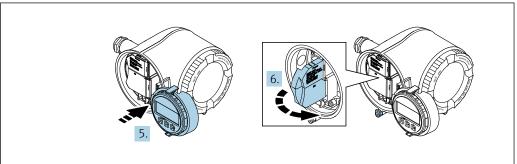
A002678

- 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)



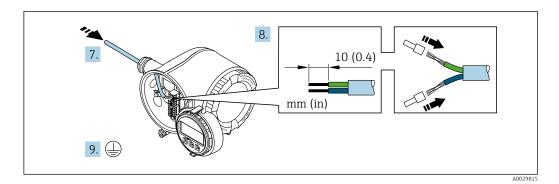
A002981

- 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.

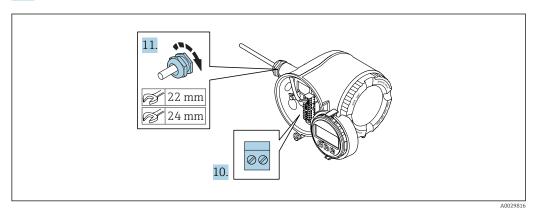


A0029814

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



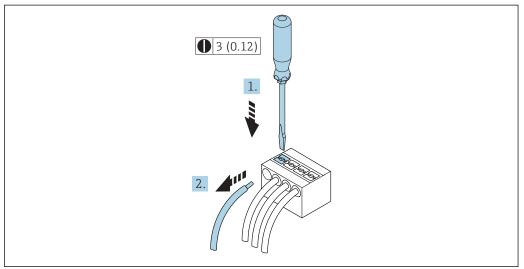
- 7. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
- 8. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
- 9. Connect the protective ground.



- 10. 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.

- 11. Firmly tighten the cable glands.
  - ► This concludes the cable connection process.
- 12. Close the terminal cover.
- 13. Fit the display module holder in the electronics compartment.
- 14. Screw on the connection compartment cover.
- 15. Secure the securing clamp of the connection compartment cover.

## Removing a cable

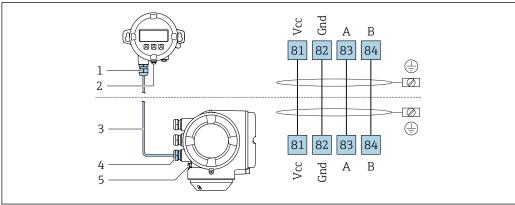


A00295

- 6 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 Connecting the remote display and operating module DKX001

- 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 Ensuring potential equalization

## 7.3.1 Requirements

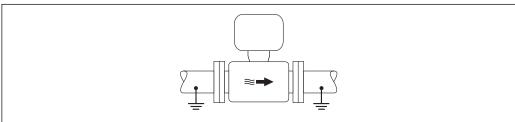
### **A** CAUTION

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

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

## 7.3.2 Connection example, standard scenario

### Metal, grounded pipe



 $\blacksquare$  7 Potential equalization via measuring tube

Endress+Hauser 41

A001631

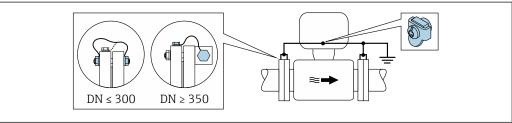
## 7.3.3 Connection example in special situations

#### 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 mm<sup>2</sup> (0.0093 in<sup>2</sup>)



Potential equalization via ground terminal and pipe flanges

A0029338

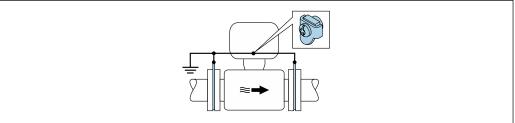
- 1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
- 2. If DN  $\leq$  300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
- 3. If DN ≥ 350 (14"): Mount the ground cable directly on the metal transport 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 mm<sup>2</sup> (0.0093 in<sup>2</sup>)



A0029339

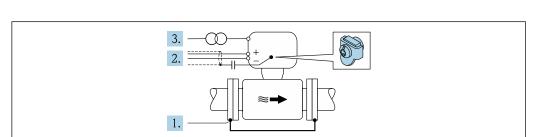
- 9 Potential equalization via ground terminal and ground disks
- 1. Connect the ground disks to the ground terminal via the ground cable.
- 2. Connect the ground disks to ground potential.

### 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

42



Copper wire, at least 6 mm<sup>2</sup> (0.0093 in<sup>2</sup>)

A0029340

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

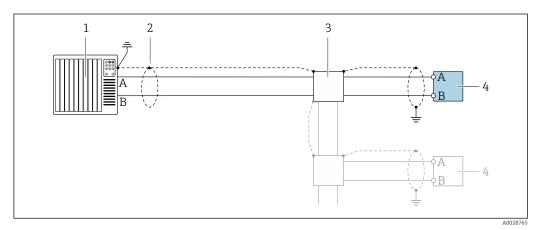
- 1. Connect the two flanges of the pipe to one another via a ground cable.
- 2. Guide the shield of the signal lines through a capacitor.
- 3. Connect the measuring device to the power supply such that it is floating in relation to the protective ground (isolation transformer).

## 7.4 Special connection instructions

## 7.4.1 Connection examples

#### PROFIBUS DP

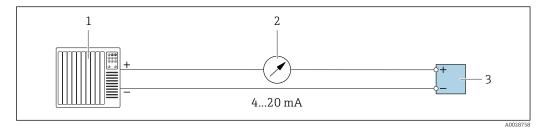
Ground cable



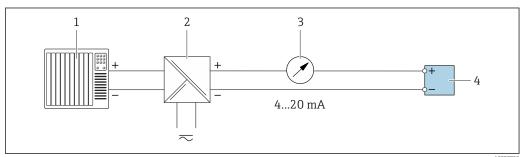
■ 10 Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2

- 1 Control system (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Distribution box
- 4 Transmitter
- If baud rates > 1.5 MBaud an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.

### Current output 4-20 mA



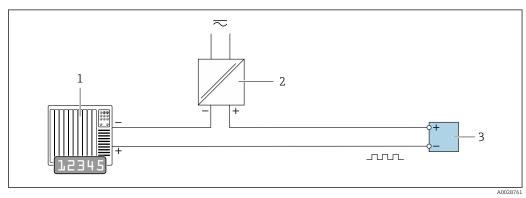
- 11 Connection example for 4-20 mA current output (active)
- 1 Automation system with current input (e.g. PLC)
- 2 Analog display unit: observe maximum load
- 3 Transmitter



AUU287

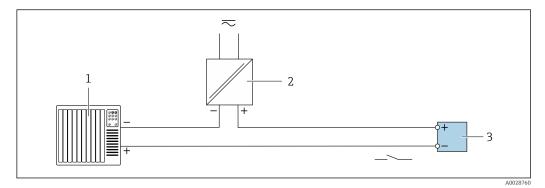
- 12 Connection example for 4-20 mA current output (passive)
- 1 Automation system with current input (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Analog display unit: observe maximum load
- 4 Transmitter

## Pulse/frequency output



- $\blacksquare$  13 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 → 🖺 191*

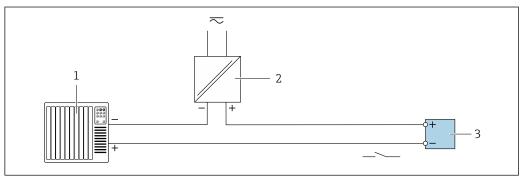
## Switch output



■ 14 Connection example for switch output (passive)

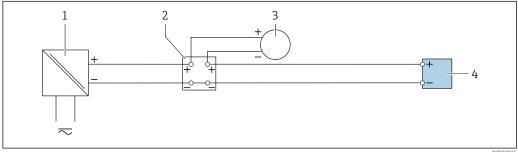
- Automation system with switch input (e.g. PLC)
- 2 Power supply
- 3 *Transmitter: Observe input values* → 🖺 191

### Relay output



- Connection example for relay output (passive)
- Automation system with relay input (e.g. PLC)
- Power supply
- *Transmitter: Observe input values →* 192

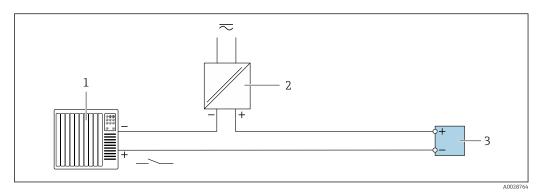
## **Current input**



A0028915

- 16 Connection example for 4 to 20 mA current input
- Power supply
- Terminal box
- External measuring device (for reading in pressure or temperature, for instance)
- Transmitter

### Status input



🖪 17 Connection example for status input

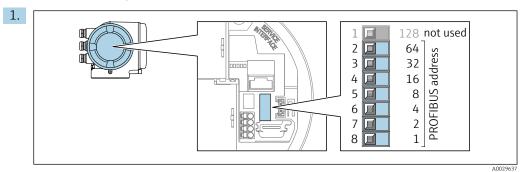
- 1 Automation system with status output (e.g. PLC)
- 2 Power supply
- 3 Transmitter

## 7.5 Hardware settings

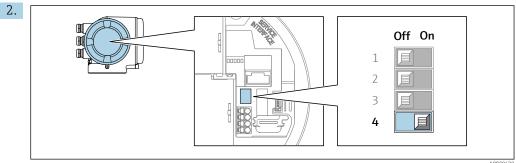
## 7.5.1 Setting the device address

The address must always be configured for a PROFIBUS DP/PA device. The valid address range is between 1 and 126. In a PROFIBUS DP/PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master. All measuring devices are delivered from the factory with the device address 126 and with the software addressing method.

### Hardware addressing



Set the desired device address using the DIP switches in the connection compartment.



A0029633

To switch addressing from software addressing to hardware addressing: set the DIP switch to  $\mathbf{On}$ .

The change of device address takes effect after 10 seconds. The device is restarted.

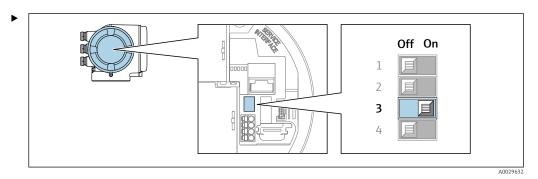
### Software addressing

- ► To switch addressing from hardware addressing to software addressing: set DIP switch No. 4 to **Off**.
  - The device address configured in the **Device address** parameter ( $\Rightarrow \implies 94$ ) takes effect after 10 seconds. The device is restarted.

## 7.5.2 Enabling the terminating resistor

To avoid incorrect communication transmission caused by impedance mismatch, terminate the PROFIBUS DP cable correctly at the start and end of the bus segment.

- If the device is operated with a baud rate of 1.5 MBaud and under: For the last transmitter on the bus, terminate by setting DIP switch 3 (bus termination) to ON.
- For baud rates > 1.5 MBaud:
   Due to the capacitance load of the user and the line reflections generated as a result, ensure that an external bus terminator is used.
- It is generally advisable to use an external bus terminator as the entire segment can fail if a device that is terminated internally is defective.



Set DIP switch No. 3 to **ON**.

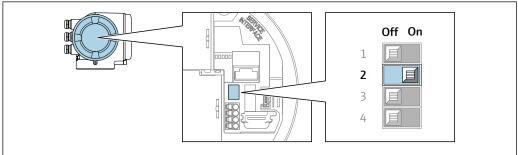
## 7.5.3 Activating the default IP address

The default IP address 192.168.1.212 can be activated 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.



A003449

- 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**  $\rightarrow$  **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.

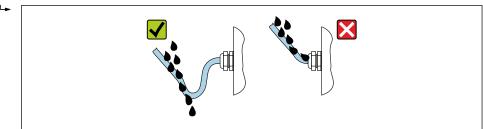
## 7.6 Ensuring the degree of protection

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").



A002927

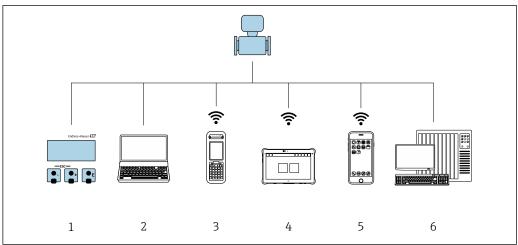
6. Insert dummy plugs into unused cable entries.

## 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" → 🖺 48?	
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



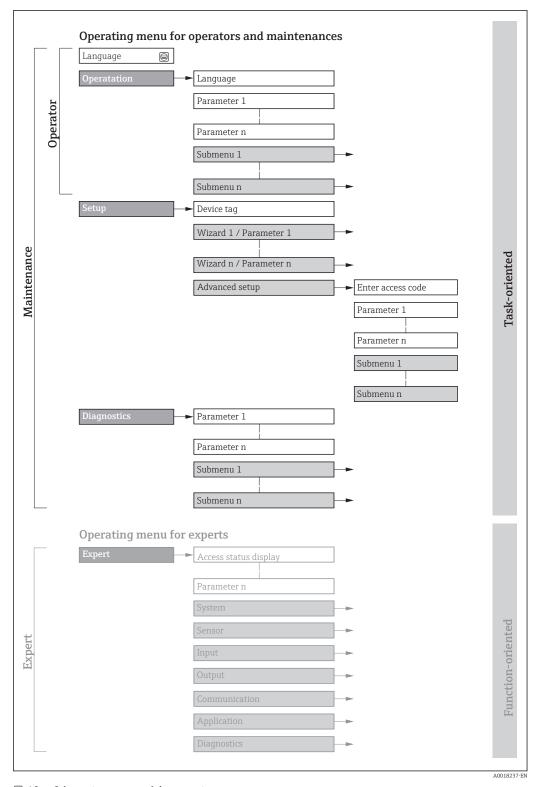
A0024E12

- 1 Local operation via display module
- 2 Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 3 Field Xpert SFX350 or SFX370
- 4 Field Xpert SMT70
- 5 Mobile handheld terminal
- 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  $\rightarrow \cong 213$ 



 $\blacksquare$  18 Schematic structure of the operating menu

## 8.2.2 Operating philosophy

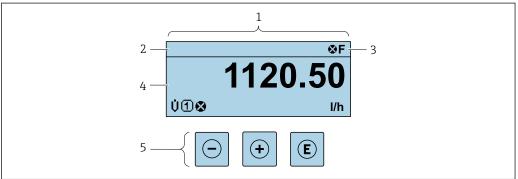
The individual parts of the operating menu are assigned to certain user roles (operator, maintenance etc.). Each user role contains typical tasks within the device lifecycle.

Menu	/parameter	User role and tasks	Content/meaning
Language	task-oriented	Role "Operator", "Maintenance" Tasks during operation: Configuring the operational display Reading measured values	<ul> <li>Defining the operating language</li> <li>Defining the Web server operating language</li> <li>Resetting and controlling totalizers</li> </ul>
Operation			<ul> <li>Configuring the operational display (e.g. display format, display contrast)</li> <li>Resetting and controlling totalizers</li> </ul>
Setup		"Maintenance" role Commissioning: Configuration of the measurement Configuration of the inputs and outputs Configuration of the communication interface	Wizards for fast commissioning:  Set the system units  Display I/O/configuration  Configure the inputs  Configure the outputs  Configuring the operational display  Define the output conditioning  Set the low flow cut off  Configure empty pipe detection  Advanced setup  For more customized configuration of the measurement (adaptation to special measuring conditions)  Configuration of totalizers  Configuration of electrode cleaning (optional)  Configure the WLAN settings  Administration (define access code, reset measuring device)
Diagnostics		"Maintenance" role Fault elimination:  Diagnostics and elimination of process and device errors  Measured value simulation	Contains all parameters for error detection and analyzing process and device errors:  Diagnostic list Contains up to 5 currently pending diagnostic messages.  Event logbook Contains event messages that have occurred.  Device information Contains information for identifying the device.  Measured values Contains all current measured values.  Analog inputs Is used to display the analog input.  Data logging submenu with "Extended HistoROM" order option Storage and visualization of measured values  Heartbeat The functionality of the device is checked on demand and the verification results are documented.  Simulation Is used to simulate measured values or output values.

Men	u/parameter	User role and tasks	Content/meaning
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device:  Commissioning measurements under difficult conditions  Optimal adaptation of the measurement to difficult conditions  Detailed configuration of the communication interface  Error diagnostics in difficult cases	Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device:  System  Contains all higher-order device parameters which do not concern the measurement or the communication interface.  Sensor  Configuration of the measurement.  Input  Configuring the status input.  Output  Configuring of the analog current outputs as well as the pulse/frequency and switch output.  Communication  Configuration of the digital communication interface and the Web server.  Submenus for function blocks (e.g. "Analog Inputs")  Configuration of function blocks.  Application  Configure the functions that go beyond the actual measurement (e.g. totalizer).  Diagnostics  Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.

## 8.3 Access to the operating menu via the local display

## 8.3.1 Operational display



A002934

- 1 Operational display
- 2 Device tag→ 🗎 91
- 3 Status area
- 4 Display area for measured values (4-line)
- 5 Operating elements→ 🖺 58

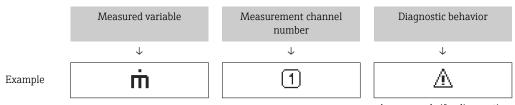
### Status area

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

- Status signals → 🗎 145
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior → 🗎 146
  - 🗙: Alarm
  - <u>∧</u>: 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:



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

#### Measured values

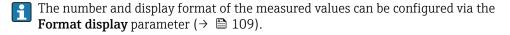
Symbol	Meaning
Ü	Volume flow
G	Conductivity
ṁ	Mass flow
Σ	Totalizer  The measurement channel number indicates which of the three totalizers is displayed.
€	Status input

### Measurement channel numbers

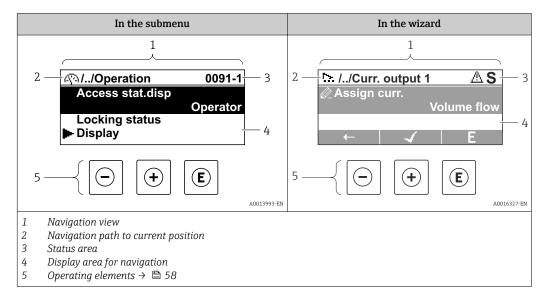
Symbol	Meaning
1 4	Measurement channel 1 to 4

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

### Diagnostic behavior

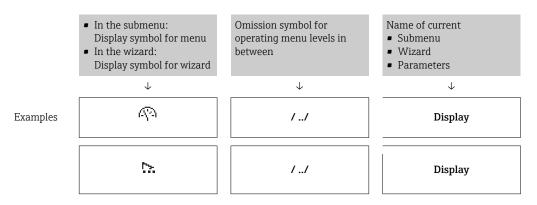


## 8.3.2 Navigation view



### 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  $\Rightarrow \stackrel{\triangle}{\Rightarrow} 55$ 

#### 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  $\rightarrow$   $\stackrel{\square}{=}$  145 ■ For information on the function and entry of the direct access code  $\rightarrow$   $\stackrel{\square}{=}$  60

## Display area

## Menus

Symbol	Meaning
49	Operation Appears: In the menu next to the "Operation" selection At the left in the navigation path in the Operation menu
۶	Setup Appears: In the menu next to the "Setup" selection At the left in the navigation path in the Setup menu
્	Diagnostics Appears: ■ In the menu next to the "Diagnostics" selection ■ At the left in the navigation path in the Diagnostics menu
÷.	Expert Appears: In the menu next to the "Expert" selection At the left in the navigation path in the Expert menu

## Submenus, wizards, parameters

Symbol	Meaning
•	Submenu
55.	Wizard
Ø.	Parameters within a wizard  No display symbol exists for parameters in submenus.

## Locking

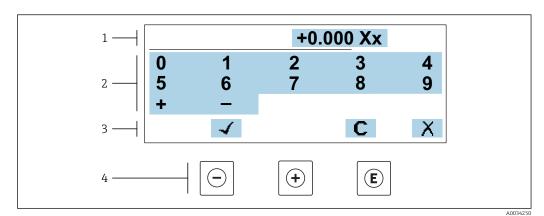
Symbol	Meaning
û	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked.  By a user-specific access code  By the hardware write protection switch

## Wizard operation

Symbol	Meaning
<b>←</b>	Switches to the previous parameter.
4	Confirms the parameter value and switches to the next parameter.
E	Opens the editing view of the parameter.

## 8.3.3 Editing view

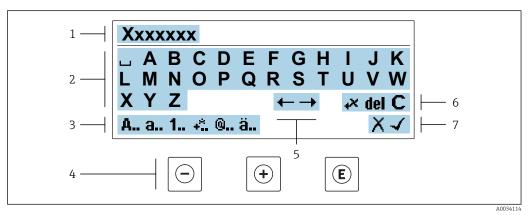
#### Numeric editor



■ 19 For entering values in parameters (e.g. limit values)

- tricering values in parameters (e.g. time values)
- Entry display area
   Input screen
- 3 Confirm, delete or reject entry
- 4 Operating elements

### Text editor



**■** 20 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 Move the entry position to the left.
+	Plus key Move the entry position to the right.

Operating key(s)	Meaning
E	<ul> <li>Enter key</li> <li>Press the key briefly: confirm your selection.</li> <li>Press the key for 2 s: confirm the entry.</li> </ul>
-++	Escape key combination (press keys simultaneously) Close the editing view without accepting the changes.

## *Input screens*

Symbol	Meaning
Α	Upper case
a	Lower case
1	Numbers
+*	Punctuation marks and special characters: = + - * / $^2$ $^3$ $^1$ /4 $^1$ /2 $^3$ /4 ( ) [ ] < > { }
0	Punctuation marks and special characters: ' " ` ^. , ; : ? ! % $\mu$ ° $\in$ \$ £ ¥ § @ # / \ I ~ & _
ä	Umlauts and accents

## Controlling data entries

Symbol	Meaning
←→	Move entry position
X	Reject entry
4	Confirm entry
.v₊	Delete character immediately to the left of the entry position
del	Delete character immediately to the right of the entry position
С	Clear all the characters entered

## 8.3.4 Operating elements

Operating key(s)	Meaning
	Minus key In a menu, submenu Moves the selection bar upwards in a picklist. With a Wizard Confirms the parameter value and goes to the previous parameter. With a text and numeric editor Move the entry position to the left.
<b>(+)</b>	Plus key In a menu, submenu Moves the selection bar downwards in a picklist. With a Wizard Confirms the parameter value and goes to the next parameter. With a text and numeric editor Move the entry position to the right.
E	Enter key  For operational display Pressing the key briefly opens the operating menu.  In a menu, submenu  Pressing the key briefly: Opens the selected menu, submenu or parameter. Starts the wizard. If help text is open, closes the help text of the parameter. Pressing the key for 2 s for parameter: If present, opens the help text for the function of the parameter.  With a Wizard Opens the editing view of the parameter.  With a text and numeric editor Press the key briefly: confirm your selection. Press the key for 2 s: confirm the entry.
(a)+(+)	Escape key combination (press keys simultaneously)  In a menu, submenu  Pressing the key briefly: Exits the current menu level and takes you to the next higher level. If help text is open, closes the help text of the parameter. Pressing the key for 2 s returns you to the operational display ("home position").  With a Wizard Exits the wizard and takes you to the next higher level.  With a text and numeric editor Close the editing view without accepting the changes.
(-)+E	<ul> <li>Minus/Enter key combination (press the keys simultaneously)</li> <li>If the keypad lock is active:     Press the key for 3 s: deactivate the keypad lock.</li> <li>If the keypad lock is not active:     Press the key for 3 s: the context menu opens along with the option for activating the keypad lock.</li> </ul>

## 8.3.5 Opening the context menu

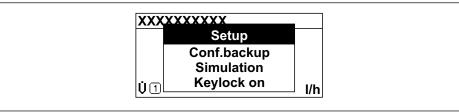
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Data backup
- Simulation

## Calling up and closing the context menu

The user is in the operational display.

- 1. Press the  $\square$  and  $\square$  keys for longer than 3 seconds.
  - └ The context menu opens.



A0034608-F

- 2. Press  $\Box$  +  $\pm$  simultaneously.
  - ► The context menu is closed and the operational display appears.

### Calling up the menu via the context menu

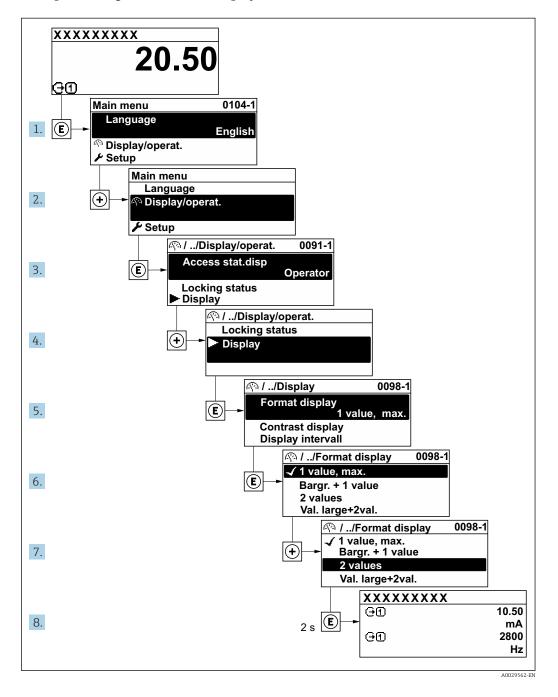
- 1. Open the context menu.
- 2. Press 🛨 to navigate to the desired menu.
- 3. Press 🗉 to confirm the selection.
  - ► The selected menu opens.

## 8.3.6 Navigating and selecting from list

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

For an explanation of the navigation view with symbols and operating elements  $\rightarrow \stackrel{\square}{=} 54$ 

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



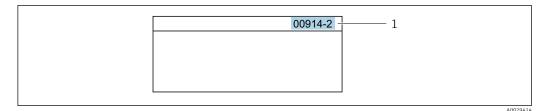
## 8.3.7 Calling the parameter directly

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

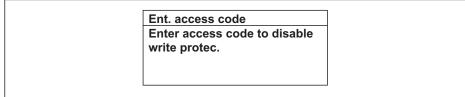
### 8.3.8 Calling up help text

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.



A0014002-EI

- 21 Example: Help text for parameter "Enter access code"
- 2. Press  $\Box$  +  $\pm$  simultaneously.
  - ► The help text is closed.

## 8.3.9 Changing the parameters

Parameters can be changed via the numeric editor or text editor.

- Numeric editor: Change values in a parameter, e.g. specifications for limit values.
- Text editor: Enter text in a parameter, e.g. tag name.

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

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

A0014049-E

For a description of the editing view - consisting of the text editor and numeric editor - with symbols  $\rightarrow \triangleq 56$ , for a description of the operating elements  $\rightarrow \triangleq 58$ 

### 8.3.10 User roles and related access authorization

### 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).	V	V
After an access code has been defined.	V	<b>✓</b> 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.	V	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  $\rightarrow$  Access status

### 8.3.11 Disabling write protection via access code

If the  $\square$ -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  $\rightarrow \square$  128.

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

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

- 2. Enter the access code.
  - The \( \bar{\text{\alpha}}\) -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

### 8.3.12 Enabling and disabling the keypad lock

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

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

#### Switching on the keypad lock

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

### To activate the keylock manually:

- 1. The device is in the measured value display.

  Press the □ and □ keys for 3 seconds.
  - ► A context menu appears.
- 2. In the context menu select the **Keylock on** option.
  - ► The keypad lock is switched on.
- If the user attempts to access the operating menu while the keypad lock is active, the **Keylock on** message appears.

### Switching off the keypad lock

- ► The keypad lock is switched on.

  Press the □ and □ keys for 3 seconds.
  - ► The keypad lock is switched off.

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

### 8.4.1 Function 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  $\mathbf{G}$  "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 Connection via Wireless LAN. connector.		
Screen	Recommended size: ≥12" (depends on the screen resolution)		

## Computer software

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

## Computer settings

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 <i>Use a Proxy Server for Your LAN</i> must be <b>deselected</b> .		
JavaScript	JavaScript must be enabled.		
	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.		
	When installing a new firmware version: To enable correct data display clear the temporary memory (cache) of the Web browser under <b>Internoptions</b> .		
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.	

 $\blacksquare$  In the event of connection problems:  $\rightarrow$   $\blacksquare$  142

Measuring device: Via CDI-RJ45 service interface

Device	CDI-RJ45 service interface	
Measuring device	The measuring device has an RJ45 interface.	
Web server	Web server must be enabled; factory setting: ON	
For information on enabling the Web server $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $		

Measuring device: via WLAN interface

Device	WLAN interface
Measuring device	The measuring device has a WLAN antenna:  Transmitter with integrated WLAN antenna Transmitter with external WLAN antenna
Web server	Web server and WLAN must be enabled; factory setting: ON  For information on enabling the Web server →   69

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

IP address of the device: 192.168.1.212 (factory setting)

- 1. Switch on the measuring device.
- 2. Connect to the computer using a cable  $\rightarrow \triangleq 70$ .
- 3. If a 2nd network card is not used, close all the applications on the notebook.
  - Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.
- 4. Close any open Internet browsers.
- 5. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

IP address	192.168.1.XXX; for XXX all numerical sequences except: 0, 212 and 255 $\rightarrow$ 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.

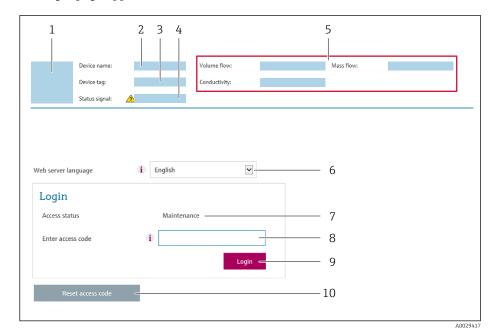
### Disconnecting

► 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
- ) Login
- 10 Reset access code ( $\rightarrow \equiv 125$ )

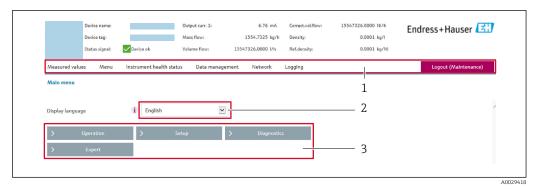
## 8.4.4 Logging on

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

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

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

## 8.4.5 User interface



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

### Header

The following information appears in the header:

- Device name
- Device tag
- Device status with status signal → 🖺 148
- Current measured values

### **Function row**

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

### Navigation area

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

### Working area

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

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

### 8.4.6 Disabling the Web server

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

### Navigation

"Expert" menu  $\rightarrow$  Communication  $\rightarrow$  Web server

### Parameter overview with brief description

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

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

Option	Description
Off	<ul><li>The web server is completely disabled.</li><li>Port 80 is locked.</li></ul>
On	<ul> <li>The complete functionality of the web server is available.</li> <li>JavaScript is used.</li> <li>The password is transferred in an encrypted state.</li> <li>Any change to the password is also transferred in an encrypted state.</li> </ul>

### Enabling the Web server

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

- Via 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)  $\rightarrow$   $\bigcirc$  65.

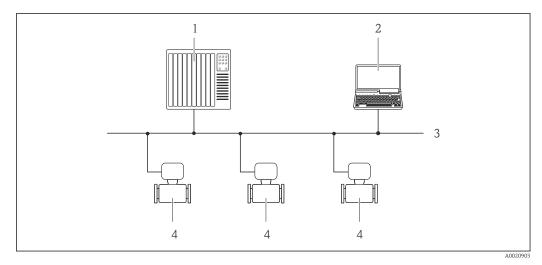
## 8.5 Access to the operating menu via the operating tool

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 PROFIBUS DP network

This communication interface is available in device versions with PROFIBUS DP.



■ 22 Options for remote operation via PROFIBUS DP network

- 1 Automation system
- 2 Computer with PROFIBUS network card
- 3 PROFIBUS DP network
- 4 Measuring device

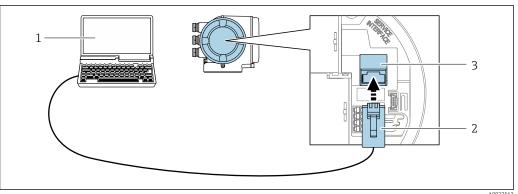
#### Service interface

*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.

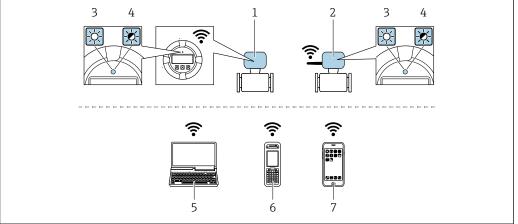


#### **2**3 € Connection via service interface (CDI-RJ45)

- Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated  $device\ Web\ server\ or\ with\ "Field Care",\ "Device Care"\ operating\ tool\ with\ COM\ DTM\ "CDI\ Communication\ TCP/IP"$
- 2 Standard Ethernet connecting cable with RJ45 connector
- 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"



A0034570

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

Encryption	WPA2-PSK AES-128 (in accordance with IEEE 802.11i)
Configurable WLAN channels	1 to 11
Degree of protection	IP67
Available antennas	<ul> <li>Internal antenna</li> <li>External antenna (optional)         In the event of poor transmission/reception conditions at the place of installation.     </li> <li>Only one antenna active in each case!</li> </ul>

Max. range	50 m (164 ft)
Materials: External WLAN antenna	<ul> <li>Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass</li> <li>Adapter: Stainless steel and nickel-plated brass</li> <li>Cable: Polyethylene</li> <li>Connector: Nickel-plated brass</li> <li>Angle bracket: Stainless steel</li> </ul>

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 → 🗎 70
- WLAN interface → 🗎 71

# 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

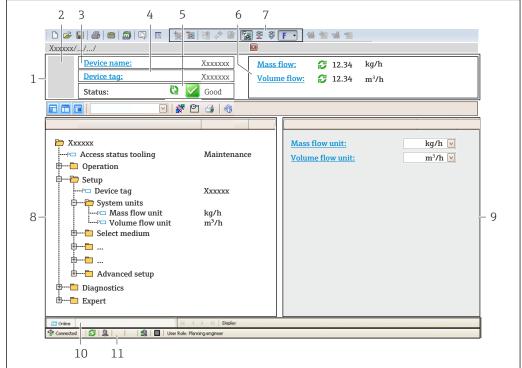
## Source for device description files

See information  $\rightarrow$   $\blacksquare$  75

## Establishing a connection

- 1. Start FieldCare and launch the project.
- 2. In the network: Add a device.
  - ► The **Add device** window opens.
- 3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.
- 4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.
- 5. Select the desired device from the list and press **OK** to confirm.
  - ► The **CDI Communication TCP/IP (Configuration)** window opens.
- 6. Enter the device address in the **IP address** field: 192.168.1.212 and press **Enter** to confirm.
- 7. Establish the online connection to the device.
- For additional information, see Operating Instructions BA00027S and BA00059S

## User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal→ 🖺 148
- 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  $\rightarrow \blacksquare 75$ 

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# 9 System integration

# 9.1 Overview of device description files

## 9.1.1 Current version data for the device

Firmware version	01.00.zz	<ul> <li>On the title page of the Operating instructions</li> <li>On the transmitter nameplate</li> <li>Firmware version         Diagnostics → Device information → Firmware version     </li> </ul>
Release date of firmware version	06.2018	
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x1570	Device type Diagnostics → Device information → Device type
Profile version	3.02	

f q For an overview of the different firmware versions for the device ightarrow f eta 181

# 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 PROFIBUS protocol	Sources for obtaining device descriptions
FieldCare	<ul> <li>www.endress.com → Download Area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>
DeviceCare	<ul> <li>www.endress.com → Download Area</li> <li>CD-ROM (contact Endress+Hauser)</li> <li>DVD (contact Endress+Hauser)</li> </ul>

# 9.2 Device master file (GSD)

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

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

With the Profile 3.02 device master file (GSD) it is possible to exchange field devices made by different manufacturers without having to reconfigure.

Generally speaking, it is possible to use two different GSDs with Profile 3.02 and higher: the manufacturer-specific GSD and the Profile GSD.

 Before configuring, the user must decide which GSD should be used to operate the system.

■ The setting can be changed via a Class 2 master.

# 9.2.1 Manufacturer-specific GSD

This GSD guarantees the unrestricted functionality of the measuring device. Device-specific process parameters and functions are therefore available.

Manufacturer-specific GSD	ID number	File name
PROFIBUS DP	0x1570	EH3x1570.gsd

The fact that the manufacturer-specific GSD should be used is specified in the **Ident number selector** parameter by selecting the **Manufacturer** option.

A

Where to acquire the manufacturer-specific GSD:

www.endress.com → Downloads area

## 9.2.2 Profile GSD

Differs in terms of the number of Analog Input blocks (AI) and the measured values. If a system is configured with a Profile GSD, it is possible to exchange devices made by different manufacturers. However, it is essential to ensure that the order of the cyclic process values is correct.

ID number	Supported blocks	Supported channels
0x9740	<ul><li>1 Analog Input</li><li>1 Totalizer</li></ul>	<ul><li>Channel Analog Input: volume flow</li><li>Channel totalizer: volume flow</li></ul>
0x9741	<ul><li>2 Analog Input</li><li>1 Totalizer</li></ul>	<ul> <li>Channel Analog Input 1: volume flow</li> <li>Channel Analog Input 2: mass flow</li> <li>Channel totalizer: volume flow</li> </ul>
0x9742	<ul><li>3 Analog Input</li><li>1 Totalizer</li></ul>	<ul> <li>Channel Analog Input 1: volume flow</li> <li>Channel Analog Input 2: mass flow</li> <li>Channel Analog Input 3: corrected volume flow</li> <li>Channel totalizer: volume flow</li> </ul>

The Profile GSD that is to be used is specified in the **Ident number selector** parameter by selecting the **Profile 0x9740** option, **Profile 0x9741** option or **Profile 0x9742** option.

# 9.3 Compatibility with earlier model

If the device is replaced, the Promag 300 measuring device supports the compatibility of the cyclic data with previous models. It is not necessary to adjust the engineering parameters of the PROFIBUS network with the Promag 300 GSD file.

Earlier models:

■ Promag 50 PROFIBUS DP

- ID No.: 1546 (hex)

Extended GSD file: EH3x1546.gsdStandard GSD file: EH3\_1546.gsd

Promag 53 PROFIBUS DP

- ID No.: 1526 (hex)

Extended GSD file: EH3x1526.gsdStandard GSD file: EH3\_1526.gsd

# 9.3.1 Automatic identification (factory setting)

The Promag 300 PROFIBUS DP automatically recognizes the measuring device configured in the automation system (Promag 50 PROFIBUS DP or Promag 53 PROFIBUS DP) and

makes the same input and output data and measured value status information available for cyclic data exchange.

Automatic identification is set in the **Ident number selector** parameter using the **Automatic mode** option (factory setting).

# 9.3.2 Manual setting

The manual setting is made in the **Ident number selector** parameter via the **Promag 50** (0x1546) option or **Promag 53** (0x1526) option.

Afterwards the Promag 300 PROFIBUS DP makes the same input and output data and measured value status information  $\rightarrow \blacksquare 150$  available for cyclic data exchange.

- If the Promag 300 PROFIBUS DP is acyclically configured via an operating program (Class 2 master), access is directly via the block structure or the parameters of the measuring device.
- If parameters have been changed in the device to be replaced (Promag 50 PROFIBUS DP oder Promag 53 PROFIBUS DP) (parameter setting no longer corresponds to the original factory setting), these parameters must be changed accordingly in the new Promag 300 PROFIBUS DP being used via an operating program (Class 2 master).

## Example

The assignment setting for low flow cut off has been changed from mass flow (factory setting) to corrected volume flow in a Promag 50 PROFIBUS DP currently in operation. This device is now replaced by a Promag 300 PROFIBUS DP.

After replacing the device, the assignment for the low flow cut off must also be changed manually in the Promag 300 PROFIBUS DP, i.e. to corrected volume flow, to ensure the measuring device behaves identically.

# 9.3.3 Replacing the measuring devices without changing the GSD file or restarting the controller

In the procedure described below, the device can be replaced without interrupting ongoing operation or restarting the controller. However with this procedure the measuring device is not fully integrated!

- 1. Replace the measuring device Promag 50 PROFIBUS DP or Promag 53 PROFIBUS DP by the Promag 300 PROFIBUS DP.
- 2. Set the device address: The same device address that was set for Promag 50 or Promag 53 PROFIBUS DP and is configured in the automation system must be used.
- 3. Connect the measuring device Promag 300 PROFIBUS DP.

If the factory setting had been changed on the replaced device (Promag 50 PROFIBUS DP or Promag 53 PROFIBUS DP), the following settings may need to be changed:

- 1. Configuration of the application-specific parameters.
- 2. Choice of process variables to be transmitted via the **Channel** parameter in the Analog Input or Totalizer function block.
- 3. Setting of the units for the process variables.

# 9.4 Using the GSD modules of the previous model

In the compatibility mode, all the modules already configured in the automation system are generally supported during cyclic data transmission. However, Promag 300 does not perform further processing for the following modules, i.e. the function is not executed:

- DISPLAY\_VALUE
- BATCHING QUANTITY
- BATCHING FIX COMP QUANTITY

If the device is replaced, the measuring device Promag 300 supports the compatibility of the cyclic data with previous models. It is not necessary to adjust the engineering parameters of the PROFIBUS network with the Promag 300 GSD file.

# 9.4.1 Using the CONTROL\_BLOCK module in the previous model

If the CONTROL\_BLOCK module is used in the previous model, the control variables are processed further if relevant functionalities can be assigned for the Promag 300.

The functions are supported as follows depending on the previous model:

Previous model: Promag 50 PROFIBUS DP

Control variable	Function	Support
0 → 2	Positive zero return: ON	Yes
0 → 3	Positive zero return: OFF	Yes
0 → 8	Measuring mode: UNIDIRECTIONAL	No
0 → 9	Measuring mode: BIDIRECTIONAL	Cause: The Profile Transducer Block Flow is no longer supported.
		To continue to use the functionality: Use the Totalizer operation mode parameter in the Totalizer function block.
0 → 24	UNIT TO BUS	No
		Cause: Functionality is no longer required as the unit is adopted automatically.

## Previous model: Promag 53 PROFIBUS DP

Control variable	Function	Support	
0 → 2	Positive zero return: ON	Yes	
0 → 3	Positive zero return: OFF	Yes	
0 → 5	Electrode cleaning circuit (ECC): OFF	Yes	
0 → 6	Electrode cleaning circuit (ECC): ON	Yes	
0 → 8	Measuring mode: UNIDIRECTIONAL	No	
0 → 9	Measuring mode: BIDIRECTIONAL	Cause: The Profile Transducer Block Flow is no longer supported.	
		To continue to use the functionality: Use the Totalizer operation mode parameter in the Totalizer function block.	
0 → 24	UNIT TO BUS	No	
		Cause: Functionality is no longer required as the unit is adopted automatically.	
0 → 50	Relay output 1: ON	Yes, terminals 24/25 (I/O 2)	
0 → 51	Relay output 1: OFF		

Control variable	Function	Support
0 → 55	Relay output 2: ON	Yes, terminals 22/23 (I/O 3)
0 → 56	Relay output 2: OFF	
0 → 30 to 46	Additional functions: Batching	No

# 9.5 Cyclic data transmission

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

## 9.5.1 Block model

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

Measuring device			Control system		
	Analog Input block 1 to 4	→ 🖺 81	Output value AI	$\rightarrow$	
			Output value TOTAL	$\rightarrow$	
	Totalizer block 1 to 3	→ 🖺 81	Controller SETTOT	<b>←</b>	
Flow			Configuration MODETOT	<b>←</b>	]
Block	Analog Output block 1 to 2	→ 🖺 83	Input values AO	+	PROFIBUS DP
	Discrete Input block 1 to 2	→ 🖺 84	Output values DI	<b>→</b>	
	Discrete Output block 1 to 5	→ 🖺 85	Input values DO	+	

## Defined order of modules

The measuring device works as a modular PROFIBUS slave. In contrast to a compact slave, a modular slave has a variable design and consists of several individual modules. The device master file (GSD) contains a description of the individual modules (input and output data) along with their individual properties.

The modules are permanently assigned to the slots, i.e. when configuring the modules, the order and the arrangement of the modules must be respected.

Slot	Module	Function block
1 to 4	AI	Analog Input block 1 to 4
5	TOTAL or SETTOT_TOTAL or SETOT_MODETOT_TOTAL.	Totalizer block 1
6		Totalizer block 2
7		Totalizer block 3
8 to 9	AO	Analog Output block 1 to 2
10 to 11	DI	Discrete Input block 1 to 2
12 to 16	DO	Discrete Output block 1 to 5

To optimize the data throughput rate of the PROFIBUS network, it is advisable to only configure modules that are processed in the PROFIBUS master system. If this results in gaps between the configured modules, these gaps must be assigned to the EMPTY\_MODULE.

# 9.5.2 Description of the modules

The data structure is described from the perspective of the PROFIBUS master:

- Input data: Are sent from the measuring device to the PROFIBUS master.
- Output data: Are sent from the PROFIBUS master to the measuring device.

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# AI module (Analog Input)

Transmit an input variable from the measuring device to the PROFIBUS master (Class 1).

The selected input variable, along with the status, is cyclically transmitted to the PROFIBUS Master (Class 1) via the AI module. The input variable is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the input variable.

Four Analog Input blocks are available (slot 1 to 4).

Selection: input variable

Input variable
Volume flow
Mass flow
Corrected volume flow
Flow velocity
Conductivity
Corrected conductivity
Temperature
Electronic temperature
Current input 1
Current input 2
Current input 3

# Factory setting

Function block	Factory setting
AI 1	Volume flow
AI 2	Mass flow
AI 3	Corrected volume flow
AI 4	Flow velocity

## Data structure

## Input data of Analog Input

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

## TOTAL module

Transmit a totalizer value from the measuring device to the PROFIBUS master (Class 1).

A selected totalizer value, along with the status, is cyclically transmitted to a PROFIBUS Master (Class 1) via the TOTAL module. The totalizer value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the totalizer value.

Three Totalizer blocks are available (slot 5 to 7).

## Selection: totalizer value

Input variable
Volume flow
Mass flow
Corrected volume flow

# Factory setting

Function block	Factory setting: TOTAL
Totalizer 1, 2 and 3	Volume flow

# Data structure

# Input data of TOTAL

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measure	d value: floating	point number (IE	EEE 754)	Status

# SETTOT\_TOTAL module

The module combination consists of the SETTOT and TOTAL functions:

- SETTOT: Control the totalizers via the PROFIBUS master.
- TOTAL: Transmit totalizer value, along with the status, to the PROFIBUS master.

Three Totalizer blocks are available (slot 5 to 7).

## Selection: control totalizer

Value SETTOT	Control totalizer
0	Totalize
1	Resetting
2	Adopt totalizer initial setting

# Factory setting

Function block	Factory setting: Value SETTOT (meaning)
Totalizer 1, 2 and 3	0 (totalizing)

# Data structure

# Output data of SETTOT

Byte 1
Control variable 1

# Input data of TOTAL

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measure	ed value: floating	point number (IE	EEE 754)	Status

# SETTOT\_MODETOT\_TOTAL module

The module combination consists of the SETTOT, MODETOT and TOTAL functions:

- SETTOT: Control the totalizers via the PROFIBUS master.
- MODETOT: Configure the totalizers via the PROFIBUS master.
- TOTAL: Transmit totalizer value, along with the status, to the PROFIBUS master.

Three Totalizer blocks are available (slot 5 to 7).

Selection: totalizer configuration

MODETOT value	Totalizer configuration
0	Balancing
1	Balance the positive flow
2	Balance the negative flow
3	Stop totalizing

## Factory setting

Function block	Factory setting: Value MODETOT (meaning)
Totalizer 1, 2 and 3	0 (balancing)

## Data structure

## Output data of SETTOT and MODETOT

Byte 1	Byte 2
Control variable 1: SETTOT	Control variable 2: MODETOT

## Input data of TOTAL

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measure	ed value: floating	point number (IE	EEE 754)	Status

## AO module (Analog Output)

Transmit a compensation value from the PROFIBUS master (Class 1) to the measuring device.

A compensation value, along with the status, is cyclically transmitted from the PROFIBUS Master (Class 1) to the measuring device via the AO module. The compensation value is depicted in the first four bytes in the form of a floating point number as per the IEEE 754 standard. The fifth byte contains standardized status information pertaining to the compensation value.

Two Analog Output blocks are available (slot 8 to 9).

# Assigned compensation values

A compensation value is permanently assigned to the individual Analog Output blocks.

Function block	Compensation value
AO 1	External temperature <sup>1)</sup>
AO 2	External density

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

The selection is made via: Expert  $\rightarrow$  Sensor  $\rightarrow$  External compensation

## Data structure

## Output data of Analog Output

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

# DI module (Discrete Input)

Transmit discrete input values from the measuring device to the PROFIBUS master (Class 1). Discrete input values are used by the measuring device to transmit the state of device functions to the PROFIBUS master (Class 1).

The DI module cyclically transmits the discrete input value, along with the status, to the PROFIBUS Master (Class 1). The discrete input value is depicted in the first byte. The second byte contains standardized status information pertaining to the input value.

Two Discrete Input blocks are available (slot 10 to 11).

Selection: device function

Device function	Factory setting: Status (meaning)		
Empty pipe detection	<ul><li>0 (device function not active)</li></ul>		
Low flow cut off	■ 1 (device function active)		
Status verification $^{1)}$	<ul> <li>Bit 0: Verification status - Check not done</li> <li>Bit 1: Verification status - Failed</li> <li>Bit 2: Verification status - Busy</li> <li>Bit 3: Verification status - Ready</li> <li>Bit 4: Verification overall result - Failed</li> <li>Bit 5: Verification overall result - Passed</li> <li>Bit 6: Verification overall result - Check not done</li> <li>Bit 7: Not used</li> </ul>		

1) Only available with the Heartbeat Verification application package

## Factory setting

Function block	Factory setting
DI 1	Empty pipe detection
DI 2	Low flow cut off

## Data structure

Input data of Discrete Input

Byte 1	Byte 2	
Discrete	Status	

## DO module (Discrete Output)

Transmit discrete output values from the PROFIBUS master (Class 1) to the measuring device. Discrete output values are used by the PROFIBUS master (Class 1) to enable and disable device functions.

The DO module cyclically transmits the discrete output value, along with the status, to the measuring device. The discrete output value is depicted in the first byte. The second byte contains standardized status information pertaining to the output value.

Five Discrete Output blocks are available (slot 12 to 16).

## Assigned device functions

A device function is permanently assigned to the individual Discrete Output blocks.

Function block	Device function	Values: control (meaning)
DO 1	Flow override	■ 0 (disable device function)
DO 2	Start verification 1)	■ 1 (enable device function)
DO 4 (I/O 2)	Relay output or switch	• 0 (non-conductive)
DO 5 (I/O 3)	output of the pulse/ frequency/switch output	■ 1 (conductive)
DO 6	Is not used.	

1) Only available with the Heartbeat Verification application package

# Data structure

Output data of Discrete Output

Byte 1	Byte 2	
Discrete	Status	

## EMPTY\_MODULE module

This module is used to assign empty spaces arising from modules not being used in the slots .

The measuring device works as a modular PROFIBUS slave. In contrast to a compact slave, a modular PROFIBUS slave has a variable design and consists of several individual modules. The GSD file contains a description of the individual modules along with their individual properties.

The modules are permanently assigned to the slots. When configuring the modules, it is absolutely essential to observe the sequence/arrangement of the modules. Any gaps between the configured modules must be filled with the EMPTY\_MODULE.

# 9.6 Address shifting configuration

# 9.6.1 Function description

The field device also makes acyclic communication services available in addition to cyclic communication. This enables automation systems (PLCs), central engineering stations and asset management systems to exchange data acyclically with the field device. This mode of communication is typically used to configure the field device. Here, addressing at the communication level is implemented by PROFIBUS for slot and index value pairs. The field device makes process and configuration parameters available over a wide range of slot and index values. Currently not all control systems are able to handle communication with such a large address area. Therefore, the field device provides the option of mirroring parameters to slot 0 with the "Address shifting configuration" function. All common masters allow access to slot 0. In the PLC, slot 0 of the field device is generally on the diagnostic address of the relevant field device.

## 9.6.2 Structure

With the "Address shifting configuration" function, 2 address areas are defined in slot 0, the configuration area (index 190 to 221) and the assigned data area (index 230 to 245). The configuration area defines which parameters should be managed.

The configuration area contains the indexes 190 to 221 with which up to 16 parameters can be managed. Two indexes are used per parameter:

- The first index is for the slot value of the parameter
- The second index is for the index value of the parameter

The data area contains the indexes 230 to 245 in slot 0 and is permanently assigned to the configuration area.

	Configuration area	Fixed	Data area			
Slot 0, Index	User entry	assignment	Slot 0, Index	User entry		
190	Slot value for parameter 1	<b>→</b>	230	Value for parameter-specific selection		
191	Index value for parameter 1					
192	Slot value for parameter 2	<b>→</b>	231	Value for parameter-specific		
193	Index value for parameter 2	,		selection		
194 to 21	194 to 219					
220	Slot value for parameter 16	<b>→</b>	245	Value for parameter-specific		
221	Index value for parameter 16	,		selection		

#### 9.6.3 Configuring address shifting

When configuring, the specific slot and index values of the parameters must be entered in the configuration area. This area can contain up to 32 entries for 16 parameters. Address shifting configuration supports float- and integer-type parameters with read and write access.

Address shifting can be configured via:

- Local display
- Configuration tool (e.g. FieldCare/DeviceCare)
- PROFIBUS master

Address shifting is configured in the menu Expert  $\rightarrow$  Communication  $\rightarrow$  Address shifting configuration:

## Example

	Configuration area			Data area		
Slot 0, Index	Entry = paramete	er	Fixed assignment	Slot 0, Index		
190	Slot shifting 1 parameter: 48	- = Volume flow unit	<del>)</del>	230	1349 = m³/h	
191	Index shifting 1 parameter: 24	volume now unit				
192	Slot shifting 2 parameter: 48	= Temperature unit	<del>)</del>	231	1001 = °C	
193	Index shifting 2 parameter: 7	- Temperature unit				
194 to 21	9					
220	Slot shifting 16 parameter: 54		tection →	245	9 = On	
221 <b>Index shifting</b> = 3 <b>16</b> parameter: 30		= Empty pipe detection				

The entry values are taken from the device-specific slot/index table. The following excerpt shows the values for the volume flow unit and the temperature unit in the example above.

Description	Slot	Index	Data type	Size [bytes]	Range
Volume flow unit	48	24	Enum16	2	 1348 : m³/min 1349 : m³/h 1350 : m³/d 
Temperature unit	48	7	Enum16	2	1001:℃ 1002:℉ 1000:K 1003:㎡

For more information on the "slot/index table", please contact the Endress+Hauser Sales Center.

#### 9.6.4 Accessing data via PROFIBUS DP

The PROFIBUS master uses the indexes 230 to 245 in slot 0 to access the address shifting data area. If, for example, slot 48, index 24 has been entered for the volume flow

parameter via address shifting, the master can read out the current volume flow measured value in slot 0 and index 230.

The data type (integer/float) and data access (read/write) depend on the parameter entered in the configuration area. If the parameter entered supports read and write access, the parameter can also be read- and write-accessed via the data area.

#### 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 → 🗎 48

#### 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"  $\rightarrow \Box$  141.

#### 10.3 Connecting via FieldCare

- For FieldCare → 🖺 70 connection
- For connecting via FieldCare → 🖺 73
- For the FieldCare → 🗎 74 user interface

#### 10.4 Configuring the device address via software

In the "Communication" submenu the device address can be set.

## **Navigation**

"Setup" menu  $\rightarrow$  Communication  $\rightarrow$  Device address

#### 10.4.1 PROFIBUS network

At time of delivery, the measuring device has the following factory setting:

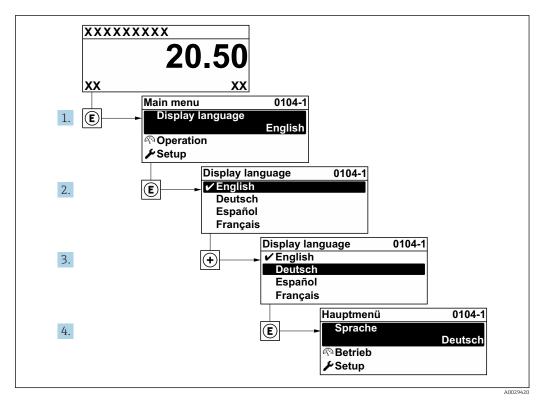
Device address	126			
----------------	-----	--	--	--



- To display the current device address: **Device address** parameter → 🗎 93
- If hardware addressing is active, software addressing is blocked → 🖺 46

#### 10.5 Setting the operating language

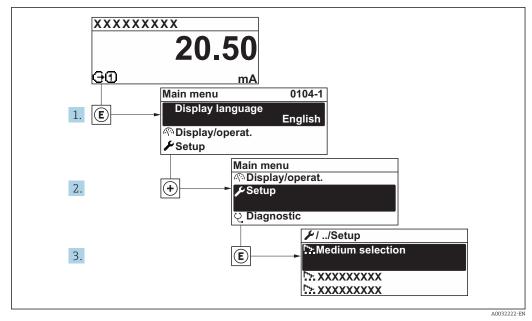
Factory setting: English or ordered local language



■ 24 Taking the example of the local display

# 10.6 Configuring the measuring device

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

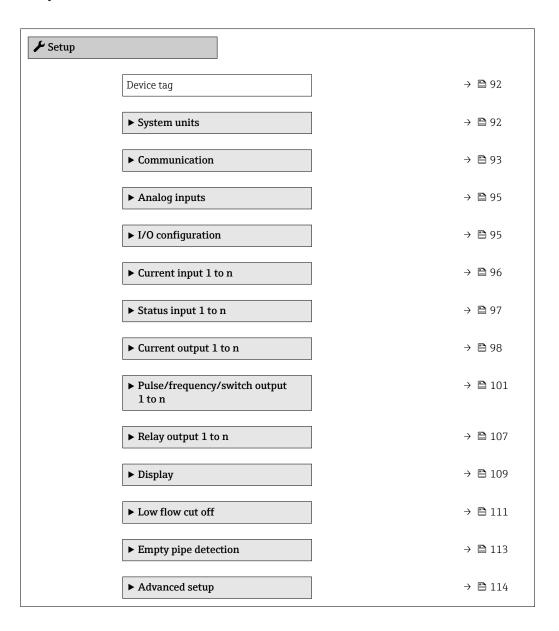


■ 25 Taking the example of the local display

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

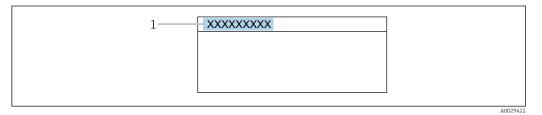
# Navigation

"Setup" menu



# 10.6.1 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.



26 Header of the operational display with tag name

1 Tag name

# 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. @, %, /).	Promag300/500DP

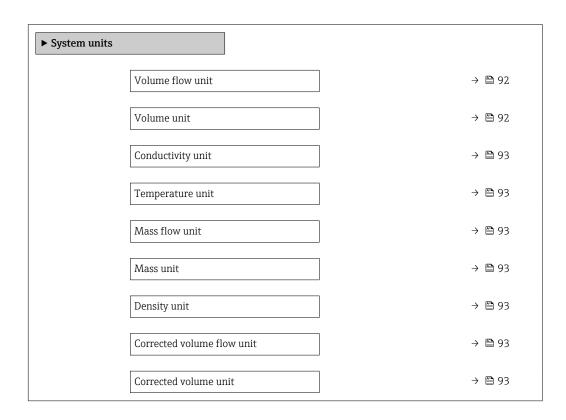
# 10.6.2 Setting the system units

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.  Result  The selected unit applies for:  Output  Low flow cut off  Simulation process variable	Unit choose list	Country-specific:  l/h gal/min (us)
Volume unit	-	Select volume unit.	Unit choose list	Country-specific:  m³ gal (us)

Parameter	Prerequisite	Description	Selection	Factory setting
Conductivity unit	The <b>On</b> option is selected in the <b>Conductivity measurement</b> parameter parameter.	Select conductivity unit.  Effect  The selected unit applies for: Simulation process variable	Unit choose list	μS/cm
Temperature unit	-	Select temperature unit.  Result  The selected unit applies for:  Temperature parameter  Maximum value parameter  Minimum value parameter  External temperature parameter  Maximum value parameter  Minimum value parameter  Minimum value parameter	Unit choose list	Country-specific:  C F
Mass flow unit	-	Select mass flow unit.  Result  The selected unit applies for:  Output  Low flow cut off Simulation process variable	Unit choose list	Country-specific:  kg/h  lb/min
Mass unit	-	Select mass unit.	Unit choose list	Country-specific:  kg lb
Density unit	-	Select density unit.  Result  The selected unit applies for:  Output  Simulation process variable	Unit choose list	Country-specific:  • kg/l  • lb/ft <sup>3</sup>
Corrected volume flow unit	-	Select corrected volume flow unit.  *Result*  The selected unit applies for:  *Corrected volume flow*  *parameter (→   *\begin{align*}	Unit choose list	Country-specific: NI/h Sft³/h
Corrected volume unit	-	Select corrected volume unit.	Unit choose list	Country-specific:  Nm³ Sft³

# 10.6.3 Configuring 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  $\rightarrow$  Communication



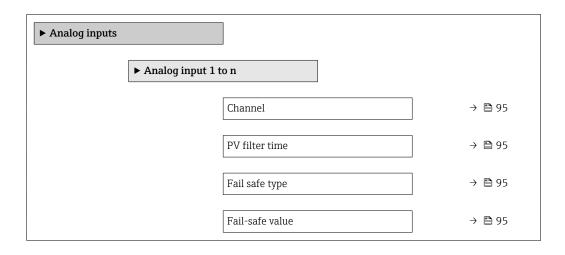
Parameter	Description	User entry	Factory setting
Device address	Enter device address.	0 to 126	126

# 10.6.4 Configuring the analog inputs

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

## Navigation

"Setup" menu  $\rightarrow$  Analog inputs



# Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Channel	-	Select the process variable.	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity</li> <li>Corrected conductivity</li> <li>Temperature</li> <li>Electronic temperature</li> <li>Current input 1 *</li> <li>Current input 2 *</li> <li>Current input 3 *</li> </ul>	Volume flow
PV filter time	-	Specify the time to suppress signal peaks. During the specified time the analog input does not respond to an erratic increase in the process variable.	Positive floating- point number	0
Fail safe type	-	Select the failure mode.	<ul><li>Fail-safe value</li><li>Fallback value</li><li>Off</li></ul>	Off
Fail-safe value	In <b>Fail safe type</b> parameter, the <b>Fail-safe value</b> option is selected.	Specify the values to be output when an error occurs.	Signed floating-point number	0

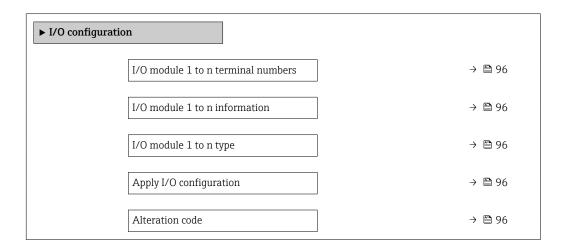
Visibility depends on order options or device settings

# 10.6.5 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  $\rightarrow$  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.	<ul> <li>Not used</li> <li>26-27 (I/O 1)</li> <li>24-25 (I/O 2)</li> <li>22-23 (I/O 3)</li> </ul>	-
I/O module 1 to n information	Shows information of the plugged I/O module.	<ul><li>Not plugged</li><li>Invalid</li><li>Not configurable</li><li>Configurable</li><li>Profibus DP</li></ul>	-
I/O module 1 to n type	Shows the I/O module type.	<ul> <li>Off</li> <li>Current output*</li> <li>Current input*</li> <li>Status input*</li> <li>Pulse/frequency/switch output*</li> </ul>	Off
Apply I/O configuration	Apply parameterization of the freely configurable I/O module.	■ No ■ Yes	No
Alteration code	Enter the code in order to change the I/O configuration.	Positive integer	0

<sup>\*</sup> Visibility depends on order options or device settings

# 10.6.6 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



Signal mode	→ 🖺 97
0/4 mA value	→ 🖺 97
20 mA value	→ 🖺 97
Current span	→ 🖺 97
Failure mode	→ 🖺 97
Failure value	→ 🖺 97

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the current input module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	_
Signal mode	The measuring device is <b>not</b> approved for use in the hazardous area with type of protection Ex-i.	Select the signal mode for the current input.	Passive Active	Active
0/4 mA value	-	Enter 4 mA value.	Signed floating-point number	0
20 mA value	-	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Current span	-	Select current range for process value output and upper/lower level for alarm signal.	<ul> <li>420 mA</li> <li>420 mA NAMUR</li> <li>420 mA US</li> <li>020 mA</li> </ul>	Country-specific: 420 mA NAMUR 420 mA US
Failure mode	-	Define input behavior in alarm condition.	<ul><li>Alarm</li><li>Last valid value</li><li>Defined value</li></ul>	Alarm
Failure value	In the <b>Failure mode</b> parameter, the <b>Defined value</b> option is selected.	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	0

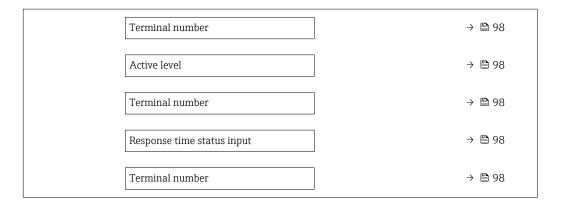
# 10.6.7 Configuring the status input

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  $\rightarrow$  Status input





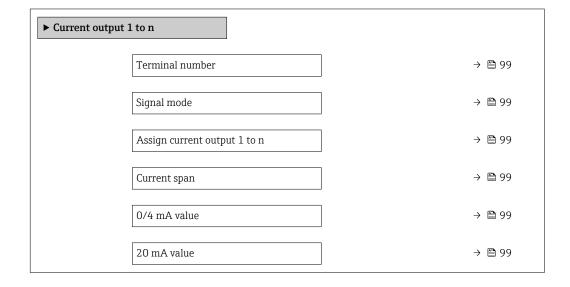
Parameter	Description	User interface / Selection / User entry	Factory setting
Terminal number	Shows the terminal numbers used by the status input module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Assign status input	Select function for the status input.	<ul> <li>Off</li> <li>Reset totalizer 1</li> <li>Reset totalizer 2</li> <li>Reset totalizer 3</li> <li>Reset all totalizers</li> <li>Flow override</li> </ul>	Off
Active level	Define input signal level at which the assigned function is triggered.	<ul><li>High</li><li>Low</li></ul>	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

# 10.6.8 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



Fixed current	→ 🖺 99
Damping output 1 to n	→ 🖺 99
Failure mode	→ 🗎 100
Failure current	→ 🖺 100

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Terminal number	-	Shows the terminal numbers used by the current output module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Signal mode	-	Select the signal mode for the current output.	<ul><li>Passive</li><li>Active</li></ul>	Active
Assign current output 1 to n	-	Select process variable for current output.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity</li> <li>Electronic temperature</li> </ul>	Volume flow
Current span	-	Select current range for process value output and upper/lower level for alarm signal.	<ul> <li>420 mA NAMUR</li> <li>420 mA US</li> <li>420 mA</li> <li>020 mA</li> <li>Fixed current</li> </ul>	Country-specific: • 420 mA NAMUR • 420 mA US
0/4 mA value	One of the following options is selected in the <b>Current span</b> parameter (→ 🖺 99):  • 420 mA NAMUR  • 420 mA US  • 420 mA  • 020 mA	Enter 4 mA value.	Signed floating-point number	Country-specific:  • 0 1/h  • 0 gal/min (us)
20 mA value	One of the following options is selected in the <b>Current span</b> parameter (→ 🖺 99):  420 mA NAMUR  420 mA US  420 mA  020 mA	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter
Fixed current	The <b>Fixed current</b> option is selected in the <b>Current span</b> parameter (→ 🖺 99).	Defines the fixed output current.	0 to 22.5 mA	22.5 mA
Damping output 1 to n	A process variable is selected in the <b>Assign current output</b> parameter (→ 🗎 99) and one of the following options is selected in the <b>Current span</b> parameter (→ 🗎 99):  • 420 mA NAMUR  • 420 mA US  • 420 mA  • 020 mA	Set reaction time for output signal to fluctuations in the measured value.	0.0 to 999.9 s	1.0 s

Parameter	Prerequisite	Description	User interface / Selection / User entry	Factory setting
Failure mode	A process variable is selected in the <b>Assign current output</b> parameter (→ 🖹 99) and one of the following options is selected in the <b>Current span</b> parameter (→ 🖺 99):  420 mA NAMUR  420 mA US  420 mA  020 mA	Define output behavior in alarm condition.	<ul><li>Min.</li><li>Max.</li><li>Last valid value</li><li>Actual value</li><li>Defined value</li></ul>	Max.
Failure current	The <b>Defined value</b> option is selected in the <b>Failure mode</b> parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

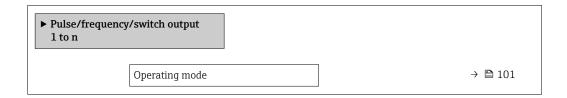
<sup>\*</sup> Visibility depends on order options or device settings

# 10.6.9 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  $\rightarrow$  Advanced setup  $\rightarrow$  Pulse/frequency/switch output



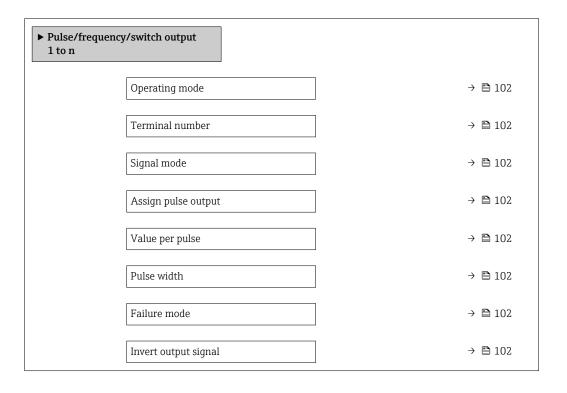
# Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Operating mode	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse

# Configuring the pulse output

# Navigation

"Setup" menu → Pulse/frequency/switch output



Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Terminal number	-	Shows the terminal numbers used by the PFS output module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Signal mode	-	Select the signal mode for the PFS output.	<ul><li>Passive</li><li>Active</li></ul>	Passive
Assign pulse output 1 to n	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter parameter.	Select process variable for pulse output.	<ul><li> Off</li><li> Volume flow</li><li> Mass flow</li><li> Corrected volume flow</li></ul>	Off
Value per pulse	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 101) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 102).	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🗎 101) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🗎 102).	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms
Failure mode	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 101) and a process variable is selected in the <b>Assign pulse output</b> parameter (→ 🖺 102).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>No pulses</li></ul>	No pulses
Invert output signal	-	Invert the output signal.	<ul><li>No</li><li>Yes</li></ul>	No

# Configuring the frequency output

# Navigation

"Setup" menu → Pulse/frequency/switch output

► Pulse/frequency/switch output 1 to n	
Operating mode	→ 🖺 103
Terminal number	→ 🖺 103
Signal mode	→ 🖺 103
Assign frequency output	→ 🖺 103
Minimum frequency value	→ 🖺 103

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Maximum frequency value	→ 🖺 103
Measuring value at minimum frequency	→ 🗎 103
Measuring value at maximum frequency	→ 🖺 104
Failure mode	→ 🖺 104
Failure frequency	→ 🖺 104
Invert output signal	→ 🖺 104

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Operating mode	-	Define the output as a pulse, frequency or switch output.	<ul><li>Pulse</li><li>Frequency</li><li>Switch</li></ul>	Pulse
Terminal number	-	Shows the terminal numbers used by the PFS output module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Signal mode	-	Select the signal mode for the PFS output.	Passive Active	Passive
Assign frequency output	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 101) parameter.	Select process variable for frequency output.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity*</li> <li>Electronic temperature</li> </ul>	Off
Minimum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 101) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 103).	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz
Maximum frequency value	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 101) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 103).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 🖺 101) and a process variable is selected in the <b>Assign frequency output</b> parameter (→ 🖺 103).	Enter measured value for minmum frequency.	Signed floating-point number	Depends on country and nominal diameter

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Measuring value at maximum frequency	The <b>Frequency</b> option is selected in the <b>Operating</b> mode parameter ( $\rightarrow \triangleq 101$ ) and a process variable is selected in the <b>Assign</b> frequency output parameter ( $\rightarrow \triangleq 103$ ).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The <b>Frequency</b> option is selected in the <b>Operating</b> mode parameter ( $\rightarrow \implies 101$ ) and a process variable is selected in the <b>Assign</b> frequency output parameter ( $\rightarrow \implies 103$ ).	Define output behavior in alarm condition.	<ul><li>Actual value</li><li>Defined value</li><li>0 Hz</li></ul>	0 Hz
Failure frequency	The <b>Frequency</b> option is selected in the <b>Operating</b> mode parameter ( $\rightarrow \triangleq 101$ ) and a process variable is selected in the <b>Assign</b> frequency output parameter ( $\rightarrow \triangleq 103$ ).	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	0.0 Hz
Invert output signal	-	Invert the output signal.	■ No ■ Yes	No

<sup>\*</sup> Visibility depends on order options or device settings

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# Configuring the switch output

# Navigation

"Setup" menu → Pulse/frequency/switch output

Pulse/free	quency/switch output	
	Operating mode	→ 🗎 105
	Terminal number	→ 🖺 105
	Signal mode	→ 🖺 105
	Switch output function	→ 🖺 106
	Assign diagnostic behavior	→ 🖺 106
	Assign limit	→ 🖺 106
	Assign flow direction check	→ 🖺 106
	Assign status	→ 🖺 106
	Switch-on value	→ 🖺 106
	Switch-off value	→ 🖺 106
	Switch-on delay	→ 🖺 106
	Switch-off delay	→ 🖺 107
	Failure mode	→ 🗎 107
	Invert output signal	→ 🖺 107

# Parameter overview with brief description

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

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Switch output function	The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter.	Select function for switch output.	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Status</li> </ul>	Off
Assign diagnostic behavior	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Diagnostic behavior option is selected.</li> </ul>	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm
Assign limit	<ul> <li>The Switch option is selected in the Operating mode parameter parameter.</li> <li>The Limit option is selected in the Switch output function parameter parameter.</li> </ul>	Select process variable for limit function.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity*</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Electronic temperature</li> </ul>	Volume flow
Assign flow direction check	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Flow direction check option is selected in the Switch output function parameter.</li> </ul>	Select process variable for flow direction monitoring.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> </ul>	Volume flow
Assign status	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Status option is selected in the Switch output function parameter.</li> </ul>	Select device status for switch output.	<ul> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> <li>Digital output 3</li> <li>Digital output 4</li> <li>Digital output 5</li> </ul>	Partially filled pipe detection
Switch-on value	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Limit option is selected.</li> </ul>	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
Switch-off value	<ul> <li>In the Operating mode parameter, the Switch option is selected.</li> <li>In the Switch output function parameter, the Limit option is selected.</li> </ul>	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
Switch-on delay	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	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	<ul> <li>The Switch option is selected in the Operating mode parameter.</li> <li>The Limit option is selected in the Switch output function parameter.</li> </ul>	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.	<ul><li>Actual status</li><li>Open</li><li>Closed</li></ul>	Open
Invert output signal	-	Invert the output signal.	<ul><li>No</li><li>Yes</li></ul>	No

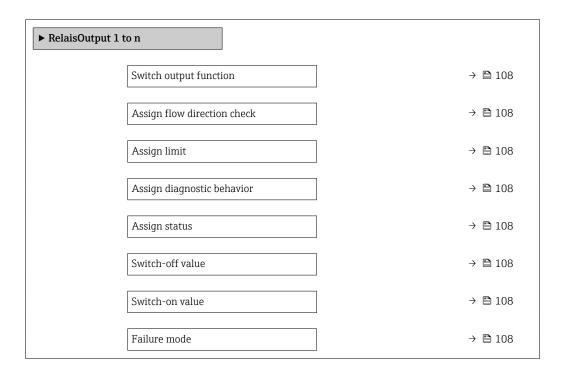
Visibility depends on order options or device settings

# 10.6.10 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  $\rightarrow$  Relay output 1 to n



Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Relay output function	-	Select the function for the relay output.	<ul> <li>Closed</li> <li>Open</li> <li>Diagnostic behavior</li> <li>Limit</li> <li>Flow direction check</li> <li>Digital Output</li> </ul>	Closed
Terminal number	-	Shows the terminal numbers used by the relay output module.	<ul><li>Not used</li><li>24-25 (I/O 2)</li><li>22-23 (I/O 3)</li></ul>	-
Assign flow direction check	In the <b>Relay output function</b> parameter, the <b>Flow direction check</b> option is selected.	Select process variable for flow direction monitoring.	<ul><li> Off</li><li> Volume flow</li><li> Mass flow</li><li> Corrected volume flow</li></ul>	Volume flow
Assign limit	The <b>Limit</b> option is selected in the <b>Relay output function</b> parameter parameter.	Select process variable for limit function.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity*</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Electronic temperature</li> </ul>	Volume flow
Assign diagnostic behavior	In the <b>Relay output function</b> parameter, the <b>Diagnostic behavior</b> option is selected.	Select diagnostic behavior for switch output.	<ul><li>Alarm</li><li>Alarm or warning</li><li>Warning</li></ul>	Alarm
Assign status	In the <b>Relay output function</b> parameter, the <b>Digital Output</b> option is selected.	Select device status for switch output.	<ul> <li>Partially filled pipe detection</li> <li>Low flow cut off</li> <li>Digital output 3</li> <li>Digital output 4</li> <li>Digital output 5</li> </ul>	Partially filled pipe detection
Switch-off value	In the <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific:  Ol/h  Ogal(us)/min
Switch-off delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> 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 <b>Relay output function</b> parameter, the <b>Limit</b> option is selected.	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific:  0 l/h 0 gal(us)/min
Switch-on delay	In the <b>Relay output function</b> parameter, the <b>Limit</b> 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.	<ul><li>Actual status</li><li>Open</li><li>Closed</li></ul>	Open

<sup>\*</sup> Visibility depends on order options or device settings

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# 10.6.11 Configuring the local display

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

### Navigation

"Setup" menu  $\rightarrow$  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.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1 value</li> <li>2 values</li> <li>1 value large + 2 values</li> <li>4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Current output 1</li> <li>Current output 2 *</li> <li>Current output 3 *</li> <li>Electronic temperature</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)

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

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
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 ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity ■ Corrected conductivity ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2 ■ Current output 3 ■ Current output 4 ■ Temperature ■ Electronic temperature	None

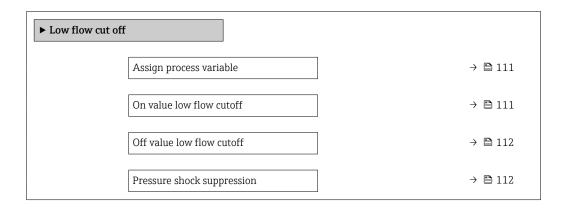
Visibility depends on order options or device settings

# $10.6.12 \ \ Configuring \ the \ low \ flow \ cut \ off$

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

### Navigation

"Setup" menu  $\rightarrow$  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.	<ul><li> Off</li><li> Volume flow</li><li> Mass flow</li><li> Corrected volume flow</li></ul>	Volume flow
On value low flow cutoff	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow \blacksquare 111$ ).	Enter on value for low flow cut off.	Positive floating- point number	Depends on country and nominal diameter

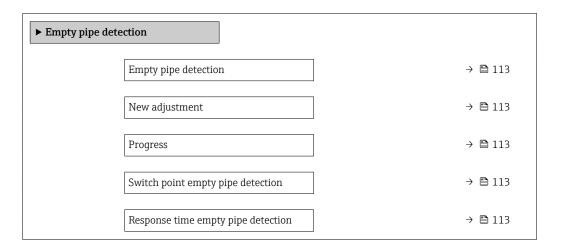
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Off value low flow cutoff	A process variable is selected in the <b>Assign process variable</b> parameter ( $\rightarrow  ext{ }  ext{ } $	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 111).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

# 10.6.13 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  $\rightarrow$  Empty pipe detection



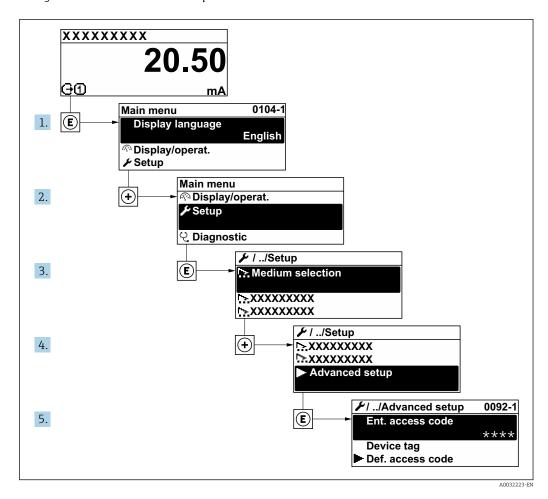
### Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Empty pipe detection	-	Switch empty pipe detection on and off.	Off On	Off
New adjustment	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Select type of adjustment.	<ul><li>Cancel</li><li>Empty pipe adjust</li><li>Full pipe adjust</li></ul>	Cancel
Progress	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Shows the progress.	<ul><li>Ok</li><li>Busy</li><li>Not ok</li></ul>	-
Switch point empty pipe detection	The <b>On</b> option is selected in the <b>Empty pipe detection</b> parameter.	Enter hysteresis in %, below this value the measuring tube will detected as empty.	0 to 100 %	10 %
Response time empty pipe detection	A process variable is selected in the <b>Assign process variable</b> parameter (→ 🖺 113).	Enter the time before diagnostic message S862 'Pipe empty' is displayed for empty pipe detection.	0 to 100 s	1s

# 10.7 Advanced settings

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

Navigation to the "Advanced setup" submenu

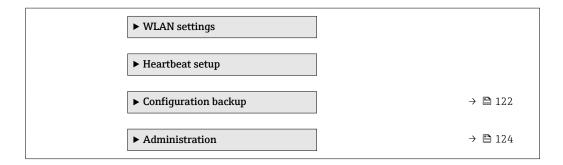


The number of submenus can vary depending on the device version. Some submenus are not dealt with in the Operating Instructions. These submenus and the parameters they contain are explained in the Special Documentation for the device.

### Navigation

"Setup" menu → Advanced setup

► Advanced setup	
Enter access code	
► Sensor adjustment	→ 🖺 115
► Totalizer 1 to n	→ 🖺 115
► Display	→ 🖺 117
► Electrode cleaning circuit	→ 🖺 120



### 10.7.1 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

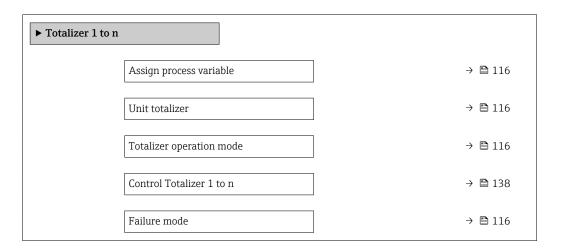
Parameter	Description	Selection	Factory setting
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	<ul><li>Flow in arrow direction</li><li>Flow against arrow direction</li></ul>	Flow in arrow direction

### 10.7.2 Configuring the totalizer

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

### Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Totalizer 1 to n



Parameter	Description	Selection	Factory setting
Assign process variable	Select process variable for totalizer.	<ul><li>Volume flow</li><li>Mass flow</li><li>Corrected volume flow</li></ul>	Volume flow
Unit totalizer	Select the unit for the process variable of the totalizer.	Unit choose list	Country-specific:  m³ ft³
Totalizer operation mode	Select totalizer calculation mode.	<ul> <li>Net flow total</li> <li>Forward flow total</li> <li>Reverse flow total</li> <li>Last valid value</li> </ul>	Net flow total
Failure mode	Define the totalizer behavior in the event of a device alarm.	<ul><li>Stop</li><li>Actual value</li><li>Last valid value</li></ul>	Actual value

# 10.7.3 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  $\rightarrow$  Advanced setup  $\rightarrow$  Display

▶ Dignlay			
► Display		_	
	Format display		→ 🖺 118
	Value 1 display		→ 🖺 118
	0% bargraph value 1		→ 🖺 118
	100% bargraph value 1		→ 🖺 118
	Decimal places 1		→ 🖺 118
	Value 2 display		→ 🖺 118
	Decimal places 2		→ 🖺 118
	Value 3 display		→ 🖺 119
	0% bargraph value 3		→ 🖺 119
	100% bargraph value 3		→ 🖺 119
	Decimal places 3		→ 🖺 119
	Value 4 display		→ 🖺 119
	Decimal places 4		→ 🖺 119
	Display language		→ 🖺 120
	Display interval		→ 🖺 120
	Display damping		→ 🖺 120
	Header		→ 🖺 120
	Header text		→ 🖺 120
	Separator		→ 🖺 120
	Backlight		→ 🖺 120

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul> <li>1 value, max. size</li> <li>1 bargraph + 1 value</li> <li>2 values</li> <li>1 value large + 2 values</li> <li>4 values</li> </ul>	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Current output 1</li> <li>Current output 2 *</li> <li>Current output 3 *</li> <li>Electronic temperature</li> </ul>	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  0 l/h 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the <b>Value 1 display</b> parameter.	Select the number of decimal places for the display value.	• X • X.X • X.XX • X.XXX • X.XXX	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	■ None ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Flow velocity ■ Conductivity ■ Corrected conductivity ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 ■ Current output 2 ■ Current output 3 ■ Current output 4 ■ Temperature ■ Electronic temperature	None
Decimal places 2	A measured value is specified in the <b>Value 2 display</b> parameter.	Select the number of decimal places for the display value.	<ul><li> x</li><li> x.x</li><li> x.xx</li><li> x.xxx</li><li> x.xxx</li></ul>	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.	<ul> <li>None</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity</li> <li>Corrected conductivity</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Current output 1</li> <li>Current output 2 *</li> <li>Current output 3 *</li> <li>Current output 4</li> <li>Temperature</li> <li>Electronic temperature</li> </ul>	None
0% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific:  • 0 l/h  • 0 gal/min (us)
100% bargraph value 3	A selection was made in the <b>Value 3 display</b> parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 3	A measured value is specified in the <b>Value 3 display</b> parameter.	Select the number of decimal places for the display value.	<ul><li> X</li><li> X.X</li><li> X.XX</li><li> X.XXX</li><li> X.XXXX</li></ul>	x.xx
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul> <li>None</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity</li> <li>Corrected conductivity</li> <li>Totalizer 1</li> <li>Totalizer 2</li> <li>Totalizer 3</li> <li>Current output 1</li> <li>Current output 2 *</li> <li>Current output 3 *</li> <li>Current output 4 *</li> <li>Temperature</li> <li>Electronic temperature</li> </ul>	None
Decimal places 4	A measured value is specified in the <b>Value 4 display</b> parameter.	Select the number of decimal places for the display value.	• x • x.x • x.xx • x.xxx • x.xxx	x.xx

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Display language	A local display is provided.	Set display language.	<ul> <li>English</li> <li>Deutsch*</li> <li>Français*</li> <li>Español*</li> <li>Italiano*</li> <li>Nederlands*</li> <li>Portuguesa*</li> <li>Polski*</li> <li>pyccкий язык (Russian)*</li> <li>Svenska*</li> <li>Türkçe*</li> <li>中文 (Chinese)*</li> <li>日本語 (Japanese)*</li> <li>한국어 (Korean)*</li> <li>誠治(Arabic)*</li> <li>Bahasa Indonesia*</li> <li>ภาษาไทย (Thai)*</li> <li>tiếng Việt (Vietnamese)*</li> <li>čeština (Czech)*</li> </ul>	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.	<ul><li>Device tag</li><li>Free text</li></ul>	Device tag
Header text	In the <b>Header</b> parameter, the <b>Free text</b> 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.	<ul><li>. (point)</li><li>, (comma)</li></ul>	. (point)
Backlight	One of the following conditions is met:  Order code for "Display; operation", option F "4-line, illum.; touch control"  Order code for "Display; operation", option G "4-line, illum.; touch control +WLAN"  Order code for "Display; operation", option O "Separate 4-line display, illum.; 10m/30ft cable; touch control"	Switch the local display backlight on and off.	<ul><li>Disable</li><li>Enable</li></ul>	Enable

<sup>\*</sup> Visibility depends on order options or device settings

# 10.7.4 Performing electrode cleaning

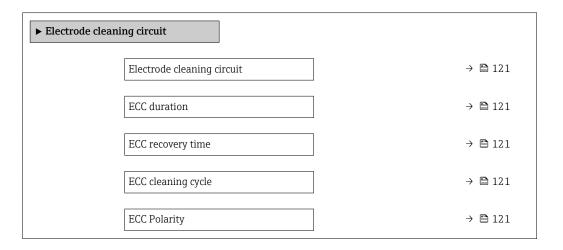
The **Electrode cleaning circuit** submenu contains parameters that must be configured for the configuration of electrode cleaning.

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

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### 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 • 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.	<ul><li>Positive</li><li>Negative</li></ul>	Depends on the electrode material:  Platinum: Negative option Tantalum, Alloy C22, stainless steel: Positive option

### 10.7.5 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  $\rightarrow$  Advanced setup  $\rightarrow$  WLAN Settings



Security type	→ 🖺 122
WLAN passphrase	→ 🖺 122
Assign SSID name	→ 🗎 122
SSID name	→ 🖺 122
Apply changes	→ 🖺 122

Parameter	Prerequisite	Description	User entry / Selection	Factory setting
WLAN IP address	-	Enter IP address of the device WLAN interface.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Network security	-	Select the security type of the WLAN network.	<ul> <li>Unsecured</li> <li>WPA2-PSK</li> <li>EAP-PEAP with MSCHAPv2</li> <li>EAP-PEAP MSCHAPv2 no server authentic.</li> <li>EAP-TLS</li> </ul>	WPA2-PSK
WLAN passphrase	The WPA2-PSK option is selected in the Security type parameter.	Enter the network key (8 to 32 characters).  The network key supplied with the device should be changed during commissioning for security reasons.	8 to 32-digit character string comprising numbers, letters and special characters	Serial number of the measuring device (e.g. L100A802000)
Assign SSID name	-	Select which name will be used for SSID: device tag or user-defined name.	<ul><li>Device tag</li><li>User-defined</li></ul>	User-defined
SSID name	<ul> <li>The User-defined option is selected in the Assign SSID name parameter parameter.</li> <li>The WLAN access point option is selected in the WLAN mode parameter parameter.</li> </ul>	Enter the user-defined SSID name (max. 32 characters).  The user-defined SSID name may only be assigned once. If the SSID name is assigned more than once, the devices can interfere with one another.	Max. 32-digit character string comprising numbers, letters and special characters	EH_device designation_last 7 digits of the serial number (e.g. EH_Promag_300_A 802000)
Apply changes	-	Use changed WLAN settings.	<ul><li>Cancel</li><li>Ok</li></ul>	Cancel

# 10.7.6 Configuration management

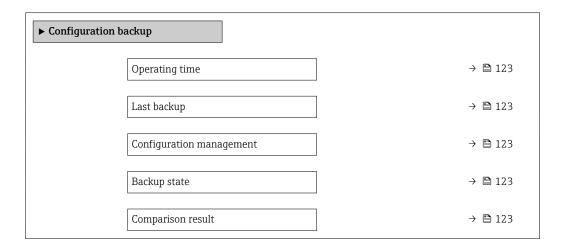
After commissioning, you can save the current device configuration or restore the previous device configuration.

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

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### Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  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.	<ul><li>Cancel</li><li>Execute backup</li><li>Restore</li><li>Compare</li><li>Clear backup data</li></ul>	Cancel
Backup state	Shows the current status of data saving or restoring.	<ul> <li>None</li> <li>Backup in progress</li> <li>Restoring in progress</li> <li>Delete in progress</li> <li>Compare in progress</li> <li>Restoring failed</li> <li>Backup failed</li> </ul>	None
Comparison result	Comparison of current device data with HistoROM backup.	<ul> <li>Settings identical</li> <li>Settings not identical</li> <li>No backup available</li> <li>Backup settings corrupt</li> <li>Check not done</li> <li>Dataset incompatible</li> </ul>	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.

Options	Description
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.

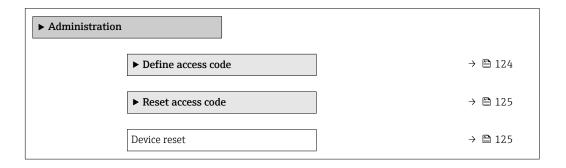
While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

### 10.7.7 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**

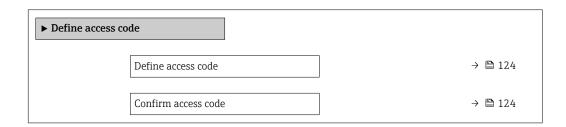
"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Administration



### Using the parameter to define the access code

### Navigation

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



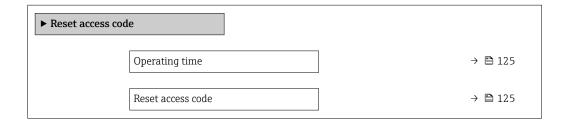
### Parameter overview with brief description

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  $\rightarrow$  Advanced setup  $\rightarrow$  Administration  $\rightarrow$  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.  For a reset code, contact your Endress+Hauser service organization.  The reset code can only be entered via:  Web browser  DeviceCare, FieldCare (via service interface CDI-RJ45)  Fieldbus	Character string comprising numbers, letters and special characters	0x00

### Using the parameter to reset the device

### Navigation

"Setup" menu  $\rightarrow$  Advanced setup  $\rightarrow$  Administration

### Parameter overview with brief description

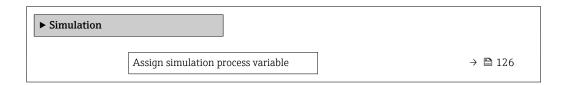
Parameter	Description	Selection	Factory setting
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul><li>Cancel</li><li>To delivery settings</li><li>Restart device</li><li>Restore S-DAT backup</li></ul>	Cancel

### 10.8 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



I	Process variable value	→ 🖺 126
	Status input simulation	→ 🖺 127
[1	input signal level	→ 🖺 127
	Current input 1 to n simulation	→ 🖺 127
	Value current input 1 to n	→ 🖺 127
	Current output 1 to n simulation	→ 🗎 127
7	Value current output 1 to n	→ 🖺 127
	Frequency output simulation 1 to n	→ 🖺 127
1	Frequency value 1 to n	→ 🖺 127
1	Pulse output simulation 1 to n	→ 🖺 127
[1	Pulse value 1 to n	→ 🖺 127
	Switch output simulation 1 to n	→ 🗎 127
	Switch status 1 to n	→ 🗎 127
	Relay output 1 to n simulation	→ ■ 127
	Switch status 1 to n	→ <b>1</b> 27
	Device alarm simulation	→ <b>1</b> 27
	Diagnostic event category	→ 🖺 128
I	Diagnostic event simulation	→ 🖺 128

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.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity*</li> </ul>	Off
Process variable value	A process variable is selected in the <b>Assign simulation process variable</b> parameter (→ 🖺 126).	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 On	Off
Input signal level	In the <b>Status input simulation</b> parameter, the <b>On</b> option is selected.	Select the signal level for the simulation of the status input.	■ High ■ Low	High
Current input 1 to n simulation	-	Switch simulation of the current input on and off.	Off On	Off
Value current input 1 to n	In the Current input 1 to n simulation parameter, the On option is selected.	Enter the current value for simulation.	0 to 22.5 mA	0 mA
Current output 1 to n simulation	-	Switch the simulation of the current output on and off.	Off 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 <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Switch the simulation of the frequency output on and off.	• Off • On	Off
Frequency value 1 to n	In the <b>Frequency output</b> simulation 1 to n parameter, the <b>On</b> option is selected.	Enter the frequency value for the simulation.	0.0 to 12500.0 Hz	0.0 Hz
Pulse output simulation 1 to n	In the <b>Operating mode</b> parameter, the <b>Pulse</b> option is selected.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→  102) defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	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 <b>Operating mode</b> parameter, the <b>Switch</b> option is selected.	Switch the simulation of the switch output on and off.	■ Off ■ On	Off
Switch status 1 to n	-	Select the status of the status output for the simulation.	<ul><li>Open</li><li>Closed</li></ul>	Open
Relay output 1 to n simulation	-	Switch simulation of the relay output on and off.	Off On	Off
Switch status 1 to n	The <b>On</b> option is selected in the <b>Switch output simulation 1 to n</b> parameter parameter.	Select status of the relay output for the simulation.	■ Open ■ Closed	Open
Pulse output simulation	-	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter defines the pulse width of the pulses output.	<ul><li>Off</li><li>Fixed value</li><li>Down-counting value</li></ul>	Off
Pulse value	In the Pulse output simulation parameter, the Down-counting value option is selected.	Set and switch off the pulse output simulation.	0 to 65 535	0
Device alarm simulation	-	Switch the device alarm on and off.	Off On	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Diagnostic event category	-	Select a diagnostic event category.	<ul><li>Sensor</li><li>Electronics</li><li>Configuration</li><li>Process</li></ul>	Process
Diagnostic event simulation	-	Select a diagnostic event to simulate this event.	<ul> <li>Off</li> <li>Diagnostic event picklist (depends on the category selected)</li> </ul>	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

# 10.9 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 → 

  ☐ 128
- Protect access to measuring device via write protection switch  $\rightarrow$  🗎 129

### 10.9.1 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 writeprotected 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 ( $\rightarrow \triangleq 124$ ).
- 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 ( $\rightarrow \triangleq 124$ ) 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.

- - The user role with which the user is currently logged on via the local display is indicated by the → 🖺 62 **Access status** parameter. Navigation path: Operation → Access status

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

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

	Parameters for configuring the local display	Parameters for configuring the totalizer
Language	Format display	Control Totalizer
	Contrast display	Preset value
	Display interval	

### Defining the access code via the Web browser

- 1. Navigate to the **Define access code** parameter ( $\rightarrow \triangleq 124$ ).
- 2. Define a max. 16-digit numeric code as an access code.
- 3. Enter the access code again in the **Confirm access code** parameter ( $\Rightarrow \triangleq 124$ ) 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 → 🗎 62.
  - 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

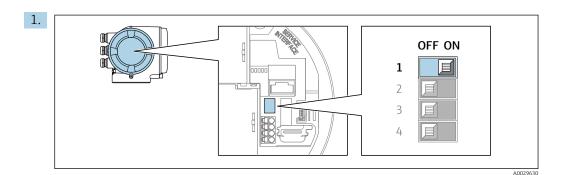
- For a reset code, contact your Endress+Hauser service organization.
- 1. Navigate to the **Reset access code** parameter ( $\rightarrow \triangleq 125$ ).
- 2. Enter the reset code.

### 10.9.2 Write protection via write protection switch

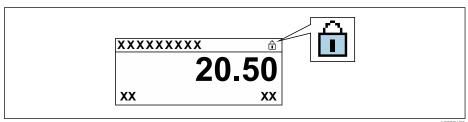
Unlike parameter write protection via a user-specific access code, this allows write access to the entire operating menu - except for the **"Contrast display" parameter** - to be locked.

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

- Via local display
- Via PROFIBUS DP protocol



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



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Endress+Hauser

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

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#### Operation 11

#### 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 <b>Access status</b> parameter applies $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $
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



Petailed information:

- To configure the operating language → 🖺 89
- For information on the operating languages supported by the measuring device → 🖺 206

#### 11.3 Configuring the display

Detailed information:

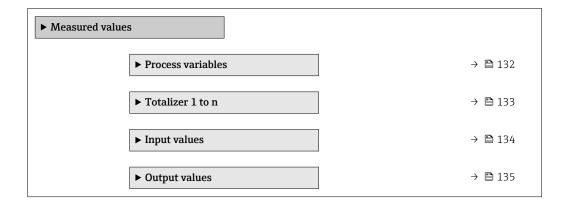
- On the advanced settings for the local display  $\rightarrow \implies 117$

#### 11.4 Reading measured values

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

### **Navigation**

"Diagnostics" menu → Measured values

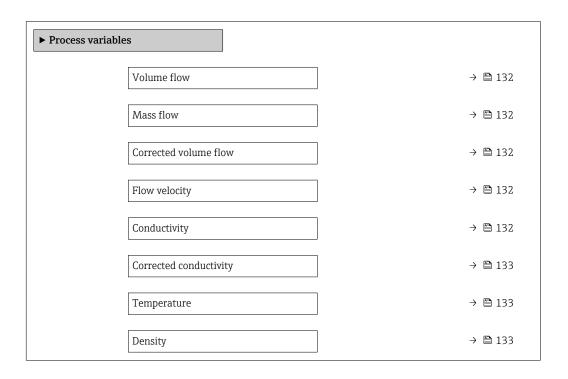


### 11.4.1 "Process variables" submenu

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

### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Process variables



### Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Volume flow	-	Displays the volume flow currently measured.	Signed floating-point number
		Dependency The unit is taken from the Volume flow unit parameter ( $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	
Mass flow	-	Displays the mass flow currently calculated.	Signed floating-point number
		Dependency The unit is taken from the Mass flow unit parameter ( $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	
Corrected volume flow	-	Displays the corrected volume flow currently calculated.	Signed floating-point number
		Dependency The unit is taken from the Corrected volume flow unit parameter $(\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	
Flow velocity	-	Displays the flow velocity currently calculated.	Signed floating-point number
Conductivity	_	Displays the conductivity currently measured.	Signed floating-point number
		Dependency The unit is taken from the Conductivity unit parameter ( $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	

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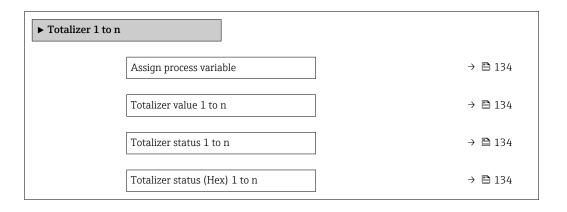
Parameter	Prerequisite	Description	User interface
Corrected conductivity	One of the following conditions is met:  Order code for "Sensor option", option CI "Medium temperature measurement" or The temperature is read into the flowmeter from an external device.	Displays the conductivity currently corrected.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

### 11.4.2 Totalizer

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

### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Totalizer 1 to n



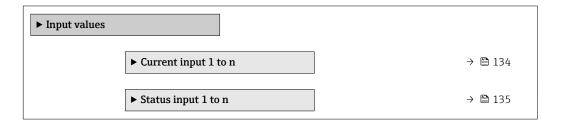
Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign process variable	_	Select process variable for totalizer.	<ul><li>Volume flow</li><li>Mass flow</li><li>Corrected volume flow</li></ul>	Volume flow
Totalizer value 1 to n	In the Assign process variable parameter one of the following options is selected:  Volume flow  Mass flow  Corrected volume flow  Total mass flow  Condensate mass flow  Energy flow  Heat flow difference	Displays the current totalizer counter value.	Signed floating-point number	0 m³
Totalizer status 1 to n	-	Displays the current totalizer status.	<ul><li>Good</li><li>Uncertain</li><li>Bad</li></ul>	-
Totalizer status (Hex) 1 to n	In <b>Target mode</b> parameter, the <b>Auto</b> option is selected.	Displays the current status value (hex) of the totalizer.	0 to 0xFF	-

# 11.4.3 "Input values" submenu

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

### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Input values

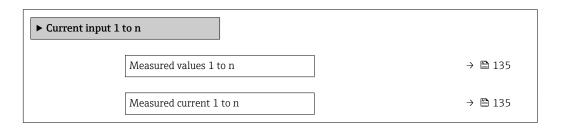


### Input values of current input

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  $\rightarrow$  Measured values  $\rightarrow$  Input values  $\rightarrow$  Current input 1 to n



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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  $\rightarrow$  Measured values  $\rightarrow$  Input values  $\rightarrow$  Status input 1 to n



### Parameter overview with brief description

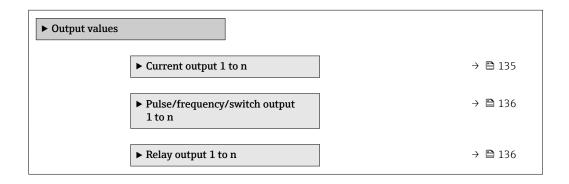
Parameter	Description	User interface
Value status input	Shows the current input signal level.	■ High ■ Low

### 11.4.4 Output values

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

### **Navigation**

"Diagnostics" menu → Measured values → Output values

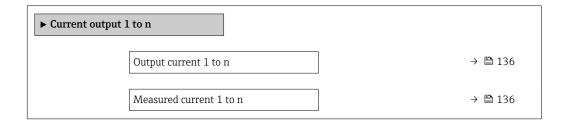


### Output values of current output

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

### **Navigation**

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Value current output 1 to n



### Parameter overview with brief description

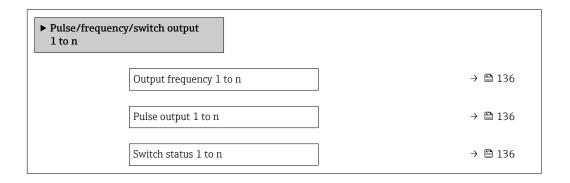
Parameter	Description	User interface
Output current 1	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA
Measured current	Displays the current value currently measured for the current output.	0 to 30 mA

### 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  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Pulse/frequency/switch output 1 to n



### Parameter overview with brief description

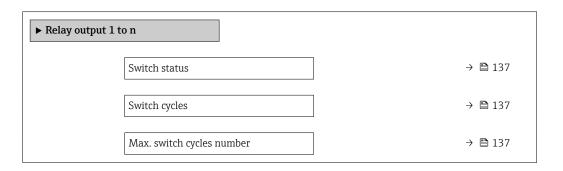
Parameter	Prerequisite	Description	User interface
Output frequency 1 to n	In the <b>Operating mode</b> parameter, the <b>Frequency</b> option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Pulse output 1 to n	The <b>Pulse</b> option is selected in the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

### Output values for relay output

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

### Navigation

"Diagnostics" menu  $\rightarrow$  Measured values  $\rightarrow$  Output values  $\rightarrow$  Relay output 1 to n



### Parameter overview with brief description

Parameter	Description	User interface
Switch status	Shows the current relay switch status.	<ul><li>Open</li><li>Closed</li></ul>
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 (→ **B** 90)
- Advanced settings using the Advanced setup submenu (→ 🗎 114)

# 11.6 Performing a totalizer reset

The totalizers are reset in the **Operation** submenu: Control Totalizer 1 to n

Function scope of the "Control Totalizer" parameter

Options	Description	
Totalize	The totalizer is started.	
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 $\bf Preset$ value 1 to $\bf n$ parameter.	

### Navigation

"Operation" menu → Totalizer handling



Preset value 1 to n	→ 🖺 138
Reset all totalizers	→ 🖺 138

Parameter	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	Control totalizer value.	<ul><li>Totalize</li><li>Reset + hold</li><li>Preset + hold</li></ul>	Totalize
Preset value 1 to n	Specify start value for totalizer.	Signed floating-point number	0 m <sup>3</sup>
Reset all totalizers	Reset all totalizers to 0 and start.	<ul><li>Cancel</li><li>Reset + totalize</li></ul>	Cancel

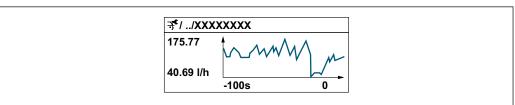
# 11.7 Showing data logging

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.

- Pata logging is also available via:
  - Plant Asset Management Tool FieldCare → 🖺 72.
  - 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

Assign channel 1
→ 🖺 139

Assign channel 2

Assign channel 2

Assign channel 3	→ 🖺 140
Assign channel 4	→ 🖺 140
Logging interval	→ 🖺 140
Clear logging data	→ 🖺 140
Data logging	→ 🖺 140
Logging delay	→ 🖺 140
Data logging control	→ 🖺 140
Data logging status	→ 🖺 140
Entire logging duration	→ 🖺 140
▶ Display channel 1	
▶ Display channel 2	
▶ Display channel 3	
▶ Display channel 4	
,	

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 1	The <b>Extended HistoROM</b> application package is available.	Assign process variable to logging channel.	<ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity*</li> <li>Electronic temperature</li> <li>Current output 1</li> <li>Current output 2</li> <li>Current output 3</li> <li>Current output 4</li> </ul>	Off
Assign channel 2	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Assign process variable to logging channel.	Picklist, see <b>Assign channel 1</b> parameter (→ 🖺 139)	Off

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Assign channel 3	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Assign process variable to logging channel.	Picklist, see <b>Assign</b> channel 1 parameter (→ 🖺 139)	Off
Assign channel 4	The Extended HistoROM application package is available.  The software options currently enabled are displayed in the Software option overview parameter.	Assign process variable to logging channel.	Picklist, see <b>Assign</b> channel 1 parameter (→ 🖺 139)	Off
Logging interval	The <b>Extended HistoROM</b> 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 <b>Extended HistoROM</b> application package is available.	Clear the entire logging data.	<ul><li>Cancel</li><li>Clear data</li></ul>	Cancel
Data logging	-	Select the data logging method.	<ul><li>Overwriting</li><li>Not overwriting</li></ul>	Overwriting
Logging delay	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Enter the time delay for measured value logging.	0 to 999 h	0 h
Data logging control	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Start and stop measured value logging.	<ul><li>None</li><li>Delete + start</li><li>Stop</li></ul>	None
Data logging status	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> option is selected.	Displays the measured value logging status.	<ul><li>Done</li><li>Delay active</li><li>Active</li><li>Stopped</li></ul>	Done
Entire logging duration	In the <b>Data logging</b> parameter, the <b>Not overwriting</b> 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 → 🖺 38.
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 → 🖺 183.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul> <li>Set the display brighter by simultaneously pressing ⊕ + E.</li> <li>Set the display darker by simultaneously pressing ⊕ + E.</li> </ul>
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 → 🗎 183.
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"). 2. Press □. 3. Set the desired language in the <b>Display language</b> parameter (→ 🖺 120).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul> <li>Check the cable and the connector between the main electronics module and display module.</li> <li>Order spare part →</li></ul>

### For output signals

Error	Possible causes	Solution	
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖺 183.	
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.	Check and correct parameter configuration.     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 sw main electronics module to position → 129.	
No write access to parameters	Current user role has limited access authorization	1. Check user role → 🖺 62. 2. Enter correct customer-specific access code → 🖺 62.
No connection via PROFIBUS DP	PROFIBUS DP bus cable connected incorrectly	Check terminal assignment → 🗎 36.
No connection via PROFIBUS DP	PROFIBUS DP cable incorrectly terminated	Check terminating resistor .
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 → 🖺 69.
	Incorrect setting for the Ethernet interface of the computer	1. Check the properties of the Internet protocol (TCP/IP) → 🗎 65. 2. Check the network settings with the IT manager.
Not connecting to Web server	Incorrect IP address	Check the IP address: 192.168.1.212 → 🖺 65
Not connecting to Web server	Incorrect WLAN access data	<ul> <li>Check WLAN network status.</li> <li>Log on to the device again using WLAN access data.</li> <li>Verify that WLAN is enabled on the measuring device and operating device .</li> </ul>
	WLAN communication disabled	-
Not connecting to Web server, FieldCare or DeviceCare	No WLAN network available	<ul> <li>Check if WLAN reception is present: LED on display module is lit blue</li> <li>Check if WLAN connection is enabled: LED on display module flashes blue</li> <li>Switch on instrument function.</li> </ul>
Network connection not present or unstable	WLAN network is weak.	<ul> <li>Operating device is outside of reception range: Check network status on operating device.</li> <li>To improve network performance, use an external WLAN antenna.</li> </ul>
	Parallel WLAN and Ethernet communication	<ul><li>Check network settings.</li><li>Temporarily enable only the WLAN as an interface.</li></ul>
Web browser frozen and operation no longer possible	Data transfer active	Wait until data transfer or current action is finished.
	Connection lost	Check cable connection and power supply.     Refresh the Web browser and restart if necessary.
Content of Web browser incomplete or difficult to read	Not using optimum version of Web server.	Use the correct Web browser version .     Clear the Web browser cache and restart the Web browser.
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.

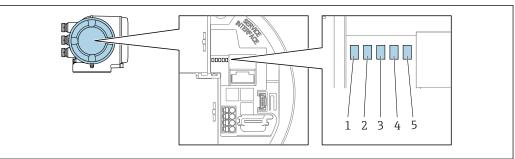
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Error	Possible causes	Solution	
No or incomplete display of contents in the Web browser	<ul><li>JavaScript not enabled</li><li>JavaScript cannot be enabled</li></ul>	Enable JavaScript.     Enter http://XXX.XXX.X.XXX/ basic.html as the IP address.	
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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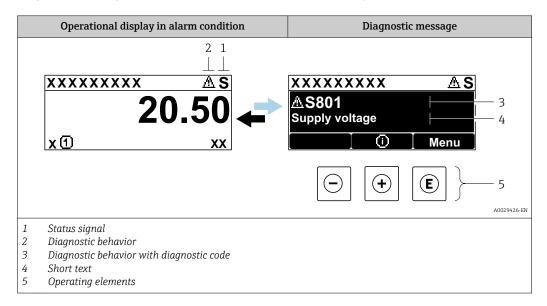
- 1 Supply voltage
- 2 Device status
- 3 Not used
- 4 Communication
- 5 Service interface (CDI) active, Ethernet Link/Activity

LED		Color	Meaning
1	Supply voltage	Off	Supply voltage is off or too low.
		Green	Supply voltage is ok.
2	Device status	Off	Firmware error
		Green	Device status is ok.
		Flashing green	Device is not configured.
		Red	A diagnostic event with "Alarm" diagnostic behavior has occurred.
		Flashing red	A diagnostic event with "Warning" diagnostic behavior has occurred.
		Flashing red/green	The device restarts.
3	Not used	-	-
4	Communication	Off	Device does not receive any Profibus data.
		White	Device receives Profibus data.
5	Service interface (CDI),	Off	Not connected or no connection established.
	Ethernet Link/Activity	Yellow	Connected and connection established.
		Flashing yellow	Service interface active.

# 12.3 Diagnostic information on local display

# 12.3.1 Diagnostic message

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



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

#### Status signals

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

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

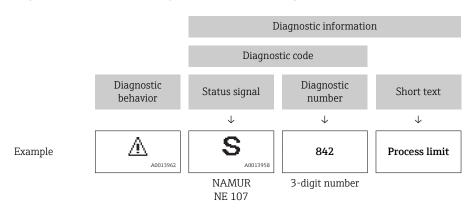
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
С	Function check The device is in service mode (e.g. during a simulation).
S	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)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

### Diagnostic behavior

Symbol	Meaning
8	<ul> <li>Alarm</li> <li>Measurement is interrupted.</li> <li>Signal outputs and totalizers assume the defined alarm condition.</li> <li>A diagnostic message is generated.</li> </ul>
Δ	Warning Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

## Diagnostic information

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



## **Operating elements**

Key	Meaning
<b>(+)</b>	Plus key In a menu, submenu Opens the message about remedy information.
E	Enter key In a menu, submenu Opens the operating menu.

### XXXXXXXX AS XXXXXXXX **AS801** Supply voltage x ① 1. $(\mathbf{+})$ Diagnostic list $\Delta$ S Diagnostics 1 <u>A</u> S801 Supply voltage Diagnostics 2 **Diagnostics 3** 2. Œ Supply voltage (ID:203) △ S801 0d00h02m25s **—** 5 Increase supply voltage (a) + (b) 3.

# 12.3.2 Calling up remedial measures

A0029431-EN

- 27 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 ± (① symbol).

- The **Diagnostic list** submenu opens.
- 2. Select the desired diagnostic event with  $\pm$  or  $\Box$  and press  $\Box$ .
  - ► The message about the remedial measures opens.
- 3. Press  $\Box$  +  $\pm$  simultaneously.
  - ► The message about the remedial measures closes.

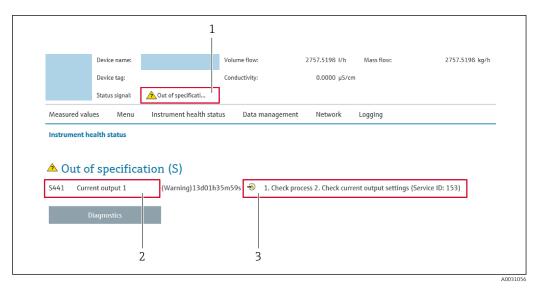
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

- 1. Press E.
  - ► The message for the remedial measures for the selected diagnostic event opens.
- 2. Press  $\Box$  +  $\pm$  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 → 🖺 146
- 3 Remedy information with Service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
  - Via parameter
  - Via submenu  $\rightarrow$  🗎 176

#### 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
8	Failure A device error has occurred. The measured value is no longer valid.
w.	Function check The device is in service mode (e.g. during a simulation).
<u>^</u>	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)
<b>&amp;</b>	Maintenance required Maintenance is required. The measured value is still valid.

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

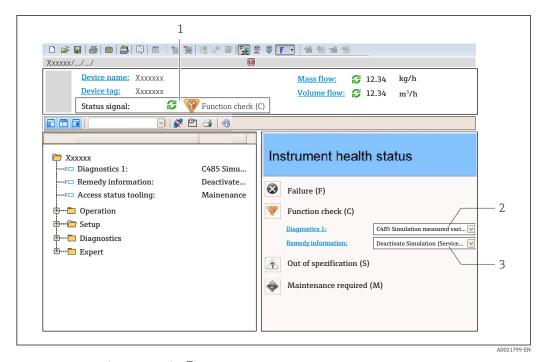
## 12.4.2 Calling up remedy information

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

# 12.5 Diagnostic information in FieldCare or DeviceCare

### 12.5.1 Diagnostic options

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

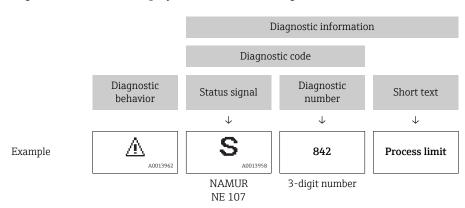


- 1 Status area with status signal→ 

  145
- 2 Diagnostic information → 🖺 146
- 3 Remedy information with Service ID
- In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
  - Via parameter
  - Via submenu  $\rightarrow$  🖺 176

#### **Diagnostic information**

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



## 12.5.2 Calling up remedy information

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

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

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

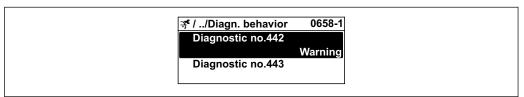
- 1. Call up the desired parameter.
- 2. On the right in the working area, mouse over the parameter.
  - ► A tool tip with remedy information for the diagnostic event appears.

# 12.6 Adapting the diagnostic information

# 12.6.1 Adapting the diagnostic behavior

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

Expert  $\rightarrow$  System  $\rightarrow$  Diagnostic handling  $\rightarrow$  Diagnostic behavior



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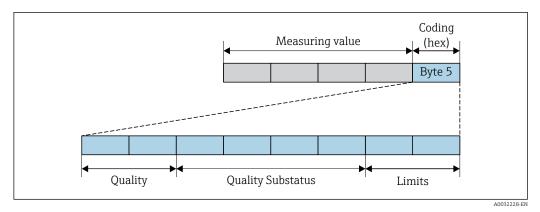
### Available diagnostic behaviors

The following diagnostic behaviors can be assigned:

Diagnostic behavior	Description
Alarm	The device stops measurement. The totalizers assume the defined alarm condition. A diagnostic message is generated.
Warning	The device continues to measure. The measured value output via PROFIBUS and 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 <b>Event logbook</b> submenu ( <b>Event list</b> submenu) and not in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

#### Displaying the measured value status

If the Analog Input, Digital Input and Totalizer function blocks are configured for cyclic data transmission, the device status is coded as per PROFIBUS PA Profile 3.02 Specification and transmitted along with the measured value to the PROFIBUS Master (Class 1) via the coding byte (byte 5). The coding byte is split into three segments: Quality, Quality Substatus and Limits.



■ 28 Structure of the coding byte

The content of the coding byte depends on the configured failsafe mode in the particular function block. Depending on which failsafe mode has been configured, status information in accordance with PROFIBUS PA Profile Specification 3.02 is transmitted to the PROFIBUS Master (Class 1) via the coding byte .

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

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

The diagnostic information is grouped as follows:

- Diagnostic information pertaining to the sensor: diagnostic number 000 to 199
   → 151
- Diagnostic information pertaining to the electronics: diagnostic number 200 to 399  $\rightarrow$   $\stackrel{ riangle}{=}$  152
- Diagnostic information pertaining to the configuration: diagnostic number 400 to 599  $\rightarrow$   $\stackrel{ o}{=}$  152
- Diagnostic information pertaining to the process: diagnostic number 800 to 999  $\rightarrow$   $\stackrel{ riangle}{=}$  152

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

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

Diagnostic behavior	N	leasured value st	Device diagnosis		
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Maintenance alarm	0x24 to 0x27	F (Failure)	Maintenance alarm
Warning	GOOD	Maintenance demanded	0xA8 to 0xAB	M (Maintenance)	Maintenance demanded
Logbook entry only	GOOD	ok	0x80 to 0x8E	_	_
Off	ОООД	OK .	OXOU TO OXOE	_	_

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

Diagnostic number 200 to 301, 303 to 399

Dia ana atia haharian	Measured value status (fixed assignment)				Di 4'
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	Device diagnosis (fixed assignment)
Alarm	BAD	Maintenance	0x24 to 0x27	F	Maintenance
Warning	BAD	alarm	0.824 (0.0827	(Failure)	alarm
Logbook entry only	GOOD	COOD	000 +- 005		
Off	GOOD	ok	0x80 to 0x8E	_	_

### Diagnostic information 302

Diagnostic hohovior	N	leasured value st	Device diagnosis		
Diagnostic behavior (configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Function check, local override	0x3C to 0x3F	С	Function check
Warning	GOOD	Function check	0xBC to 0xBF	-	_

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

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

When Heartbeat verification starts, data logging is interrupted, the last valid measured value is output and the totalizers are stopped.

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

Diagnostic behavior	Measured value status (fixed assignment)				Device diagnosis
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Function check	0x3C to 0x3F	C (Check)	Function check
Logbook entry only	- GOOD	GOOD Function check	0xBC to 0xBF	-	Function check
Off					
Logbook entry only	GOOD	GOOD ok	0x80 to 0x8E		
Off	GOOD	UK	OXOU TO OXOE		

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

Diagnostic behavior	Measured value status (fixed assignment)				Device diagnosis
(configurable)	Quality	Quality Substatus	Coding (hex)	Category (NE107)	(fixed assignment)
Alarm	BAD	Process related	0x28 to 0x2B	F (Failure)	Invalid process condition
Warning	UNCERTA IN	Process related	0x78 to 0x7B	S (Out of specification)	Invalid process condition
Logbook entry only	GOOD	GOOD ok	0x80 to 0x8E	_	_
Off	GOOD	OK .	ONCO TO ONOL		

# 12.7 Overview of diagnostic information

- The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.
- In the case of some items of diagnostic information, the diagnostic behavior can be changed. Change the diagnostic information  $\rightarrow \triangleq 150$

# 12.7.1 Diagnostic of sensor

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
043	Sensor short circuit		1. Check sensor cable and sensor	<ul> <li>Conductivity</li> </ul>
	Measured variable status [from the factory] 1)		Execute Heartbeat Verification     Replace sensor cable or sensor	<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Uncertain		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus Maintenance demanded			Flow velocity
	Coding (hex)	0x68 to 0x6B		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	S		Reference density
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

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

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
082	Data storage		1. Check module connections	<ul> <li>Conductivity</li> </ul>
	Measured variable status		2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
083			1. Restart device	• Conductivity
			Restore HistoROM S-DAT backup     ('Device reset' parameter)	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad	3. Replace HistoROM S-DAT	<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
169	Conductivity measurement fail	ed	1. Check grounding conditions	• Conductivity
	Measured variable status		2. Deactivate conductivity measurement	<ul><li>Corrected conductivity</li><li>Electronic temperature</li></ul>
	Quality	Bad		<ul> <li>Empty pipe detection</li> <li>Flow velocity</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Temperature</li> </ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	М		
	Diagnostic behavior	Warning		■ Volume flow

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
170	Coil resistance		Check ambient and process temperature	Conductivity
	Measured variable status			<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Bad		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		<ul> <li>Flow velocity</li> </ul>
<u> </u>	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	F		Reference density
	Diagnostic behavior	Alarm		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
180	Temperature sensor defective		1. Check sensor connections	<ul> <li>Conductivity</li> </ul>
	Measured variable status		Replace sensor cable or sensor     Turn off temperature measurement	<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Bad		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		Flow velocity
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	F		Reference density
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	No. Short text			variables
181	Sensor connection		Check sensor cable and sensor	<ul> <li>Conductivity</li> </ul>
	Measured variable status		Execute Heartbeat Verification     Replace sensor cable or sensor	<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Bad		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		Flow velocity
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	F		Reference density
	Diagnostic behavior	Alarm		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

# 12.7.2 Diagnostic of electronic

	Diagnostic information		Remedy instructions	Influenced measured variables
No.	S	hort text		Variables
201	Device failure		1. Restart device	<ul><li>Conductivity</li></ul>
	Measured variable status		2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul> <li>Measured values 2</li> <li>Measured values 3</li> <li>Density</li> <li>Electronic temperature</li> <li>Empty pipe detection</li> <li>Flow velocity</li> </ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
242	Software incompatible		1. Check software	<ul><li>Conductivity</li></ul>
	Measured variable status		Flash or change main electronics     module	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
252	Modules incompatible		1. Check electronic modules	<ul><li>Conductivity</li></ul>
	Measured variable status		Check if correct modules are available     (e.g. NEx, Ex)	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad	3. Replace electronic modules	<ul> <li>Measured values 2</li> <li>Measured values 3</li> </ul>
	Quality substatus	Maintenance alarm		<ul><li>Measured values 5</li><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul> <li>Flow velocity</li> </ul>
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
252	Modules incompatible		1. Check if correct electronic modul is	<ul> <li>Conductivity</li> </ul>
	Measured variable status		plugged  2. Replace electronic module	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured variables
No.		Short text		variables
262	Sensor electronic connectio	n faulty	1. Check or replace connection cable	<ul><li>Conductivity</li></ul>
	Measured variable status		between sensor electronic module (ISEM) and main electronics	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad	Check or replace ISEM or main electronics	<ul> <li>Measured values 2</li> <li>Measured values 3</li> </ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

No.	1	c information Short text	Remedy instructions	Influenced measured variables	
270	Main electronic failure		Change main electronic module	<ul><li>Conductivity</li></ul>	
	Measured variable status			<ul> <li>Corrected conductivity</li> <li>Measured values 1</li> <li>Measured values 2</li> </ul>	
	Quality	Bad		Measured values 2	
	Quality substatus	Maintenance alarm		<ul><li>Measured values 3</li><li>Density</li></ul>	
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>	
	Status signal	F		<ul> <li>Flow velocity</li> </ul>	
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>	

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
271	Main electronic failure		1. Restart device	<ul> <li>Conductivity</li> </ul>
	Measured variable status		2. Change main electronic module	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul> <li>Measured values 2</li> <li>Measured values 3</li> </ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	5	Short text		variables
272	Main electronic failure		1. Restart device	<ul><li>Conductivity</li></ul>
	Measured variable status		2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	5	Short text		variables
273	Main electronic failure		Change electronic	■ Conductivity
	Measured variable status			<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
275	I/O module 1 to n defective		Change I/O module	<ul><li>Conductivity</li><li>Corrected conductivity</li></ul>
	Measured variable status  Quality	Bad		<ul> <li>Measured values 1</li> <li>Measured values 2</li> <li>Measured values 3</li> <li>Density</li> </ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul> <li>Electronic temperature</li> <li>Empty pipe detection</li> </ul>
	Status signal  Diagnostic behavior	F Alarm		<ul><li>Flow velocity</li><li>Low flow cut off</li><li>Mass flow</li><li>Reference density</li></ul>
				<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.		Short text		variables
276	I/O module 1 to n faulty		1. Restart device	<ul><li>Conductivity</li></ul>
-	Measured variable status		2. Change I/O module	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		• Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured variables
No.		Short text		variables
283	Memory content		1. Reset device	<ul> <li>Conductivity</li> </ul>
-	Measured variable status		2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul> <li>Measured values 2</li> <li>Measured values 3</li> </ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		<ul> <li>Flow velocity</li> </ul>
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
302	Measured variable status [from the factory] 1)		Device verification active, please wait.	<ul> <li>Conductivity</li> <li>Corrected conductivity</li> <li>Measured values 1</li> <li>Measured values 2</li> </ul>
	Quality  Quality substatus  Coding (hex)	Good Function check  0xBC to 0xBF		<ul> <li>Measured values 2</li> <li>Measured values 3</li> <li>Density</li> <li>Electronic temperature</li> <li>Empty pipe detection</li> </ul>
	Status signal Diagnostic behavior	C Warning		<ul> <li>Flow velocity</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
303		_		
	Measured variable status		(parameter 'Apply I/O configuration')  2. Afterwards reload device description and check wiring	
	Quality	Bad		
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	M		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	5	Short text		variables
311			1. Do not reset device	<ul> <li>Conductivity</li> </ul>
			2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	M		■ Flow velocity
	Diagnostic behavior	Warning		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
332	Writing in HistoROM backup f	ailed	Replace user interface board	• Conductivity
	Measured variable status		Ex d/XP: replace transmitter	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul> <li>Measured values 2</li> <li>Measured values 3</li> </ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
361	I/O module 1 to n faulty		1. Restart device	<ul><li>Conductivity</li></ul>
	Managinad wariable status		Check electronic modules     Change I/O Modul or main electronics	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
372	Sensor electronic (ISEM) fault	у	1. Restart device	■ Conductivity
	Management reminded at a true		Check if failure recurs     Replace sensor electronic module	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
Quality Bad  Quality substatus Maintenance  Coding (hex) 0x24 to 0x27	Quality	Bad	(ISEM)	<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>	
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	No. Short text			variables
373	Sensor electronic (ISEM) faulty	I	1. Transfer data or reset device	<ul> <li>Conductivity</li> </ul>
	Measured variable status		2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	<b>Diagnost</b>	ic information	Remedy instructions	Influenced measured variables
No.		Short text		
375	I/O- 1 to n communication f	ailed	1. Restart device	<ul><li>Conductivity</li></ul>
	Measured variable status			Corrected conductivity
	Micubarca variable status		2. Check if failure recurs     3. Replace module rack inclusive electronic modules	Measured values 1
	Quality	Bad		<ul> <li>Measured values 2</li> </ul>
				<ul> <li>Measured values 3</li> </ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul> <li>Electronic temperature</li> </ul>
	County (nex)	0x24 to 0x27		<ul> <li>Empty pipe detection</li> </ul>
	Status signal	F		Flow velocity
				<ul> <li>Low flow cut off</li> </ul>
	Diagnostic behavior	Alarm		<ul> <li>Mass flow</li> </ul>
				<ul> <li>Reference density</li> </ul>
				Corrected volume flow
				<ul> <li>Temperature</li> </ul>
				■ Volume flow
1				

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	Short text		variables
376	Managered variable status [from the factory 1 1)		Replace sensor electronic module	<ul> <li>Conductivity</li> </ul>
			(ISEM) 2. Turn off diagnostic message	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	S		Flow velocity
	Diagnostic behavior	Warning		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	Short text			variables
377	Sensor electronic (ISEM) faulty	1	1. Check sensor cable and sensor	• Conductivity
	Measured variable status [fro	om the factory] 1)	Perform Heartbeat Verification     Replace sensor cable or sensor	<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Bad		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		Flow velocity
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li><li>Reference density</li></ul>
	Status signal	S		
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
382	Data storage		1. Insert T-DAT	<ul><li>Conductivity</li></ul>
	Measured variable status		2. Replace T-DAT	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	1	information	Remedy instructions	Influenced measured variables
No.	2	Short text		
			1. Restart device	■ Conductivity
			2. Delete T-DAT via 'Reset device' parameter	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad	■ Me ■ Der ■ Ele	<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

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	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
387	HistoROM backup failed		Contact service organization	<ul> <li>Conductivity</li> </ul>
	Measured variable status			<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		■ Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
512	Sensor electronic (ISEM) faulty	7	1. Check ECC recovery time	■ Conductivity
	Measured variable status		2. Turn off ECC	<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Bad		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		<ul> <li>Flow velocity</li> </ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	F		Reference density
	Diagnostic behavior	Alarm		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

# 12.7.3 Diagnostic of configuration

	Diagnostic information		Remedy instructions	Influenced measured	
No.	s	hort text		variables	
330	Flash file invalid		1. Update firmware of device	<ul><li>Conductivity</li></ul>	
	Measured variable status		2. Restart device	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>	
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>	
1	Quality substatus	Maintenance alarm		Density	
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>	
	Status signal	M		Flow velocity	
	Diagnostic behavior	Warning		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>	

	Diagnostic information		Remedy instructions	Influenced measured
No.	s	hort text		variables
331	Firmware update failed		1. Update firmware of device	<ul> <li>Conductivity</li> </ul>
	Measured variable status		2. Restart device	<ul> <li>Corrected conductivity</li> <li>Measured values 1</li> <li>Measured values 2</li> <li>Measured values 3</li> </ul>
	Quality	Bad		
	Quality substatus	Maintenance alarm		Density
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		Flow velocity
	Diagnostic behavior	Warning		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

No.	Diagno	stic information Short text	Remedy instructions	Influenced measured variables
NO.		Short text		
410	Data transfer		1. Check connection	<ul><li>Conductivity</li></ul>
	Measured variable status		2. Retry data transfer	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Status signal	F		<ul><li>Flow velocity</li><li>Low flow cut off</li></ul>
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
412	Processing download		Download active, please wait	• Conductivity
	Measured variable status			<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Uncertain		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Initial value		■ Flow velocity
	Coding (hex)	0x4C to 0x4F		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	С		Reference density
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	. Short text			variables
431	Trim 1 to n		Carry out trim	_
	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
437	Configuration incompatible		1. Restart device	<ul><li>Conductivity</li></ul>
	Measured variable status		2. Contact service	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality substatus	Maintenance alarm		<ul><li>Density</li></ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	F		Flow velocity
	Diagnostic behavior	Alarm		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.		Short text		variables
438	Dataset		1. Check data set file	<ul><li>Conductivity</li></ul>
	Management granishly atotics		Check device configuration     Up- and download new configuration	<ul><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality	Uncertain		Measured values 2
	Quality substatus	Maintenance demanded		<ul><li>Measured values 3</li><li>Density</li></ul>
	Coding (hex)	0x68 to 0x6B		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	M		■ Flow velocity
	Diagnostic behavior	Warning		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
441	Current output 1 to n		1. Check process	-
	Measured variable status [from the factory] 1)	2. Check current output settings		
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	S		
	Diagnostic behavior	Warning		

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
442	Frequency output 1 to n		1. Check process	_
	Measured variable status [fro	om the factory] <sup>1)</sup>	2. Check frequency output settings	
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	S		
	Diagnostic behavior	Warning		

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

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
443		1. Check process	_	
	Measured variable status [from the factory] 1)		2. Check pulse output settings	
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	S		
	Diagnostic behavior	Warning		

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

	Diagnostic information		Remedy instructions	Influenced measured	
No.	SI	hort text		variables	
444	Current input 1 to n		1. Check process	Measured values 1	
	Measured variable status [fro	om the factory] 1)	2. Check current input settings	<ul><li>Measured values 2</li><li>Measured values 3</li></ul>	
	Quality	Good			
	Quality substatus	Function check			
	Coding (hex)	0xBC to 0xBF			
	Status signal	S			
	Diagnostic behavior	Warning			

	Diagnostic	information	Remedy instructions	Influenced measured
No.	Short text			variables
453	Flow override		Deactivate flow override	Conductivity
	Measured variable status			<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Good		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Function check		■ Flow velocity
	Coding (hex)	0xBC to 0xBF		<ul><li> Low flow cut off</li><li> Mass flow</li><li> Reference density</li></ul>
	Status signal	С		
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
463	Analog input 1 to n selection invalid	nvalid	1. Check module/channel configuration	Measured values 1
	Measured variable status		2. Check I/O module configuration	<ul><li>Measured values 2</li><li>Measured values 3</li></ul>
	Quality	Bad		
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic	information	Remedy instructions	Influenced measured
No.	S	hort text		variables
482	FB not Auto/Cas		Set Block in AUTO mode	-
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
484	Failure mode simulation  Measured variable status		Deactivate simulation	<ul><li>Conductivity</li><li>Corrected conductivity</li></ul>
	Quality Quality substatus Coding (hex) Status signal	Bad Function check 0x3C to 0x3F		<ul> <li>Density</li> <li>Electronic temperature</li> <li>Empty pipe detection</li> <li>Flow velocity</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> </ul>
	Diagnostic behavior	Alarm		<ul> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
485	Measured variable simulation		Deactivate simulation	<ul><li>Conductivity</li><li>Corrected conductivity</li></ul>
	Measured variable status			<ul><li>Density</li></ul>
	Quality	Good		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Function check		<ul> <li>Flow velocity</li> </ul>
	Coding (hex)	0xBC to 0xBF		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	С		Reference density
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
486	Current input 1 to n simulation		Deactivate simulation	Measured values 1
Measured variable status			<ul><li>Measured values 2</li><li>Measured values 3</li></ul>	
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
491	Current output 1 to n simulation	on	Deactivate simulation	_
	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
492	Simulation frequency output 1	to n	Deactivate simulation frequency output	-
	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
493	Simulation pulse output 1 to n		Deactivate simulation pulse output	-
	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	OxBC to OxBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
494	Switch output simulation 1 to	n	Deactivate simulation switch output	-
	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
495	Diagnostic event simulation		Deactivate simulation	-
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
496	Status input simulation		Deactivate simulation status input	-
	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
497	Simulation block output		Deactivate simulation	_
	Measured variable status			
	Quality	Good		
	Quality substatus	Ok		
	Coding (hex)	0x80 to 0x83		
	Status signal	С		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
511	ISEM settings faulty		1. Check measuring period and integration	■ Conductivity
	Measured variable status		time  2. Check sensor properties	<ul><li>Corrected conductivity</li><li>Density</li></ul>
	Quality	Bad		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		Flow velocity
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	С		Reference density
	Diagnostic behavior	Alarm		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
520	I/O 1 to n hardware configuration invalid  1. Check I/O hardware configuration	_		
	Measured variable status		<ul><li>2. Replace wrong I/O module</li><li>3. Plug the module of double pulse output</li></ul>	
	Quality	Bad	on correct slot	
	Quality substatus	Function check		
	Coding (hex)	0x3C to 0x3F		
	Status signal	F		
	Diagnostic behavior	Alarm		

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
530	Electrode cleaning is running		Turn off ECC	<ul><li>Conductivity</li><li>Corrected conductivity</li></ul>
	Measured variable status			<ul><li>Density</li></ul>
	Quality	Good		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Quality substatus	Function check		Flow velocity
	Coding (hex)	0xBC to 0xBF		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	С		Reference density
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic	information	Remedy instructions	Influenced measured
No.	SI	hort text		variables
531	Empty pipe adjustment faulty		Execute EPD adjustment	Conductivity     Connected conductivity
	Measured variable status [fro	om the factory] 1)		<ul><li>Corrected conductivity</li><li>Empty pipe detection</li></ul>
	Quality	Bad		Flow velocity  Low flow cut off
	Quality substatus	Maintenance alarm		Mass flow
	Coding (hex)	0x24 to 0x27		<ul><li>Corrected volume flow</li><li>Volume flow</li></ul>
	Status signal	S		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	S	hort text		variables
537	537 Configuration		1. Check IP addresses in network	-
1	Measured variable status		2. Change IP address	
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	F		
	Diagnostic behavior	Warning		

	Diagnostic information		Remedy instructions	Influenced measured
No.	o. Short text			variables
594	Relay output simulation		Deactivate simulation switch output	-
Mea	Measured variable status			
	Quality	Good		
	Quality substatus	Function check		
	Coding (hex)	0xBC to 0xBF		
	Status signal	С		
	Diagnostic behavior	Warning		

# 12.7.4 Diagnostic of process

	Diagnostic	information	Remedy instructions	Influenced measured
No.	Short text			variables
803			1. Check wiring	_
	Measured variable status		2. Change I/O module	
	Quality	Bad		
	Quality substatus	Process related		
	Coding (hex)	0x28 to 0x2B		
	Status signal	F		
	Diagnostic behavior	Alarm		

	Diagnostic information		Remedy instructions	Influenced measured
No.	o. Short text			variables
832	Electronic temperature too hig	h	Reduce ambient temperature	<ul> <li>Conductivity</li> </ul>
	Measured variable status [from the factory] 1)			<ul> <li>Corrected conductivity</li> <li>Measured values 1</li> </ul>
	Quality	Bad		<ul><li>Measured values 2</li><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x28 to 0x2B		<ul><li>Electronic temperature</li><li>Empty pipe detection</li></ul>
	Status signal	S		■ Flow velocity
	Diagnostic behavior	Warning		<ul> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

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

No.	Diagnostic information  No. Short text		Remedy instructions	Influenced measured variables
833	Electronic temperature too low  Measured variable status [from the factory] 1)		Increase ambient temperature	<ul><li>Conductivity</li><li>Corrected conductivity</li><li>Measured values 1</li></ul>
	Quality Quality substatus Coding (hex)	Bad Process related  0x28 to 0x2B		<ul> <li>Measured values 2</li> <li>Measured values 3</li> <li>Density</li> <li>Electronic temperature</li> <li>Empty pipe detection</li> </ul>
	Status signal  Diagnostic behavior	Warning		<ul> <li>Flow velocity</li> <li>Low flow cut off</li> <li>Mass flow</li> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

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

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	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
834	Process temperature too high  Measured variable status [from the factory] 1)		Reduce process temperature	<ul><li>Conductivity</li><li>Corrected conductivity</li></ul>
	Quality	Uncertain		<ul><li> Empty pipe detection</li><li> Flow velocity</li><li> Low flow cut off</li><li> Mass flow</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x78 to 0x7B		<ul><li>Corrected volume flow</li><li>Temperature</li></ul>
	Status signal	S		<ul> <li>Volume flow</li> </ul>
	Diagnostic behavior	Warning		

	Diagnostic	information	Remedy instructions	Influenced measured
No.	. Short text			variables
835	Process temperature too low		Increase process temperature	<ul><li>Conductivity</li><li>Corrected conductivity</li></ul>
	Measured variable status [fro	om the factory] 1)		Empty pipe detection
	Quality	Uncertain		<ul><li>Flow velocity</li><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x78 to 0x7B		<ul><li>Corrected volume flow</li><li>Temperature</li></ul>
	Status signal	S		<ul> <li>Volume flow</li> </ul>
	Diagnostic behavior	Warning		

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

	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
842	Process limit		Low flow cut off active!	Flow velocity
	Measured variable status [fro	om the factory] <sup>1)</sup>	Check low flow cut off configuration	<ul><li>Mass flow</li><li>Corrected volume flow</li><li>Volume flow</li></ul>
	Quality	Uncertain		• Volume flow
	Quality substatus	Process related		
	Coding (hex)	0x78 to 0x7B		
	Status signal	S		
	Diagnostic behavior	Warning		

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

	Diagnostic information		Remedy instructions	Influenced measured
No.	Short text			variables
882	Input signal		1. Check input configuration	Corrected conductivity
	Measured variable status		2. Check external device or process conditions	<ul><li>Measured values 1</li><li>Measured values 2</li></ul>
	Quality	Bad		<ul><li>Measured values 3</li><li>Density</li></ul>
	Quality substatus	Maintenance alarm		Empty pipe detection
	Coding (hex)	0x24 to 0x27		<ul><li>Flow velocity</li><li>Low flow cut off</li></ul>
	Status signal	F		Mass flow
	Diagnostic behavior	Alarm		<ul> <li>Reference density</li> <li>Corrected volume flow</li> <li>Temperature</li> <li>Volume flow</li> </ul>

	Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text			
937	Sensor symmetry		1. Eliminate external magnetic field near	<ul><li>Conductivity</li></ul>
	Measured variable status [from the factory] 1)	sensor  2. Turn off diagnostic message	<ul><li>Corrected conductivity</li><li>Density</li></ul>	
	Quality	Bad		<ul><li> Electronic temperature</li><li> Empty pipe detection</li></ul>
	Quality substatus	Maintenance alarm		<ul> <li>Flow velocity</li> </ul>
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	S		Reference density
	Diagnostic behavior	Warning		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

	Diagnostic information		Remedy instructions	Influenced measured
No.	. Short text			variables
938	EMC interference		1. Check ambient conditions regarding	<ul> <li>Conductivity</li> </ul>
	Measured variable status [fr	om the factory] <sup>1)</sup>	EMC influence  2. Turn off diagnostic message	<ul> <li>Corrected conductivity</li> <li>Density</li> <li>Electronic temperature</li> <li>Empty pipe detection</li> <li>Flow velocity</li> </ul>
	Quality	Bad		
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Status signal	F		■ Reference density
	Diagnostic behavior	Alarm		<ul><li>Corrected volume flow</li><li>Temperature</li><li>Volume flow</li></ul>

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

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	Diagnostic information		Remedy instructions	Influenced measured
No.	SI	hort text		variables
961	Electrode potential out of speci	ification	1. Check process conditions	Empty pipe detection
	Measured variable status [fro	om the factory] 1)	2. Check ambient conditions	<ul><li>Low flow cut off</li><li>Mass flow</li></ul>
	Quality	Bad		■ Volume flow
	Quality substatus	Maintenance alarm		
	Coding (hex)	0x24 to 0x27		
	Status signal	S		
	Diagnostic behavior	Warning		

	Diagnostic	information	Remedy instructions	Influenced measured
No.	SI	hort text		variables
962	- T		Perform full pipe adjustment	<ul> <li>Conductivity</li> </ul>
	Measured variable status [fro	om the factory] 1)	Perform empty pipe adjustment     Turn off empty pipe detection	<ul><li>Corrected conductivity</li><li>Flow velocity</li></ul>
	Quality	Bad		<ul><li>Low flow cut off</li><li>Mass flow</li><li>Corrected volume flow</li></ul>
	Quality substatus	Process related		
	Coding (hex)	0x28 to 0x2B		<ul><li>Volume flow</li></ul>
	Status signal	S		
	Diagnostic behavior	Warning		

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

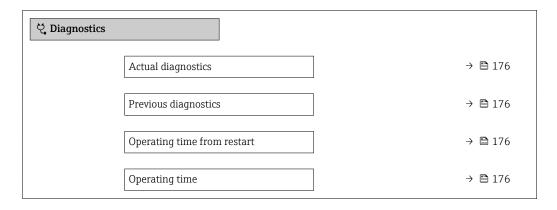
# 12.8 Pending diagnostic events

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

- To call up the measures to rectify a diagnostic event:
  - Via local display → 147
    - Via Web browser → 🗎 148
    - Via "FieldCare" operating tool → 🖺 149
    - Via "DeviceCare" operating tool → 🗎 149
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu  $\rightarrow \stackrel{\square}{=} 176$

## Navigation

"Diagnostics" menu



### Parameter overview with brief description

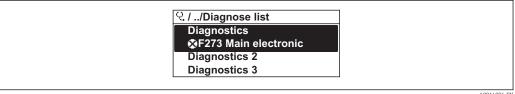
Parameter	Prerequisite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured diagnostic event along with its diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.
		If two or more messages occur simultaneously, the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

# 12.9 Diagnostic list

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

#### Navigation path

Diagnostics → Diagnostic list



A0014006-EN

■ 29 Taking the example of the local display

- To call up the measures to rectify a diagnostic event:
  - Via local display → 🖺 147
  - Via Web browser → 🗎 148
  - Via "FieldCare" operating tool → 🖺 149
  - Via "DeviceCare" operating tool  $\rightarrow$  🗎 149

# 12.10 Event logbook

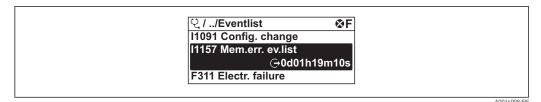
## 12.10.1 Reading out the event logbook

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

## Navigation path

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

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■ 30 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 → 🖺 153
- Information events  $\rightarrow$  🗎 177

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 → 

  147
  - Via Web browser → 

    148
  - Via "FieldCare" operating tool → 🗎 149
  - Via "DeviceCare" operating tool → 🖺 149
- 🛐 For filtering the displayed event messages → 🗎 177

## 12.10.2 Filtering the event logbook

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

#### Navigation path

Diagnostics → Event logbook → Filter options

## Filter categories

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

#### 12.10.3 Overview of information events

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

Info number	Info name
I1000	(Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed

Info number	Info name
I1092	HistoROM backup deleted
I1137	Electronic changed
I1151	History reset
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1184	Display connected
I1256	Display: access status changed
I1278	I/O module reset detected
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1361	Web server: login failed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1443	Coating thickness not determined
I1444	Device verification passed
I1445	Device verification failed
I1457	Measured error verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1462	Sensor electronic module verific. failed
I1512	Download started
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
I1636	Fieldbus address reset
I1639	Max. switch cycles number reached

Info number	Info name	
I1649	Hardware write protection activated	
I1650	Hardware write protection deactivated	
I1712	New flash file received	
I1725	Sensor electronic module (ISEM) changed	
I1726	Configuration backup failed	

# 12.11 Resetting the measuring device

Using the **Device reset** parameter ( $\rightarrow \implies 125$ ) it is possible to reset the entire device configuration or some of the configuration to a defined state.

# 12.11.1 Function scope of the "Device reset" parameter

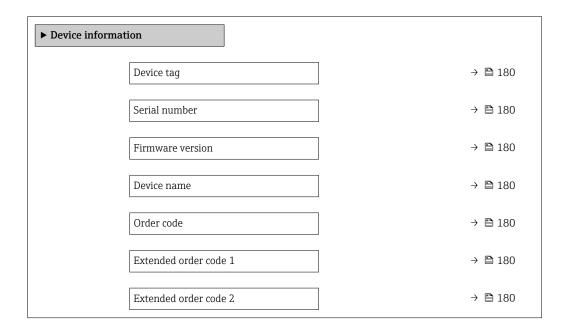
Options	Description	
Cancel	No action is executed and the user exits the parameter.	
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.	
Restart device	The restart 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.	

# 12.12 Device information

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

### Navigation

"Diagnostics" menu → Device information



Extended order code 3	→ 🖺 180
ENP version	→ 🖺 180
PROFIBUS ident number	→ 🖺 180
Status PROFIBUS Master Config	→ 🖺 180

# 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.	Max. 11-digit character string comprising letters and numbers.	-
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	-
Device name	Shows the name of the transmitter.  The name can be found on the nameplate of the transmitter.	Promag 300/500	-
Order code	Shows the device order code.  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	-
Extended order code 1	Shows the 1st part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
Extended order code 2	Shows the 2nd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
Extended order code 3	Shows the 3rd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	-
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00
PROFIBUS ident number	Displays the PROFIBUS identification number.	0 to FFFF	0x156C
Status PROFIBUS Master Config	Displays the status of the PROFIBUS Master configuration.	Active Not active	Not active

# 12.13 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware Changes	Documentation type	Documentation
06.2018	01.00.zz	Option <b>75</b>	Original firmware	Operating Instructions	BA01853D/06/EN/01.18

- 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:
  - $\blacksquare$  In the Download Area of the Endress+Hauser web site: www.endress.com  $\to$  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)  $\rightarrow \triangle 213$ 

# 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:  $\rightarrow \implies 185$ 

# 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

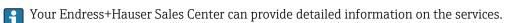
*W@M Device Viewer* (www.endress.com/deviceviewer):

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 (→ 180) in the Device information submenu.

## 14.3 Endress+Hauser services

Endress+Hauser offers a wide range of 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 <a href="http://www.endress.com/support/return-material">http://www.endress.com/support/return-material</a>

# 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

## **MARNING**

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

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

Observe the following notes during disposal:

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

# 15 Accessories

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

# 15.1 Device-specific accessories

## 15.1.1 For the transmitter

Accessories	Description
Proline 300 transmitter	Transmitter for replacement or storage. Use the order code to define the following specifications:  • Approvals • Output • Input • Display/operation • Housing • Software  • Order code: 5X3BXX  Installation Instructions EA01150
Remote display and operating module DKX001	<ul> <li>If ordered directly with the measuring device:         Order code for "Display; operation", option O "Separate 4-line display, illum.;         10 m (30 ft)Cable; touch control".</li> <li>If ordered separately:             — Measuring device: order code for "Display; operation", option M "None, prepared for separate display".             — DKX001: Via the separate product structure DKX001.</li> <li>If ordered subsequently:             DKX001: Via the separate product structure DKX001.</li> <li>Mounting bracket for DKX001         <ul> <li>Ordered directly with the DKX001:                   Ordered directly with the DKX001:                   Ordered subsequently: order number: 71340960</li> </ul> </li> <li>Connecting cable (replacement cable)         Via the separate product structure: DKX002</li> <li>Further information on display and operating module DKX001 → 1207.</li> <li>Special Documentation SD01763D</li> </ul>
External WLAN antenna	External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Enclosed accessories", option P8 "Wireless antenna wide area".  ■ The external WLAN antenna is not suitable for use in hygienic applications.  ■ Further information on the WLAN interface → 🖺 71.  ■ Order number: 71351317  ■ Installation Instructions EA01238D
Protective cover	Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.  ① Order number: 71343505  ① 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.
	For details, see Installation Instructions EA00070D

# 15.2 Service-specific accessories

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

# 15.3 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.
	<ul> <li>Technical Information TI00133R</li> <li>Operating Instructions BA00247R</li> </ul>

# 16 Technical data

# 16.1 Application

The measuring device is only suitable for flow measurement of liquids with a minimum conductivity of 5  $\mu S/cm$ .

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  $\rightarrow = 14$ 

# 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: DN 15 to 125 (1/2 to 4")

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	1/2	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 1100	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)
f1	r. 1		f 1 2 / 1 1	r , 21	
[mm]	[in]	[dm³/min]	[dm <sup>3</sup> /min]	[dm <sup>3</sup> ]	[dm³/min]
80	3 3	90 to 3 000	750	[ <b>dm</b> <sup>3</sup> ]	[dm³/min]
					, ,

Flow characteristic values in SI units: DN 150 to 600 (6 to 24")

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]	[m³/h]	[m³/h]	[m <sup>3</sup> ]	[m <sup>3</sup> /h]	
150	6	20 to 600	150	0.03	2.5	
200	8	35 to 1100	300	0.05	5	
250	10	55 to 1700	500	0.05	7.5	
300	12	80 to 2 400	750	0.1	10	
350	14	110 to 3 300	1000	0.1	15	
400	16	140 to 4200	1200	0.15	20	
450	18	180 to 5 400	1500	0.25	25	
500	20	220 to 6600	2 000	0.25	30	
600	24	310 to 9600	2 500	0.3	40	

# 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]
1/2	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 1250	300	2	4
6	150	90 to 2 650	600	5	12
8	200	155 to 4850	1200	10	15
10	250	250 to 7 500	1500	15	30
12	300	350 to 10600	2400	25	45
14	350	500 to 15 000	3600	30	60
16	400	600 to 19000	4800	50	60
18	450	800 to 24 000	6000	50	90

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]
20	500	1000 to 30000	7500	75	120
24	600	1400 to 44000	10500	100	180

## Recommended measuring range

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  $\rightarrow \blacksquare 186$

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

#### Current input

#### Digital communication

The measured values are written from the automation system to the measuring device via PROFIBUS DP.

#### Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	<ul><li>4 to 20 mA (active)</li><li>0/4 to 20 mA (passive)</li></ul>
Resolution	1 μΑ
Voltage drop	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
Maximum input voltage	≤ 30 V (passive)
Open-circuit voltage	≤ 28.8 V (active)
Possible input variables	<ul><li>Pressure</li><li>Temperature</li><li>Density</li></ul>

# Status input

Maximum input values	■ DC $-3$ to 30 V ■ If status input is active (ON): $R_i > 3 \text{ k}\Omega$
Response time	Adjustable: 5 to 200 ms
Input signal level	<ul> <li>Low signal: DC -3 to +5 V</li> <li>High signal: DC 12 to 30 V</li> </ul>
Assignable functions	<ul> <li>Off</li> <li>Reset the individual totalizers separately</li> <li>Reset all totalizers</li> <li>Flow override</li> </ul>

# 16.4 Output

# Output signal

# PROFIBUS DP

Signal encoding	NRZ code
Data transfer	9.6 kBaud12 MBaud

# Current output 0/4 to 20 mA

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

# Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output	
Version	Open collector Can be set to: Active Passive 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	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	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> </ul>
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 $10000Hz$ (f $_{max}$ = $12500Hz$ )
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity</li> <li>Corrected conductivity</li> <li>Temperature</li> <li>Electronic temperature</li> </ul>
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 On Diagnostic behavior Limit value: Off Volume flow Mass flow Corrected volume flow Flow velocity Conductivity Corrected conductivity Totalizer 1-3 Temperature Electronic temperature Flow direction monitoring Status Empty pipe detection Low flow

# Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: NO (normally open), factory setting NC (normally closed)

Maximum switching capacity (passive)	■ DC 30 V, 0.1 A ■ AC 30 V, 0.5 A
Assignable functions	<ul> <li>Off</li> <li>On</li> <li>Diagnostic behavior</li> <li>Limit value: <ul> <li>Off</li> <li>Volume flow</li> <li>Mass flow</li> <li>Corrected volume flow</li> <li>Flow velocity</li> <li>Conductivity</li> <li>Corrected conductivity</li> <li>Totalizer 1-3</li> <li>Temperature</li> <li>Electronic temperature</li> </ul> </li> <li>Flow direction monitoring</li> <li>Status <ul> <li>Empty pipe detection</li> <li>Low flow</li> </ul> </li> </ul>

#### 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:

## PROFIBUS DP

Status and alarm	Diagnostics in accordance with PROFIBUS PA Profile 3.02
messages	

# Current output 0/4 to 20 mA

## 4 to 20 mA

Failure mode	Choose from:  4 to 20 mA in accordance with NAMUR recommendation NE 43  4 to 20 mA in accordance with US  Min. value: 3.59 mA  Max. value: 22.5 mA
	<ul> <li>Freely definable value between: 3.59 to 22.5 mA</li> <li>Actual value</li> <li>Last valid value</li> </ul>

#### 0 to 20 mA

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

# Pulse/frequency/switch output

Pulse output		
Failure mode	Choose from:  Actual value No pulses	
Frequency output		
Failure mode	Choose from:  Actual value  O Hz  Defined value (f max 2 to 12 500 Hz)	
Switch output	Switch output	
Failure mode	Choose from:  Current status  Open Closed	

# Relay output

Failure mode	Choose from:
	<ul><li>Current status</li></ul>
	■ Open
	■ 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: PROFIBUS DP
- 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
	The following information is displayed depending on the device version:  Supply voltage active Data transmission active Device alarm/error has occurred
	Diagnostic information via light emitting diodes

Low flow cut off	The switch points for low flow cut off are user-selectable.	
Galvanic isolation	The outputs are galvanical	lly isolated from one another and from earth (PE).
Protocol-specific data	Manufacturer ID	0x11
	Ident number	0x1570
	Profile version	3.02
	Device description files (GSD, DTM, DD)	Information and files under:  ■ www.endress.com  On the product page for the device: Documents/Software → Device drivers  ■ www.profibus.org
	Supported functions	<ul> <li>Identification &amp; Maintenance         Simplest device identification on the part of the control system and         nameplate</li> <li>PROFIBUS upload/download         Reading and writing parameters is up to ten times faster with PROFIBUS         upload/download</li> <li>Condensed status         Simplest and self-explanatory diagnostic information by categorizing         diagnostic messages that occur</li> </ul>
	Configuration of the device address	<ul> <li>DIP switches on the I/O electronics module</li> <li>Via operating tools (e.g. FieldCare)</li> </ul>
	System integration	Information regarding system integration .  Cyclic data transmission Block model Description of the modules

# 16.5 Power supply

Terminal assignment

→ 🖺 36

Order code for "Power supply"	terminal voltage		Frequency range
Option <b>D</b>	DC24 V	±20%	-
Option <b>E</b>	AC100 to 240 V	-15+10%	50/60 Hz, ±4 Hz
Option I	DC24 V	±20%	-
Option i	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

Depending on the device version, the configuration is retained in the device memoryor in the pluggable data memory (HistoROM DAT).

Electrical connection	→ 🖺 37
Potential equalization	→ 🗎 41
terminals	Spring-loaded terminals: Suitable for strands and strands with ferrules. Conductor cross-section 0.2 to 2.5 mm <sup>2</sup> (24 to 12 AWG).
Cable entries	<ul> <li>Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)</li> <li>Thread for cable entry: <ul> <li>NPT ½"</li> <li>G ½"</li> <li>M20</li> </ul> </li> <li>Device plug for digital communication: M12</li> </ul>
Cable specification	→ <b>(a)</b> 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

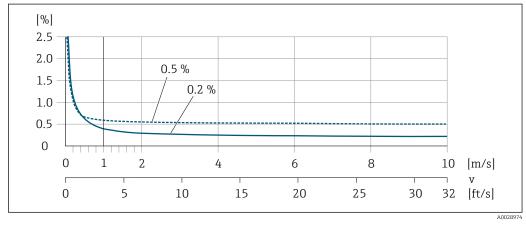
#### Maximum measured error

## Error limits under reference operating conditions

o.r. = of reading

#### Volume flow

- $\bullet$  ±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.



■ 31 Maximum measured error in % o.r.

#### **Electrical conductivity**

Max. measured error not specified.

#### Accuracy of outputs

The outputs have the following base accuracy specifications.

Current output

- 1		
- 1	A course our	ΙΙΕΛ
- 1	ACCURACY	I T ) II A
		±2 pri

Pulse/frequency output

o.r. = of reading

Accuracy	Max. ±50 ppm o.r. (over the entire ambient temperature range)
----------	---

#### Repeatability

o.r. = of reading

#### Volume flow

Max.  $\pm 0.1$  % o.r.  $\pm 0.5$  mm/s (0.02 in/s)

#### **Electrical conductivity**

Max. ±5 % o.r.

# Influence of ambient temperature

#### **Current output**

Temperature coefficient	Max. 1 μA/°C
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#### Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.
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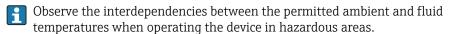
# 16.7 Installation

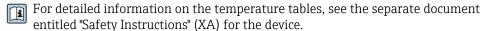
# 16.8 Environment

# Ambient temperature range

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#### Temperature tables





#### Storage temperature

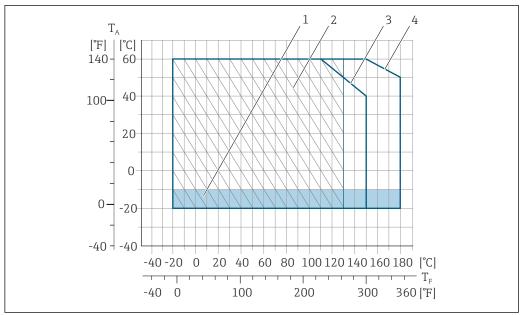
- Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.
- If protection caps or protective 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	<ul> <li>Oscillation, sinusoidal, following IEC 60068-2-6</li> <li>2 to 8.4 Hz, 3.5 mm peak</li> <li>8.4 to 2 000 Hz, 1 g peak</li> <li>Oscillation, broadband noise following IEC 60068-2-64</li> <li>10 to 200 Hz, 0.003 g²/Hz</li> <li>200 to 2 000 Hz, 0.001 g²/Hz</li> <li>Total: 1.54 g rms</li> </ul>
Shock resistance	Shock, half-sine according to IEC 60068-2-27 6 ms 50 g
Shock resistance	Shock due to rough handling following IEC 60068-2-31
Mechanical load	<ul> <li>Protect the transmitter housing against mechanical effects, such as shock or impact.</li> <li>Never use the transmitter housing as a ladder or climbing aid.</li> </ul>
Electromagnetic compatibility (EMC)	<ul> <li>As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)</li> <li>Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784</li> </ul>
	The following applies for PROFIBUS DP: If baud rates > 1.5 MBaud, an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.
	Details are provided in the Declaration of Conformity.
	16.9 Process

-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")

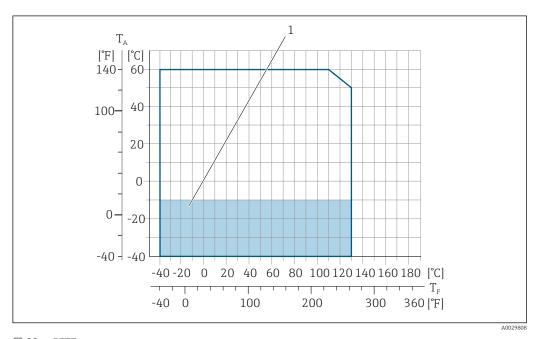
Medium temperature range



A0035803

■ 32 PFA

- $T_A$  Ambient temperature range
- $T_F$  Fluid temperature
- Colored area: the ambient temperature range -10 to -20  $^{\circ}$ C (+14 to -4  $^{\circ}$ 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")



**■** 33 *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

 $\geq 5~\mu S/cm$  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	1/2	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						
500	20		No negative pressure permitted!				
600	24						

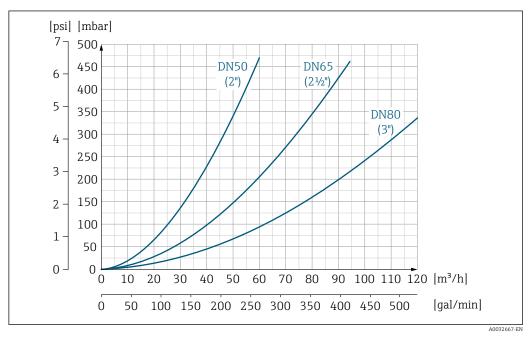
Flow limit

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:

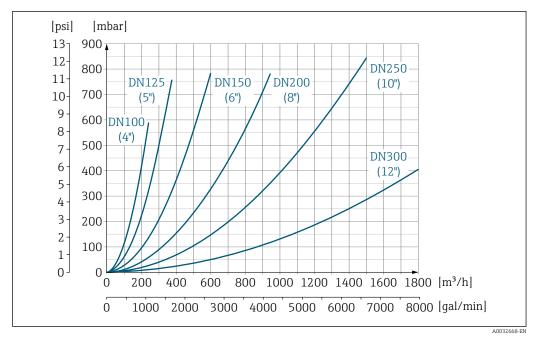
- v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludge)
- A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.

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



■ 34 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"



■ 35 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 d	ninal diameter EN (DIN), AS 1) ASME		fominal diameter EN (DIN), AS <sup>1)</sup> ASME			JIS	
[mm]	[in]	Pressure rating	[kg]	Pressure rating	[kg]	Pressure rating	[kg]
15	1/2	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 d	liameter	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

<sup>1)</sup> For flanges to AS, only DN 25 and 50 are available.

# Weight in US units

Nominal diameter		ASME		
[mm]	[in]	Pressure rating	[lbs]	
15	1/2	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 of	connection	internal (	diameter
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PI	FA.	PT	FE
[mm]	[in]	[bar]	[psi]	[bar]	[bar]	[bar]	[mm]	[in]	[mm]	[in]
15	1/2	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

Nom diam			Pressure rating					connection	internal (	diameter
		EN (DIN)	ASME	AS 2129	AS 4087	JIS	PI	FA.	PT	FE
[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":

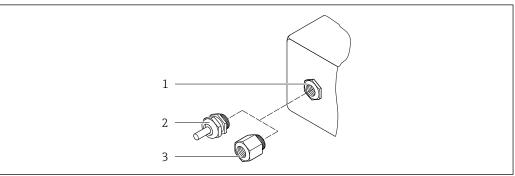
Option A "Aluminum, coated": aluminum, AlSi10Mg, coated

Window material

Order code for "Housing":

Option A "Aluminum, coated": glass

# Cable entries/cable glands



 $\blacksquare$  36 Possible cable entries/cable glands

- Female thread M20  $\times$  1.5
- Cable gland M20 × 1.5
- Adapter for cable entry with internal thread G  $\frac{1}{2}$ " or NPT  $\frac{1}{2}$ "

205

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 1/2"	Nickel-plated brass
Adapter for cable entry with internal thread NPT ½"	
Device plug	Plug M12 × 1 Socket: Stainless steel, 1.4404 (316L) Contact housing: Polyamide 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 ( $\frac{1}{2}$  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)

<sup>1)</sup> DN 15 to 300 ( $\frac{1}{2}$  to 12") with Al/Zn protective coating; DN 350 to 600 (14 to 24") with protective varnish

#### 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:

- Standard: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum, titanium
- Optional: only platinum measuring electrodes

#### Surface roughness

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

 $\leq 0.3$  to 0.5 µm (11.8 to 19.7 µin)

(All data relate to parts in contact with fluid)

Liner with PFA:  $\leq 0.4 \mu \text{m} (15.7 \mu \text{in})$ 

(All data relate to parts in contact with fluid)

# 16.11 Operability

#### Languages

Can be operated in the following languages:

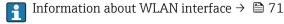
- Via local operation
  - English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech, Swedish
- Via Web browser
  - English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese,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

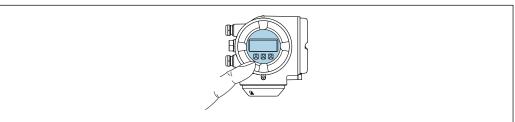
#### Local operation

#### 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"





A002678

■ 37 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

#### Operating elements

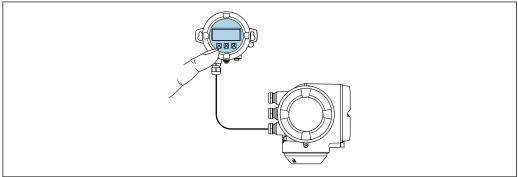
- External operation via touch control (3 optical keys) without opening the housing: ±,
- Operating elements also accessible in the various zones of the hazardous area

## Via remote display and operating module DKX001



The remote display and operating module DKX001 is available as an optional extra → ■ 185.

- 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.



₹ 38 Operation via remote display and operating module DKX001

#### Display and operating elements

The display and operating elements correspond to those of the display module  $\rightarrow \cong 206$ .

#### 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

→ 🖺 34

Dimensions

Information on the dimensions:

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

Remote operation → 🖺 70 Service interface → 🖺 70

#### Supported operating tools

Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li></ul>	Special Documentation for device
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li><li>Fieldbus protocol</li></ul>	→ 🖺 186
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul><li>CDI-RJ45 service interface</li><li>WLAN interface</li><li>Fieldbus protocol</li></ul>	→ 🖺 186

- 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  $\rightarrow$ 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  $\rightarrow \stackrel{\text{\tiny $\square$}}{=} 212$ )



# 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	<ul> <li>Event logbook such as diagnostic events for example</li> <li>Parameter data record backup</li> <li>Device firmware package</li> <li>Driver for system integration for exporting via Web server, e.g:         GSD for PROFIBUS DP</li> </ul>	<ul> <li>Measured value logging ("Extended HistoROM" order option)</li> <li>Current parameter data record (used by firmware at run time)</li> <li>Peakhold indicator (min/max values)</li> <li>Totalizer values</li> </ul>	<ul> <li>Sensor data: nominal diameter etc.</li> <li>Serial number</li> <li>Calibration data</li> <li>Device configuration (e.g. SW options, fixed I/O or multi I/O)</li> </ul>
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.:
   GSD for PROFIBUS DP

#### **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



Currently available certificates and approvals can be called up via the product configurator.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

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
- USP Class VI
- TSE/BSE Certificate of Suitability

#### Certification PROFIBUS

#### PROFIBUS interface

The measuring device is certified and registered by the PNO (PROFIBUS User Organization Organization). The measuring system meets all the requirements of the following specifications:

- Certified in accordance with PROFIBUS PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

#### Radio approval

The measuring device has radio approval.



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/EU.
- Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Article 4 paragraph 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/EU.

# Measuring instrument approval

The measuring device is qualified to OIML R117 and has an OIML Certificate of Conformity (optional).

#### Additional certification

#### **PWIS-free**

PWIS = paint-wetting impairment substances

Order code for "Service":

- Option **HC**: PWIS-free (version A)
- Option **HD**: PWIS-free (version B)
- Option **HE**: PWIS-free (version C)



# Other standards and quidelines

■ EN 60529

Degrees of protection provided by enclosures (IP code)

■ EN 61010-1

Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements

■ IEC/EN 61326

Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).

NAMUR NE 21

Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment

■ NAMUR NE 32

Data retention in the event of a power failure in field and control instruments with microprocessors

■ NAMUR NE 43

Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.

■ NAMUR NE 53

Software of field devices and signal-processing devices with digital electronics

■ NAMUR NE 105

Specifications for integrating fieldbus devices in engineering tools for field devices

■ NAMUR NE 107

Self-monitoring and diagnosis of field devices

■ NAMUR NE 131

Requirements for field devices for standard applications

■ ETSI EN 300 328

Guidelines for 2.4 GHz radio components.

■ EN 301489

Electromagnetic compatibility and radio spectrum matters (ERM).

# 16.13 Application packages

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

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

#### Diagnostics functions

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

## Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	Heartbeat Verification  Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".  Functional testing in the installed state without interrupting the process.  Traceable verification results on request, including a report.  Simple testing process via local operation or other operating interfaces.  Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.  Extension of calibration intervals according to operator's risk assessment.
	<ul> <li>Heartbeat Monitoring         Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:         <ul> <li>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.</li> <li>Schedule servicing in time.</li> <li>Monitor the process or product quality, e.g. gas pockets.</li> </ul> </li> </ul>

eaning	

Package	Description
Electrode cleaning circuit (ECC)	The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe $_3$ O $_4$ ) 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 → 🗎 185

# Supplementary documentation



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

- W@M Device Viewer (www.endress.com/deviceviewer): Enter the serial number from nameplate
- Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2D 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	KA01385D

## **Technical Information**

Measuring device	Documentation code
Promag P 300	TI01224D

### Description of device parameters

Measuring device	Documentation code
Promag 300	GP01135D

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

Contents	Documentation code
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	SD02206D
Web server	SD02235D

# **Installation Instructions**

Contents	Comment		
Installation instructions for spare part sets and accessories	<ul> <li>Access the overview of all the available spare part sets via W@MDevice Viewer → 183</li> <li>Accessories available for order with Installation Instructions → 185</li> </ul>		

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