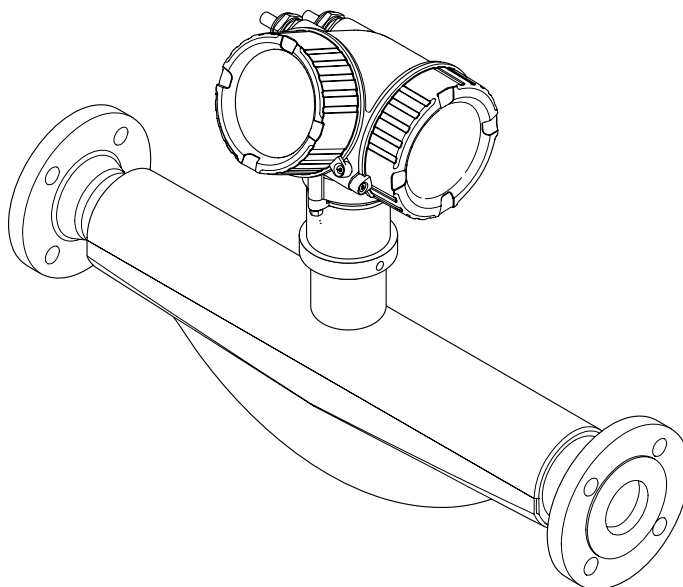


Operating Instructions

Proline Promass F 200

Coriolis flowmeter
FOUNDATION Fieldbus



- 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 Document information

1.1 Document function







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

1.2 Symbols used




1.2.1 Safety symbols

Symbol	Meaning
	DANGER! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
	NOTE! This symbol contains information on procedures and other facts which do not result in personal injury.









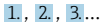



1.2.2 Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	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 ground connection A terminal which must be connected to ground prior to establishing any other connections.
	Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.


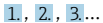
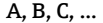
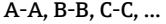



1.2.3 Tool symbols

Symbol	Meaning
	Flat blade screwdriver
	Allen key
	Open-ended wrench


1.2.4 Symbols for certain types of information

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



1.2.5 Symbols in graphics

Symbol	Meaning
	Item numbers
	Series of steps
	Views
	Sections
	Hazardous area
	Safe area (non-hazardous area)
	Flow direction

1.3 Documentation

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

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

 For a detailed list of the individual documents along with the documentation code
→  159

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 style="list-style-type: none"> ■ Incoming acceptance and product identification ■ Storage and transport ■ Installation
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 style="list-style-type: none"> ■ Product description ■ Installation ■ Electrical connection ■ Operation options ■ System integration ■ Commissioning ■ Diagnostic information
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

FOUNDATION™ Fieldbus

Registration-pending trademark of the FieldComm Group, Austin, Texas, USA

TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

Applicator®, FieldCare®, DeviceCare®, Field Xpert™, HistoROM®, Heartbeat Technology™

Registered or registration-pending trademarks of the Endress+Hauser Group

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 Instructions is intended only for flow measurement of liquids and gases.

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

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

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

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

Incorrect use

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

WARNING

Danger of breakage due to corrosive or abrasive fluids!

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

NOTICE**Verification for borderline cases:**

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

Residual risks**⚠ WARNING**

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

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

⚠ WARNING

Danger of housing breaking due to measuring tube breakage!

- ▶ In the event of a measuring tube breakage for a device version without rupture disk it is possible for the pressure loading capacity of the sensor housing to be exceeded. This can lead to rupture or failure of the sensor housing.

2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

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

2.4 Operational safety

Risk of injury.

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

Conversions to the device

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

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

Repair

To ensure continued operational safety and reliability,

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

2.5 Product safety

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

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

2.6 IT security

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

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

2.7 Device-specific IT security

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

2.7.1 Protecting access via hardware write protection


Write access to the device parameters via the local display 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

A password can be used to protect against write access to the device parameters.


This password locks write access to the device parameters via the local display or another operating tool (e.g. FieldCare, DeviceCare) and, in terms of functionality, is equivalent to hardware write protection. If the service interface CDI RJ-45 is used, read access is only possible if the password is entered.

User-specific access code

Write access to the device parameters via the local display or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code (→  84).

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

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 →  84

2.7.3 Access via fieldbus

Cyclic fieldbus communication (read and write, e.g. measured value transmission) with a higher-order system is not affected by the restrictions mentioned above.

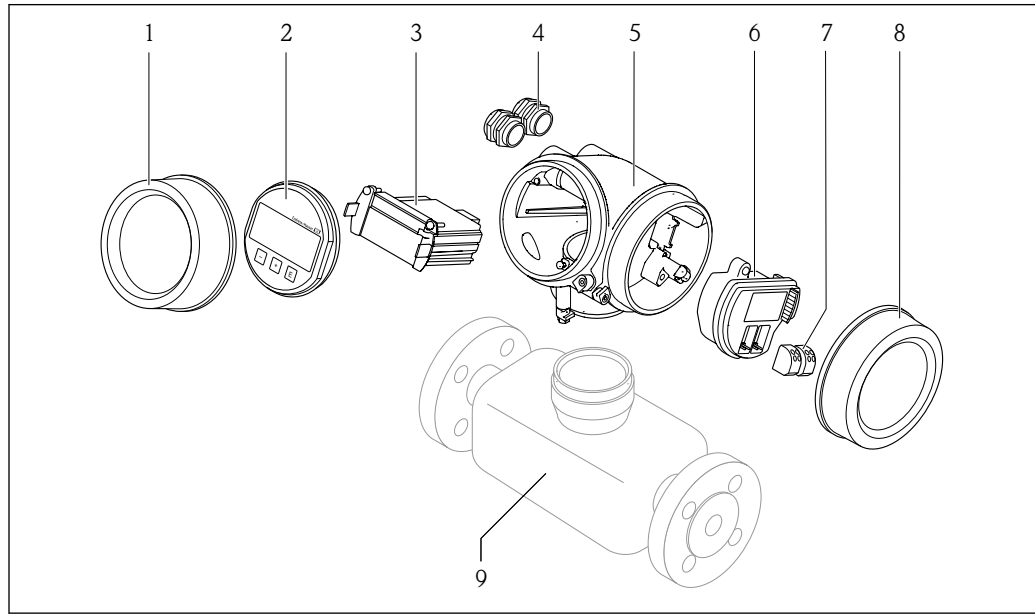
3 Product description

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



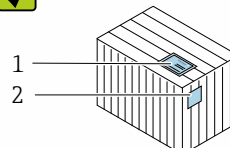
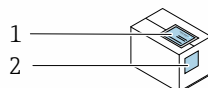
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1 Important components of a measuring device

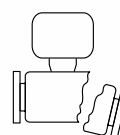
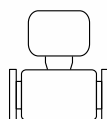
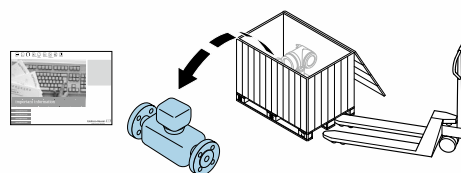
- 1 Electronics compartment cover
- 2 Display module
- 3 Main electronics module
- 4 Cable glands
- 5 Transmitter housing (incl. integrated HistoROM)
- 6 I/O electronics module
- 7 Terminals (pluggable spring terminals)
- 8 Connection compartment cover
- 9 Sensor

4 Incoming acceptance and product identification

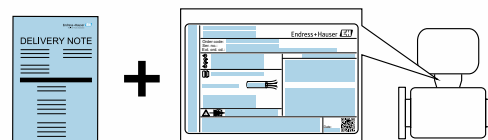
4.1 Incoming acceptance



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



Are the goods undamaged?



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



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





- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 14.

4.2 Product identification

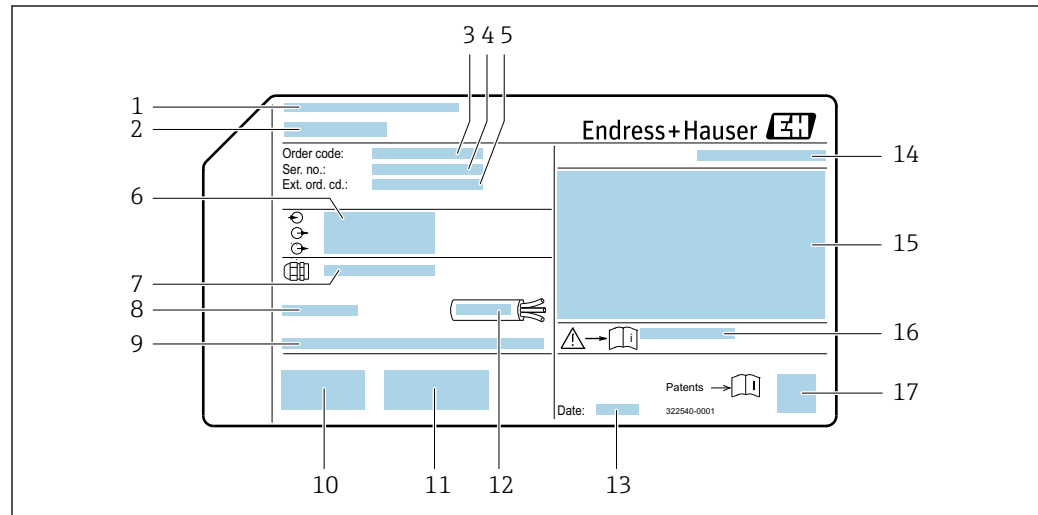
The following options are available for identification of the measuring device:

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


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


- The chapters "Additional standard documentation on the device" →  8 and "Supplementary device-dependent documentation" →  8
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

4.2.1 Transmitter nameplate

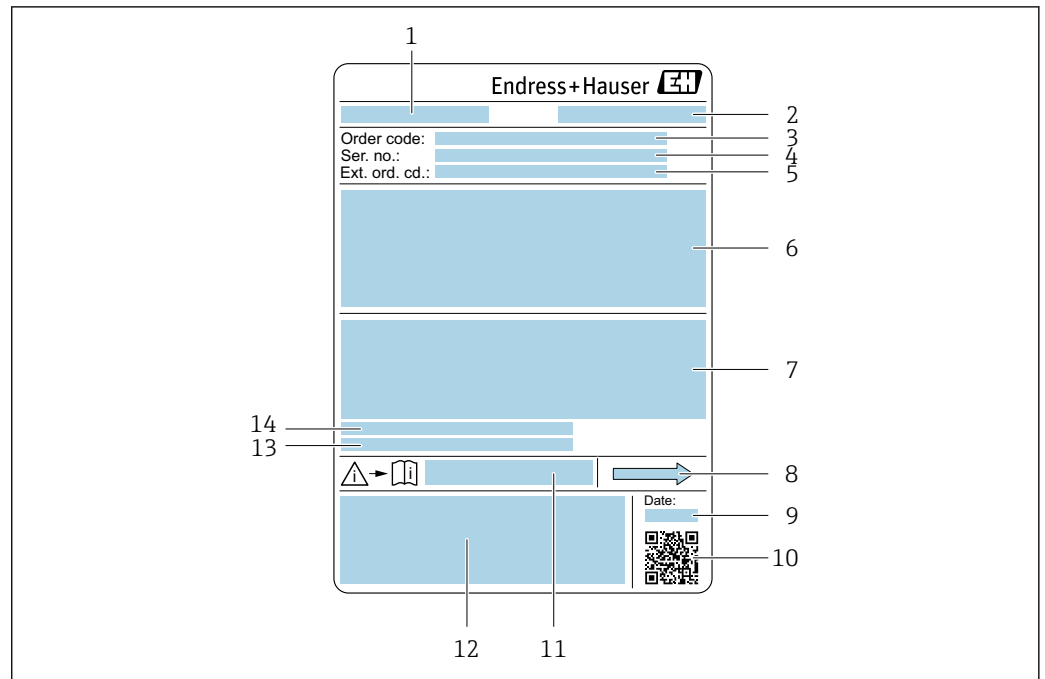


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 2 Example of a transmitter nameplate

- 1 Manufacturing location
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number (ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 7 Type of cable glands
- 8 Permitted ambient temperature (T_a)
- 9 Firmware version (FW) from the factory
- 10 CE mark, C-Tick
- 11 Additional information on version: certificates, approvals
- 12 Permitted temperature range for cable
- 13 Manufacturing date: year-month
- 14 Degree of protection
- 15 Approval information for explosion protection
- 16 Document number of safety-related supplementary documentation →  159
- 17 2-D matrix code

4.2.2 Sensor nameplate



A0029199

3 Example of a 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 Nominal diameter of the sensor; flange nominal diameter/nominal pressure; sensor test pressure; medium temperature range; material of measuring tube and manifold; sensor-specific information: e.g. pressure range of secondary containment, wide-range density specification (special density calibration)
- 7 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 8 Flow direction
- 9 Manufacturing date: year-month
- 10 2-D matrix code
- 11 Document number of safety-related supplementary documentation
- 12 CE mark, C-Tick
- 13 Surface roughness
- 14 Permitted ambient temperature (T_a)




Order code

The measuring device is reordered using the order code.

Extended order code

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

4.2.3 Symbols on measuring device

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

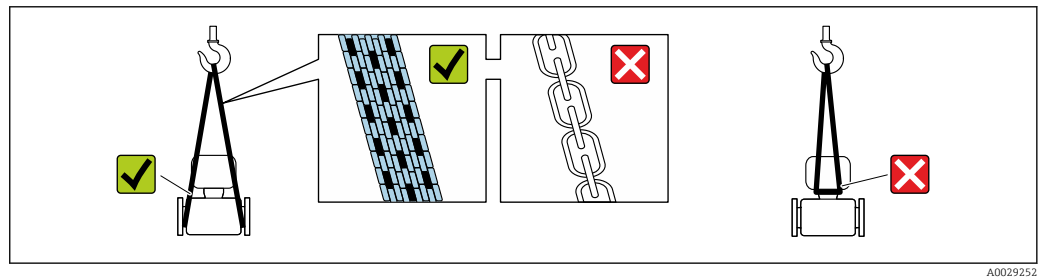
Observe the following notes for storage:

- 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.
- Store in a dry and dust-free place.
- Do not store outdoors.


Storage temperature →  148

5.2 Transporting the product

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



A0029252

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

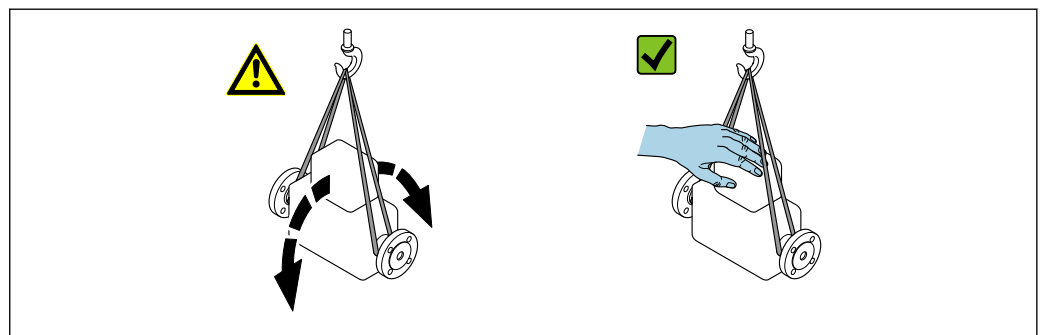
5.2.1 Measuring devices without lifting lugs

WARNING

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

Risk of injury if the measuring device slips.

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



A0029214

5.2.2 Measuring devices with lifting lugs

CAUTION

Special transportation instructions for devices with lifting lugs

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

5.2.3 Transporting with a fork lift

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

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

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

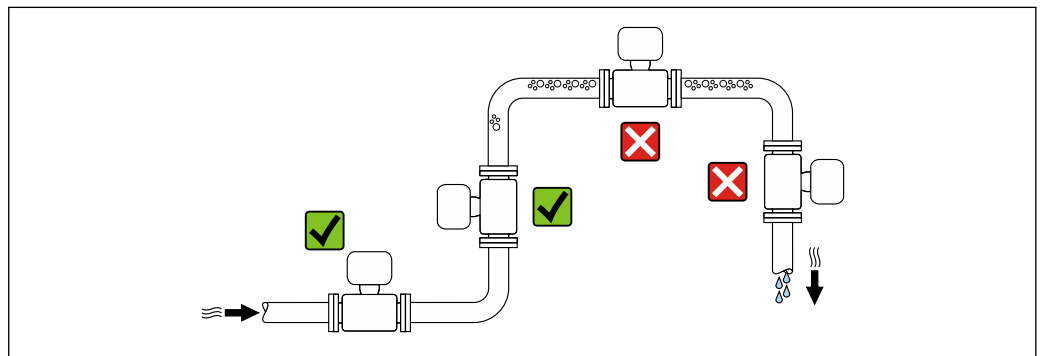
6 Installation

6.1 Installation conditions

No special measures such as supports are necessary. External forces are absorbed by the construction of the device.

6.1.1 Mounting position

Mounting location



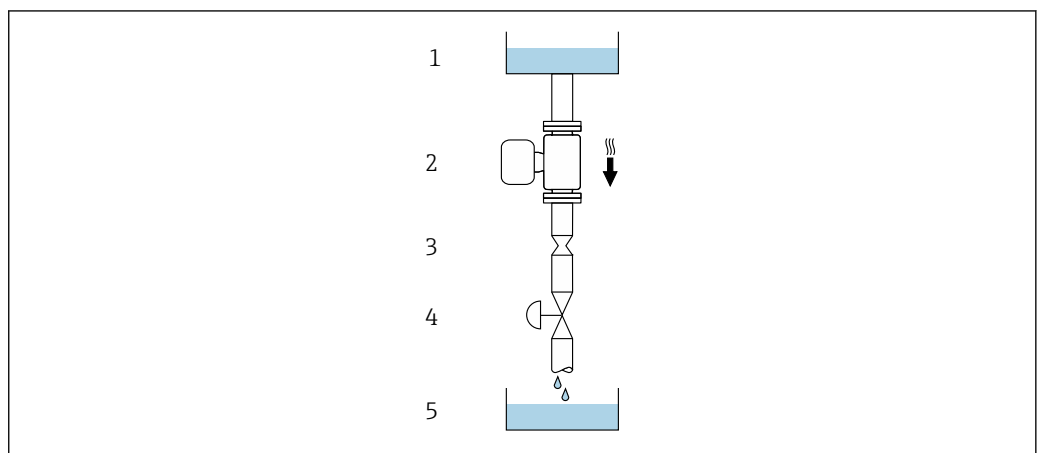
A0028772

To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

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



A0028773

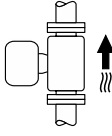
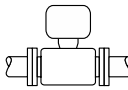
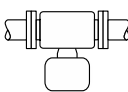
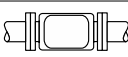
4 Installation in a down pipe (e.g. for batching applications)

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

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	$\frac{3}{8}$	6	0.24
15	$\frac{1}{2}$	10	0.40
25	1	14	0.55
40	$1\frac{1}{2}$	22	0.87
50	2	28	1.10
80	3	50	1.97

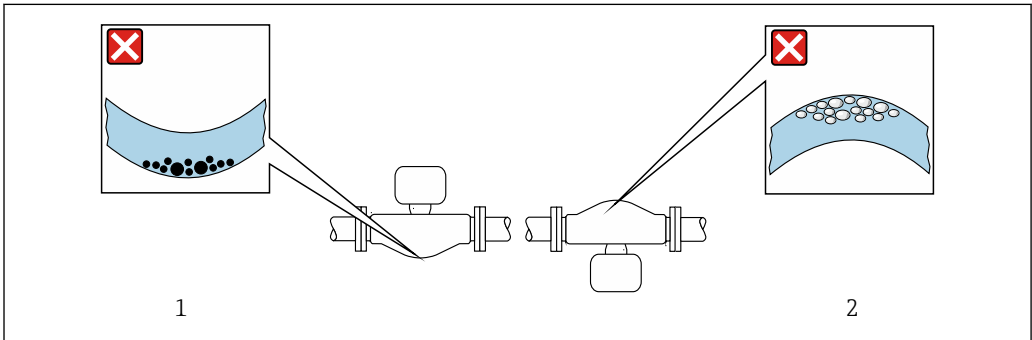
Orientation

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

Orientation			Recommendation
A	Vertical orientation	 <small>A0015591</small>	✓✓
B	Horizontal orientation, transmitter at top	 <small>A0015589</small>	✓✓ ¹⁾ Exceptions: → ☒ 5, ☒ 20
C	Horizontal orientation, transmitter at bottom	 <small>A0015590</small>	✓✓ ²⁾ Exceptions: → ☒ 5, ☒ 20
D	Horizontal orientation, transmitter at side	 <small>A0015592</small>	✗

- 1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

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

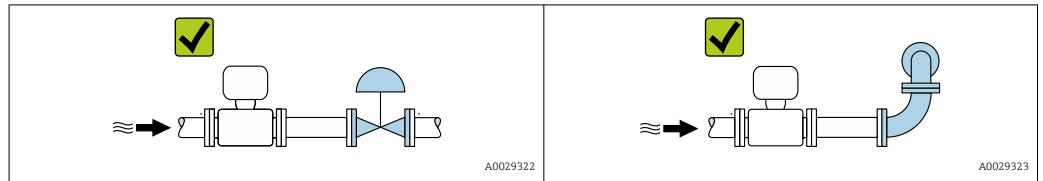


☒ 5 Orientation of sensor with curved measuring tube

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

Inlet and outlet runs

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 21.



Installation dimensions



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

6.1.2 Requirements from environment and process

Ambient temperature range

Measuring device	-40 to +60 °C (-40 to +140 °F)
Readability of the local display	-20 to +60 °C (-4 to +140 °F) The readability of the display may be impaired at temperatures outside the temperature range.

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



You can order a weather protection cover from Endress+Hauser : → 134

System pressure

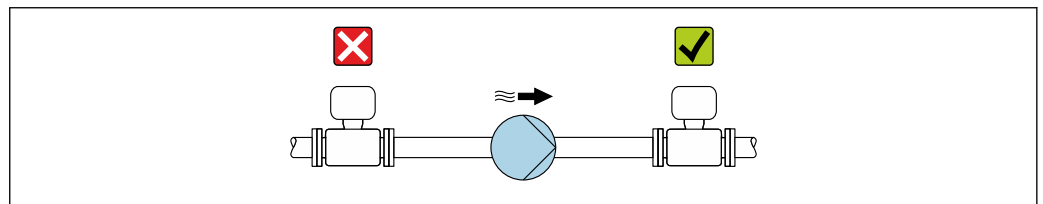
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

Cavitation is caused if the pressure drops below the vapor pressure:

- In liquids that have a low boiling point (e.g. hydrocarbons, solvents, liquefied gases)
- In suction lines
- Ensure the system pressure is sufficiently high to prevent cavitation and outgassing.

For this reason, the following mounting locations are recommended:

- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)



A0028777

Thermal insulation

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

NOTICE

Electronics overheating on account of thermal insulation!

- Observe maximum permitted insulation height of the transmitter neck so that the transmitter head is completely free.

NOTICE

Danger of overheating with insulation

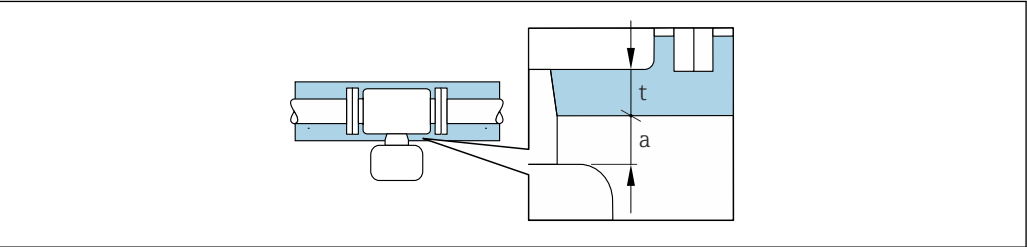
- Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F)

NOTICE

The insulation can also be thicker than the maximum recommended insulation thickness.

Prerequisite:

- Ensure that convection takes place on a sufficiently large scale at the transmitter neck.
- Ensure that a sufficiently large area of the housing support remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.

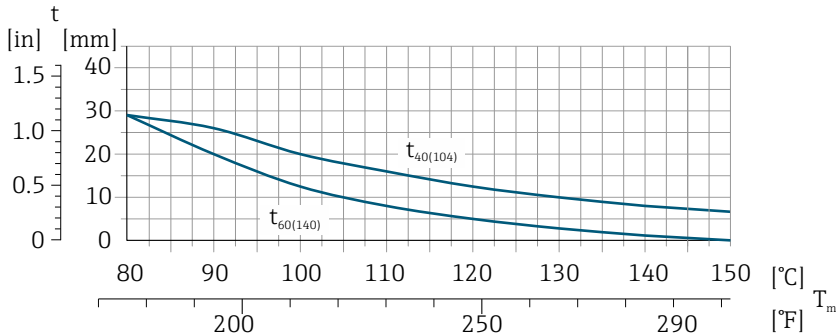


A0028853

t Maximum insulation thickness
a Minimum distance to insulation

The minimum distance a between the transmitter and the insulation is 20 mm (0.79 in). This is to ensure that the transmitter remains completely exposed.

Maximum recommended insulation thickness



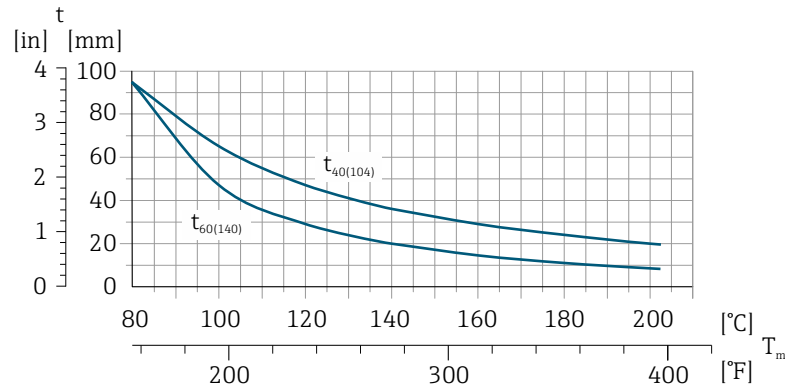
A0028904

6 Maximum recommended insulation thickness depending on the temperature of the medium and the ambient temperature

t Insulation thickness
 T_m Medium temperature
 $t_{40(104)}$ Maximum recommended insulation thickness at an ambient temperature of $T_a = 40\text{ °C}$ (104 °F)
 $t_{60(140)}$ Maximum recommended insulation thickness at an ambient temperature of $T_a = 60\text{ °C}$ (140 °F)

Maximum recommended insulation thickness for the extended temperature range or insulation

For the extended temperature range, version with long extension neck, order code for "Measuring tube material", option **SD, SE, SF, TH** or extension neck for insulation, order code for "Sensor option", option **CG**:



A0029921

t Insulation thickness

T_m Medium temperature

$t_{40(104)}$ Maximum recommended insulation thickness at an ambient temperature of $T_a = 40\text{ °C}$ (104 °F)

$t_{60(140)}$ Maximum recommended insulation thickness at an ambient temperature of $T_a = 60\text{ °C}$ (140 °F)

Heating

NOTICE

Electronics can overheat due to elevated ambient temperature!

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

NOTICE

Danger of overheating when heating

- ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F).
- ▶ Ensure that convection takes place on a sufficiently large scale at the transmitter neck.
- ▶ Ensure that a sufficiently large area of the housing support remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.

Heating options

If a fluid requires that no heat loss should occur at the sensor, users can avail of the following heating options:

- Electrical heating, e.g. with electric band heaters
- Via pipes carrying hot water or steam
- Via heating jackets

Using an electrical trace heating system

If heating is regulated via phase angle control or pulse packages, magnetic fields can affect the measured values (= for values that are greater than the values permitted by the EN standard (sine 30 A/m)).

For this reason, the sensor must be magnetically shielded: the housing can be shielded with tin plates or electric sheets without a privileged direction (e.g. V330-35A).

The sheet must have the following properties:

- Relative magnetic permeability $\mu_r \geq 300$
- Plate thickness $d \geq 0.35 \text{ mm}$ ($d \geq 0.014 \text{ in}$)

Vibrations

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

6.1.3 Special mounting instructions

Rupture disk

Information that is relevant to the process: (Verweisziel existiert nicht, aber @y.link.required=true).

WARNING

Limited functional reliability of the rupture disk.

Danger to persons from escaping fluids!

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

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

The transportation guard must be removed.



For information on the dimensions: see the "Mechanical construction" section

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

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

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 144. Therefore, a zero point adjustment in the field is generally not required.

Experience shows that zero point adjustment is advisable only in special cases:

- To achieve maximum measuring accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

6.2 Mounting the measuring device

6.2.1 Required tools

For transmitter

- For turning the transmitter housing: Open-ended wrench 8 mm
- For opening the securing clamps: Allen key 3 mm
- For turning the transmitter housing: Open-ended wrench 8 mm
- For opening the securing clamps: Allen key 3 mm

For sensor

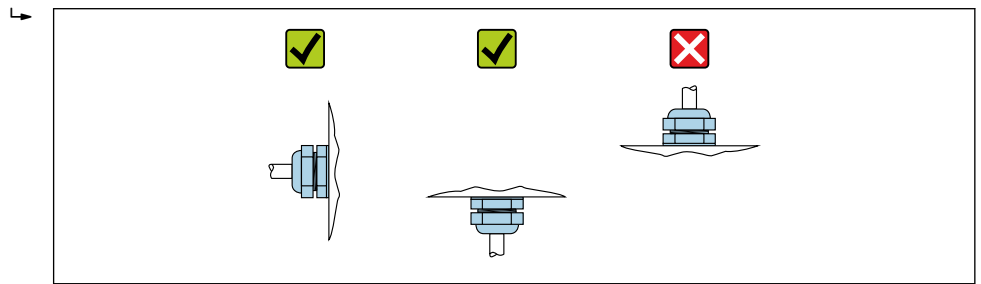
For flanges and other process connections: Corresponding mounting tools

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 measuring device**⚠ WARNING****Danger due to improper process sealing!**

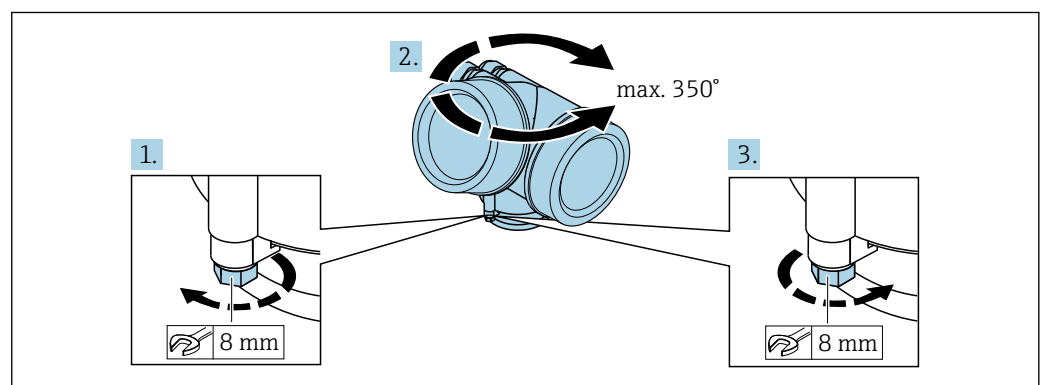
- ▶ Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
 - ▶ Ensure that the gaskets are clean and undamaged.
 - ▶ Install the gaskets correctly.
1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the fluid.
 2. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



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6.2.4 Turning the transmitter housing

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

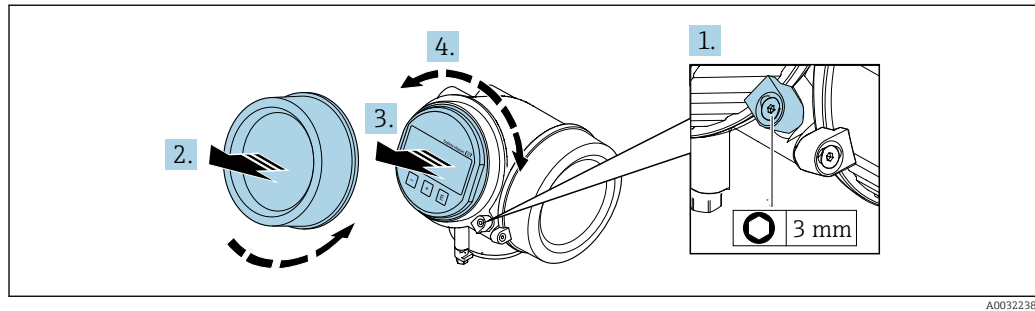


A0032242

1. Release the fixing screw.
2. Turn the housing to the desired position.
3. Firmly tighten the securing screw.

6.2.5 Turning the display module

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




A0032238

1. Loosen the securing clamp of the electronics compartment cover using an Allen key.
2. Unscrew cover of the electronics compartment from the transmitter housing.
3. Optional: pull out the display module with a gentle rotational movement.
4. Turn the display module to the desired position: max. $8 \times 45^\circ$ in every direction.
5. Without display module pulled out:
Allow display module to engage at desired position.
6. With display module pulled out:
Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment until it engages.
7. Reverse the removal procedure to reassemble the transmitter.

6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none"> ■ Process temperature → 149 ■ Process pressure (refer to the chapter on "Pressure-temperature ratings" of the "Technical Information" document) ■ Ambient temperature ■ Measuring range 	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none"> ■ According to sensor type ■ According to medium temperature ■ According to medium properties (outgassing, with entrained solids) 	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 20?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Are the securing screw and securing clamp tightened securely?	<input type="checkbox"/>

7 Electrical connection

 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.

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 Connecting cable requirements

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

Electrical safety

In accordance with applicable federal/national regulations.

Permitted temperature range

Minimum requirement: cable temperature range \geq ambient temperature +20 K


Signal cable

Pulse/frequency/switch output

Standard installation cable is sufficient.

FOUNDATION Fieldbus

Twisted, shielded two-wire cable.

 For further information on planning and installing FOUNDATION Fieldbus networks see:

- Operating Instructions for "FOUNDATION Fieldbus Overview" (BA00013S)
- FOUNDATION Fieldbus Guideline
- IEC 61158-2 (MBP)

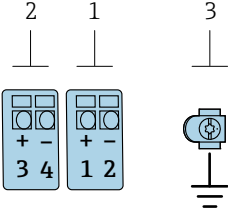
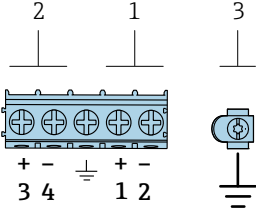
Cable diameter

- Cable glands supplied:
M20 \times 1.5 with cable \varnothing 6 to 12 mm (0.24 to 0.47 in)
- Plug-in spring terminals for device version without integrated overvoltage protection:
wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- Screw terminals for device version with integrated overvoltage protection: wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)

7.1.3 Terminal assignment

Transmitter

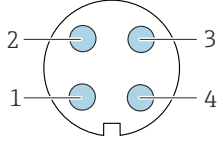
Connection version for FOUNDATION Fieldbus, pulse/frequency/switch output

 <div>A0013570</div>	 <div>A0018161</div>
Maximum number of terminals	Maximum number of terminals for order code for "Accessory mounted", option NA "Overvoltage protection"
<div>1 Output 1: FOUNDATION Fieldbus</div> <div>2 Output 2 (passive: pulse/frequency/switch output</div> <div>3 Ground terminal for cable shield</div>	

Order code for "Output"	Terminal numbers			
	Output 1		Output 2	
	1 (+)	2 (-)	3 (+)	4 (-)
Option E ^{1) 2)}	FOUNDATION Fieldbus		Pulse/frequency/switch output (passive)	

- 1) Output 1 must always be used; output 2 is optional.
- 2) FOUNDATION Fieldbus with integrated reverse polarity protection.

7.1.4 Pin assignment of device plug

	Pin	Assignment		Coding	Plug/socket
	1	+	Signal +	A	Plug
	2	-	Signal -		
	3		Grounding		
	4		Not assigned		

7.1.5 Shielding and grounding

FOUNDATION Fieldbus

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!

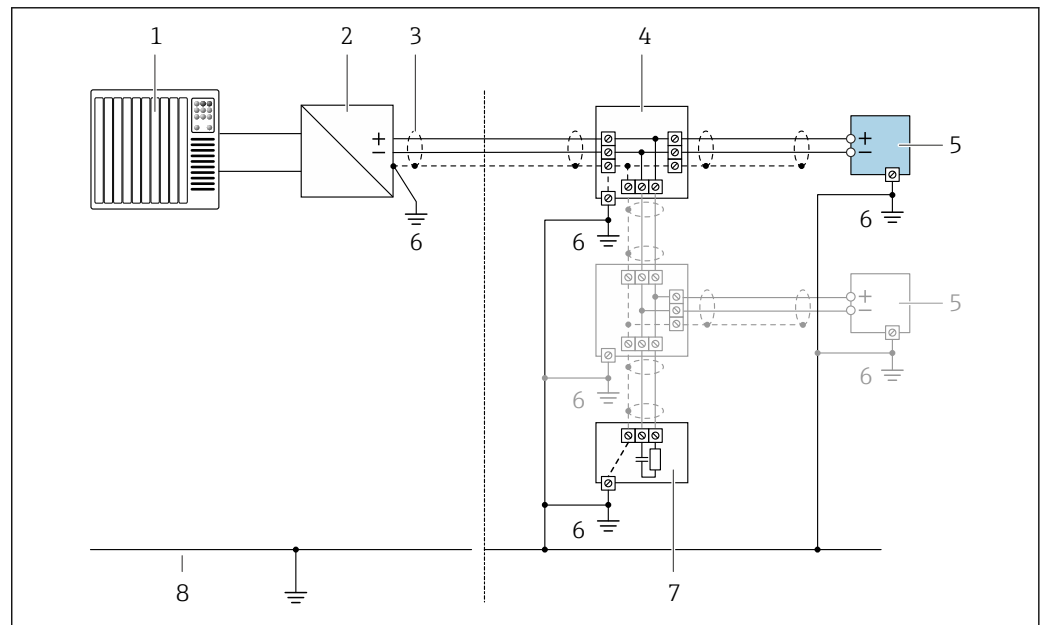
Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground. In systems without potential equalization, therefore, cable shielding of fieldbus systems should only be grounded on one side, for example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



7 Connection example for FOUNDATION Fieldbus

- 1 Control system (e.g. PLC)
- 2 Power Conditioner (FOUNDATION Fieldbus)
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

7.1.6 Requirements for the supply unit

Supply voltage

Transmitter

An external power supply is required for each output.

The following supply voltage values apply for the outputs available:

Order code for "Output"	Minimum terminal voltage	Maximum terminal voltage
Option E ¹⁾ : FOUNDATION Fieldbus, pulse/frequency/switch output	≥ DC 9 V	DC 32 V

- 1) For device version with SD03 local display: The terminal voltage must be increased by DC 0.5 V if backlighting is used.


7.1.7 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 →  27.

7.2 Connecting the measuring device

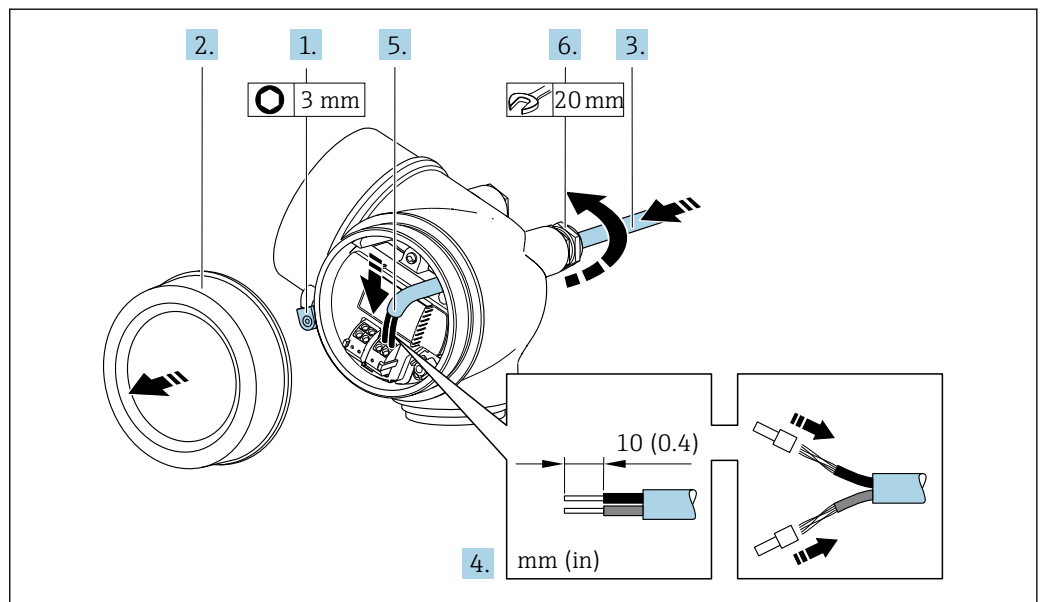
NOTICE

Limitation of electrical safety due to incorrect connection!

- Have electrical connection work carried out by correspondingly 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

Connection via terminals



A0032239

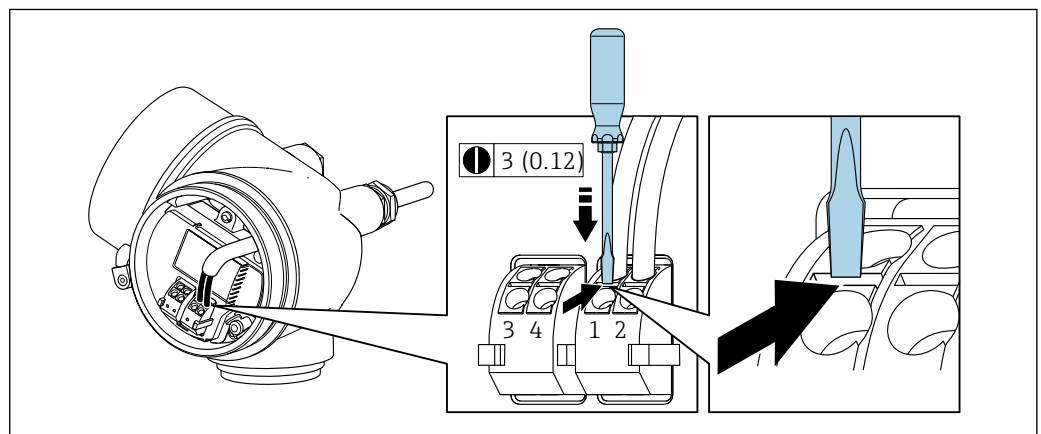
1. Loosen the securing clamp of the connection compartment cover.
2. Unscrew the connection compartment cover.
3. Push the cable through the cable entry. To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
5. **⚠ WARNING**

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

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

Reverse the removal procedure to reassemble the transmitter.

Removing a cable



A0032240

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

7.2.2 Ensuring potential equalization

Requirements

No special measures for potential equalization are required.

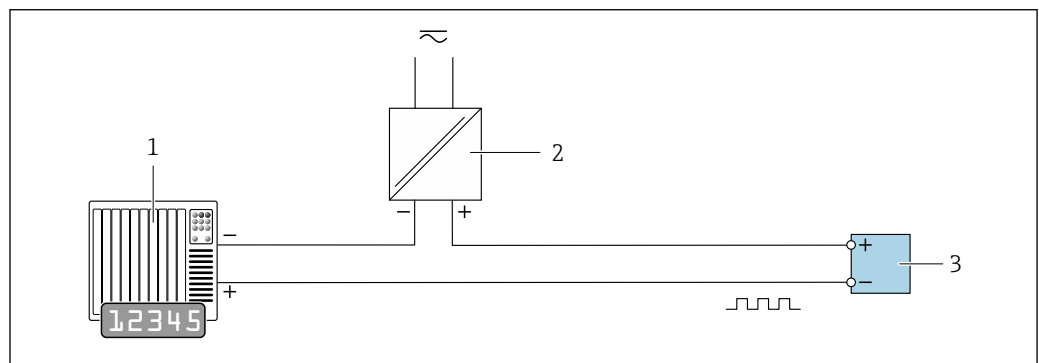


For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).

7.3 Special connection instructions

7.3.1 Connection examples

Pulse/frequency output

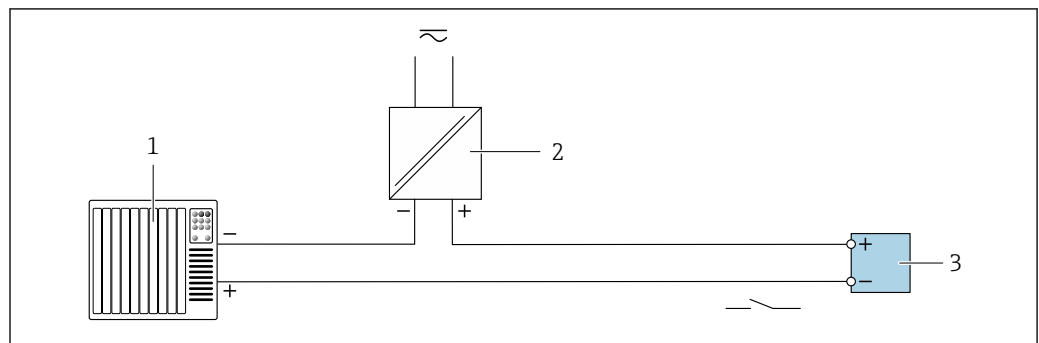


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8 Connection example for pulse/frequency output (passive)

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

Switch output

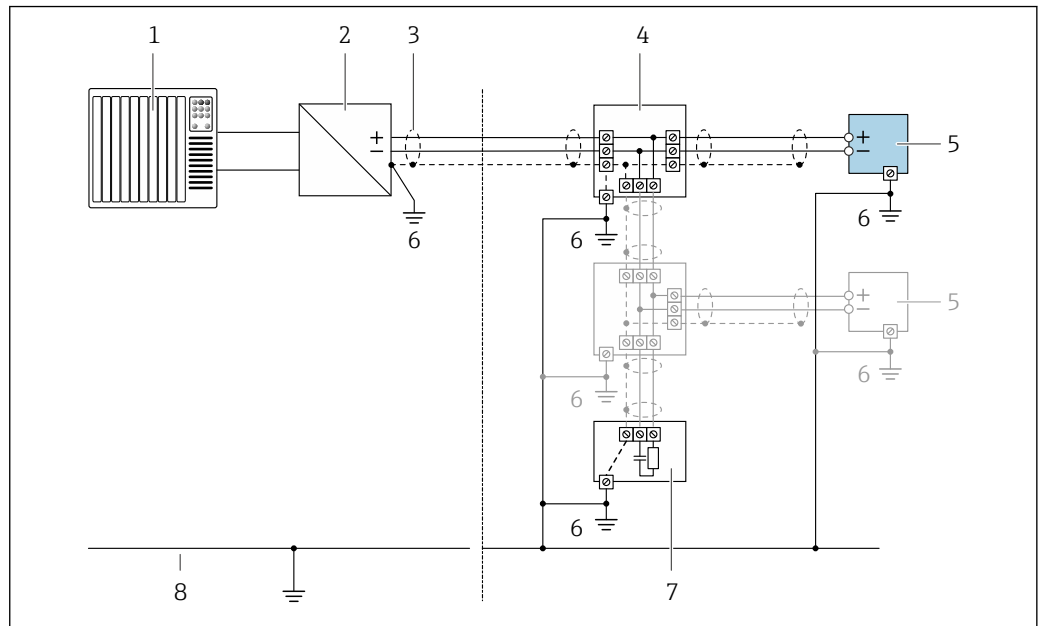


A0028760

9 Connection example for switch output (passive)

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

FOUNDATION Fieldbus



A0028768

10 Connection example for FOUNDATION Fieldbus

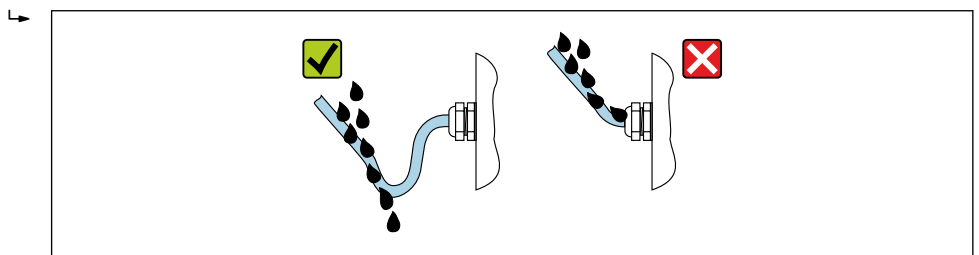
- 1 Control system (e.g. PLC)
- 2 Power Conditioner (FOUNDATION Fieldbus)
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

7.4 Ensuring the degree of protection

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

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






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



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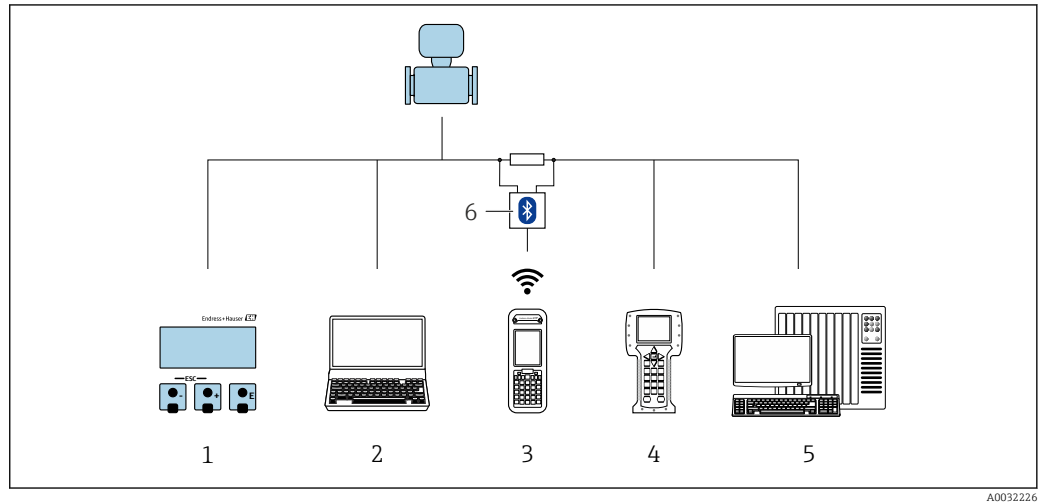
6. Insert dummy plugs into unused cable entries.

7.5 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements →  27?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" →  33 ?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened →  30?	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate →  29?	<input type="checkbox"/>
Is the terminal assignment correct →  28?	<input type="checkbox"/>
If supply voltage is present, do values appear on the display module?	<input type="checkbox"/>
Are all housing covers installed and firmly tightened?	<input type="checkbox"/>
Is the securing clamp tightened correctly?	<input type="checkbox"/>

8 Operation options

8.1 Overview of operation options




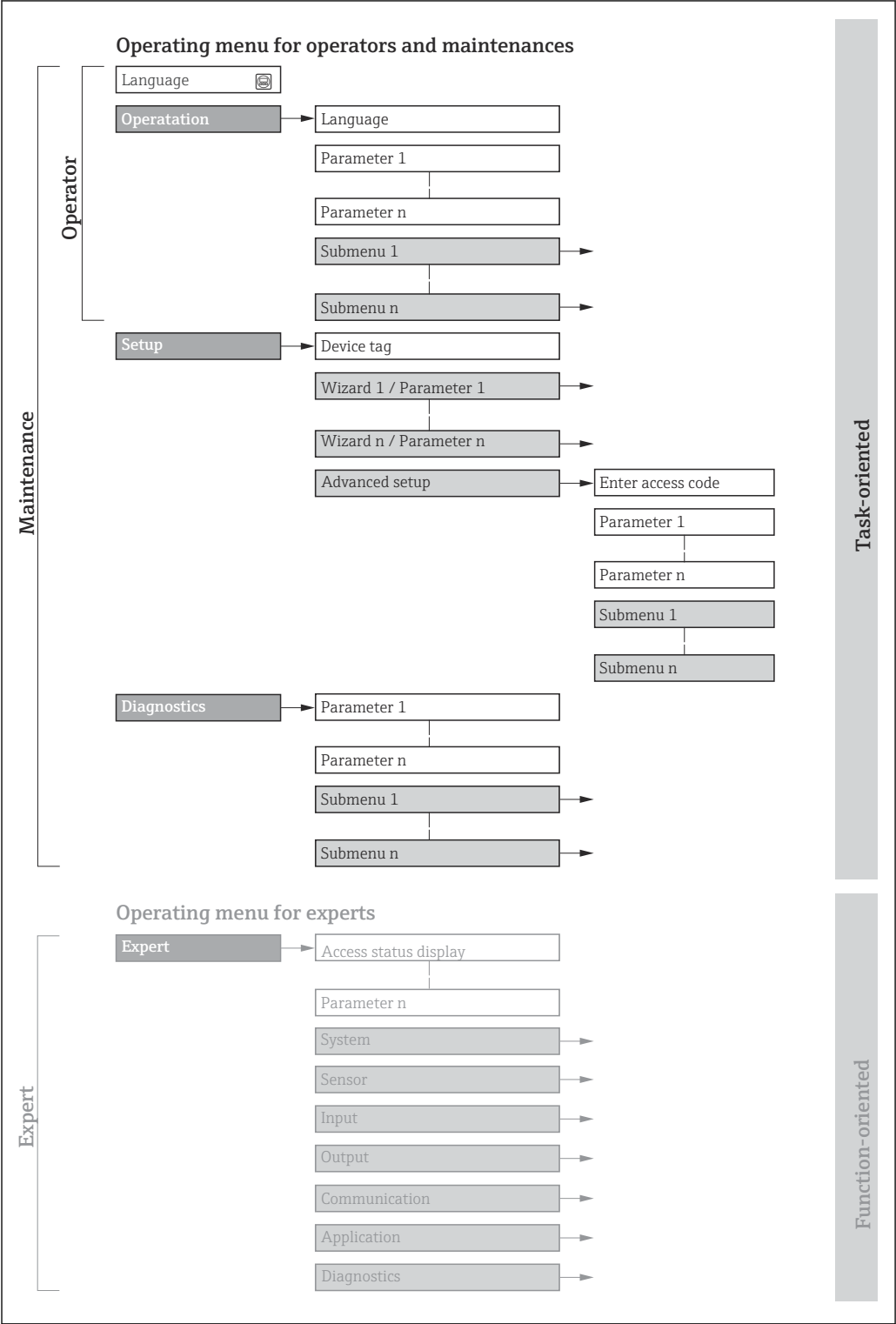
A0032226


- 1 Local operation via display module
- 2 Computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM)
- 3 Field Xpert SFX350 or SFX370
- 4 Field Communicator 475
- 5 Control system (e.g. PLC)
- 6 VIATOR Bluetooth modem with connecting cable

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



 11 Schematic structure of the operating menu

A0018237-EN

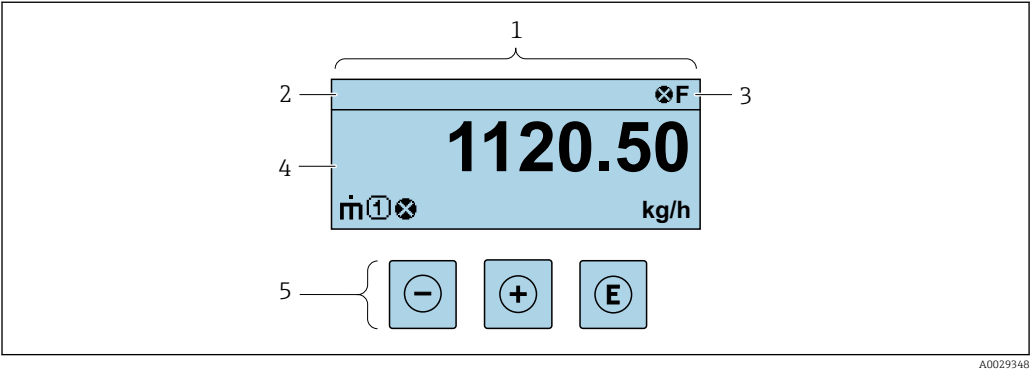
8.2.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles (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: <ul style="list-style-type: none"> ■ Configuring the operational display ■ Reading measured values 	<ul style="list-style-type: none"> ■ Defining the operating language ■ Resetting and controlling totalizers
Operation			<ul style="list-style-type: none"> ■ Configuring the operational display (e.g. display format, display contrast) ■ Resetting and controlling totalizers
Setup		"Maintenance" role Commissioning: <ul style="list-style-type: none"> ■ Configuration of the measurement ■ Configuration of the inputs and outputs 	Wizards for fast commissioning: <ul style="list-style-type: none"> ■ Set the system units ■ Define the medium ■ Configure the outputs ■ Configuring the operational display ■ Define the output conditioning ■ Set the low flow cut off ■ Configure partial and empty pipe detection Advanced setup <ul style="list-style-type: none"> ■ For more customized configuration of the measurement (adaptation to special measuring conditions) ■ Configuration of totalizers ■ Configure the WLAN settings ■ Administration (define access code, reset measuring device)
Diagnostics		"Maintenance" role Fault elimination: <ul style="list-style-type: none"> ■ Diagnostics and elimination of process and device errors ■ Measured value simulation 	Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> ■ Diagnostic list Contains up to 5 currently pending diagnostic messages. ■ Event logbook Contains event messages that have occurred. ■ Device information Contains information for identifying the device. ■ Measured values Contains all current measured values. ■ Data logging submenu with "Extended HistoROM" order option Storage and visualization of measured values ■ Heartbeat The functionality of the device is checked on demand and the verification results are documented. ■ Simulation Is used to simulate measured values or output values.
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device: <ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> ■ System Contains all higher-order device parameters which do not concern the measurement or the communication interface. ■ Sensor Configuration of the measurement. ■ Output Configure the pulse/frequency/switch output. ■ Communication Configuration of the digital communication interface. ■ 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



- 1 Operational display
- 2 Device tag
- 3 Status area
- 4 Display area for measured values (4-line)
- 5 Operating elements → 42

Status area

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

- Status signals → 98
 - **F**: Failure
 - **C**: Function check
 - **S**: Out of specification
 - **M**: Maintenance required
- Diagnostic behavior → 99
 - **X**: Alarm
 - **A**: Warning
- **L**: Locking (the device is locked via the hardware)
- **R**: Communication (communication via remote operation is active)


Display area

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


Measured values



Symbol	Meaning
\dot{m}	Mass flow
\dot{V}	<ul style="list-style-type: none">■ Volume flow■ Corrected volume flow
ρ	<ul style="list-style-type: none">■ Density■ Reference density
θ	Temperature
Σ	Totalizer <ul style="list-style-type: none">i The measurement channel number indicates which of the three totalizers is displayed.

Measurement channel numbers

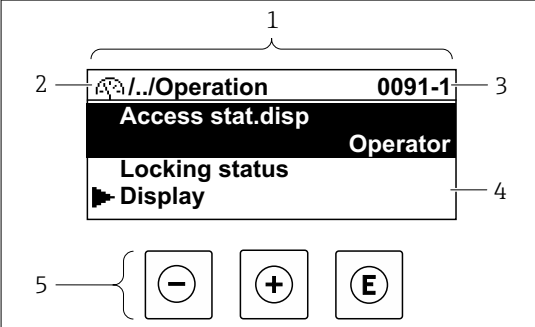
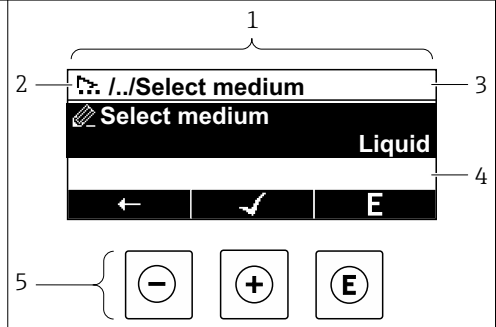

Symbol	Meaning
	Measurement channel 1 to 4
The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. Totalizer 1 to 3).	

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols →  99
--



 The number and display format of the measured values can be configured via the **Format display** parameter (→  65).



8.3.2 Navigation view

In the submenu	In the wizard
	
<div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div> <div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div> <div><div>A0013993-EN</div><div>A0013995-EN</div></div> <div><div>1</div><div>2</div><div>3</div><div>4</div><div>5</div></div> <div><div>Navigation view</div><div>Navigation path to current position</div><div>Status area</div><div>Display area for navigation</div><div>Operating elements →  42</div></div>	

Navigation path




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

	<div><div>■ In the submenu: Display symbol for menu</div><div>■ In the wizard: Display symbol for wizard</div></div>	<div>Omission symbol for operating menu levels in between</div>	<div>Name of current</div> <div><div>■ Submenu</div><div>■ Wizard</div><div>■ Parameters</div></div>
	↓	↓	↓
Examples		<div>/ .. /</div>	<div>Display</div>
		<div>/ .. /</div>	<div>Display</div>

 For more information about the icons in the menu, refer to the "Display area" section
→  40





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 →  98
 ■ For information on the function and entry of the direct access code →  45

Display area


Menus

Symbol	Meaning
	Operation Appears: <ul style="list-style-type: none"> ■ In the menu next to the "Operation" selection ■ At the left in the navigation path in the Operation menu
	Setup Appears: <ul style="list-style-type: none"> ■ In the menu next to the "Setup" selection ■ At the left in the navigation path in the Setup menu
	Diagnostics Appears: <ul style="list-style-type: none"> ■ In the menu next to the "Diagnostics" selection ■ At the left in the navigation path in the Diagnostics menu
	Expert Appears: <ul style="list-style-type: none"> ■ 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
	Wizard
	Parameters within a wizard  No display symbol exists for parameters in submenus.

Locking

Symbol	Meaning
	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. <ul style="list-style-type: none"> ■ By a user-specific access code ■ By the hardware write protection switch

Wizard operation

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

8.3.3 Editing view

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20

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1

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3

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5

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9

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←

C

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A0013941

1

User

2

ABC_

DEFG

HIJK

LMNO

PQRS

TUVW

XYZ

↔C↔

Aa1@

C

X

✓

4

-

+

E

A0013999

1 Editing view

2 Display area of the entered values

3 Input mask

4 Operating elements → 42

Input mask

The following input symbols are available in the input mask of the numeric and text editor:


Numeric editor

Symbol	Meaning
<div>0</div> <div>...</div> <div>9</div>	Selection of numbers from 0 to 9.
<div>.</div>	Inserts decimal separator at the input position.
<div>-</div>	Inserts minus sign at the input position.
<div>✓</div>	Confirms selection.
<div>←</div>	Moves the input position one position to the left.
<div>X</div>	Exits the input without applying the changes.
<div>C</div>	Clears all entered characters.

Text editor



Symbol	Meaning
<div>Aa1@</div>	Toggle <ul style="list-style-type: none">Between upper-case and lower-case lettersFor entering numbersFor entering special characters
<div>ABC_</div> <div>...</div> <div>XYZ</div>	Selection of letters from A to Z.






<div>abc _</div> <div>...</div> <div>xyz</div>	Selection of letters from a to z.
<div>""^ _</div> <div>...</div> <div>~& _</div>	Selection of special characters.
<div>✓</div>	Confirms selection.
<div>✕C↔</div>	Switches to the selection of the correction tools.
<div>✕</div>	Exits the input without applying the changes.
<div>C</div>	Clears all entered characters.

Correction symbols under 

Symbol	Meaning
<div>C</div>	Clears all entered characters.
<div>→</div>	Moves the input position one position to the right.
<div>←</div>	Moves the input position one position to the left.
<div>✕</div>	Deletes one character immediately to the left of the input position.

8.3.4 Operating elements

Key	Meaning
<div></div>	Minus key <i>In a menu, submenu</i> Moves the selection bar upwards in a choose list. <i>With a Wizard</i> Confirms the parameter value and goes to the previous parameter. <i>With a text and numeric editor</i> In the input mask, moves the selection bar to the left (backwards).
<div></div>	Plus key <i>In a menu, submenu</i> Moves the selection bar downwards in a choose list. <i>With a Wizard</i> Confirms the parameter value and goes to the next parameter. <i>With a text and numeric editor</i> Moves the selection bar to the right (forwards) in an input screen.

Key	Meaning
	Enter key <i>For operational display</i> <ul style="list-style-type: none"> Pressing the key briefly opens the operating menu. Pressing the key for 2 s opens the context menu. <i>In a menu, submenu</i> <ul style="list-style-type: none"> Pressing the key briefly: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> If present, opens the help text for the function of the parameter. <i>With a Wizard</i> Opens the editing view of the parameter. <i>With a text and numeric editor</i> <ul style="list-style-type: none"> Pressing the key briefly: <ul style="list-style-type: none"> Opens the selected group. Carries out the selected action. Pressing the key for 2 s confirms the edited parameter value.
	Escape key combination (press keys simultaneously) <i>In a menu, submenu</i> <ul style="list-style-type: none"> Pressing the key briefly: <ul style="list-style-type: none"> 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"). <i>With a Wizard</i> Exits the wizard and takes you to the next higher level. <i>With a text and numeric editor</i> Closes the text or numeric editor without applying changes.
	Minus/Enter key combination (press the keys simultaneously) Reduces the contrast (brighter setting).
	Plus/Enter key combination (press and hold down the keys simultaneously) Increases the contrast (darker setting).
	Minus/Plus/Enter key combination (press the keys simultaneously) <i>For operational display</i> Enables or disables the keypad lock (only SD02 display module).


8.3.5 Opening the context menu

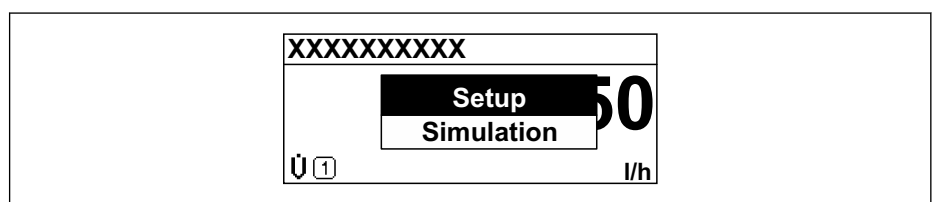
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Configuration backup display
- Simulation

Calling up and closing the context menu

The user is in the operational display.

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



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2. Press \square + \boxplus simultaneously.
 - ↳ The context menu is closed and the operational display appears.

Calling up the menu via the context menu

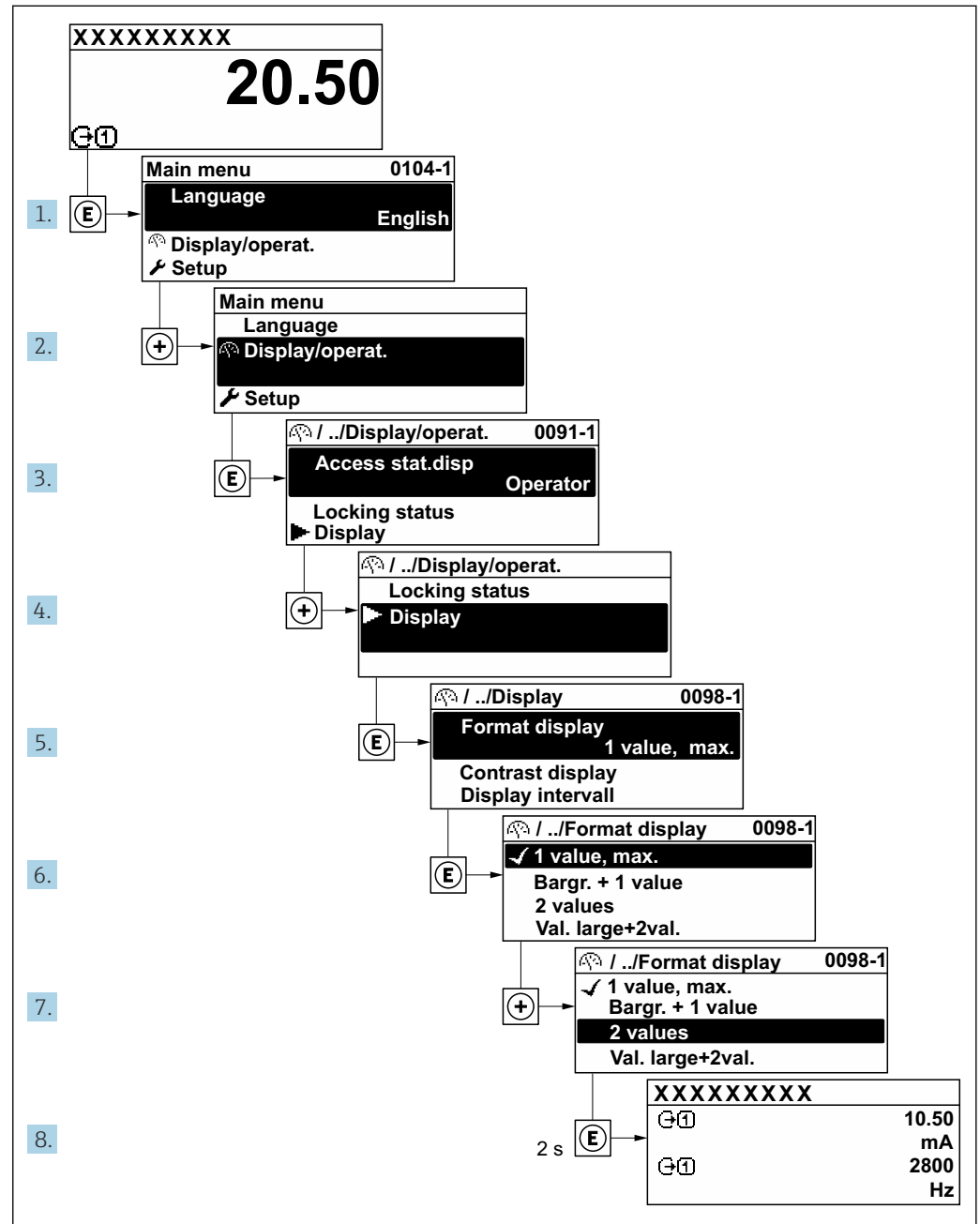
1. Open the context menu.
2. Press \boxplus to navigate to the desired menu.
3. Press \boxtimes to confirm the selection.
 - ↳ The selected menu opens.

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
→  39

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



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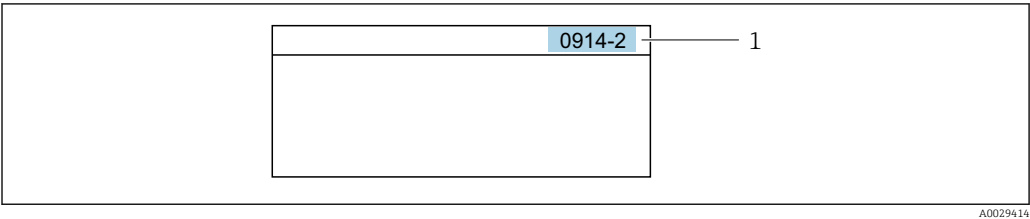
8.3.7 Calling the parameter directly

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

Navigation path

Expert → Direct access


The direct access code consists of a 4-digit number and the channel number, which identifies the channel of a process variable: e.g. 0914-1. 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: Input of "914" instead of "0914"
- If no channel number is entered, channel 1 is jumped to automatically.
Example: Enter 0914 → **Assign process variable** parameter
- If a different channel is jumped to: Enter the direct access code with the corresponding channel number.
Example: Enter 0914-2 → **Assign process variable** parameter


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

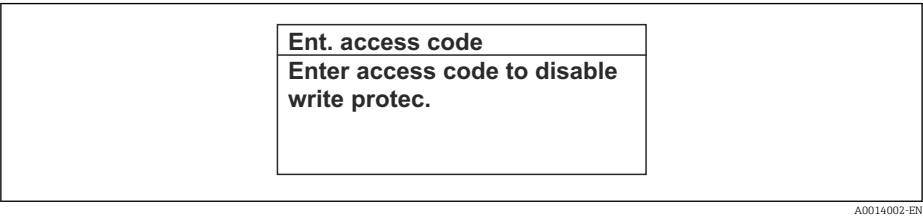
8.3.8 Calling up help text


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



Calling up and closing the help text

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




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



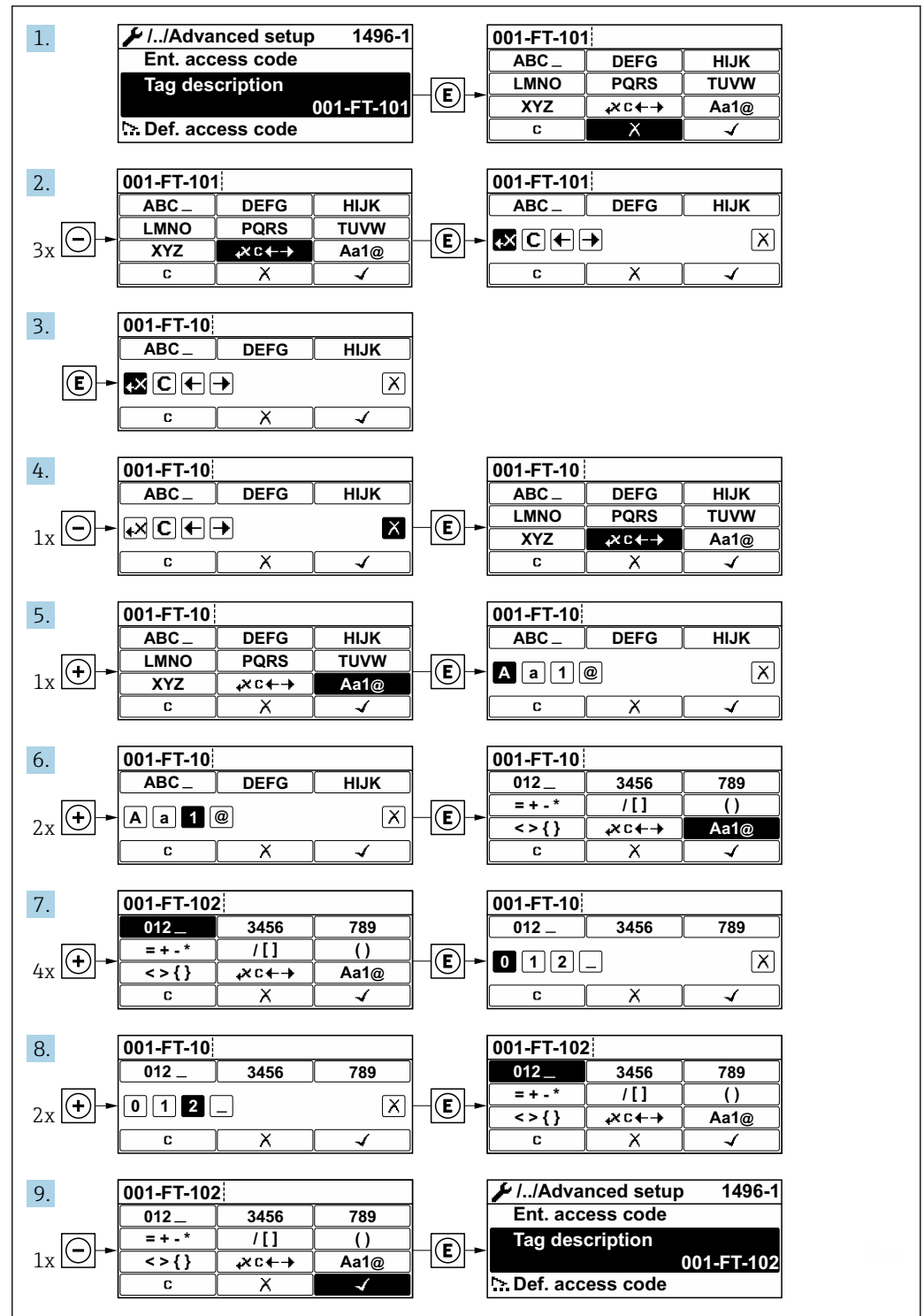
 12 Example: Help text for parameter "Enter access code"

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

8.3.9 Changing the parameters

 For a description of the editing display - consisting of text editor and numeric editor - with symbols →  41, for a description of the operating elements →  42

Example: Changing the tag name in the "Tag description" parameter from 001-FT-101 to 001-FT-102



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

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8.3.10 User roles and related access authorization

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

Access authorization to parameters: "Operator" user role


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

- 1)
- 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

Access authorization to parameters: "Maintenance" user role



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

- 1)
- If an incorrect access code is entered, the user obtains the access rights of the "Operator" user role.






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

8.3.11 Disabling write protection via access code

If the -symbol appears on the local display in front of a parameter, the parameter is write-protected by a user-specific access code and its value cannot be changed at the moment using local operation →  84.

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 , the input prompt for the access code appears.
2.
- Enter the access code.

 The -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

8.3.12 Enabling and disabling the keypad lock




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

Local operation with mechanical push buttons (display module SD02)

 Display module SD02: order characteristic "Display; Operation", option C




The keypad lock is switched on and off in the same way.

Switching on the keypad lock

- ▶ The device is in the measured value display.
Press the  +  +  keys simultaneously.
 - ↳ The message **Keylock on** appears on the display: The keypad lock is switched on.

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

Switching off the keypad lock

- ▶ The keypad lock is switched on.
Press the  +  +  keys simultaneously.
 - ↳ The message **Keylock off** appears on the display: The keypad lock is switched off.

Local operation with touch control (display module SD03)


 Display module SD03: Order characteristic "Display; Operation", option E

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

Switching on the keypad lock


The keypad lock is switched on automatically:

- Each time the device is restarted.
- If the device has not been operated for longer than one minute in the measured value display.

1. The device is in the measured value display.
Press  for at least 2 seconds.
 - ↳ A context menu appears.
2. In the context menu, select the **Keylock on** option.
 - ↳ The keypad lock is switched on.

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

Switching off the keypad lock

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

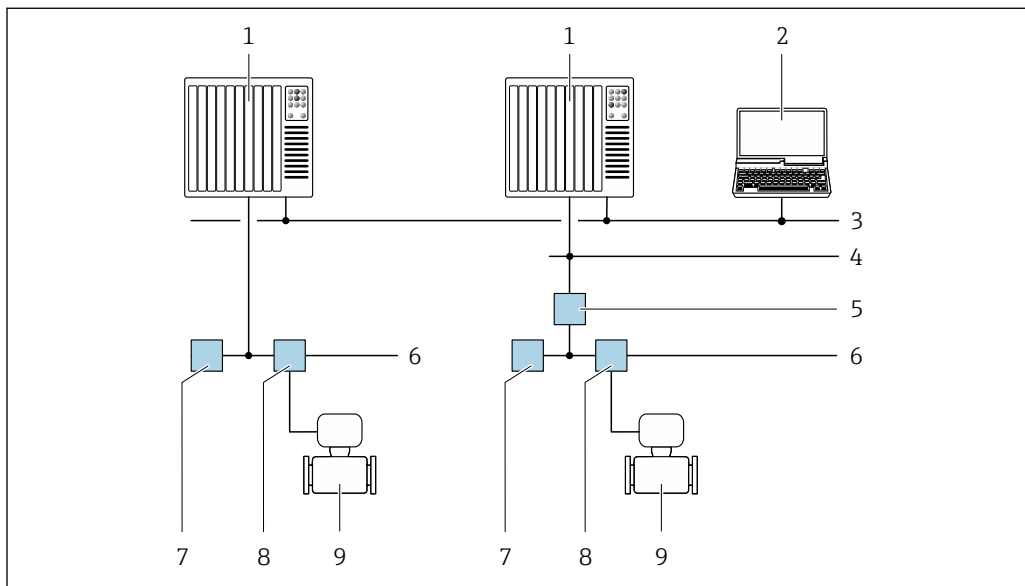
8.4 Access to the operating menu via the operating tool

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

8.4.1 Connecting the operating tool

Via FOUNDATION Fieldbus network

This communication interface is available in device versions with FOUNDATION Fieldbus.

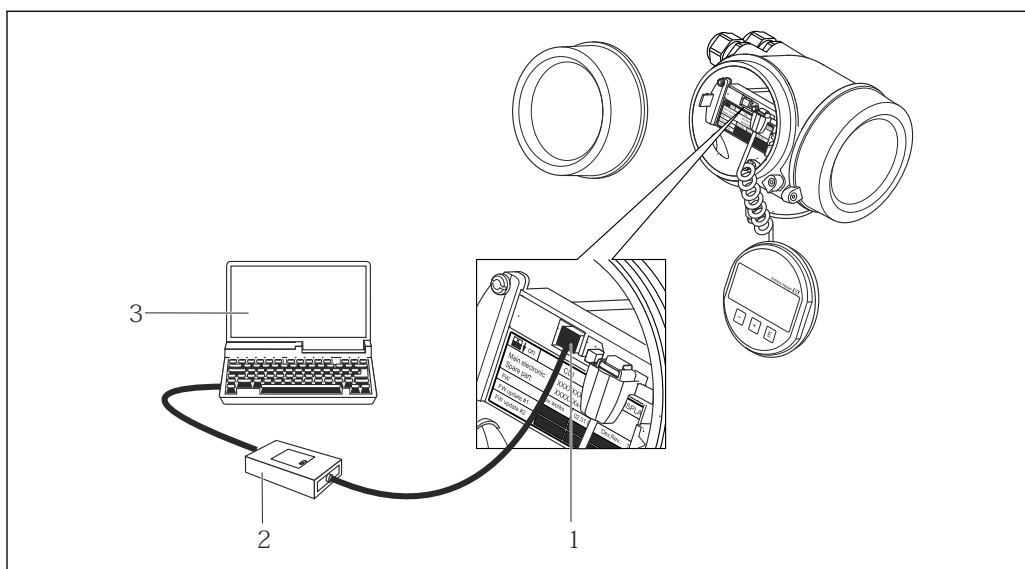


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13 Options for remote operation via FOUNDATION Fieldbus network

- 1 Automation system
- 2 Computer with FOUNDATION Fieldbus network card
- 3 Industry network
- 4 High Speed Ethernet FF-HSE network
- 5 Segment coupler FF-HSE/FF-H1
- 6 FOUNDATION Fieldbus FF-H1 network
- 7 Power supply FF-H1 network
- 8 T-box
- 9 Measuring device

Via service interface (CDI)



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- 1 Service interface (CDI = Endress+Hauser Common Data Interface) of the measuring device
- 2 Commubox FXA291
- 3 Computer with "FieldCare" operating tool with COM DTM "CDI Communication FXA291"

8.4.2 Field Xpert SFX350, SFX370


Function scope

Field Xpert SFX350 and Field Xpert SFX370 are mobile computers for commissioning and maintenance. They enable efficient device configuration and diagnostics for HART and FOUNDATION fieldbus devices in the **non-Ex area** (SFX350, SFX370) and the **Ex area** (SFX370).



For details, see Operating Instructions BA01202S

Source for device description files

See data →  54

8.4.3 FieldCare

Function scope

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

Access is via:

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

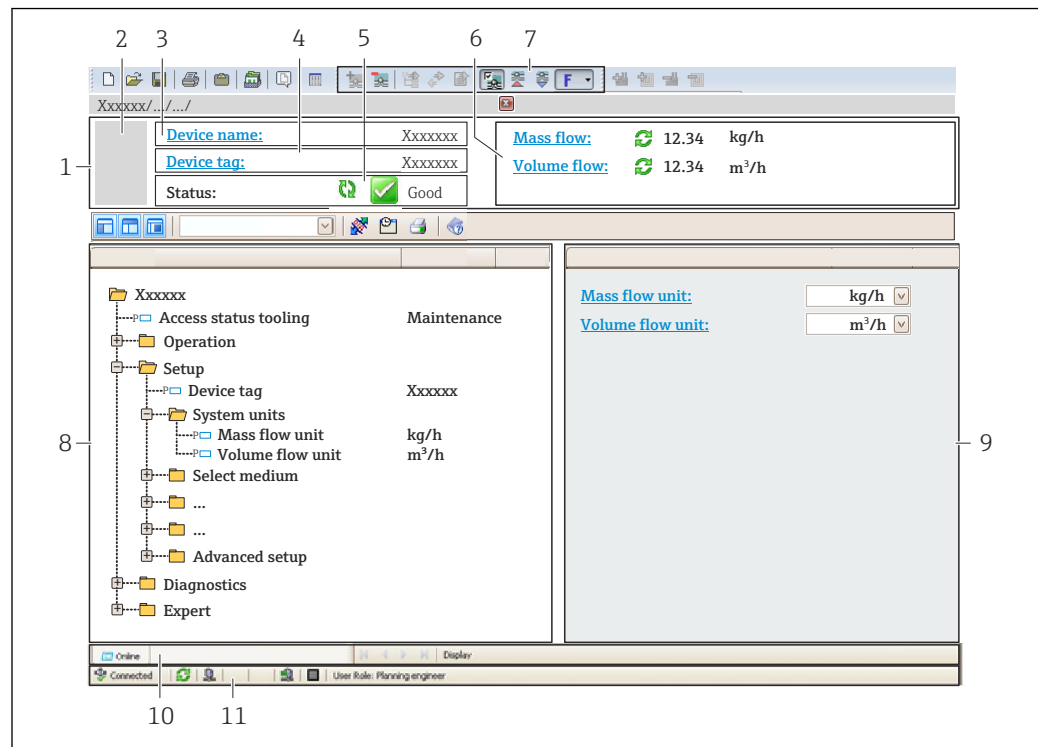
See information →  54

Establishing a connection



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 → 101
- 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

8.4.4 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 → 54

8.4.5 AMS Device Manager

Function scope

Program from Emerson Process Management for operating and configuring measuring devices via FOUNDATION Fieldbus H1 protocol.


Source for device description files

See data →  54

8.4.6 Field Communicator 475**Function scope**

Industrial handheld terminal from Emerson Process Management for remote configuration and measured value display via FOUNDATION Fieldbus H1 protocol.

Source for device description files

See data →  54

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.00.zz	<ul style="list-style-type: none"> On the title page of the Operating instructions On the transmitter nameplate Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	06.2015	---
Manufacturer ID	452B48 hex	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x1054	Device type Diagnostics → Device information → Device type
Device revision	1	<ul style="list-style-type: none"> On the transmitter nameplate Device revision Diagnostics → Device information → Device revision
DD revision	Information and files under: <ul style="list-style-type: none"> www.endress.com www.fieldbus.org 	
CFF revision		



For an overview of the different firmware versions for the device → 129

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 FOUNDATION Fieldbus	Sources for obtaining device descriptions
FieldCare	<ul style="list-style-type: none"> www.endress.com → Download Area CD-ROM (contact Endress+Hauser) DVD (contact Endress+Hauser)
DeviceCare	<ul style="list-style-type: none"> www.endress.com → Download Area CD-ROM (contact Endress+Hauser) DVD (contact Endress+Hauser)
<ul style="list-style-type: none"> Field Xpert SFX350 Field Xpert SFX370 	Use update function of handheld terminal
AMS Device Manager (Emerson Process Management)	www.endress.com → Download Area
Field Communicator 475 (Emerson Process Management)	Use update function of handheld terminal

9.2 Cyclic data transmission

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

9.2.1 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 FOUNDATION Fieldbus master (Class 1), e.g. a control system etc.

Display text (xxxx... = serial number)	Base index	Description
RESOURCE_ xxxxxxxxxxxx	400	Resource block
SETUP_ xxxxxxxxxxxx	600	"Setup" Transducer block
ADVANCED_SETUP_ xxxxxxxxxxxx	800	"Advanced setup" Transducer block
DISPLAY_ xxxxxxxxxxxx	1000	"Display" Transducer block
HISTOROM_ xxxxxxxxxxxx	1200	"HistoROM" Transducer block
DIAGNOSTIC_ xxxxxxxxxxxx	1400	"Diagnostic" Transducer block
EXPERT_CONFIG_ xxxxxxxxxxxx	1600	"Expert configuration" Transducer block
EXPERT_INFO_ xxxxxxxxxxxx	1800	"Expert information" Transducer block
SERVICE_SENSOR_ xxxxxxxxxxxx	2000	"Service sensor" Transducer block
SERVICE_INFO_ xxxxxxxxxxxx	2200	"Service info" Transducer block
TOTAL_INVENTORY_COUNTER_ xxxxxxxx xxx	2400	"Totalizer" Transducer block
HEARTBEAT_RESULTS1_ xxxxxxxxxxxx	2600	"Heartbeat results 1" Transducer block
HEARTBEAT_RESULTS2_ xxxxxxxxxxxx	2800	"Heartbeat results 2" Transducer block
HEARTBEAT_RESULTS3_ xxxxxxxxxxxx	3000	"Heartbeat results 3" Transducer block
HEARTBEAT_RESULTS4_ xxxxxxxxxxxx	3200	"Heartbeat results 4" Transducer block
HEARTBEAT_TECHNOLOGY_ xxxxxxxxxxxx	3400	"Heartbeat" Transducer block
ANALOG_INPUT_1_ xxxxxxxxxxxx	3600	Analog Input function block 1 (AI)
ANALOG_INPUT_2_ xxxxxxxxxxxx	3800	Analog Input function block 2 (AI)
ANALOG_INPUT_3_ xxxxxxxxxxxx	4000	Analog Input function block 3 (AI)
ANALOG_INPUT_4_ xxxxxxxxxxxx	4200	Analog Input function block 4 (AI)
ANALOG_INPUT_5_ xxxxxxxxxxxx	4400	Analog Input function block 5 (AI)
ANALOG_INPUT_6_ xxxxxxxxxxxx	4600	Analog Input function block 6 (AI)
MULTI_ANALOG_OUTPUT_ xxxxxxxxxxxx	4800	Multiple Analog Output block (MAO)
DIGITAL_INPUT_1_ xxxxxxxxxxxx	5000	Digital Input function block 1 (DI)
DIGITAL_INPUT_2_ xxxxxxxxxxxx	5200	Digital Input function block 2 (DI)
MULTI_DIGITAL_OUTPUT_ xxxxxxxxxxxx	5400	Multiple Digital Output block (MDO)
PID_ xxxxxxxxxxxx	5600	PID function block (PID)
INTEGRATOR_ xxxxxxxxxxxx	5800	Integrator function block (INTG)

9.2.2 Assignment of the measured values in the function blocks

The input value of a function block is defined via the CHANNEL parameter.

AI module (Analog Input)

Description

Six Analog Input blocks are available.

CHANNEL	Measured variable
0	Uninitialized (factory setting)
7	Temperature
9	Volume flow
11	Mass flow
13	Corrected volume flow
14	Density
15	Reference density
16	Totalizer 1
17	Totalizer 2
18	Totalizer 3

MAO module (Multiple Analog Output)

Description

Channel	Name
121	Channel_0

Structure

Channel_0							
Value 1	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7	Value 8

Values	Measured variable
Value 1	External pressure ¹⁾
Value 2	Not assigned
Value 3	Not assigned
Value 4	Not assigned
Value 5	Not assigned
Value 6	Not assigned
Value 7	Not assigned
Value 8	Not assigned

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



The selection is made via: Setup → Select medium → Pressure compensation

DI module (Discrete Input)

Two Discrete Input blocks are available.

Description

CHANNEL	Device function	State
0	Uninitialized (factory setting)	–
101	Switch output state	0 = off, 1 = active

CHANNEL	Device function	State
102	Empty pipe detection	0 = full, 1 = empty
103	Low flow cut off	0 = off, 1 = active
105	Status verification ¹⁾	0 = good, 1 = bad

1) Only available with the Heartbeat Verification application package

MDO module (Multiple Discrete Output)

Description

Channel	Name
122	Channel_DO

Structure

Channel_DO							
Value 1	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7	Value 8

Value	Device function	State
Value 1	Reset totalizer 1	0 = off, 1 = execute
Value 2	Reset totalizer 2	0 = off, 1 = execute
Value 3	Reset totalizer 3	0 = off, 1 = execute
Value 4	Flow override	0 = off, 1 = active
Value 5	Start heartbeat verification ¹⁾	0 = off, 1 = start
Value 6	Status switch output	0 = off, 1 = on
Value 7	Start zero point adjustment	0 = off, 1 = start
Value 8	Not assigned	–

1) Only available with the Heartbeat Verification application package

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 → 26
- "Post-connection check" checklist → 34

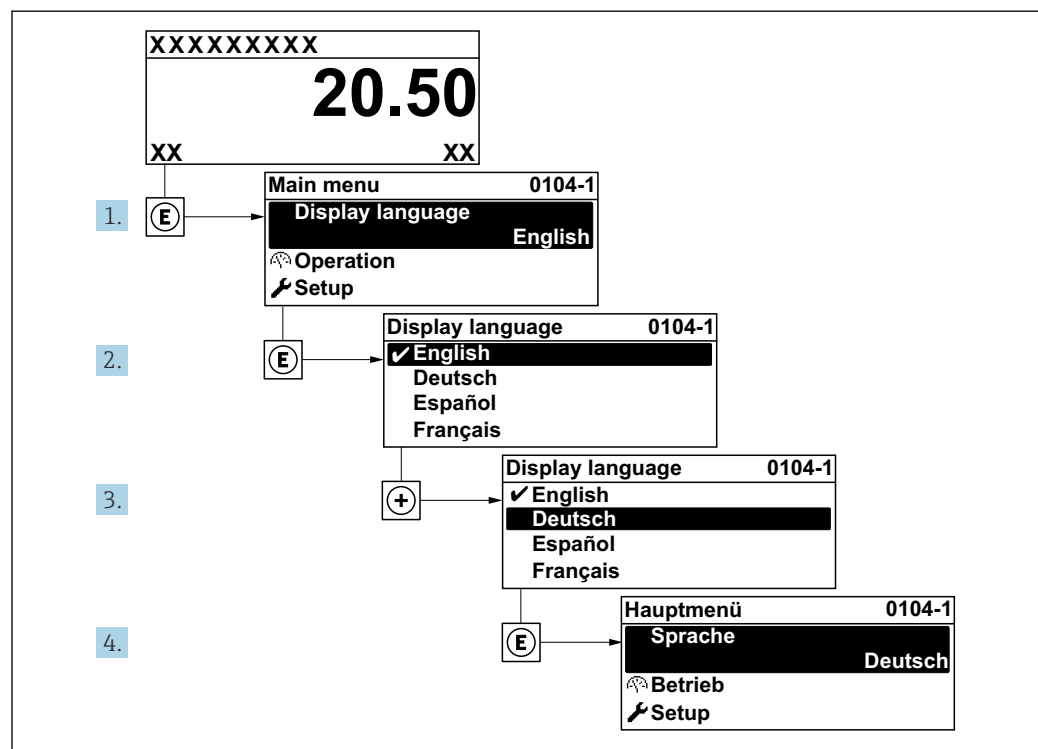
10.2 Switching on the measuring device

- 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" → 96.

10.3 Setting the operating language

Factory setting: English or ordered local language

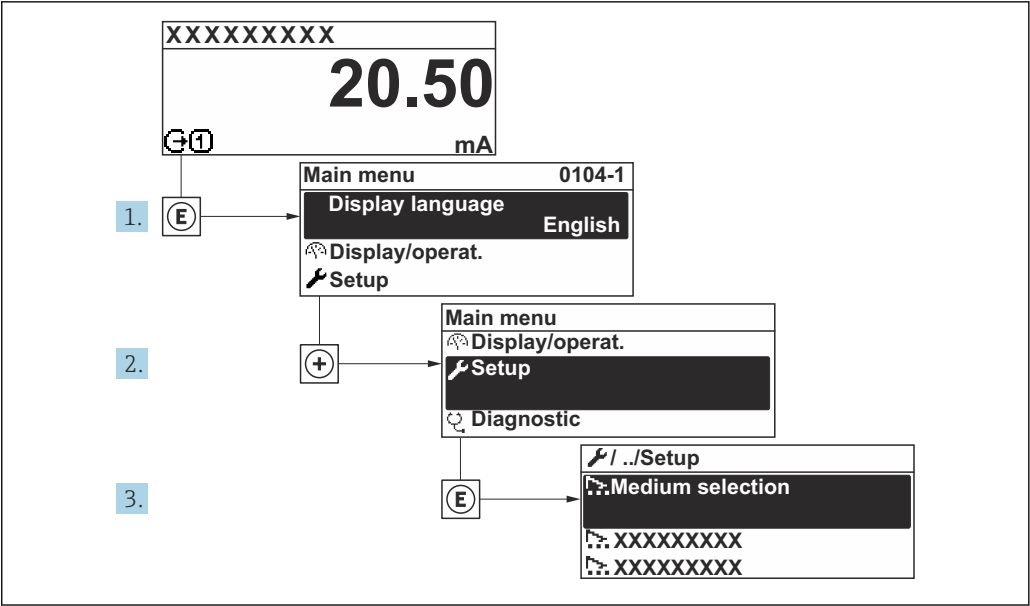


14 Taking the example of the local display

A0029420

10.4 Configuring the measuring device

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



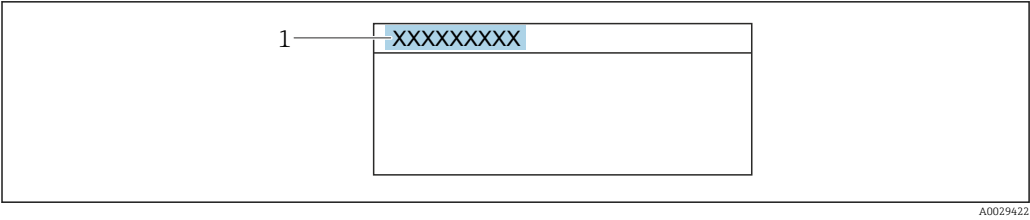
A0032222-EN

15 Taking the example of the local display

Setup		
Device tag	→	60
▶ System units	→	60
▶ Select medium		
▶ Analog inputs	→	64
▶ Display	→	64
▶ Low flow cut off	→	66
▶ Partially filled pipe detection	→	67
▶ Advanced setup	→	68



10.4.1 Defining the tag name

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



16 Header of the operational display with tag name

1 Tag name

 Enter the tag name in the "FieldCare" operating tool →  52


Navigation
"Setup" menu → Device tag

Parameter overview with brief description

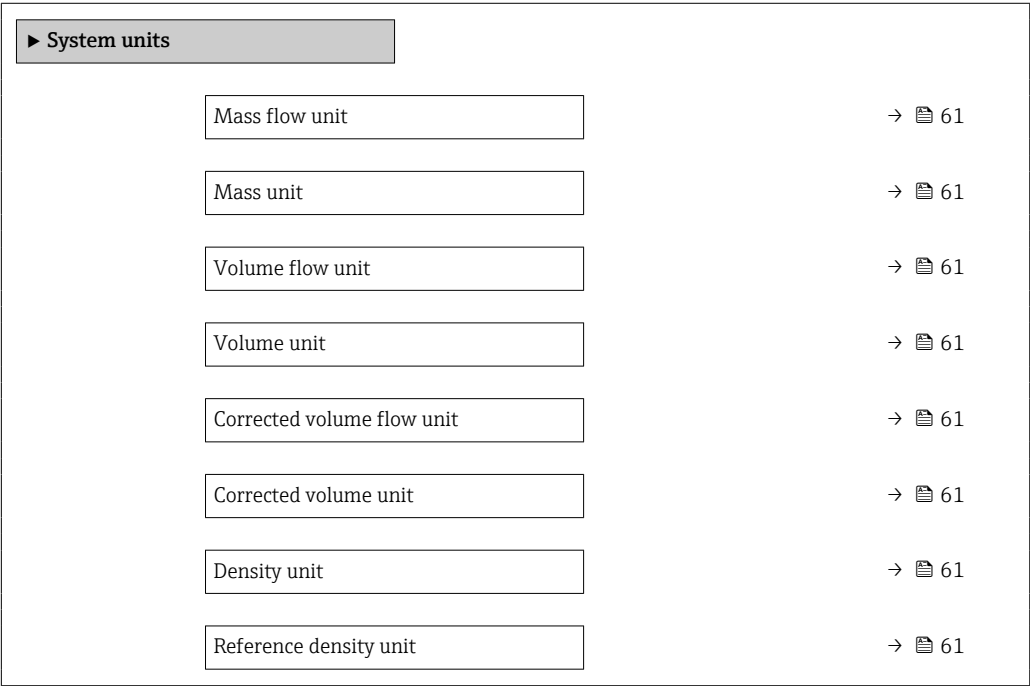
Parameter	Description	User entry
Device tag	Enter the name for the measuring point.	32 characters such as letters, numbers or special characters (e.g. @, %, /)

10.4.2 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



Temperature unit	→ 61
Pressure unit	→ 62

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Low flow cut off Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg/h lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg lb
Volume flow unit	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Low flow cut off Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> l/h gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> l (DN > 150 (6")): m³ option gal (us)
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: Corrected volume flow parameter (→ 91)	Unit choose list	Country-specific: <ul style="list-style-type: none"> NI/h Sft³/min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> NI Sft³
Density unit	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Simulation process variable Density adjustment (Expert menu) 	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg/l lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent <ul style="list-style-type: none"> kg/NI lb/Sft³
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Minimum value Maximum value Maximum value Minimum value Average value Minimum value Maximum value Minimum value Maximum value Reference temperature 	Unit choose list	Country-specific: <ul style="list-style-type: none"> °C °F

Parameter	Description	Selection	Factory setting
Length unit	Select length unit for nominal diameter.	Unit choose list	Country-specific: <ul style="list-style-type: none">■ mm■ in
Pressure unit	Select process pressure unit.	Unit choose list	Country-specific: <ul style="list-style-type: none">■ bar a■ psi a

10.4.3 Selecting and setting the medium

The **Medium selection** wizard systematically guides the user through all the parameters that must be configured in order to select and set the medium.

Navigation

"Setup" menu → Medium selection

▶ Select medium

Select medium

Select gas type


Reference sound velocity


Temperature coefficient sound velocity


Pressure compensation


Pressure value


External pressure


→  63

→  63

→  63

→  63

→  63

→  63

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Select medium	–	Select medium type.	<ul style="list-style-type: none"> ■ Liquid ■ Gas 	–
Select gas type	In the Select medium parameter the Gas option is selected.	Select measured gas type.	Gas type choose list	–
Reference sound velocity	In the Select gas type parameter the Others option is selected.	Enter sound velocity of gas at 0 °C (32 °F).	1 to 99 999.9999 m/s	–
Temperature coefficient sound velocity	In the Select gas type parameter the Others option is selected.	Enter temperature coefficient for the gas sound velocity.	Positive floating-point number	–
Pressure compensation	–	Select pressure compensation type.	<ul style="list-style-type: none"> ■ Off ■ Fixed value ■ External value 	–
Pressure value	In the Pressure compensation parameter the Fixed value option is selected.	Enter process pressure to be used for pressure correction.	Positive floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 1.01 bar a ■ 14.7 psi a

10.4.4 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 → Analog inputs

▶ Analog inputs

▶ Analog input 1 to n

Block tag → 64

Channel → 64

Process Value Filter Time → 64

Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Block tag	Unique name of the measuring device.	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /).	–
Channel	Select the process variable.	<ul style="list-style-type: none">■ Uninitialized■ Mass flow■ Volume flow■ Corrected volume flow■ Density■ Reference density■ Temperature■ Totalizer 1■ Totalizer 2■ Totalizer 3	–
Process Value Filter Time	Enter the filter time specification for the filtering of the unconverted input value (PV).	Positive floating-point number	–

10.4.5 Configuring the local display

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







Navigation
"Setup" menu → Display

▶ Display



Format display → 65

Value 1 display → 65

0% bargraph value 1 → 65

100% bargraph value 1	→  65
Value 2 display	→  65
Value 3 display	→  65
0% bargraph value 3	→  65
100% bargraph value 3	→  65
Value 4 display	→  65

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 style="list-style-type: none"> 1 value, max. size 1 bargraph + 1 value 2 values 1 value large + 2 values 4 values 	–
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> Mass flow Volume flow Corrected volume flow Density Reference density Temperature Totalizer 1 Totalizer 2 Totalizer 3 	–
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> 0 kg/h 0 lb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter	–
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter (→  65)	–
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: <ul style="list-style-type: none"> 0 kg/h 0 lb/min
100% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	–
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter (→  65)	–

10.4.6 Configuring the low flow cut off


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

Navigation


"Setup" menu → Low flow cut off

▶ Low flow cut off


Assign process variable

→  66


On value low flow cutoff

→  66




Off value low flow cutoff

→  66

Pressure shock suppression

→  66

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow 	–
On value low flow cutoff	One of the following options is selected in the Assign process variable parameter (→  66): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	One of the following options is selected in the Assign process variable parameter (→  66): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Enter off value for low flow cut off.	0 to 100.0 %	–
Pressure shock suppression	One of the following options is selected in the Assign process variable parameter (→  66): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	–

10.4.7 Configuring the partial filled pipe detection

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

Navigation

"Setup" menu → Partially filled pipe detection

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

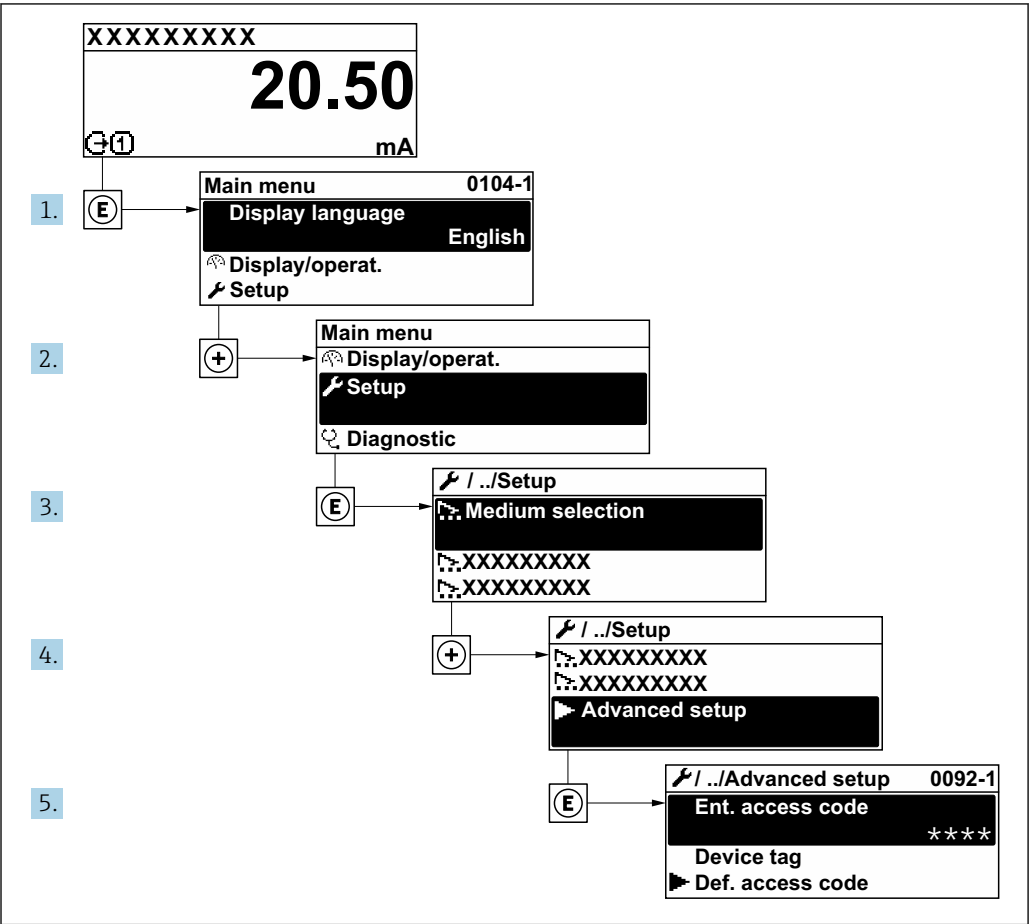
Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry
Assign process variable	–	Select process variable for partially filled pipe detection.	<ul style="list-style-type: none"> ■ Off ■ Density ■ Reference density
Low value partial filled pipe detection	One of the following options is selected in the Assign process variable parameter: <ul style="list-style-type: none"> ■ Density ■ Reference density 	Enter lower limit value for deactivating partially filled pipe detection.	Positive floating-point number
High value partial filled pipe detection	One of the following options is selected in the Assign process variable parameter: <ul style="list-style-type: none"> ■ Density ■ Reference density 	Enter upper limit value for deactivating partially filled pipe detection.	Signed floating-point number
Response time part. filled pipe detect.	One of the following options is selected in the Assign process variable parameter: <ul style="list-style-type: none"> ■ Density ■ Reference density 	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s

10.5 Advanced settings

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

Navigation to the "Advanced setup" submenu



Navigation

"Setup" menu → Advanced setup

▶ Advanced setup

Enter access code

▶ Sensor adjustment → 69

▶ Pulse/frequency/switch output → 71

▶ Totalizer 1 to n → 76

▶ Display → 78

▶ Heartbeat setup

► Configuration backup display	→ 81
► Administration	→ 80

10.5.1 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

► Sensor adjustment	
Installation direction	→ 69
► Zero point adjustment	→ 69

Parameter overview with brief description

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

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 144. Therefore, a zero point adjustment in the field is generally not required.

Experience shows that zero point adjustment is advisable only in special cases:

- To achieve maximum measuring accuracy even with low flow rates
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

Navigation

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

► Zero point adjustment	
Zero point adjustment control	→ 70
Adjustment in progress	→ 70

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface
Zero point adjustment control	–	Start zero point adjustment.	<ul style="list-style-type: none">■ Cancel■ Busy■ Zero point adjust failure■ Start
Adjustment in progress	The Start option is selected in the Zero point adjustment control parameter.		0 to 100 %

10.5.2 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 → Pulse/frequency/switch output

► Pulse/frequency/switch output

Operating mode

→ 70

Parameter overview with brief description

Parameter	Description	Selection
Operating mode	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none">■ Pulse■ Frequency■ Switch

Configuring the pulse output

Navigation

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

► Pulse/frequency/switch output

Operating mode

→ 71

Assign pulse output

→ 71

Value per pulse

→ 71

Pulse width

→ 71

Failure mode

→ 71

Invert output signal

→ 71

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	–
Assign pulse output	In the Operating mode parameter, the Pulse option is selected.	Select process variable for pulse output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow 	–
Value per pulse	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→ 71): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→ 71): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Define time width of the output pulse.	5 to 2 000 ms	–
Failure mode	In the Operating mode parameter, the Pulse option is selected and one of the following options is selected in the Assign pulse output parameter (→ 71): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Actual value ■ No pulses 	–
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ■ No ■ Yes 	–

Configuring the frequency output

Navigation

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

▶ Pulse/frequency/switch output

Operating mode

→ 72

Assign frequency output






→ 72

Minimum frequency value



→ 72

Maximum frequency value

→ 73

Measuring value at minimum frequency	→  73
Measuring value at maximum frequency	→  73
Failure mode	→  74
Failure frequency	→  74
Invert output signal	→  74

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	–
Assign frequency output	In the Operating mode parameter (→  70), the Frequency option is selected.	Select process variable for frequency output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	–
Minimum frequency value	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→  72): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Enter minimum frequency.	0 to 1 000 Hz	0 Hz

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Maximum frequency value	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→ 72): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Enter maximum frequency.	0 to 1000 Hz	1000 Hz
Measuring value at minimum frequency	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→ 72): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter
Measuring value at maximum frequency	In the Operating mode parameter, the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→ 72): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Failure mode	In the Operating mode parameter (→ 70), the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→ 72): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Actual value ■ Defined value ■ 0 Hz 	–
Failure frequency	In the Operating mode parameter (→ 70), the Frequency option is selected and one of the following options is selected in the Assign frequency output parameter (→ 72): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry 	Enter frequency output value in alarm condition.	0.0 to 1 250.0 Hz	–
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ■ No ■ Yes 	–

Configuring the switch output

Navigation

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

▶ Pulse/frequency/switch output

Operating mode

→ 75

Switch output function

→ 75

Assign diagnostic behavior

→ 75

Assign limit

→ 75

Assign flow direction check

→ 75

Assign status	→ 76
Switch-on value	→ 76
Switch-off value	→ 76
Switch-on delay	→ 76
Switch-off delay	→ 76
Failure mode	→ 76
Invert output signal	→ 76

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	–
Switch output function	In the Operating mode parameter the Switch option is selected.	Select function for switch output.	<ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit ■ Flow direction check ■ Status 	–
Assign diagnostic behavior	<ul style="list-style-type: none"> ■ In the Operating mode parameter, the Switch option is selected. ■ In the Switch output function parameter, the Diagnostic behavior option is selected. 	Select diagnostic behavior for switch output.	<ul style="list-style-type: none"> ■ Alarm ■ Alarm or warning ■ Warning 	–
Assign limit	<ul style="list-style-type: none"> ■ In the Operating mode parameter, the Switch option is selected. ■ In the Switch output function parameter, the Limit option is selected. 	Select process variable for limit function.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 	–
Assign flow direction check	<ul style="list-style-type: none"> ■ The Switch option is selected in the Operating mode parameter. ■ The Flow direction check option is selected in the Switch output function parameter. 	Select process variable for flow direction monitoring.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow 	–

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign status	<ul style="list-style-type: none"> The Switch option is selected in the Operating mode parameter. The Status option is selected in the Switch output function parameter. 	Select device status for switch output.	<ul style="list-style-type: none"> Partially filled pipe detection Low flow cut off Digital output 6 	–
Switch-on value	<ul style="list-style-type: none"> In the Operating mode parameter, the Switch option is selected. In the Switch output function parameter, the Limit option is selected. 	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> 0 kg/h 0 lb/min
Switch-off value	<ul style="list-style-type: none"> In the Operating mode parameter, the Switch option is selected. In the Switch output function parameter, the Limit option is selected. 	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> 0 kg/h 0 lb/min
Switch-on delay	<ul style="list-style-type: none"> The Switch option is selected in the Operating mode parameter. The Limit option is selected in the Switch output function parameter. 	Define delay for the switch-on of status output.	0.0 to 100.0 s	–
Switch-off delay	<ul style="list-style-type: none"> The Switch option is selected in the Operating mode parameter. The Limit option is selected in the Switch output function parameter. 	Define delay for the switch-off of status output.	0.0 to 100.0 s	–
Failure mode	–	Define output behavior in alarm condition.	<ul style="list-style-type: none"> Actual status Open Closed 	–
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> No Yes 	–

10.5.3 Configuring the totalizer




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

Navigation

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

► Totalizer 1 to n	
Assign process variable	→ 77
Unit totalizer	→ 77
Totalizer operation mode	→ 77
Failure mode	→ 77

Parameter overview with brief description











Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow 	–
Unit totalizer	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Select process variable totalizer unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ l ■ gal (us)
Totalizer operation mode	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Select totalizer calculation mode.	<ul style="list-style-type: none"> ■ Net flow total ■ Forward flow total ■ Reverse flow total 	–
Failure mode	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> ■ Stop ■ Actual value ■ Last valid value 	–

10.5.4 Carrying out additional display configurations

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

Navigation

"Setup" menu → Advanced setup → Display

► Display		
Format display	→	 79
Value 1 display	→	 79
0% bargraph value 1	→	 79
100% bargraph value 1	→	 79
Decimal places 1	→	 79
Value 2 display	→	 79
Decimal places 2	→	 79
Value 3 display	→	 79
0% bargraph value 3	→	 79
100% bargraph value 3	→	 79
Decimal places 3	→	 79
Value 4 display	→	 79
Decimal places 4	→	 79
Language	→	 80
Display interval	→	 80
Display damping	→	 80
Header	→	 80
Header text	→	 80
Separator	→	 80
Backlight	→	 80

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 style="list-style-type: none"> ■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values 	–
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 	–
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 kg/h ■ 0 lb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the Value 1 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	–
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter	–
Decimal places 2	A measured value is specified in the Value 2 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	–
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter (→ 65)	–
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: <ul style="list-style-type: none"> ■ 0 kg/h ■ 0 lb/min
100% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	–
Decimal places 3	A measured value is specified in the Value 3 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	–
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter (→ 65)	–
Decimal places 4	A measured value is specified in the Value 4 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	–

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Language	A local display is provided.	Set display language.	<ul style="list-style-type: none"> ■ English * ■ Deutsch * ■ Français * ■ Español * ■ Italiano * ■ Nederlands * ■ Portuguesa * ■ Polski * ■ русский язык (Russian) * ■ Svenska * ■ Türkçe * ■ 中文 (Chinese) * ■ 日本語 (Japanese) * ■ 한국어 (Korean) * ■ Bahasa Indonesia * ■ tiếng Việt (Vietnamese) * ■ čeština (Czech) * 	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	–
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	–
Header	A local display is provided.	Select header contents on local display.	<ul style="list-style-type: none"> ■ Device tag ■ Free text 	–
Header text	In the Header parameter, the Free text option is selected.	Enter display header text.	Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)	–
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	<ul style="list-style-type: none"> ■ . (point) ■ , (comma) 	. (point)
Backlight	Order code for "Display; operation", option E "SD03 4-line, illum.; touch control + data backup function"	Switch the local display backlight on and off.	<ul style="list-style-type: none"> ■ Disable ■ Enable 	–

* Visibility depends on order options or device settings

10.5.5 Using parameters for device administration

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

Navigation
"Setup" menu → Advanced setup → Administration

► Administration

► Define access code

Define access code

→ 81

Confirm access code

→ 81

Restart

Parameter overview with brief description

Parameter	Description	User entry / Selection
Define access code	Restrict write-access to parameters to protect the configuration of the device against unintentional changes via the local display.	0 to 9999
Confirm access code	Confirm the entered access code.	0 to 9999
Device reset		<div>■ Cancel</div> <div>■ To factory defaults</div> <div>■ To delivery settings</div> <div>■ Restart device</div>

10.6 Configuration management

After commissioning, you can save the current device configuration, copy it to another measuring point or restore the previous device configuration.

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

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

► Configuration backup display

Operating time

→ 82

Last backup

→ 82

Configuration management

→ 82

Comparison result

→ 82

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface / Selection
Operating time	–	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)
Last backup	A local display is provided.	Indicates when the last data backup was saved to the display module.	Days (d), hours (h), minutes (m) and seconds (s)
Configuration management	A local display is provided.	Select action for managing the device data in the display module.	<ul style="list-style-type: none"> ■ Cancel ■ Execute backup ■ Restore ■ Duplicate ■ Compare ■ Clear backup data ■ Display incompatible
Comparison result	A local display is provided.	Comparison between present device data and display backup.	<ul style="list-style-type: none"> ■ Settings identical ■ Settings not identical ■ No backup available ■ Backup settings corrupt ■ Check not done ■ Dataset incompatible

10.6.1 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 integrated HistoROM to the display module 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 display module to the device's integrated HistoROM. The backup copy includes the transmitter data of the device.
Compare	The device configuration saved in the display module is compared with the current device configuration of the integrated HistoROM.
Duplicate	The transmitter configuration from another device is duplicated to the device using the display module.
Clear backup data	The backup copy of the device configuration is deleted from the display module of the device.
Display incompatible	This option is displayed if the display module is incompatible. All of the other options are not available. Selection is therefore not possible. This option is displayed if it is not possible to save the device and fieldbus data. The display module should be updated to the latest software version so that the data can be saved.

**Integrated HistoROM**

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 Simulation

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





Navigation

"Diagnostics" menu → Simulation

► Simulation		
Assign simulation process variable	→	83
Value process variable	→	83
Frequency simulation	→	83
Frequency value	→	83
Pulse simulation	→	84
Pulse value	→	84
Switch output simulation	→	84
Switch status	→	84
Simulation device alarm	→	84
Diagnostic event category	→	84
Simulation diagnostic event	→	84



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature
Value process variable	One of the following options is selected in the Assign simulation process variable parameter (→ 83): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature 	Enter the simulation value for the selected process variable.	Depends on the process variable selected
Frequency simulation	In the Operating mode parameter, the Frequency option is selected.	Switch the simulation of the frequency output on and off.	<ul style="list-style-type: none"> ■ Off ■ On
Frequency value	In the Frequency simulation parameter, the On option is selected.	Enter the frequency value for the simulation.	0.0 to 1 250.0 Hz

Parameter	Prerequisite	Description	Selection / User entry
Pulse simulation	In the Operating mode parameter, the Pulse option is selected.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→  71) defines the pulse width of the pulses output.	<ul style="list-style-type: none"> ■ Off ■ Fixed value ■ Down-counting value
Pulse value	In the Pulse simulation parameter (→  84), the Down-counting value option is selected.	Enter the number of pulses for simulation.	0 to 65 535
Switch output simulation	In the Operating mode parameter, the Switch option is selected.	Switch the simulation of the switch output on and off.	<ul style="list-style-type: none"> ■ Off ■ On
Switch status	In the Switch output simulation parameter (→  84) Switch output simulation 1 to n parameter Switch output simulation 1 to n parameter, the On option is selected.	Select the status of the status output for the simulation.	<ul style="list-style-type: none"> ■ Open ■ Closed
Simulation device alarm	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> ■ Off ■ On
Diagnostic event category	–	Select a diagnostic event category.	<ul style="list-style-type: none"> ■ Sensor ■ Electronics ■ Configuration ■ Process
Simulation diagnostic event	–		<ul style="list-style-type: none"> ■ Off ■ Diagnostic event picklist (depends on the category selected)

10.8 Protecting settings from unauthorized access

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


- Write protection via access code
- Write protection via write protection switch
- Write protection via keypad lock →  48
- FOUNDATION Fieldbus: write protection via block operation →  86

10.8.1 Write protection via access code

The effects of the user-specific access code are as follows:

- Via local operation, the parameters for the measuring device configuration are write-protected and their values can no longer be changed.
- Device access is protected via the Web browser, as are the parameters for the measuring device configuration.

Defining the access code via local display

1. Navigate to the **Enter access code** parameter.
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 to confirm the code.
 - ↳ The -symbol appears in front of all write-protected parameters.

The device automatically locks the write-protected parameters again if a key is not pressed for 10 minutes in the navigation and editing view. The device locks the write-protected

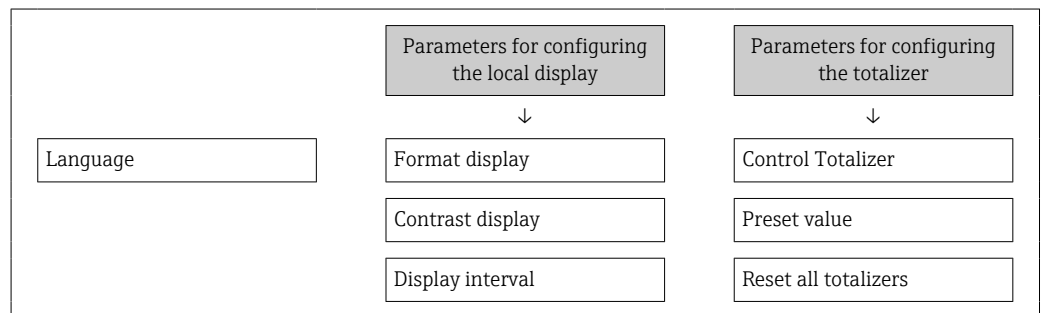
parameters automatically after 60 s if the user skips back to the operational display mode from the navigation and editing view.



- If parameter write protection is activated via an access code, it can also only be deactivated via this access code → 48.
- The user role with which the user is currently logged on via the local display is indicated by the → 48 **Access status display** parameter. Navigation path: Operation → Access status display

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.

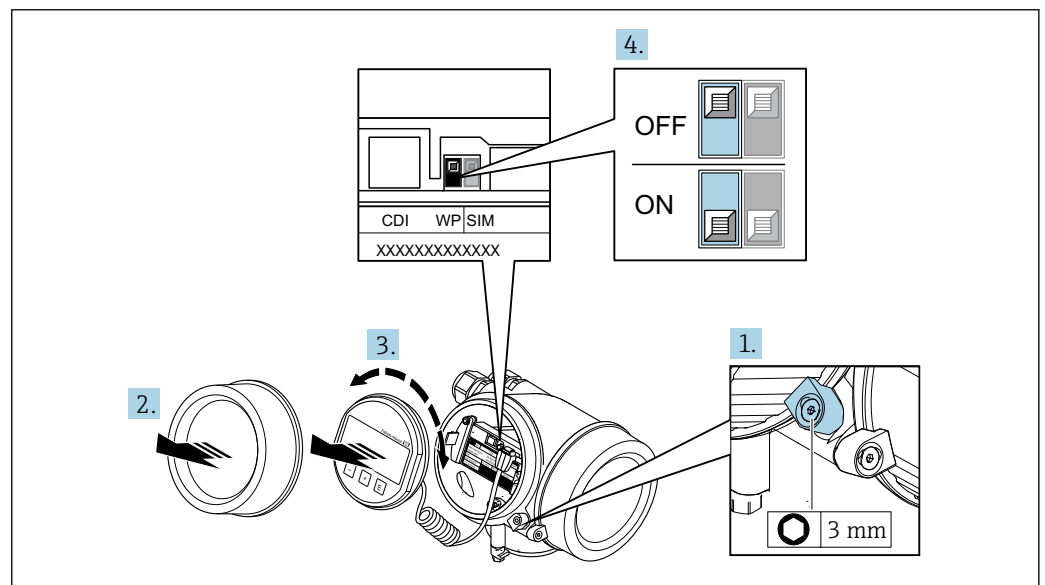


10.8.2 Write protection via write protection switch

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

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

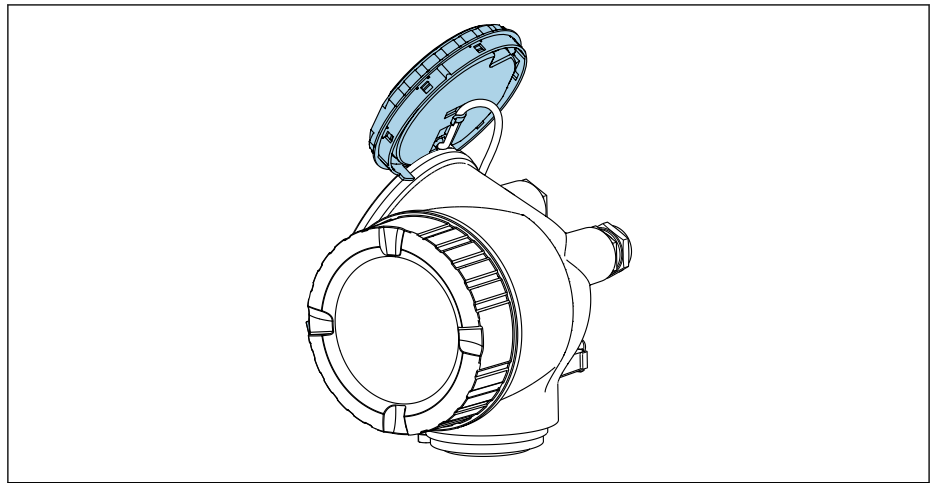
- Via local display
- Via FOUNDATION Fieldbus




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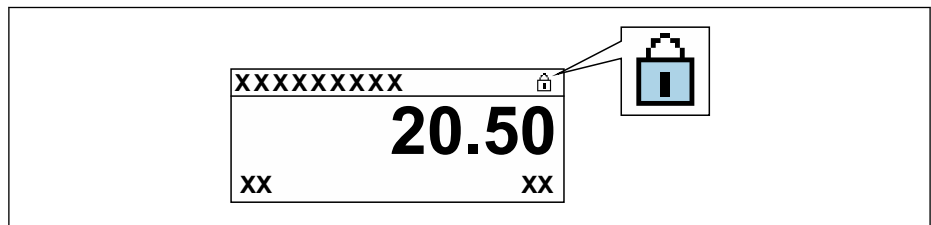
1. Loosen the securing clamp.
2. Unscrew the electronics compartment cover.

3. Pull out the display module with a gentle rotational movement. To make it easier to access the write protection switch, attach the display module to the edge of the electronics compartment.
 - ↳ Display module is attached to the edge of the electronics compartment.




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4. Setting the write protection switch (WP) on the main electronics module to the **ON** position enables hardware write protection. Setting the write protection switch (WP) on the main electronics module to the **OFF** position (factory setting) disables hardware write protection.
 - ↳ If the hardware write protection is enabled: The **Hardware locked** option is displayed in the **Locking status** parameter → 90. In addition, on the local display the -symbol appears in front of the parameters in the header of the operational display and in the navigation view.



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If the hardware write protection is disabled: No option is displayed in the **Locking status** parameter → 90. On the local display, the -symbol disappears from in front of the parameters in the header of the operational display and in the navigation view.

5. Feed the cable into the gap between the housing and main electronics module and plug the display module into the electronics compartment in the desired direction until it engages.
6. Reverse the removal procedure to reassemble the transmitter.

10.8.3 Write protection via block operation


Locking via block operation:

- Block: **DISPLAY (TRDDISP)**; parameter: **Define access code**
- Block: **EXPERT_CONFIG (TRDEXP)**; parameter: **Enter access code**

10.9 Configuring the measuring device via FOUNDATION Fieldbus

10.9.1 Block configuration

Preparation

 The correct Cff and device description files are needed for preparatory purposes.

1. Switch on the device.
2. Make a note of the **DEVICE_ID**.
3. Open the configuration program.
4. Load Cff and device description files into the host system or the configuration program.
5. Identify the device using the **DEVICE_ID**.
6. Assign the desired tag name to the device via the **Pd-tag/FF_PD_TAG** parameter.

Configuring the Resource Block


1. Open the Resource Block.
2. Disable the lock for device operation.
3. Change the block name (optional). Factory setting: RS-xxxxxxxxxx (RB2)
4. Assign a description to the block via the **Description of the identification tag/TAG_DESC** parameter.
5. Change other parameters as required.

Configuring the Transducer Blocks

The measurement and the display module are configured via the Transducer Blocks.

The basic procedure is the same for all Transducer Blocks.

1. Open the specific Transducer Block.
2. Change the block name (optional).
3. Set the block mode to **OOS** via the **Block mode/MODE_BLK** parameter, **TARGET** element.
4. Configure the device in accordance with the measuring task
5. Set the block mode to **Auto** via the **Block mode/MODE_BLK** parameter, **TARGET** element.

 The block mode must be set to **Auto** to ensure the smooth operation of the device.

Configuring the Analog Input Blocks

1. Open the Analog Input Block.
2. Change the block name (optional).
3. Set the block mode to **OOS** via the **Block mode/MODE_BLK** parameter, **TARGET** element.
4. Via the **Channel/CHANNEL** parameter, select the process variable which should be used as the input value for the Analog Input Block.

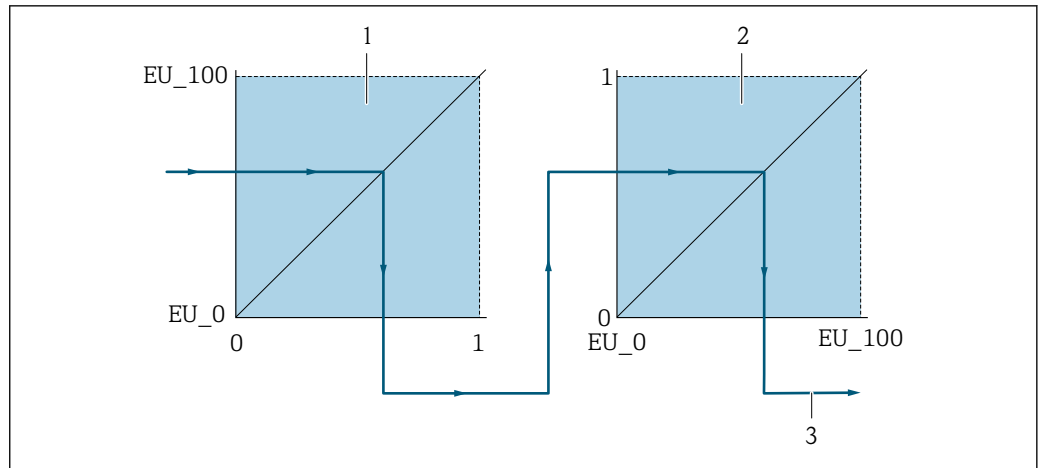
5. Via the **Transducer scale/XD_SCALE** parameter, select the desired unit and the block input range for the process variable. The selected unit must suit the selected process variable. If the process variable does not suit the unit, the **Block error/BLOCK_ERR** parameter reports *Block Configuration Error* and the block mode cannot be set to **Auto**.
6. Via the **Linearization type/L_TYPE** parameter, select the type of linearization for the input variable (factory setting: **Direct**). In the **Direct** linearization mode, the settings for the **Transducer scale/XD_SCALE** and **Output scale/OUT_SCALE** parameters must be identical. If the values do not suit the units, the **Block error/BLOCK_ERR** parameter reports *Block Configuration Error* and the block mode cannot be set to **Auto**.
7. Enter the alarms and critical alarm messages via the **High alarm limit/ HI_HI_LIM**, **High early warning limit/HI_LIM**, **Low alarm limit/ LO_LO_LIM** and **Low early warning limit/LO_LIM** parameters. The limit values entered must be within the value range specified for the **Output scale/OUT_SCALE** parameter.
8. Specify the alarm priorities via the **Priority for high limit value alarm/HI_HI_PRI**, **Priority for high early warning/HI_PRI**, **Priority for low limit value alarm/LO_LO_PRI** and **Priority for low limit value early warning/LO_PRI** parameters. Reporting to the field host system only takes place with alarms with a priority greater than 2.
9. Set the block mode to **Auto** via the **Block mode/MODE_BLK** parameter, **TARGET** element. For this purpose, the Resource Block must also be set to the **Auto** block mode.

Additional configuration

1. Link the function blocks and output blocks.
2. After specifying the active LAS, download all the data and parameters to the field device.

10.9.2 Scaling the measured value in the Analog Input Block

The measured value can be scaled if the **L_TYPE = Indirect** linearization type has been selected in the Analog Input Block. **XD_SCALE** defines the input range with the **EU_0** and **EU_100** elements. This is mapped linearly to the output range, defined by **OUT_SCALE** also with the elements **EU_0** and **EU_100**.



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17 Scaling the measured value in the Analog Input Block

- 1 XD_SCALE
- 2 OUT_SCALE
- 2 OUT_VALUE



- If you have selected the **Direct** mode in the **L_TYPE** parameter, you cannot change the values and units for **XD_SCALE** and **OUT_SCALE**.
- The **L_TYPE**, **XD_SCALE** and **OUT_SCALE** parameters can only be changed in the **OOS** block mode.

11 Operation

11.1 Reading device locking status

The write protection types that are currently active can be determined using the **Locking status** parameter.

Navigation

"Operation" menu → Locking status

Function scope of "Locking status" parameter

Options	Description
None	The access status displayed in " Access status display " parameter applies → 48. Only appears on local display.
Hardware locked	The DIP switch for hardware locking is activated on the main electronics module. This prevents write access to the parameters .
Temporarily locked	Due to internal processing in the device (e.g. up-/downloading of data, reset), write access to the parameters is blocked for a short time. Once the internal processing has been completed, the parameters can be changed once again.

11.2 Adjusting the operating language



Detailed information:

- To configure the operating language → 58
- For information on the operating languages supported by the measuring device → 154

11.3 Configuring the display

Detailed information:

- On the basic settings for the local display → 64
- On the advanced settings for the local display → 78

11.4 Reading measured values

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

11.4.1 Process variables

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

Navigation

"Diagnostics" menu → Measured values → Process variables

► Process variables

Mass flow

→ 91

Volume flow

→ 91

Corrected volume flow	→ 91
Density	→ 91
Reference density	→ 91
Temperature	→ 91

Parameter overview with brief description

Parameter	Description	User interface
Mass flow	Displays the mass flow currently measured. <i>Dependency</i> The unit is taken from the Mass flow unit parameter	Signed floating-point number
Volume flow	Displays the volume flow currently measured. <i>Dependency</i> The unit is taken from the Volume flow unit parameter	Signed floating-point number
Corrected volume flow	Displays the corrected volume flow currently calculated. <i>Dependency</i> The unit is taken from the Corrected volume flow unit parameter	Signed floating-point number
Density	Displays the density or specific density currently measured. <i>Dependency</i> The unit is taken from the Density unit parameter	Positive floating-point number
Reference density	Displays the density at the reference temperature. <i>Dependency</i> The unit is taken from the Reference density unit parameter	Positive floating-point number
Temperature	Displays the temperature currently measured. <i>Dependency</i> The unit is taken from the Temperature unit parameter	Positive floating-point number

11.4.2 "Totalizer" submenu



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

Navigation

"Diagnostics" menu → Measured values → Totalizer

► Totalizer	
Totalizer value 1 to n	→ 92
Totalizer overflow 1 to n	→ 92

Parameter overview with brief description





Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to n	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Displays the current totalizer overflow.	Integer with sign

11.4.3 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	
Terminal voltage 1	→  92
Pulse output	→  92
Output frequency	→  92
Switch status	→  92

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Terminal voltage 1	–	Displays the current terminal voltage that is applied at the output.	0.0 to 50.0 V
Pulse output	In the Operating mode parameter, the Pulse option is selected.	Displays the pulse frequency currently output.	Positive floating-point number
Output frequency	In the Operating mode parameter, the Frequency option is selected.	Displays the value currently measured for the frequency output.	0 to 1 250 Hz
Switch status	The Switch option is selected in the Operating mode parameter.	Displays the current switch output status.	<ul style="list-style-type: none"> ■ Open ■ Closed

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→  58)
- Advanced settings using the **Advanced setup** submenu (→  68)




11.6 Performing a totalizer reset

The totalizers are reset in the **Operation** submenu:





- Control Totalizer
- Reset all totalizers

Navigation

"Operation" menu → Totalizer handling

► Totalizer handling	
Control Totalizer 1 to n	→  93
Preset value 1 to n	→  93
Reset all totalizers	→  93

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Control totalizer value.	<ul style="list-style-type: none"> ■ Totalize ■ Reset + hold ■ Preset + hold ■ Reset + totalize ■ Preset + totalize 	–
Preset value 1 to n	One of the following options is selected in the Assign process variable parameter (→  77) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow 	Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→  77).	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 l ■ 0 gal (us)
Reset all totalizers	–	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize 	–

11.6.1 Function scope of the "Control Totalizer" parameter

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



Options	Description
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset + totalize	The totalizer is set to the defined start value from the Preset value parameter and the totaling process is restarted.

11.6.2 Function scope of the "Reset all totalizers" parameter

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

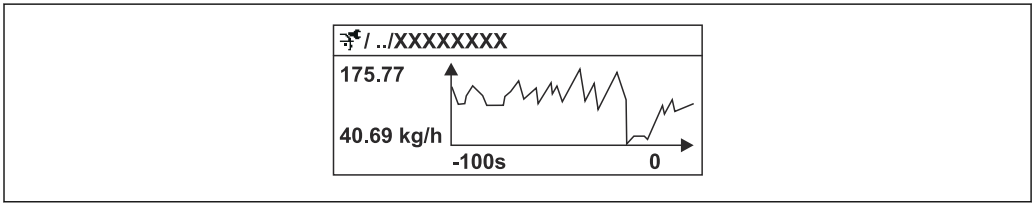
11.7 Showing data logging


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

-  Data logging is also available via:
 - Plant Asset Management Tool FieldCare →  51.
 - 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



 18 Chart of a measured value trend

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


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

Navigation


"Diagnostics" menu → Data logging







► Data logging

Assign channel 1...4

→  95

Logging interval

→  95

Clear logging data	→  95
Data logging	→  95
Logging delay	→  95
Data logging control	→  95
Data logging status	→  95
Entire logging duration	→  95

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface
Assign channel 1 to n	The Extended HistoROM application package is available.	Assign process variable to logging channel.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Carrier pipe temperature ■ Electronic temperature ■ Oscillation frequency ■ Oscillation amplitude ■ Oscillation damping ■ Signal asymmetry
Logging interval	The Extended HistoROM application package is available.	Define the logging interval for data logging. This value defines the time interval between the individual data points in the memory.	1.0 to 3 600.0 s
Clear logging data	The Extended HistoROM application package is available.	Clear the entire logging data.	<ul style="list-style-type: none"> ■ Cancel ■ Clear data
Data logging	–	Select the data logging method.	<ul style="list-style-type: none"> ■ Overwriting ■ Not overwriting
Logging delay	In the Data logging parameter, the Not overwriting option is selected.	Enter the time delay for measured value logging.	0 to 999 h
Data logging control	In the Data logging parameter, the Not overwriting option is selected.	Start and stop measured value logging.	<ul style="list-style-type: none"> ■ None ■ Delete + start ■ Stop
Data logging status	In the Data logging parameter, the Not overwriting option is selected.	Displays the measured value logging status.	<ul style="list-style-type: none"> ■ Done ■ Delay active ■ Active ■ Stopped
Entire logging duration	In the Data logging parameter, the Not overwriting option is selected.	Displays the total logging duration.	Positive floating-point number

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 → 30.
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.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part → 131.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul style="list-style-type: none"> Set the display brighter by simultaneously pressing + . Set the display darker by simultaneously pressing + .
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 131.
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.	<ol style="list-style-type: none"> Press + for 2 s ("home position"). Press . Set the desired language in the Display language parameter (→ 80).
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul style="list-style-type: none"> Check the cable and the connector between the main electronics module and display module. Order spare part → 131.

For output signals

Error	Possible causes	Solution
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 131.
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.	<ol style="list-style-type: none"> Check and correct parameter configuration. Observe limit values specified in the "Technical Data".

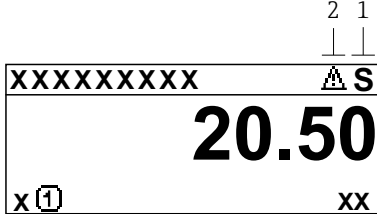
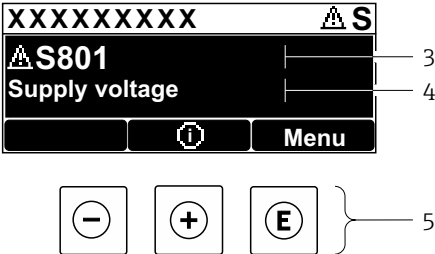
For access

Error	Possible causes	Solution
No write access to parameters	Hardware write protection enabled	Set the write protection switch on main electronics module to the OFF position →  85.
No write access to parameters	Current user role has limited access authorization	1. Check user role →  48. 2. Enter correct customer-specific access code →  48.
No connection via service interface	Incorrect configuration of USB interface on PC or driver not installed correctly.	Observe the documentation for the Commubox.  FXA291: Document "Technical Information" TI00405C

12.2 Diagnostic information on local display



12.2.1 Diagnostic message

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

Operational display in alarm condition	Diagnostic message
	
<p>1 Status signal 2 Diagnostic behavior 3 Diagnostic behavior with diagnostic code 4 Short text 5 Operating elements</p>	


A0029426-EN

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

-  Other diagnostic events that have occurred can be displayed in the **Diagnostics** menu:
- Via parameter
 - Via submenus →  125



Status signals

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

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

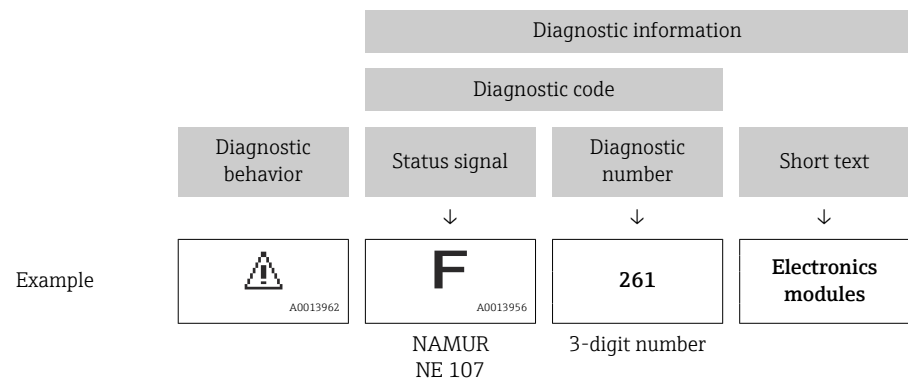
Symbol	Meaning
F	Failure A device error has occurred. The measured value is no longer valid.
C	Function check The device is in service mode (e.g. during a simulation).
S	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)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

Diagnostic behavior



Symbol	Meaning
	Alarm <ul style="list-style-type: none"> Measurement is interrupted. Signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated. For local display with touch control: the background lighting changes to red.
	Warning Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

Diagnostic information

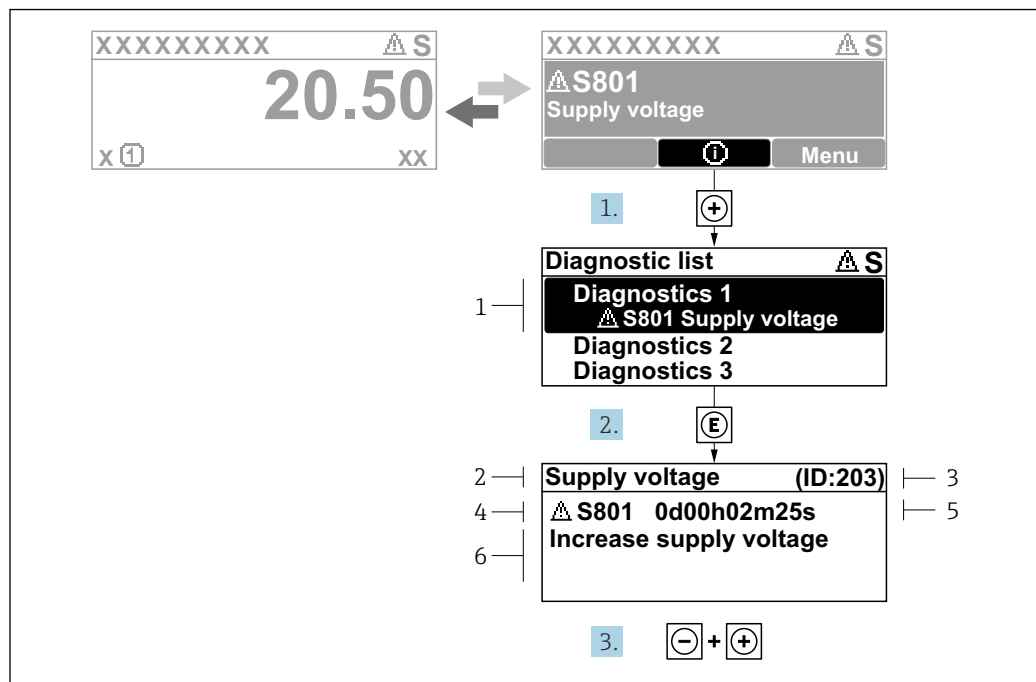
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault. In addition, the corresponding symbol for the diagnostic behavior is displayed in front of the diagnostic information on the local display.



Operating elements

Key	Meaning
	Plus key <i>In a menu, submenu</i> Opens the message about remedy information.
	Enter key <i>In a menu, submenu</i> Opens the operating menu.

12.2.2 Calling up remedial measures



A0029431-EN

19 Message for 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

The user is in the diagnostic message.

1. Press \oplus (① symbol).
↳ The **Diagnostic list** submenu opens.
2. Select the desired diagnostic event with \oplus or \ominus and press \boxplus .
↳ The message for the remedial measures for the selected diagnostic event opens.
3. Press $\ominus + \oplus$ simultaneously.
↳ The message for the remedial measures closes.

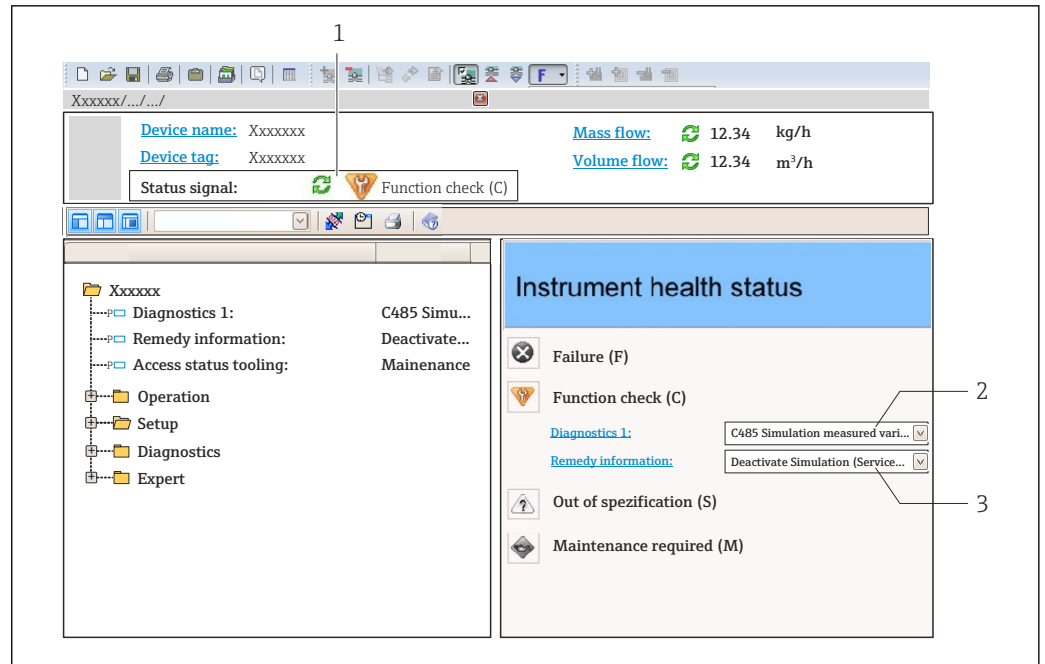
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or **Previous diagnostics** parameter.

1. Press \boxplus .
↳ The message for the remedial measures for the selected diagnostic event opens.
2. Press $\ominus + \oplus$ simultaneously.
↳ The message for the remedial measures closes.

12.3 Diagnostic information in DeviceCare or FieldCare

12.3.1 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 → 98
- 2 Diagnostic information → 99
- 3 Remedy information with Service ID

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

- Via parameter
- Via submenu → 125

Status signals

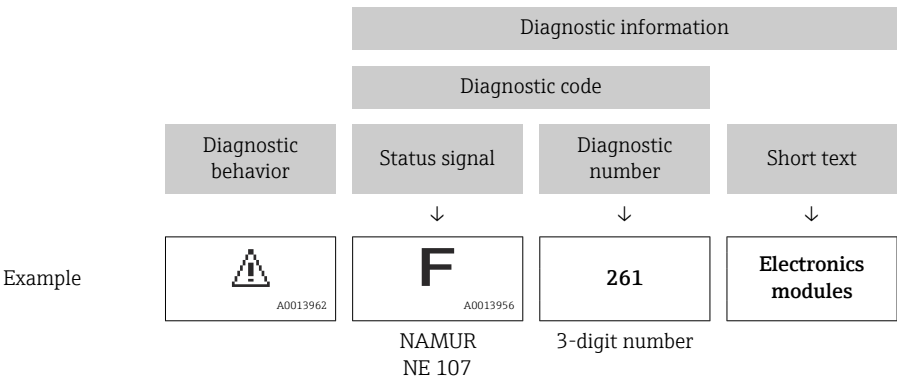
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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

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

Diagnostic information

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



12.3.2 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.

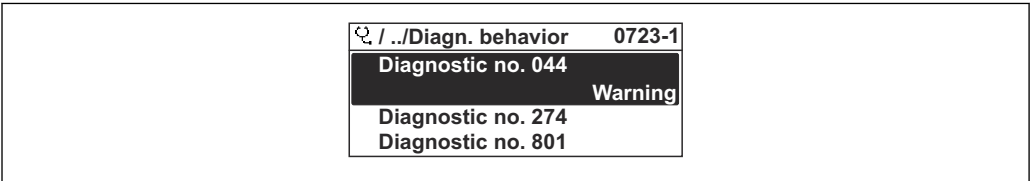
1. Call up the desired parameter.
2. On the right in the working area, mouse over the parameter.
↳ A tool tip with remedy information for the diagnostic event appears.

12.4 Adapting the diagnostic information

12.4.1 Adapting the diagnostic behavior

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

Expert → System → Diagnostic handling → Diagnostic behavior



20 Taking the example of the local display

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

Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated. For local display with touch control: the background lighting changes to red.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.

Options	Description
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the Event logbook submenu (Event list submenu) and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.4.2 Adapting the status signal

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

Expert → Communication → Diagnostic event category

Available status signals

Configuration as per FOUNDATION Fieldbus Specification (FF912), in accordance with NAMUR NE107.

Symbol	Meaning
F A0013956	Failure A device error is present. The measured value is no longer valid.
C A0013959	Function check The device is in service mode (e.g. during a simulation).
S A0013958	Out of specification The device is being operated: <ul style="list-style-type: none"> Outside its technical specification limits (e.g. outside the process temperature range) Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
M A0013957	Maintenance required Maintenance is required. The measured value is still valid.

Enabling the configuration of the diagnostic information according to FF912

For compatibility reasons, the configuration of the diagnostic information according to FOUNDATION Fieldbus Specification FF912 is not enabled when the device is delivered from the factory.

Enabling the configuration of the diagnostic information according to FOUNDATION Fieldbus Specification FF912

1. Open the Resource block.
2. In **Feature Selection** parameter, select **Multi-bit Alarm (Bit-Alarm) Support** option.
 - ↳ The diagnostic information can be configured according to FOUNDATION Fieldbus Specification FF912.

Grouping the diagnostic information

Diagnostic information is assigned to different groups. The groups differ depending on the weighting (severity) of the diagnostic event:



- Highest weighting
- High weighting
- Low weighting

Assignment of the diagnostic information (factory setting)

The assignment of the diagnostic information ex-works is indicated in the following tables.

The individual ranges of the diagnostic information can be assigned to another status signal →  104.

Some diagnostic information can be assigned individually, irrespective of their range →  106.

 Overview and description of all diagnostic information →  107

Weighting	Status signal (factory setting)	Allocation	Diagnostic information range
Highest	Failure (F)	Sensor	F000 to 199
		Electronics	F200 to 399
		Configuration	F400 to 700
		Process	F800 to 999



Weighting	Status signal (factory setting)	Allocation	Diagnostic information range
High	Function check (C)	Sensor	C000 to 199
		Electronics	C200 to 399
		Configuration	C400 to 700
		Process	C800 to 999

Weighting	Status signal (factory setting)	Allocation	Diagnostic information range
Low	Out of specification (S)	Sensor	S000 to 199
		Electronics	S200 to 399
		Configuration	S400 to 700
		Process	S800 to 999

Weighting	Status signal (factory setting)	Allocation	Diagnostic information range
Low	Maintenance required (M)	Sensor	M000 to 199
		Electronics	M200 to 399
		Configuration	M400 to 700
		Process	M800 to 999

Changing the assignment of the diagnostic information

The individual ranges of the diagnostic information can be assigned to another status signal. This is done by changing the bit in the associated parameter. The bit change always applies for the entire range of the diagnostic information.

 Some diagnostic information can be assigned individually, irrespective of their range →  106

Each status signal has a parameter in the Resource Block in which it is possible to define the diagnostic event for which the status signal is transmitted:

- Failure (F): **FD_FAIL_MAP** parameter
- Function check (C): **FD_CHECK_MAP** parameter
- Out of specification (S): **FD_OFFSPEC_MAP** parameter
- Maintenance required (M): **FD_MAINT_MAP** parameter

Structure and assignment of the parameters for the status signals (factory setting)

Weighting	Allocation	Bit	FD_FAIL_MAP	FD_CHECK_MAP	FD_OFFSPEC_MAP	FD_MAINT_MAP
Highest	Sensor	31	1	0	0	0
	Electronics	30	1	0	0	0
	Configuration	29	1	0	0	0
	Process	28	1	0	0	0
High	Sensor	27	0	1	0	0
	Electronics	26	0	1	0	0
	Configuration	25	0	1	0	0
	Process	24	0	1	0	0
Low	Sensor	23	0	0	1	0
	Electronics	22	0	0	1	0
	Configuration	21	0	0	1	0
	Process	20	0	0	1	0
Low	Sensor	19	0	0	0	1
	Electronics	18	0	0	0	1
	Configuration	17	0	0	0	1
	Process	16	0	0	0	1
Configurable range → 106		15 to 1	0	0	0	0
Reserved (Fieldbus Foundation)		0	0	0	0	0

Changing the status signal for a range of diagnostic information

Example: The status signal for the diagnostic information for electronics with the "Highest" weighting is to be changed from failure (F) to function check (C).

1. Set the Resource Block to the **OOS** block mode.
2. Open the **FD_FAIL_MAP** parameter in the Resource Block.
3. Change **Bit 30** to **0** in the parameter.
4. Open the **FD_CHECK_MAP** parameter in the Resource Block.
5. Change **Bit 26** to **1** in the parameter.
 - ↳ If a diagnostic event occurs for electronics with the "Highest weighting", the diagnostic information to this effect is displayed with the function check (C) status signal.
6. Set the Resource Block to the **AUTO** block mode.

NOTICE**No status signal is assigned to an area of diagnostic information.**

If a diagnostic event occurs in this area, no status signal is transmitted to the control system.

- If you are changing the parameters, make sure that a status signal is assigned to all areas.



If FieldCare is used, the status signal is enabled and disabled using the check box of the particular parameter.

Assigning diagnostic information individually to a status signal

Some diagnostic information can be individually assigned to a status signal, irrespective of their original range.

Assigning diagnostic information individually to a status signal via FieldCare.

1. In the FieldCare navigation window: **Expert** → **Communication** → **Field diagnostics** → **Alarm detection enable**
2. Select the desired diagnostic information from one of the fields **Configurable Area Bits 1** to **Configurable Area Bits 15**.
3. Press Enter to confirm.
4. When selecting the desired status signal (e.g. Offspec Map), also select the **Configurable Area Bit 1** to **Configurable Area Bit 15** that was assigned previously to the diagnostic information (step 2).
5. Press Enter to confirm.
 - ↳ The diagnostic event of the selected diagnostic information is recorded.
6. In the FieldCare navigation window: **Expert** → **Communication** → **Field diagnostics** → **Alarm broadcast enable**
7. Select the desired diagnostic information from one of the fields **Configurable Area Bits 1** to **Configurable Area Bits 15**.
8. Press Enter to confirm.
9. When selecting the desired status signal (e.g. Offspec Map), also select the **Configurable Area Bit 1** to **Configurable Area Bit 15** that was assigned previously to the diagnostic information (step 7).
10. Press Enter to confirm.
 - ↳ The selected diagnostic information is transmitted over the bus when a diagnostic event to this effect occurs.



A change in the status signal does not affect diagnostic information that already exists. The new status signal is only assigned if this error occurs again after the status signal has changed.

Transmitting the diagnostic information over the bus*Prioritizing diagnostic information for transmission over the bus*

Diagnostic information is only transmitted over the bus if its priority is between 2 and 15. Priority 1-events are displayed but are not transmitted over the bus. Diagnostic information with priority 0 (factory setting) is ignored.


It is possible to change the priority individually for the different status signals. The following parameters of the Resource Block are used for this purpose:



- FD_FAIL_PRI
- FD_CHECK_PRI
- FD_OFFSPEC_PRI
- FD_MAINT_PRI

Suppressing certain diagnostic information

It is possible to suppress certain events during transmission over the bus using a mask. While these events are displayed they are not transmitted over the bus. This mask is in FieldCare **Expert** → **Communication** → **Field diagnostics** → **Alarm broadcast enable**. The mask is a negative selection mask, i.e. if a field is selected the associated diagnostic information is not transmitted over the bus.

12.5 Overview of diagnostic information

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

 In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Change the diagnostic information →  102

12.5.1 Diagnostic of sensor

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
022	Sensor temperature		1. Change main electronic module 2. Change sensor	<ul style="list-style-type: none">■ Density■ Mass flow■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Sensor failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
046	Sensor limit exceeded		1. Inspect sensor 2. Check process condition	<div><div>■ Density</div><div>■ Mass flow</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Volume flow</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Sensor conversion not accurate		
	Status signal [from the factory] ²⁾	S		
Diagnostic behavior [from the factory] ³⁾	Warning			

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
062	Sensor connection		1. Change main electronic module 2. Change sensor	<ul style="list-style-type: none">■ Mass flow■ Corrected volume flow■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Sensor failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
082	Data storage		1. Change main electronic module 2. Change sensor	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Sensor failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
083	Memory content		1. Restart device 2. Restore S-Dat data 3. Change sensor	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Sensor failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
140	Sensor signal		1. Check or change main electronics 2. Change sensor	<div><div>■ Density</div><div>■ Mass flow</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Temperature</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Bad		
	Quality substatus	Sensor failure		
	Status signal [from the factory] ²⁾	S		
Diagnostic behavior [from the factory] ³⁾	Warning			

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

12.5.2 Diagnostic of electronic

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
242	Software incompatible		1. Check software 2. Flash or change main electronics module	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
252	Modules incompatible		1. Check electronic modules 2. Change I/O or main electronic module	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
261	Electronic modules		1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
262	Module connection		1. Check module connections 2. Change electronic modules	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
270	Main electronic failure		Change main electronic module	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
271	Main electronic failure		1. Restart device 2. Change main electronic module	<ul style="list-style-type: none">■ Density■ Mass flow■ Reference density■ Corrected volume flow■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
272	Main electronic failure		1. Restart device 2. Contact service	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
273	Main electronic failure		1. Emergency operation via display 2. Change main electronics	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
274	Main electronic failure		Unstable measurement 1. Change main electronics	<div><div>■</div> Mass flow</div> <div><div>■</div> Corrected volume flow</div> <div><div>■</div> Volume flow</div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
275	I/O module failure		Change I/O module	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
276	I/O module failure		1. Restart device 2. Change I/O module	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
282	Data storage		1. Restart device 2. Contact service	<div><div>■ Density</div><div>■ Empty pipe detection option</div><div>■ Low flow cut off option</div><div>■ Mass flow</div><div>■ Switch output status option</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Temperature</div><div>■ Volume flow</div></div>
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
283	Memory content		1. Transfer data or reset device 2. Contact service	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
302	Device verification active		Device verification active, please wait.	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
311	Electronic failure		1. Transfer data or reset device 2. Contact service	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
311	Electronic failure		Maintenance required! 1. Do not perform reset 2. Contact service	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	M		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
362	Main electronic failure		1. Change main electronic module 2. Change sensor	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Device failure		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

12.5.3 Diagnostic of configuration

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
410	Data transfer		1. Check connection 2. Retry data transfer	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Configuration error		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
412	Processing Download		Download active, please wait	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
	Diagnostic behavior	Warning		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
437	Configuration incompatible		1. Restart device 2. Contact service	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Configuration error		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	<ul style="list-style-type: none"> ■ Density ■ Empty pipe detection option ■ Low flow cut off option ■ Mass flow ■ Switch output status option ■ Reference density ■ Corrected volume flow ■ Temperature ■ Volume flow
	Measured variable status		
	Quality		
	Quality substatus		
	Status signal [from the factory] ¹⁾		
	Diagnostic behavior		

1) Status signal can be changed.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
442	Frequency output	1. Check process 2. Check frequency output settings	–
	Measured variable status		
	Quality		
	Quality substatus		
	Status signal [from the factory] ¹⁾		
	Diagnostic behavior [from the factory] ²⁾		

1) Status signal can be changed.

2) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
443	Pulse output	1. Check process 2. Check pulse output settings	–
	Measured variable status		
	Quality		
	Quality substatus		
	Status signal [from the factory] ¹⁾		
	Diagnostic behavior [from the factory] ²⁾		

1) Status signal can be changed.

2) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
453	Flow override		Deactivate flow override	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
482	Block in OOS		Set Block in AUTO mode	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
484	Simulation failure mode		Deactivate simulation	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Configuration error		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
485	Simulation measured variable		Deactivate simulation	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
492	Simulation frequency output		Deactivate simulation frequency output	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
493	Simulation pulse output		Deactivate simulation pulse output	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
494	Switch output simulation		Deactivate simulation switch output	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
Diagnostic behavior	Warning			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
495	Simulation diagnostic event		Deactivate simulation	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
	Diagnostic behavior	Warning		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
497	Simulation block output		Deactivate simulation	–
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	C		
	Diagnostic behavior	Warning		

1) Status signal can be changed.

12.5.4 Diagnostic of process

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
801	Supply voltage too low		Increase supply voltage	<div><div>■ Density</div><div>■ Empty pipe detection option</div><div>■ Low flow cut off option</div><div>■ Mass flow</div><div>■ Switch output status option</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Temperature</div><div>■ Volume flow</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
830	Sensor temperature too high		Reduce ambient temp. around the sensor housing	<div><div>■ Density</div><div>■ Mass flow</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Volume flow</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
831	Sensor temperature too low		Increase ambient temp. around the sensor housing	<ul style="list-style-type: none">■ Density■ Mass flow■ Reference density■ Corrected volume flow■ Volume flow
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
832	Electronic temperature too high		Reduce ambient temperature	<div><div>■ Density</div><div>■ Empty pipe detection option</div><div>■ Low flow cut off option</div><div>■ Mass flow</div><div>■ Switch output status option</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Temperature</div><div>■ Volume flow</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
833	Electronic temperature too low		Increase ambient temperature	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Volume flow
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
834	Process temperature too high		Reduce process temperature	<div><div>■ Density</div><div>■ Mass flow</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Temperature</div><div>■ Volume flow</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
835	Process temperature too low		Increase process temperature	<div><div>■ Density</div><div>■ Mass flow</div><div>■ Reference density</div><div>■ Corrected volume flow</div><div>■ Temperature</div><div>■ Volume flow</div></div>
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
842	Process limit		Low flow cut off active! 1. Check low flow cut off configuration	<ul style="list-style-type: none">■ Density■ Empty pipe detection option■ Low flow cut off option■ Mass flow■ Switch output status option■ Reference density■ Corrected volume flow■ Temperature■ Volume flow
	Measured variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	S		
	Diagnostic behavior	Warning		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
862	Partly filled pipe		1. Check for gas in process 2. Adjust detection limits	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
	Diagnostic behavior [from the factory] ³⁾	Warning		

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
882	Input signal		1. Check input configuration 2. Check external device or process conditions	<ul style="list-style-type: none">■ Density■ Mass flow■ Reference density■ Corrected volume flow■ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
910	Tubes not oscillating		1. Check process conditions 2. Increase supply 3. Check main electronic or sensor	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status			
	Quality	Bad		
	Quality substatus	Non specific		
	Status signal [from the factory] ¹⁾	F		
Diagnostic behavior	Alarm			

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measured variables
No.	Short text			
912	Medium inhomogeneous		1. Check process cond. 2. Increase system pressure	<ul style="list-style-type: none">▪ Density▪ Empty pipe detection option▪ Low flow cut off option▪ Mass flow▪ Switch output status option▪ Reference density▪ Corrected volume flow▪ Temperature▪ Volume flow
	Measured variable status [from the factory] ¹⁾			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] ²⁾	S		
Diagnostic behavior [from the factory] ³⁾	Warning			

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

2) Status signal can be changed.

3) Diagnostic behavior can be changed.

Diagnostic information		Remedy instructions	Influenced measured variables
No.	Short text		
913	Medium unsuitable	1. Check process conditions 2. Increase supply 3. Check main electronic or sensor	<ul style="list-style-type: none">■ Density■ Mass flow■ Reference density■ Corrected volume flow■ Volume flow
	Measured variable status [from the factory] ¹⁾		
	Quality		
	Quality substatus		
	Status signal [from the factory] ²⁾		
	Diagnostic behavior [from the factory] ³⁾		

- 1) Quality can be changed. This causes the overall status of the measured variable to change.
- 2) Status signal can be changed.
- 3) Diagnostic behavior can be changed.

12.6 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 → 100
 - Via "FieldCare" operating tool → 102
 - Via "DeviceCare" operating tool → 102
- Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 125

Navigation
"Diagnostics" menu

Diagnostics

Actual diagnostics

Previous diagnostics

Operating time from restart

Operating time


→ 125

→ 125

→ 125

→ 125

Parameter overview with brief description

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

12.7 Diagnostic messages in the DIAGNOSTIC Transducer Block

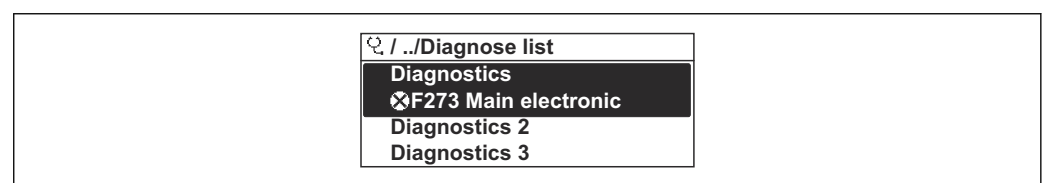
- The **Actual diagnostics** parameter (**actual diagnostics**) displays the message with the highest priority.
- A list of the active alarms can be viewed via the **Diagnostics 1** parameter (**diagnostics_1**) to Diagnostics 5 (**diagnostics_5**). If more than 5 messages are pending, the messages with the highest priority are shown on the display.
- You can view the last alarm that is no longer active via the **Previous diagnostics** parameter (**previous_diagnostics**).

12.8 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

 21 Taking the example of the local display

 To call up the measures to rectify a diagnostic event:

- Via local display →  100
- Via "FieldCare" operating tool →  102
- Via "DeviceCare" operating tool →  102

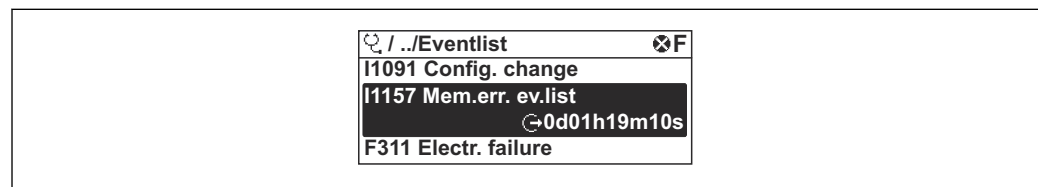
12.9 Event logbook

12.9.1 Event history

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



A0014008-EN

22 Taking the example of the local display

- Max. 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 → 107
- Information events → 126

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 → 100
- Via "FieldCare" operating tool → 102
- Via "DeviceCare" operating tool → 102

For filtering the displayed event messages → 126

12.9.2 Filtering the event logbook

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

Navigation path

Diagnostics → **Event logbook** → Filter options

Filter categories

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

12.9.3 Overview of information events

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

Info number	Info name
I1000	----- (Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I1092	Trend data deleted
I1110	Write protection switch changed
I1111	Density adjust failure
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronic temperature
I1156	Memory error trend
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared
I1189	Backup compared
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1227	Sensor emergency mode activated
I1228	Sensor emergency mode failed
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished

12.10 Resetting the measuring device

Using the **Restart** parameter it is possible to reset the entire device configuration or some of the configuration to a defined state.

12.10.1 Function scope of the "Restart" parameter

Options	Description
Uninitialized	The selection has no effect on the device.
Run	The selection has no effect on the device.

Options	Description
Resource	The selection has no effect on the device.
Defaults	All FOUNDATION Fieldbus blocks are reset to their factory settings. Example: Analog Input Channel to the Uninitialized option.
Processor	The device is restarted.
To factory defaults	The extended FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information) and the device parameters are reset to their factory settings.
To delivery settings	Advanced FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information) and device parameters for which a customer-specific default setting was ordered are reset to this customer-specific value.
ENP restart	The parameters of the electronic name plate are reset. The device is restarted.
To transducer defaults	Certain (measured-value specific) device parameters are reset. The parameters of the FOUNDATION Fieldbus blocks remain unchanged.
Factory Default Blocks	The extended FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information) are reset to their factory settings.

12.11 Device information

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

Navigation

"Diagnostics" menu → Device information

► Device information

Device tag

Serial number

Firmware version

Order code

Extended order code 1

Extended order code 2

Device Revision

Device Type

→ ⓘ 129

→ ⓘ 129

→ ⓘ 129

→ ⓘ 129




→ ⓘ 129

→ ⓘ 129

→ ⓘ 129




→ ⓘ 129

Parameter overview with brief description

Parameter	Description	User entry / User interface	Factory setting
Device tag	Enter the name for the measuring point.	32 characters such as letters, numbers or special characters (e.g. @, %, /)	–
Serial number	Displays 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 with the following format: xx.yy.zz	–
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	–
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	–
Device Type	Shows the device type with which the measuring device is registered with the FOUNDATION Fieldbus.	Promass 200	–
Device Revision	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource.	1	–

12.12 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
07.2014	01.00.zz	Option 74	Original firmware	Operating Instructions	BA01315D/06/EN/01.14

-  It is possible to flash the firmware to the current version or the previous version using the service interface.
-  For the compatibility of the firmware version with the previous version, the installed device description files and operating tools, observe the information about the device in the "Manufacturer's information" document.
-  The manufacturer's information is available:
 - In the Download Area of the Endress+Hauser web site: www.endress.com → Downloads
 - Specify the following details:
 - Product root, e.g. 8E2B
 - 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

Observe the following points for CIP and SIP cleaning:


- Use only cleaning agents to which the process-wetted materials are adequately resistant.
- Observe the maximum permitted medium temperature for the measuring device
→  149.

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: →  134

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:

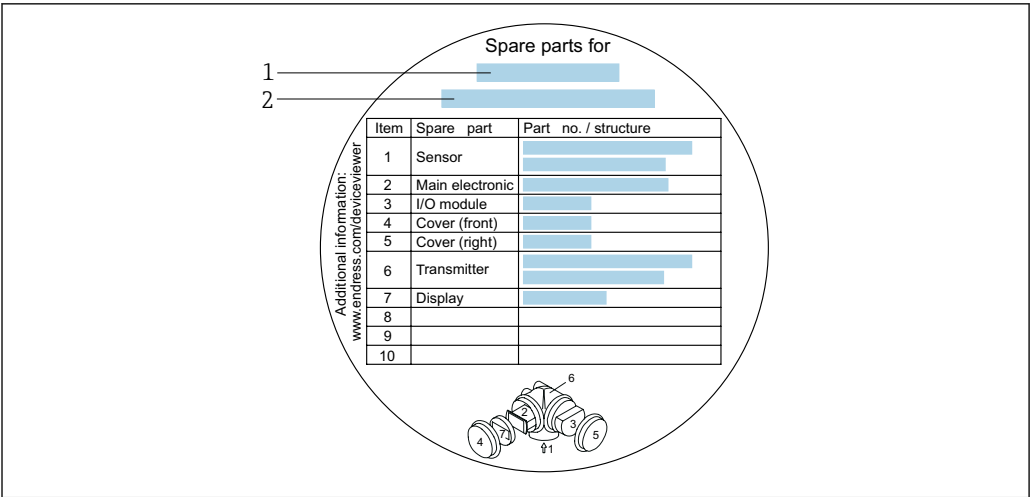
- ▶ Use only original Endress+Hauser spare parts.
- ▶ Carry out the repair according to the Installation Instructions.
- ▶ Observe the applicable standards, federal/national regulations, Ex documentation (XA) and certificates.
- ▶ Document every repair and each conversion and enter them into the *W@M*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

14.2 Spare parts

Some interchangeable measuring device components are listed on an overview sign in the connection compartment cover.

The spare part overview sign contains the following information:

- A list of the most important spare parts for the measuring device, including their ordering information.
- The URL for the *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.



23 Example for "Spare part overview sign" in connection compartment cover

- 1 Measuring device name
- 2 Measuring device serial number

- Measuring device serial number:
 - Is located on the device nameplate and the spare part overview sign.
 - Can be read out via the **Serial number** parameter in the **Device information** submenu.

14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.

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

14.4 Return

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

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

14.5 Disposal

14.5.1 Removing the measuring device

- Switch off the device.

⚠ WARNING

Danger to persons from process conditions.

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

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

14.5.2 Disposing of the measuring device

WARNING

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

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

Observe the following notes during disposal:



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



15 Accessories

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


15.1 Device-specific accessories

15.1.1 For the transmitter




Accessories	Description
Promass 200 transmitter	<p>Transmitter for replacement or storage. Use the order code to define the following specifications:</p> <ul style="list-style-type: none"> ■ Approvals ■ Output ■ Display / operation ■ Housing ■ Software <p> For details, see Installation Instructions EA00104D</p>
Remote display FHX50	<p>FHX50 housing for accommodating a display module .</p> <ul style="list-style-type: none"> ■ FHX50 housing suitable for: <ul style="list-style-type: none"> ■ SD02 display module (push buttons) ■ SD03 display module (touch control) ■ Housing material: <ul style="list-style-type: none"> ■ Plastic PBT ■ Stainless steel CF-3M (316L, 1.4404) ■ Length of connecting cable: up to max. 60 m (196 ft) (cable lengths available for order: 5 m (16 ft), 10 m (32 ft), 20 m (65 ft), 30 m (98 ft)) <p>The measuring device can be ordered with the FHX50 housing and a display module. The following options must be selected in the separate order codes:</p> <ul style="list-style-type: none"> ■ Order code for measuring device, feature 030: Option L or M "Prepared for FHX50 display" ■ Order code for FHX50 housing, feature 050 (device version): Option A "Prepared for FHX50 display" ■ Order code for FHX50 housing, depends on the desired display module in feature 020 (display, operation): <ul style="list-style-type: none"> ■ Option C: for an SD02 display module (push buttons) ■ Option E: for an SD03 display module (touch control) <p>The FHX50 housing can also be ordered as a retrofit kit. The measuring device display module is used in the FHX50 housing. The following options must be selected in the order code for the FHX50 housing:</p> <ul style="list-style-type: none"> ■ Feature 050 (measuring device version): option B "Not prepared for FHX50 display" ■ Feature 020 (display, operation): option A "None, existing displayed used" <p> For details, see Special Documentation SD01007F</p> <p>(Order number: FHX50)</p>

Overvoltage protection for 2-wire devices	<p>Ideally, the overvoltage protection module should be ordered directly with the device. See product structure, characteristic 610 "Accessory mounted", option NA "Overvoltage protection". Separate order necessary only if retrofitting.</p> <ul style="list-style-type: none"> ■ OVP10: For 1-channel devices (characteristic 020, option A): ■ OVP20: For 2-channel devices (characteristic 020, options B, C, E or G) <p> For details, see Special Documentation SD01090F.</p>
Protective cover	<p>Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight or extreme cold in winter.</p> <p> For details, see Special Documentation SD00333F</p>

15.1.2 For the sensor



Accessories	Description
Heating jacket	<p>Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids. If using oil as a heating medium, please consult with Endress+Hauser. Heating jackets cannot be used with sensors fitted with a rupture disk.</p> <p> For details, see Operating Instructions BA00132D</p>

15.2 Communication-specific accessories




Accessories	Description
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> For details, see the "Technical Information" document TI405C/07</p>
Field Xpert SFX350	<p>Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area.</p> <p> For details, see Operating Instructions BA01202S</p>
Field Xpert SFX370	<p>Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area and the Ex area.</p> <p> For details, see Operating Instructions BA01202S</p>

15.3 Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> ■ 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. <p>Applicator is available:</p> <ul style="list-style-type: none"> ■ Via the Internet: https://wapps.endress.com/applicator ■ As a downloadable DVD for local PC installation.

W@M	<p>W@M Life Cycle Management</p> <p>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.</p> <p>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.</p> <p>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement</p>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>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.</p> <p> For details, see Operating Instructions BA00027S and BA00059S</p>
DeviceCare	<p>Tool for connecting and configuring Endress+Hauser field devices.</p> <p> For details, see Innovation brochure IN01047S</p>

15.4 System components


Accessories	Description
Memograph M graphic display recorder	<p>The Memograph M graphic display recorder provides information on all relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p>
Cerabar M	<p>The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.</p> <p> For details, see "Technical Information" TI00426P, TI00436P and Operating Instructions BA00200P, BA00382P</p>
Cerabar S	<p>The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.</p> <p> For details, see "Technical Information" TI00383P and Operating Instructions BA00271P</p>

16 Technical data

16.1 Application

- The measuring device is intended only for the flow measurement of liquids and gases.
 - The measuring device is intended only for the flow measurement of liquids with a minimum conductivity of 20 µS/cm.
- Depending on the version ordered, the measuring device can also measure potentially explosive, flammable, poisonous and oxidizing media.
- To ensure that the device remains in proper operating condition for its service life, use the measuring device only for media against which the process-wetted materials are sufficiently resistant.

16.2 Function and system design

Measuring principle	Mass flow measurement based on the Coriolis measuring principle
Measuring system	<p>The device consists of a transmitter and a sensor.</p> <p>The device is available as a compact version: The transmitter and sensor form a mechanical unit.</p> <p>For information on the structure of the device →  12</p>

16.3 Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

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

Measuring range for gases

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

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

$\dot{m}_{\max(G)}$	Maximum full scale value for gas [kg/h]
$\dot{m}_{\max(F)}$	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$
ρ_G	Gas density in [kg/m ³] at operating conditions
x	Constant dependent on nominal diameter
c_G	Sound velocity (gas) [m/s]
d_i	Measuring tube internal diameter [m]

DN		x
[mm]	[in]	[kg/m ³]
8	$\frac{3}{8}$	60
15	$\frac{1}{2}$	80
25	1	90
40	$1\frac{1}{2}$	90
50	2	90
80	3	110



Calculation example for gas

- Sensor: Promass F, DN 50
- Gas: Air with a density of 60.3 kg/m³ (at 20 °C and 50 bar)
- Measuring range (liquid): 70 000 kg/h
- $x = 90 \text{ kg/m}^3$ (for Promass F, DN 50)



Maximum possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_G : x = 70\,000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 : 90 \text{ kg/m}^3 = 46\,900 \text{ kg/h}$$

Recommended measuring range

 Flow limit →  151

Operable flow range	Over 1000 : 1. Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly.
---------------------	--

Input signal	External measured values To increase the accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write the operating pressure to the measuring device. Endress+Hauser recommends the use of a pressure measuring device for absolute pressure, e.g. Cerabar M or Cerabar S.  Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section →  136 It is recommended to read in external measured values to calculate the following measured variables: <ul style="list-style-type: none"> ■ Mass flow ■ Corrected volume flow <i>Digital communication</i> The measured values are written from the automation system to the measuring device via FOUNDATION Fieldbus.
--------------	--

16.4 Output

Output signal	Pulse/frequency/switch output
Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	<ul style="list-style-type: none"> ■ DC 35 V ■ 50 mA
Voltage drop	<ul style="list-style-type: none"> ■ For ≤ 2 mA: 2 V ■ For 10 mA: 8 V
Residual current	≤ 0.05 mA
Pulse output	
Pulse width	Adjustable: 5 to 2 000 ms
Maximum pulse rate	100 Impulse/s
Pulse value	Adjustable
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow

Frequency output	
Output frequency	Adjustable: 0 to 1000 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit value <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1-3 ■ Flow direction monitoring ■ Status <ul style="list-style-type: none"> ■ Partially filled pipe detection ■ Low flow cut off

FOUNDATION Fieldbus

FOUNDATION Fieldbus	H1, IEC 61158-2, galvanically isolated
Data transfer	31.25 kbit/s
Current consumption	10 mA
Permitted supply voltage	9 to 32 V
Bus connection	With integrated reverse polarity protection

Signal on alarm

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

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ No pulses
Frequency output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ 0 Hz ■ Defined value: 0 to 1250 Hz

Switch output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed

FOUNDATION Fieldbus

Status and alarm messages	Diagnostics in accordance with FF-891
Failure current FDE (Fault Disconnection Electronic)	0 mA

Local display

Plain text display	With information on cause and remedial measures
Backlight	Additionally for device version with SD03 local display: red lighting indicates a device error.

 Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
FOUNDATION Fieldbus
- Via service interface
CDI service interface

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

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

Galvanic isolation All outputs are galvanically isolated from one another.

Protocol-specific data	Manufacturer ID	0x452B48
	Ident number	0x1054
	Device revision	1
	DD revision	Information and files under: <ul style="list-style-type: none"> ■ www.endress.com ■ www.fieldbus.org
	CFF revision	
	Device Tester Version (ITK version)	6.1.1
	ITK Test Campaign Number	IT094200
	Link Master capability (LAS)	Yes
	Choice of "Link Master" and "Basic Device"	Yes Factory setting: Basic Device
	Node address	Factory setting: 247 (0xF7)
	Supported functions	The following methods are supported: <ul style="list-style-type: none"> ■ Restart ■ ENP Restart ■ Diagnostic

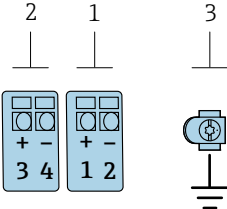
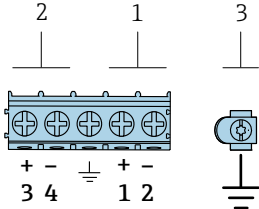
Virtual Communication Relationships (VCRs)	
Number of VCRs	44
Number of link objects in VFD	50
Permanent entries	1
Client VCRs	0
Server VCRs	10
Source VCRs	43
Sink VCRs	0
Subscriber VCRs	43
Publisher VCRs	43
Device Link Capabilities	
Slot time	4
Min. delay between PDU	8
Max. response delay	Min. 5
System integration	<div>For information on system integration, see . → 54</div> <div><div>■</div>Cyclic data transmission</div> <div><div>■</div>Description of the modules</div> <div><div>■</div>Execution times</div> <div><div>■</div>Methods</div>

16.5 Power supply

Terminal assignment

Transmitter

Connection version for FOUNDATION Fieldbus, pulse/frequency/switch output

 <div>A0013570</div>	 <div>A0018161</div>
Maximum number of terminals	Maximum number of terminals for order code for "Accessory mounted", option NA "Overvoltage protection"
<div>1 Output 1: FOUNDATION Fieldbus</div> <div>2 Output 2 (passive): pulse/frequency/switch output</div> <div>3 Ground terminal for cable shield</div>	

Order code for "Output"	Terminal numbers			
	Output 1		Output 2	
	1 (+)	2 (-)	3 (+)	4 (-)
Option E ^{1) 2)}	FOUNDATION Fieldbus		Pulse/frequency/switch output (passive)	

1) Output 1 must always be used; output 2 is optional.
2) FOUNDATION Fieldbus with integrated reverse polarity protection.

Supply voltage

Transmitter

An external power supply is required for each output.

The following supply voltage values apply for the outputs available:

Order code for "Output"	Minimum terminal voltage	Maximum terminal voltage
Option E ¹⁾ : FOUNDATION Fieldbus, pulse/frequency/switch output	≥ DC 9 V	DC 32 V

- 1) For device version with SD03 local display: The terminal voltage must be increased by DC 0.5 V if backlighting is used.

Power consumption

Transmitter

Order code for "Output; input"	Maximum power consumption
Option E: FOUNDATION Fieldbus, pulse/frequency/switch output	<ul style="list-style-type: none"> ■ Operation with output 1: 576 mW ■ Operation with output 1 and 2: 2 576 mW

Current consumption


FOUNDATION Fieldbus

18 mA

Power supply failure

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

Electrical connection

→  30

Potential equalization

→  32


Terminals

- For device version without integrated overvoltage protection: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)
- For device version with integrated overvoltage protection: screw terminals for wire cross-sections 0.2 to 2.5 mm² (24 to 14 AWG)

Cable entries


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

Cable specification



→  27

Overvoltage protection



The device can be ordered with integrated overvoltage protection for diverse approvals:
Order code for "Accessory mounted", option NA "Overvoltage protection"

Input voltage range	Values correspond to supply voltage specifications →  143 ¹⁾
Resistance per channel	2 · 0.5 Ω max.
DC sparkover voltage	400 to 700 V
Trip surge voltage	< 800 V

Capacitance at 1 MHz	< 1.5 pF
Nominal discharge current (8/20 µs)	10 kA
Temperature range	−40 to +85 °C (−40 to +185 °F)

- 1) The voltage is reduced by the amount of the internal resistance $I_{min} \cdot R_i$
-  Depending on the temperature class, restrictions apply to the ambient temperature for device versions with overvoltage protection .
-  For detailed information on the temperature tables, see the "Safety Instructions" (XA) for the device.

16.6 Performance characteristics

Reference operating conditions	<div><ul style="list-style-type: none">■ Error limits based on ISO 11631■ Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)■ Specifications as per calibration protocol■ Accuracy based on accredited calibration rigs that are traced to ISO 17025.</div> <div> To obtain measured errors, use the <i>Applicator</i> sizing tool →  135</div>
--------------------------------	--

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

Base accuracy

 Design fundamentals →  147

Mass flow and volume flow (liquids)

±0.10 % o.r.

Mass flow (gases)

±0.25 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration	Wide-range Density specification ^{1) 2)}
[g/cm³]	[g/cm³]	[g/cm³]
±0.0005	±0.0005	±0.001

- 1) Valid range for special density calibration: 0 to 2 g/cm³, +5 to +80 °C (+41 to +176 °F)
- 2) Order code for "Application package", option EE "Special density"

Temperature

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

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0.180	0.007
15	$\frac{1}{2}$	0.585	0.021
25	1	1.62	0.059
40	$1\frac{1}{2}$	4.05	0.149
50	2	6.30	0.231
80	3	16.2	0.617

Flow values

Flow values as turndown parameter depending on nominal diameter.

SI units

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

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
$\frac{3}{8}$	73.50	7.350	3.675	1.470	0.735	0.147
$\frac{1}{2}$	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
$1\frac{1}{2}$	1 654	165.4	82.70	33.08	16.54	3.308
2	2 573	257.3	128.7	51.46	25.73	5.146
3	6 615	661.5	330.8	132.3	66.15	13.23

Accuracy of outputs

The outputs have the following base accuracy specifications.

Pulse/frequency output



o.r. = of reading

Accuracy	Max. ± 100 ppm o.r.
----------	-------------------------

Repeatability

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

Base repeatability

 Design fundamentals →  147

Mass flow and volume flow (liquids)

±0.05 % o.r.

Mass flow (gases)

±0.20 % o.r.

Density (liquids)

±0.00025 g/cm³

Temperature

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

Response time

- The response time depends on the configuration (damping).
- Response time in the event of erratic changes in the measured variable: After 500 ms → 95 % of full scale value

Influence of ambient temperature

Pulse/frequency output

o.r. = of reading

Temperature coefficient	Max. ±100 ppm o.r.
-------------------------	--------------------

Influence of medium temperature

Mass flow and volume flow

o.f.s. = of full scale value


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

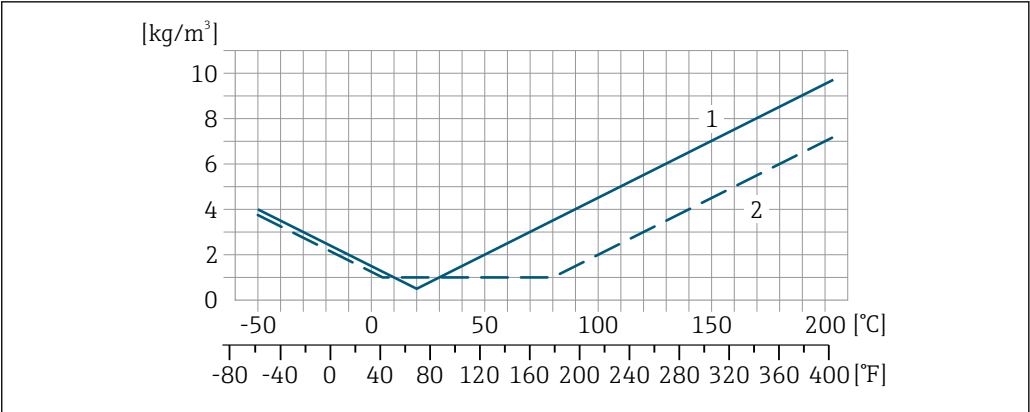
The effect is reduced if zero point adjustment is performed at process temperature.

Density

When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is ±0.00005 g/cm³ /°C (±0.000025 g/cm³ /°F). Field density calibration is possible.

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range (→  144) the measured error is ±0.00005 g/cm³ /°C (±0.000025 g/cm³ /°F)



A0016591

- 1 Field density calibration, for example at +20 °C (+68 °F)
- 2 Special density calibration

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

Influence of medium pressure

The table below shows the effect on accuracy of mass flow due to a difference between calibration pressure and process pressure.

o.r. = of reading

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

Operating Instructions .

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	3/8	no influence	
15	½	no influence	
25	1	no influence	
40	1½	-0.003	-0.0002
50	2	-0.008	-0.0006
80	3	-0.009	-0.0006

Design fundamentals

o.r. = of reading, o.f.s. = of full scale value
BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.
MeasValue = measured value; ZeroPoint = zero point stability

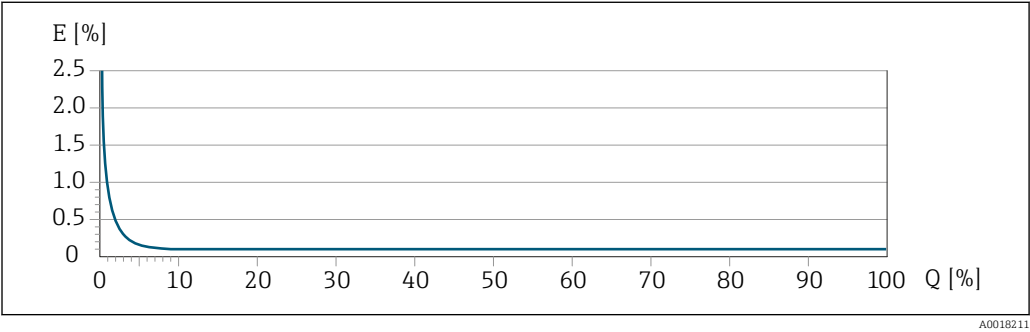
Calculation of the maximum measured error as a function of the flow rate

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

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

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{4}{3} \cdot \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021341</small>	$\pm \frac{1}{2} \cdot \text{BaseAccu}$ <small>A0021343</small>
$< \frac{4}{3} \cdot \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021342</small>	$\pm \frac{2}{3} \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021344</small>

Example for maximum measured error



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



16.7 Installation

Installation conditions → 19

16.8 Environment

Ambient temperature range → 21 → 21

Temperature tables

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

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

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


Degree of protection **Transmitter**

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

Sensor
IP66/67, type 4X enclosure

Connector

IP67, only in screwed situation

Vibration resistance	<ul style="list-style-type: none"> ■ Oscillation, sinusoidal, following IEC 60068-2-6 <ul style="list-style-type: none"> ■ 2 to 8.4 Hz, 3.5 mm peak ■ 8.4 to 2 000 Hz, 1 g peak ■ Oscillation, broadband noise following IEC 60068-2-64 <ul style="list-style-type: none"> ■ 10 to 200 Hz, 0.003 g²/Hz ■ 200 to 2 000 Hz, 0.001 g²/Hz ■ Total: 1.54 g rms
Shock resistance	Shock, half-sine according to IEC 60068-2-27 6 ms 30 g
Shock resistance	Shock due to rough handling following IEC 60068-2-31
Interior cleaning	<ul style="list-style-type: none"> ■ Cleaning in place (CIP) ■ Sterilization in place (SIP) Options <ul style="list-style-type: none"> ■ Oil- and grease-free version for wetted parts, without declaration Order code for "Service", option HA ■ Oil- and grease-free version for wetted parts as per IEC/TR 60877-2.0 and BOC 50000810-4, with declaration Order code for "Service", option HB
Electromagnetic compatibility (EMC)	 Details are provided in the Declaration of Conformity.

16.9 Process


Medium temperature range

Standard version	-50 to +150 °C (-58 to +302 °F)	Order code for "Measuring tube mat., wetted surface", option HA, SA, SB, SC
Extended temperature version	-50 to +205 °C (-58 to +401 °F)	Order code for "Measuring tube mat., wetted surface", option SD, SE, SF, TH

Density

0 to 2 000 kg/m³ (0 to 125 lb/cf)

Pressure-temperature ratings




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

Sensor housing

For standard versions with the temperature range -50 to +150 °C (-58 to +302 °F), the sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside.

For all other temperature versions the sensor housing is filled with dry inert gas.




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

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

If there is a need to drain the leaking medium into a discharge device, the sensor should be fitted with a rupture disk. Connect the discharge to the additional threaded connection .

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

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

Maximum pressure:

- DN 08 to 150 (3/8 to 6"): 5 bar (72.5 psi)
- DN 250 (10"):
 - Medium temperature ≤ 100 °C (212 °F): 5 bar (72.5 psi)
 - Medium temperature > 100 °C (212 °F): 3 bar (43.5 psi)

Burst pressure of the sensor housing


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

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

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

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

DN		Sensor housing burst pressure	
[mm]	[in]	[bar]	[psi]
8	3/8	400	5 800
15	1/2	350	5 070
25	1	280	4 060
40	1 1/2	260	3 770
50	2	180	2 610
80	3	120	1 740

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

Rupture disk

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

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



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

Flow limit

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



For an overview of the full scale values for the measuring range, see the "Measuring range" section → 138

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
- For gas measurement the following rules apply:
 - The flow velocity in the measuring tubes should not exceed half the sound velocity (0.5 Mach).
 - The maximum mass flow depends on the density of the gas: formula → 138



To calculate the flow limit, use the *Applicator* sizing tool → 135

Pressure loss



To calculate the pressure loss, use the *Applicator* sizing tool → 135

Promass F with reduced pressure loss: order code for "Sensor option", option CE "Reduced pressure loss"

System pressure

→ 21

16.10 Mechanical construction

Design, dimensions



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

Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges.

Weight in SI units

DN [mm]	Weight [kg]	
	Order code for "Housing", option C Aluminum coated	Order code for "Housing", option B 1.4404 (316L)
8	9	11.5
15	10	12.5
25	12	14.5
40	17	19.5
50	28	30.5
80	53	55.5

Weight in US units

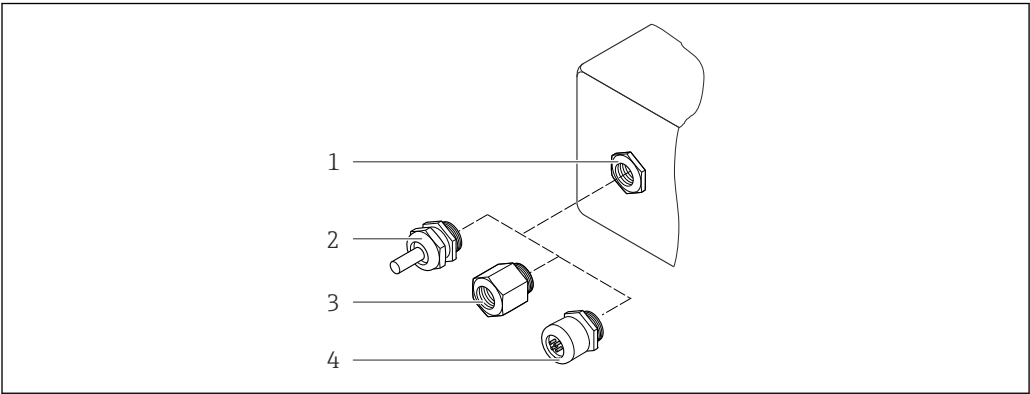
DN [in]	Weight [lbs]	
	Order code for "Housing", option C Aluminum coated	Order code for "Housing", option B 1.4404 (316L)
3/8	20	25
½	22	28
1	26	32
1½	37	43
2	62	67
3	117	122

Materials

Transmitter housing

- Order code for "Housing", option B: stainless steel CF-3M (316L, 1.4404)
- Order code for "Housing", option C "Compact, aluminum coated":
Aluminum, AlSi10Mg, coated
- Window material: glass

Cable entries/cable glands



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24 Possible cable entries/cable glands

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

Order code for "Housing", option B "GT18 dual compartment, 316L"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	<ul style="list-style-type: none">■ Non-Ex■ Ex ia■ Ex ic■ Ex nA■ Ex tb	Stainless steel ,1.4404
Adapter for cable entry with female thread G ½"	For non-Ex and Ex (except for CSA Ex d/XP)	Stainless steel, 1.4404 (316L)
Adapter for cable entry with female thread NPT ½"	For non-Ex and Ex	

Order code for "Housing", option C "GT20 dual compartment, aluminum coated"


Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	<ul style="list-style-type: none"> ■ Non-Ex ■ Ex ia ■ Ex ic 	Plastic
	Adapter for cable entry with female thread G ½"	Nickel-plated brass
Adapter for cable entry with female thread NPT ½"	For non-Ex and Ex (except for CSA Ex d/XP)	Nickel-plated brass
Thread NPT ½" via adapter	For non-Ex and Ex	

Device plug

Electrical connection	Material
Plug M12x1	<ul style="list-style-type: none"> ■ Socket: stainless steel, 1.4401/316 ■ Contact housing: plastic, PUR, black ■ Contacts: metal, CuZn, gold-plated ■ Threaded connection seal: NBR

Sensor housing

 The material of the sensor housing depends on the option selected in the order code for "Measuring tube mat., wetted surface".



Order code for "Measuring tube mat., wetted surface"	Material
Option HA, SA, SD, TH	<ul style="list-style-type: none"> ■ Acid and alkali-resistant outer surface ■ Stainless steel 1.4301 (304) <p> With order code for "Sensor option", option CC "316L Sensor housing": stainless steel, 1.4404 (316L)</p>
Option SB, SC, SE, SF	<ul style="list-style-type: none"> ■ Acid and alkali-resistant outer surface ■ Stainless steel 1.4301 (304)

Measuring tubes

- DN 8 to 80 (3/8 to 3"): stainless steel, 1.4539 (904L);
Manifold: stainless steel, 1.4404 (316/316L)
- DN 8 to 80 (3/8 to 3"): Alloy C22, 2.4602 (UNS N06022);
Manifold: Alloy C22, 2.4602 (UNS N06022)

Process connections

- Flanges according to EN 1092-1 (DIN2501) / according to ASME B 16.5 / as per JIS B2220:
 - Stainless steel, 1.4404 (F316/F316L)
 - Alloy C22, 2.4602 (UNS N06022)
 - Lap joint flanges: stainless steel, 1.4301 (F304); wetted parts Alloy C22
- All other process connections:
Stainless steel, 1.4404 (316/316L)

 Available process connections →  154

Seals

Welded process connections without internal seals



Accessories

Protective cover

Stainless steel, 1.4404 (316L)

Process connections

- Fixed flange connections:
 - EN 1092-1 (DIN 2501) flange
 - EN 1092-1 (DIN 2512N) flange
 - Namur lengths in accordance with NE 132
 - ASME B16.5 flange
 - JIS B2220 flange
 - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
- Clamp connections:
 - Tri-Clamp (OD tubes), DIN 11866 series C
- Thread:
 - DIN 11851 thread, DIN 11866 series A
 - SMS 1145 thread
 - ISO 2853 thread, ISO 2037
 - DIN 11864-1 Form A thread, DIN 11866 series A
- VCO connections:
 - 8-VCO-4
 - 12-VCO-4

 Process connection materials →  152

Surface roughness

All data relate to parts in contact with fluid. The following surface roughness quality can be ordered.

- Not polished
- $Ra_{\max} = 0.76 \mu\text{m}$ (30 μin)
- $Ra_{\max} = 0.38 \mu\text{m}$ (15 μin)
- $Ra_{\max} = 0.38 \mu\text{m}$ (15 μin) electropolished

16.11 Operability

Languages

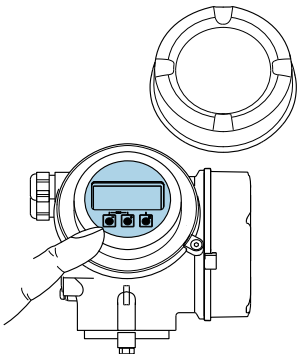
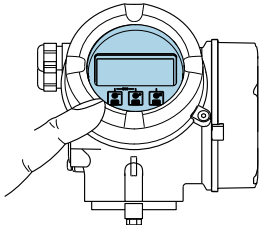
Can be operated in the following languages:

- Via local display:
 - English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Swedish, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech
- Via "FieldCare" 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 C "SD02"	Order code for "Display; Operation", option E "SD03"
 1 Operation with pushbuttons	 1 Operation with touch control

Display elements

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


Operating elements

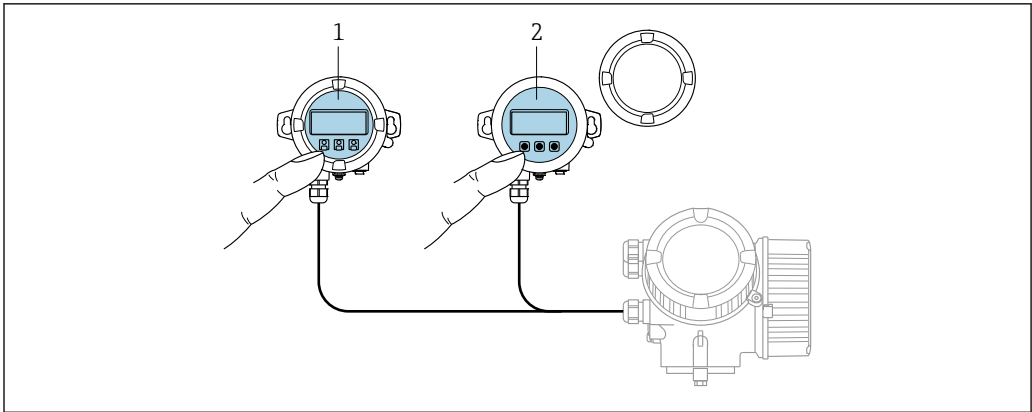
- Operation with 3 push buttons with open housing: , , 
- or
- External operation via touch control (3 optical keys) without opening the housing: , , 
- Operating elements also accessible in the various zones of the hazardous area

Additional functionality


- Data backup function
The device configuration can be saved in the display module.
- Data comparison function
The device configuration saved in the display module can be compared to the current device configuration.
- Data transfer function
The transmitter configuration can be transmitted to another device using the display module.

Via remote display FHX50

-  The remote display FHX50 can be ordered as an optional extra.



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 25 FHX50 operating options

1 SD02 display and operating module, push buttons: cover must be opened for operation

2 SD03 display and operating module, optical buttons: operation possible through cover glass


Display and operating elements

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

Remote operation →  50

Service interface →  50

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.

Sanitary compatibility

- 3-A approval
Only devices with the order code for "Additional approval", option LP "3A" have 3-A approval.
- EHEDG-tested
Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.
To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (www.ehedg.org).

FOUNDATION Fieldbus certification	FOUNDATION Fieldbus interface <p>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified in accordance with FOUNDATION Fieldbus H1 ■ Interoperability Test Kit (ITK), revision version 6.1.1 (certificate available on request) ■ Physical Layer Conformance Test ■ The device can also be operated with certified devices of other manufacturers (interoperability)
Pressure Equipment Directive	<ul style="list-style-type: none"> ■ 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.
Other standards and guidelines	<ul style="list-style-type: none"> ■ EN 60529 Degrees of protection provided by enclosures (IP code) ■ IEC/EN 60068-2-6 Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal). ■ IEC/EN 60068-2-31 Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices. ■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements ■ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ■ IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment ■ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 80 The application of the pressure equipment directive to process control devices ■ NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices ■ NAMUR NE 107 Self-monitoring and diagnosis of field devices ■ NAMUR NE 131 Requirements for field devices for standard applications

- NAMUR NE 132
Coriolis mass meter
- NACE MR0103
Materials resistant to sulfide stress cracking in corrosive petroleum refining environments.
- NACE MR0175/ISO 15156-1
Materials for use in H₂S-containing Environments in Oil and Gas Production.

16.13 Application packages

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

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



Detailed information on the application packages:
Special Documentation for the device → 159

Diagnostics functions

Package	Description
Extended HistoROM	<p>Comprises extended functions concerning the event log and the activation of the measured value memory.</p> <p>Event log: Memory volume is extended from 20 message entries (standard version) to up to 100 entries.</p> <p>Data logging (line recorder):</p> <ul style="list-style-type: none"> ■ Memory capacity for up to 1000 measured values is activated. ■ 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user. ■ Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.

Heartbeat Technology

Package	Description
Heartbeat Verification	<p>Heartbeat Verification</p> <p>Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> ■ 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.

Special density

Package	Description
Special density	<p>Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.</p> <p>The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.</p>

16.14 Accessories



Overview of accessories available for order → 134

16.15 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 Promass F	KA01261D

Brief Operating Instructions for transmitter

Measuring device	Documentation code
Proline Promass 200	KA01267D

Technical Information

Measuring device	Documentation code
Promass F 200	TI01060D

Supplementary device-dependent documentation



Safety instructions

Contents	Documentation code
ATEX/IECEX Ex i	XA00144D
ATEX/IECEX Ex d	XA00143D
ATEX/IECEX Ex nA	XA00145D
cCSAus IS	XA00151D
cCSAus XP	XA00152D
INMETRO Ex i	XA01300D
INMETRO Ex d	XA01305D
INMETRO Ex nA	XA01306D
NEPSI Ex i	XA00156D
NEPSI Ex d	XA00155D
NEPSI Ex nA	XA00157D
NEPSI Ex i	XA1755D
NEPSI Ex d	XA1754D
NEPSI Ex nA	XA1756D
JPN Ex d	XA01763D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Display and operating module FHX50	SD01007F
Heartbeat Technology	SD01848D

Installation Instructions

Contents	Comment
Installation instructions for spare part sets and accessories	<ul style="list-style-type: none">▪ Access the overview of all the available spare part sets via <i>W@M Device Viewer</i> →  131▪ Accessories available for order with Installation Instructions →  134

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