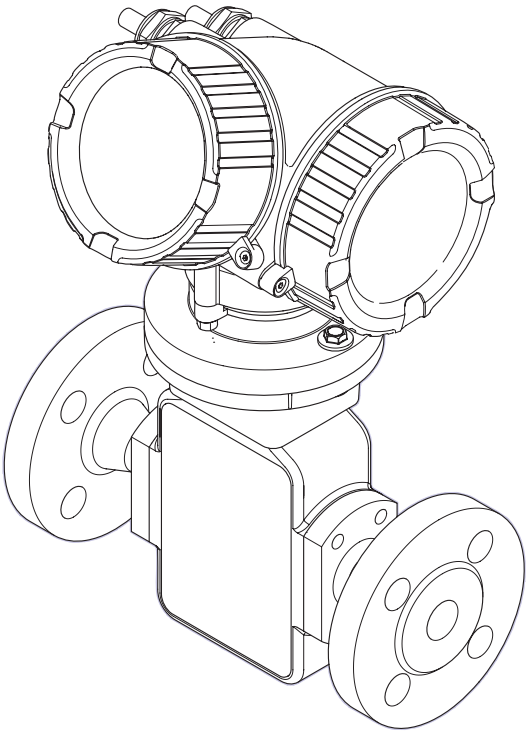
BA01377D/06/EN/01.15
71281888

Valid as of version
01.00.zz (Device firmware)

Operating Instructions
Proline Promag H 200 FOUNDATION Fieldbus

Electromagnetic flowmeter



Endress+Hauser
People for Process Automation

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

Table of contents

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

1.2.2 Electrical symbols

Symbol	Meaning	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
1. , 2. , 3. …	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.5 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3,...	Item numbers	1. , 2. , 3. …	Series of steps
A, B, C, ...	Views	A-A, B-B, C-C, ...	Sections
	Hazardous area		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 CD-ROM provided for the device (depending on the device version, the CD-ROM might not be part of the delivery!)
- 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

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.
Brief Operating Instructions	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

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 Fieldbus Foundation, Austin, Texas, USA

Applicator®, FieldCare®, 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 beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Following instructions and basic conditions

The operating personnel must fulfill the following requirements:
- Being instructed and authorized according to the requirements of the task by the facility's owner-operator
- Following the instructions in these Operating Instructions

2.2 Designated use

Application and media
The measuring device is only suitable for 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.

Measuring devices for use in hazardous areas, in hygienic applications or in applications 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.
- Check the nameplate to verify if the device ordered can be put to its intended use in the approval-related area (e.g. explosion protection, pressure vessel safety).
- Use the measuring device only for media against which the process-wetted materials are adequately 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 → 🖹 7.
- 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 of the sensor due to corrosive or abrasive fluids or from environmental conditions!
- Verify the compatibility of the process fluid with the sensor material.
- Ensure the resistance of all fluid-wetted materials in the process.
- Keep within the specified pressure and temperature range.

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
The external surface temperature of the housing can increase by max. 10 K due to the power consumption of the electronic components. Hot process fluids passing through the measuring device will further increase the surface temperature of the housing. The surface of the sensor, in particular, can reach temperatures which are close to the fluid temperature.

Possible burn hazard due to fluid temperatures!
- For elevated fluid temperature, ensure protection against contact to prevent burns.

2.3 Workplace safety

For work on and with the device:
- Wear the required personal protective equipment according to federal/national regulations.

For welding work on the piping:
- Do not ground the welding unit via the measuring device.

If working on and with the device with wet hands:
- It is recommended to wear gloves on account of the higher risk of electric shock.

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 EC directives listed in the device-specific EC 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.

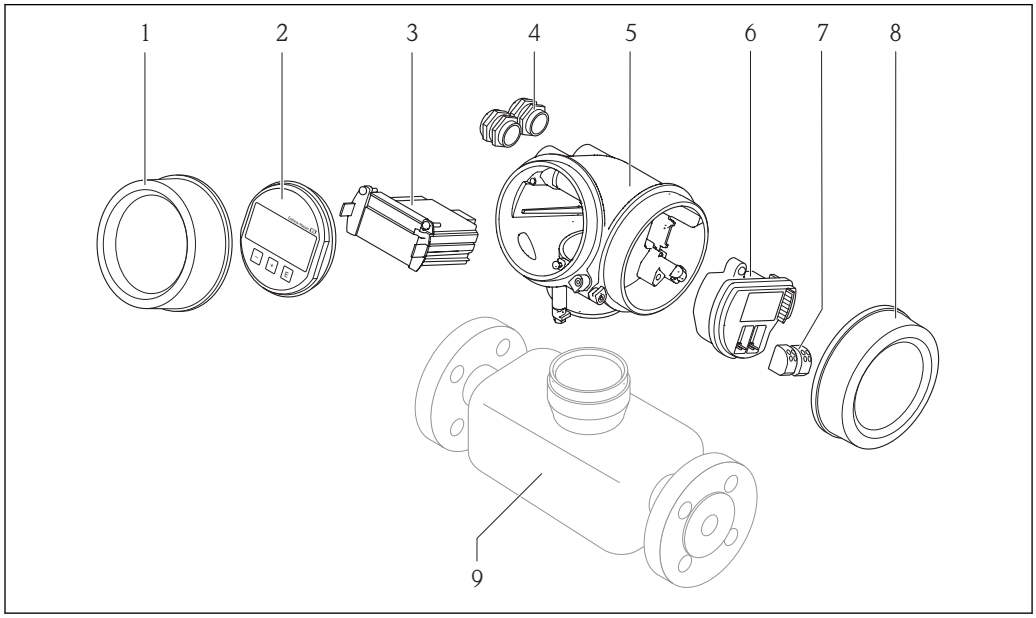
IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Product description

The device consists of a transmitter and a sensor.

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

3.1 Product design

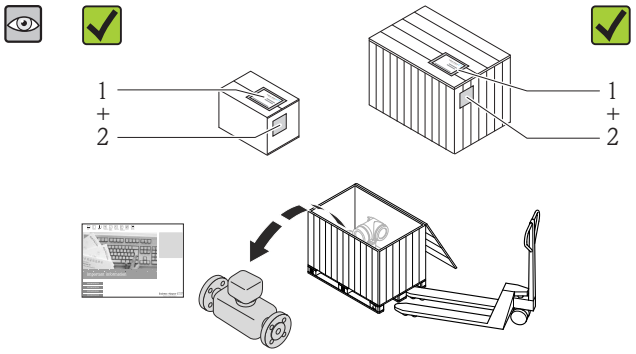


1 Important components of a measuring device

1 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

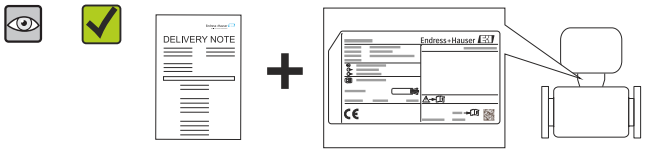
4 Incoming acceptance and product identification

4.1 Incoming acceptance

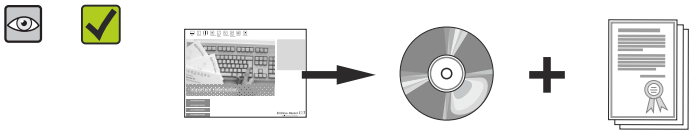


Are the order codes on the delivery note (1) and the product sticker (2) identical?

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.

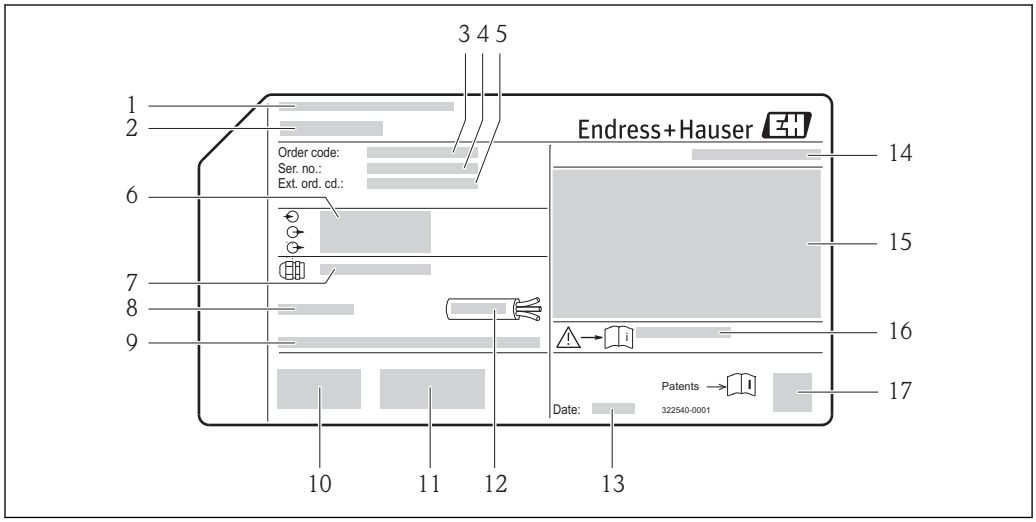
4.2 Product identification

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.

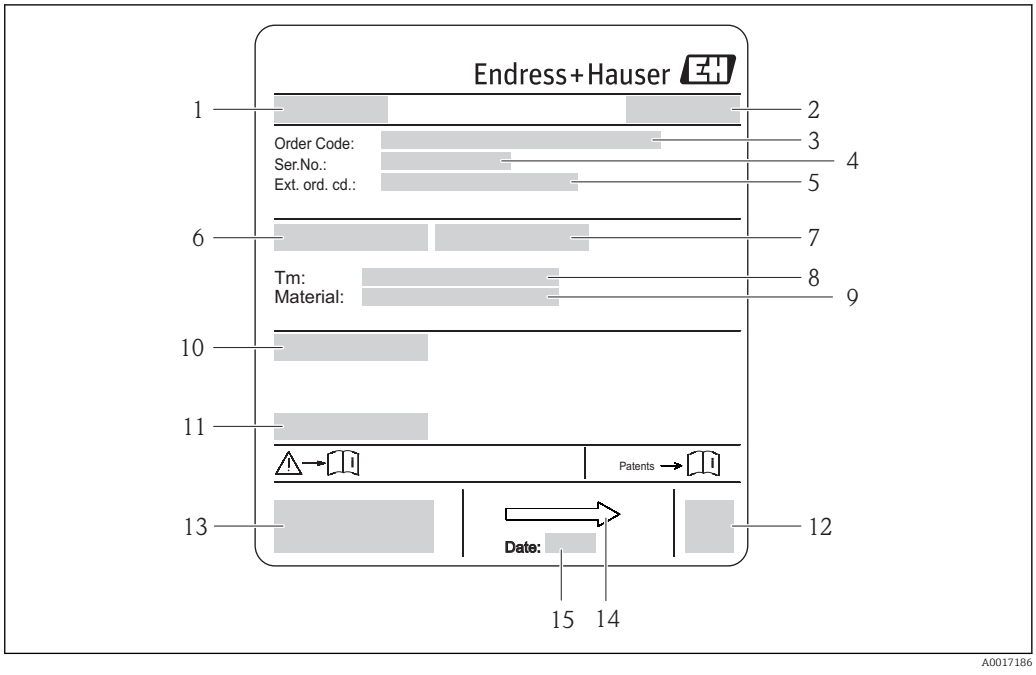
4.2.1 Transmitter nameplate



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*
17 *2-D matrix code*

4.2.2 Sensor nameplate



3 *Example of sensor nameplate*

1 *Name of the sensor*
2 *Manufacturing location*
3 *Order code*
4 *Serial number (ser. no.)*
5 *Extended order code (ext. ord. cd.)*
6 *Nominal diameter of sensor*
7 *Test pressure of the sensor*
8 *Fluid temperature range*
9 *Material of lining and electrodes*
10 *Degree of protection: e.g. IP, NEMA*
11 *Permitted ambient temperature (T_a)*
12 *2-D matrix code*
13 *CE mark, C-Tick*
14 *Flow direction*
15 *Manufacturing date: year-month*

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

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

4.2.3 Symbols on 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

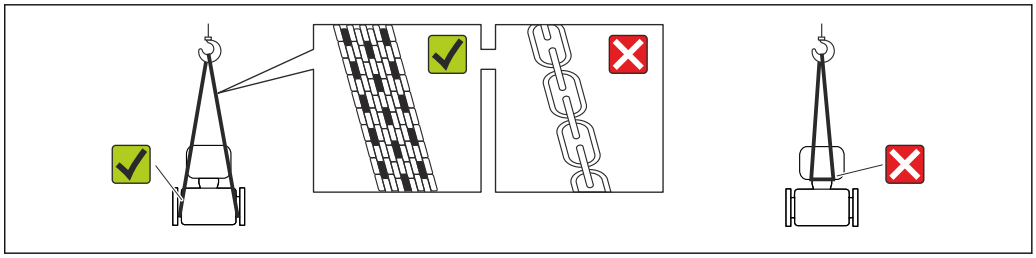
5.1 Storage conditions

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.
- Select a storage location where moisture cannot collect in the measuring device as fungus and bacteria infestation can damage the lining.
- Store in a dry and dust-free place.
- Do not store outdoors.

Storage temperature → 132

5.2 Transporting the product

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



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

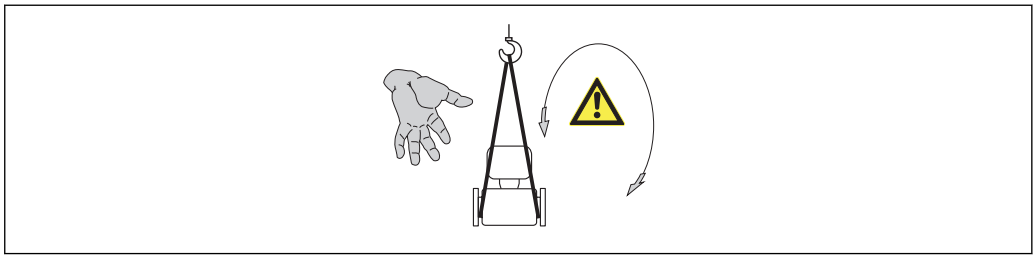
5.2.1 Measuring devices without lifting lugs

WARNING

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

Risk of injury if the measuring device slips.

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



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5.2.2 Measuring devices with lifting lugs

⚠ CAUTION

Special transportation instructions for devices with lifting lugs

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

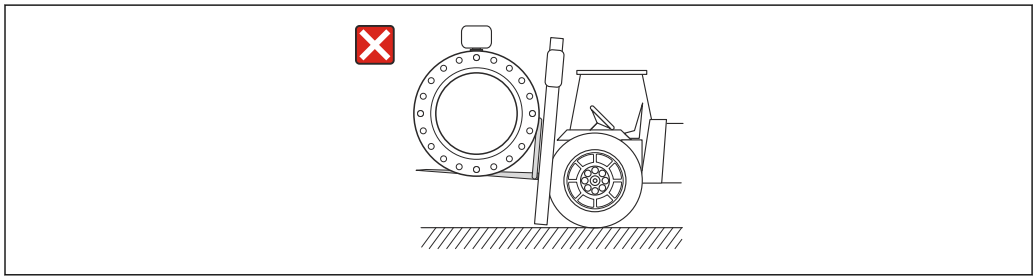
5.2.3 Transporting with a fork lift

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

⚠ CAUTION

Risk of damaging the magnetic coil

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



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5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

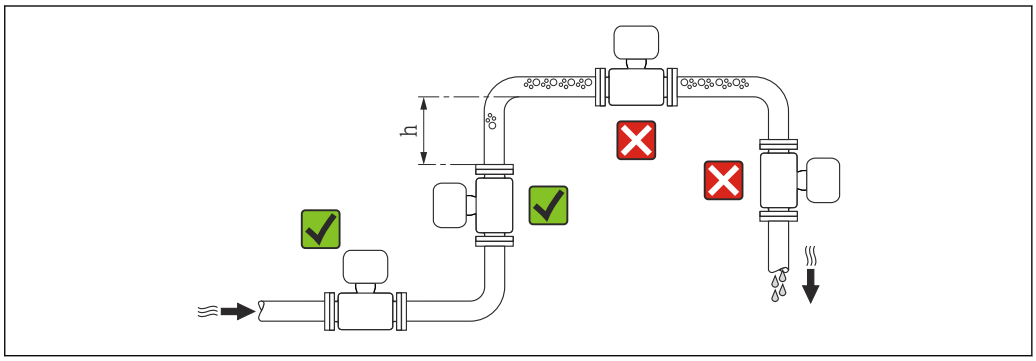
- Measuring device secondary packaging: polymer stretch film that conforms to EC Directive 2002/95/EC (RoHS).
- Packaging:
  - Wood crate, treated in accordance with ISPM 15 standard, which is confirmed by the affixed IPPC logo.
    or
  - Carton in accordance with European Packaging Directive 94/62EC;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

6 Installation

6.1 Installation conditions

6.1.1 Mounting position

Mounting location



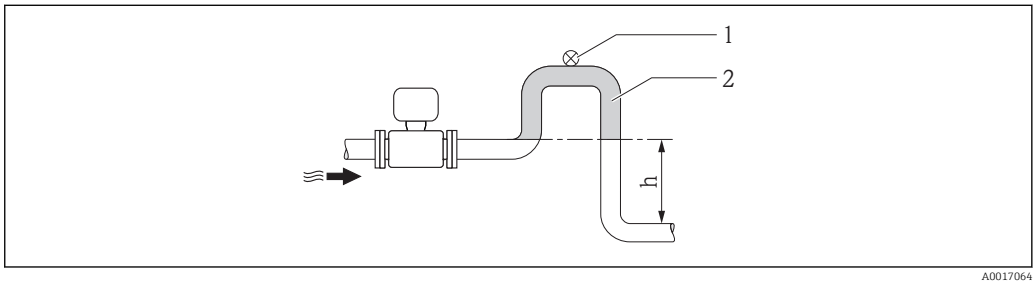
Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: h ≥ 2 × DN

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

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

For information on the liner's resistance to partial vacuum

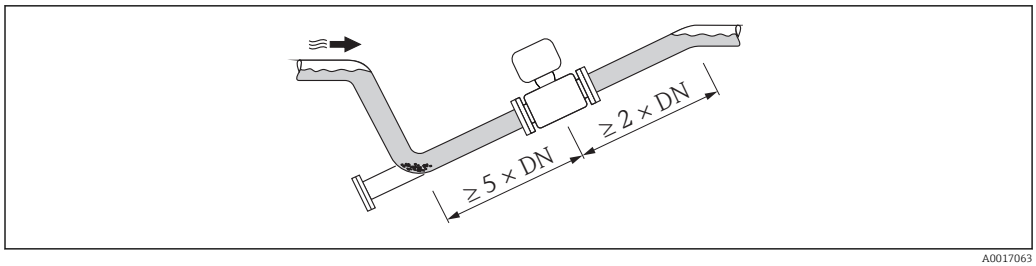


4 *Installation in a down pipe*

1 Vent valve
2 Pipe siphon
h Length of down pipe

Installation in partially filled pipes

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



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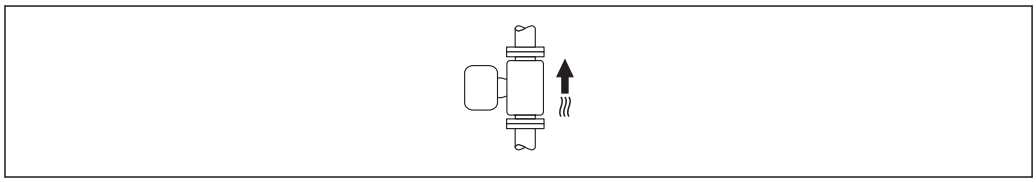
Orientation

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

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube.

The measuring device also offers the empty pipe detection function to detect partially filled measuring pipes in the event of outgassing fluids or variable process pressures.

Vertical



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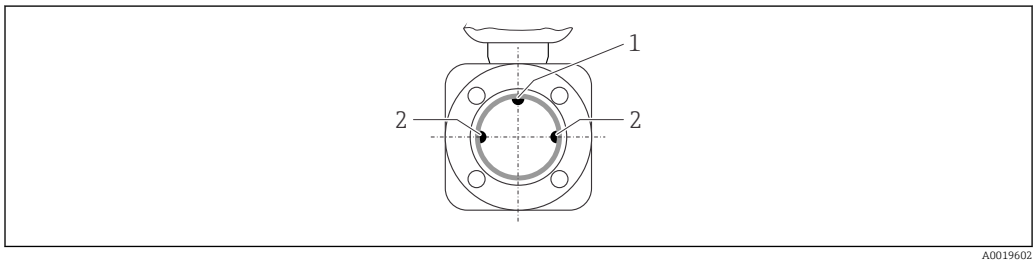
Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.

Horizontal



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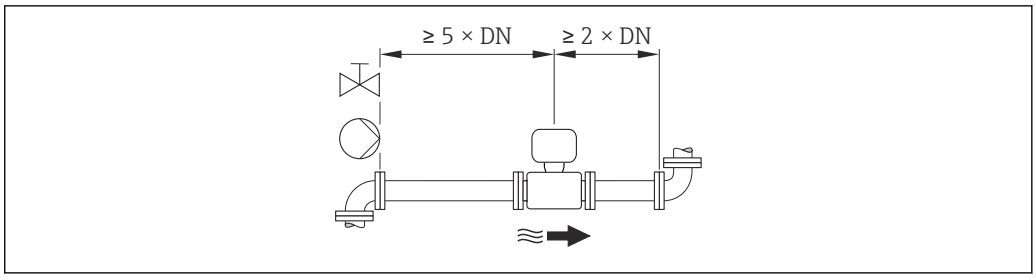
1 *EPD electrode for empty pipe detection*
2 *Measuring electrodes for signal detection*

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

Inlet and outlet runs

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

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



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Installation dimensions

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

6.1.2 Requirements from environment and process

Ambient temperature range

Transmitter	−40 to +60 °C (−40 to +140 °F)
Local display	−20 to +60 °C (−4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range.
Sensor	−20 to +60 °C (−4 to +140 °F)
Liner	Do not exceed or fall below the permitted temperature range of the liner .

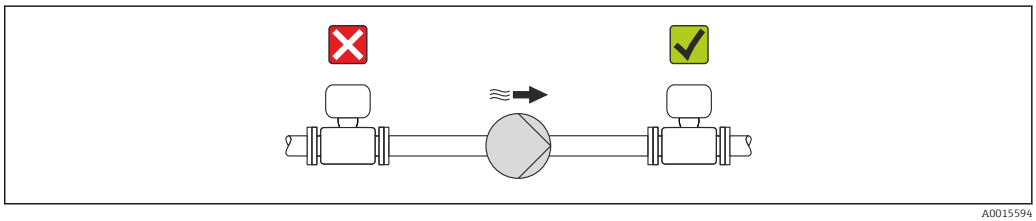
If operating outdoors:
- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

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.

System pressure



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

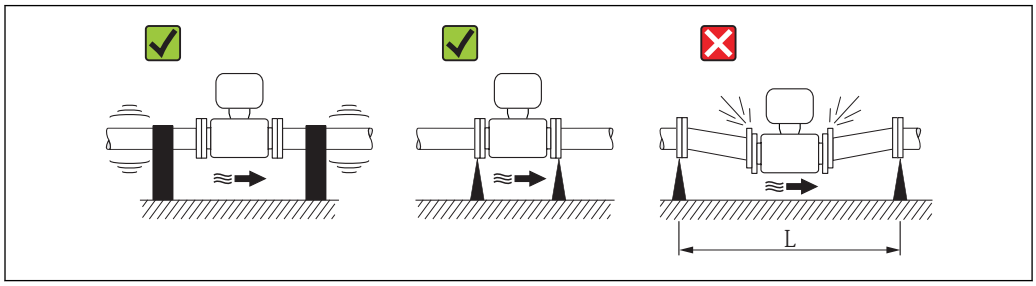
Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.

- For information on the liner's resistance to partial vacuum → 133
- For information on the shock resistance of the measuring system → 132
- For information on the vibration resistance of the measuring system → 133

Vibrations

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

- For information on the shock resistance of the measuring system → 132
- For information on the vibration resistance of the measuring system → 133



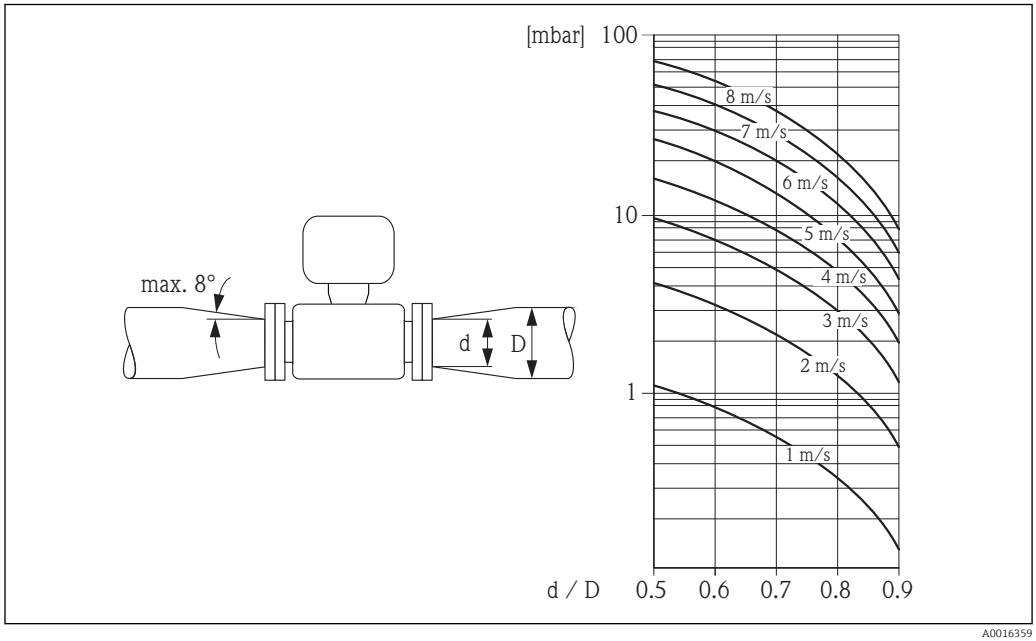
5 *Measures to avoid device vibrations (L > 10 m (33 ft))*

Adapters

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

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

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



6.1.3 Special mounting instructions

Display protection

- To ensure that the optional display protection can be easily opened, maintain the following minimum head clearance: 350 mm (13.8 in)

6.2 Mounting the measuring device

6.2.1 Required tools

For transmitter

- For turning the transmitter housing: Open-ended wrench8 mm
- For opening the securing clamps: Allen key3 mm

For sensor

For flanges and other process connections:
- Screws, nuts, seals etc. are not included in the scope of supply and must be provided by the customer.
- Appropriate mounting tools

6.2.2 Preparing the measuring device

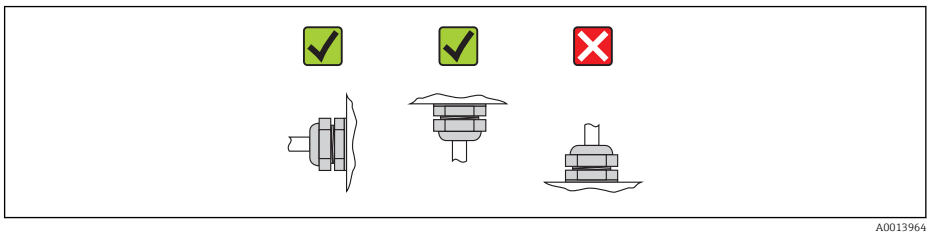
1. Remove all remaining transport packaging.
2. Remove any protective covers or protective caps present from the sensor.
3. Remove stick-on label on the electronics compartment cover.

6.2.3 Mounting the sensor

⚠ WARNING

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

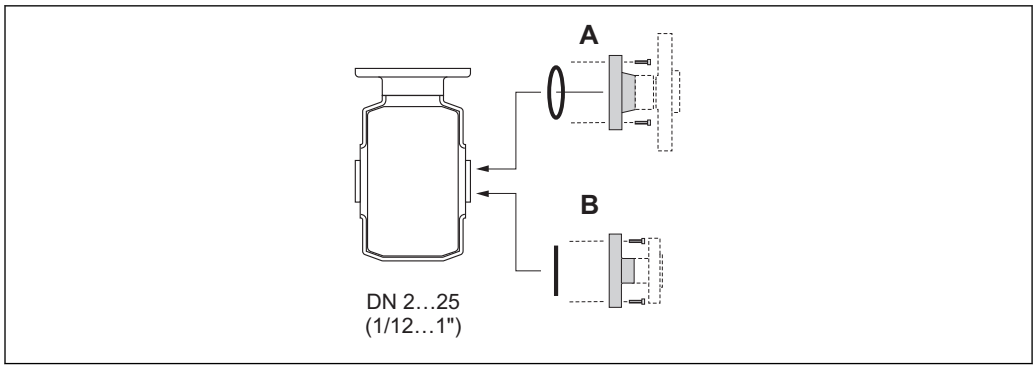
1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.
3. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0013964

The sensor is supplied to order, with or without pre-installed process connections. Pre-installed process connections are firmly secured to the sensor by 4 or 6 hexagonal-headed bolts.

The sensor may need to be supported or additionally secured depending on the application and pipe length. In particular, it is absolutely essential to secure the sensor additionally if plastic process connections are used. An appropriate wall mounting kit can be ordered separately as an accessory from Endress+Hauser → 141.



6 *Process connection seals*

A Process connections with O-ring seal
B Process connections with aseptic molded seal

Welding the sensor into the pipe (welding connections)

⚠ WARNING

Risk of destroying the electronics!

▶ Make sure that the welding system is not grounded via the sensor or transmitter.

1. Tack-weld the sensor to secure it in the pipe. A suitable welding aid can be ordered separately as an accessory → 141.
2. Release the screws on the process connection flange and remove the sensor, along with the seal, from the pipe.
3. Weld the process connection into the pipe.
4. Reinstall the sensor in the pipe, and in doing so make sure that the seal is clean and in the right position.

- If thin-walled pipes carrying food are welded correctly, the seal is not damaged by the heat even when mounted. However, it is recommended to disassemble the sensor and seal.
- It must be possible to open the pipe by approx. 8 mm (0.31 in) in total to permit disassembly.

Cleaning with pigs

It is essential to take the internal diameters of the measuring tube and process connection into account when cleaning with pigs. All the dimensions and lengths of the sensor and transmitter are provided in the separate "Technical Information" document.

Mounting the seals

⚠ CAUTION

An electrically conductive layer could form on the inside of the measuring tube!

Risk of measuring signal short circuit.

▶ Do not use electrically conductive sealing compounds such as graphite.

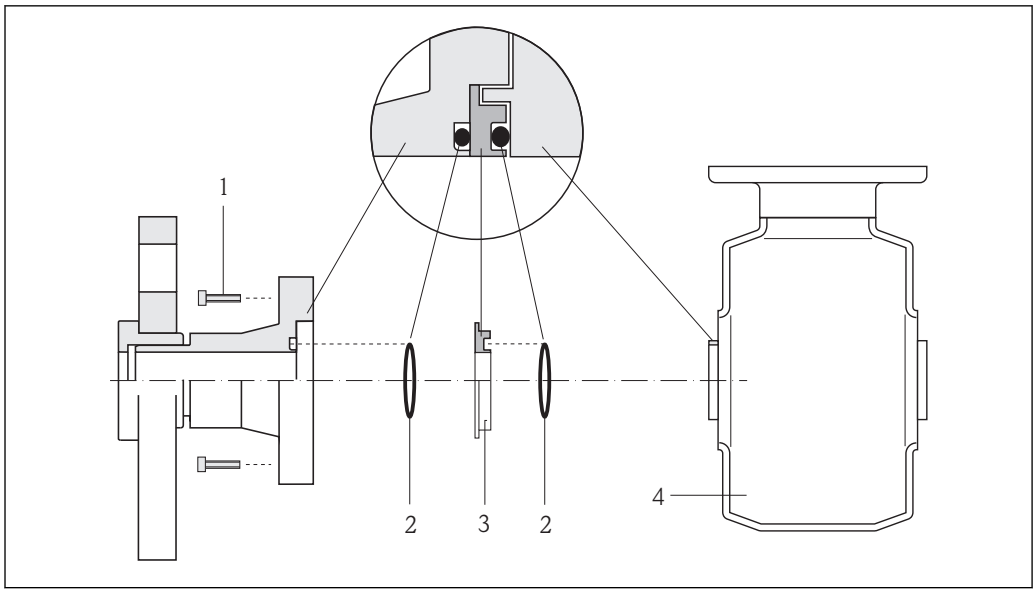
Comply with the following instructions when installing seals:
- Make sure that the seals do not protrude into the piping cross-section.
- In the case of metal process connections, the screws must be tightened securely. The process connection forms a metal connection with the sensor, which ensures a defined compression of the seal.
- In the case of plastic process connections, comply with the max. screw tightening torques for lubricated threads: 7 Nm (5.2 lbf ft). In the case of plastic flanges, always insert a seal between the connection and the counterflange.
- For "PFA" lining: additional seals are **always** required.
- Depending on the application the seals should be replaced periodically, particularly if molded seals are used (aseptic version)! The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature. Replacement seals can be ordered as an accessory → 141.

Mounting grounding rings (DN 2 to 25 (1/12 to 1"))

Pay attention to the information on potential equalization → 33.

In the case of plastic process connections (e.g. flange connections or adhesive fittings), additional ground rings must be used to ensure potential matching between the sensor and the fluid. If grounding rings are not installed, this can affect the measuring accuracy or cause the destruction of the sensor as a result of the electrochemical decomposition of the electrodes.

- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. These plastic disks only act as "spacers" and do not have any potential matching function. Furthermore, they also perform a significant sealing function at the sensor/process connection interface. Therefore, in the case of process connections without metal grounding rings, these plastic disks/seals should never be removed and should always be installed!
- Grounding rings can be ordered separately as an accessory from Endress+Hauser → 141. When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion!
  Material specifications → 136.
- Grounding rings, including seals, are mounted inside the process connections. Therefore the installation length is not affected.



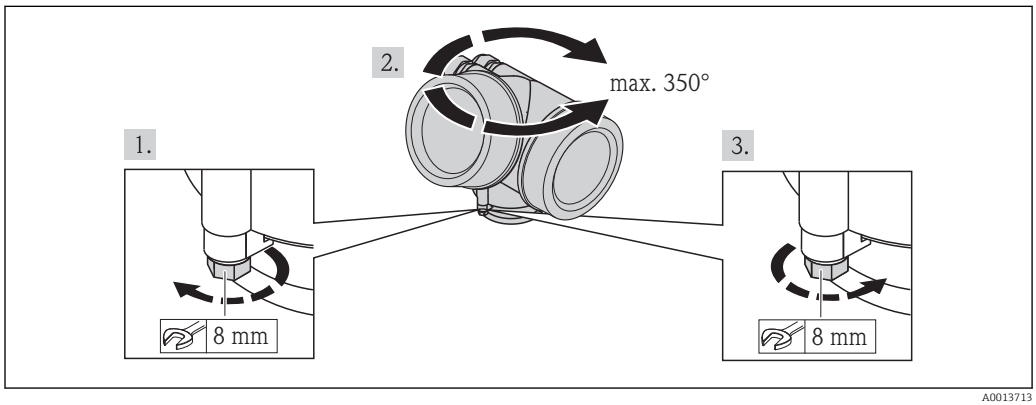
7 Installing grounding rings

1 Hexagonal-headed bolts of process connection
2 O-ring seals
3 Grounding ring or plastic disk (spacer)
4 Sensor

1. Release the 4 or 6 hexagonal-headed bolts (1) and remove the process connection from the sensor (4).
2. Remove the plastic disk (3), along with the two O-ring seals (2), from the process connection.
3. Place the first O-ring seal (2) back into the groove of the process connection.
4. Fit the metal grounding ring (3) in the process connection as illustrated.
5. Place the second O-ring seal (2) into the groove of the grounding ring.
6. Mount the process connection back on the sensor. In doing so, make sure to observe the maximum screw tightening torques for lubricated threads: 7 Nm (5.2 lbf ft)

6.2.4 Turning the transmitter housing

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

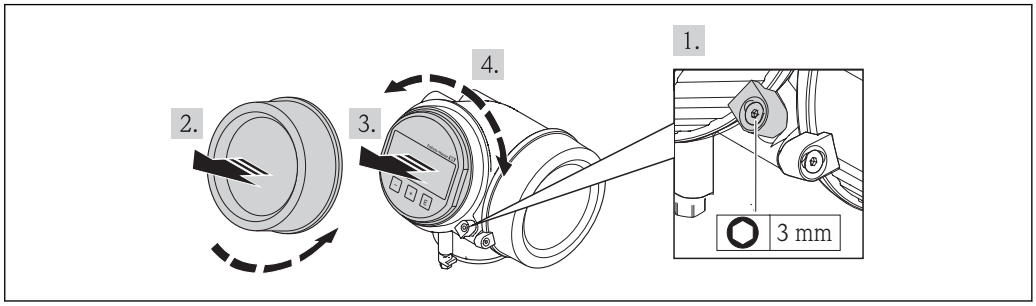


1. Release the fixing screw.
2. Turn the housing to the desired position.

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.



A0013905

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. Rotate the display module into the desired position: Max. 8 × 45° in each 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)?	❑
Does the measuring device conform to the measuring point specifications? For example: ▪ Process temperature ▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document) ▪ Ambient temperature ▪ Measuring range	❑
Has the correct orientation for the sensor been selected ? ▪ According to sensor type ▪ According to medium temperature ▪ According to medium properties (outgassing, with entrained solids)	❑
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping ?	❑
Are the measuring point identification and labeling correct (visual inspection)?	❑
Is the device adequately protected from precipitation and direct sunlight?	❑
Have the fixing screws been tightened with the correct tightening torque?	❑

7 Electrical connection

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: crimping tool for 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

- −40 °C (−40 °F) to +80 °C (+176 °F)
- Minimum requirement: cable temperature range ≥ ambient temperature +20 K

Signal cable

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)

Pulse/frequency/switch output

Standard installation cable is sufficient.

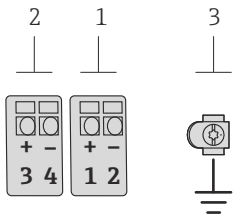
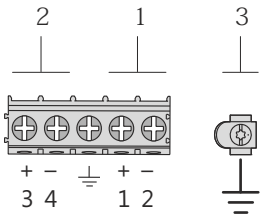
Cable diameter

- Cable glands supplied:
  M20 × 1.5 with cable Φ 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

	
Maximum number of terminals	*Maximum number of terminals for order code for "Accessory mounted", option NA "Overvoltage protection"*

1 Output 1: FOUNDATION Fieldbus
2 Output 2 (passive: pulse/frequency/switch output
3 Ground terminal for cable shield

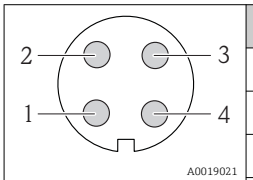
Order code for "Output"	Terminal numbers			
	Output 1		Output 2	
	1 (+)	2 (-)	3 (+)	4 (-)
Option **E** [1) 2)]	FOUNDATION Fieldbus		Pulse/frequency/switch output (passive)	

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

7.1.4 Pin assignment, device plug

FOUNDATION Fieldbus

Device plug for signal transmission (device side)



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

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!

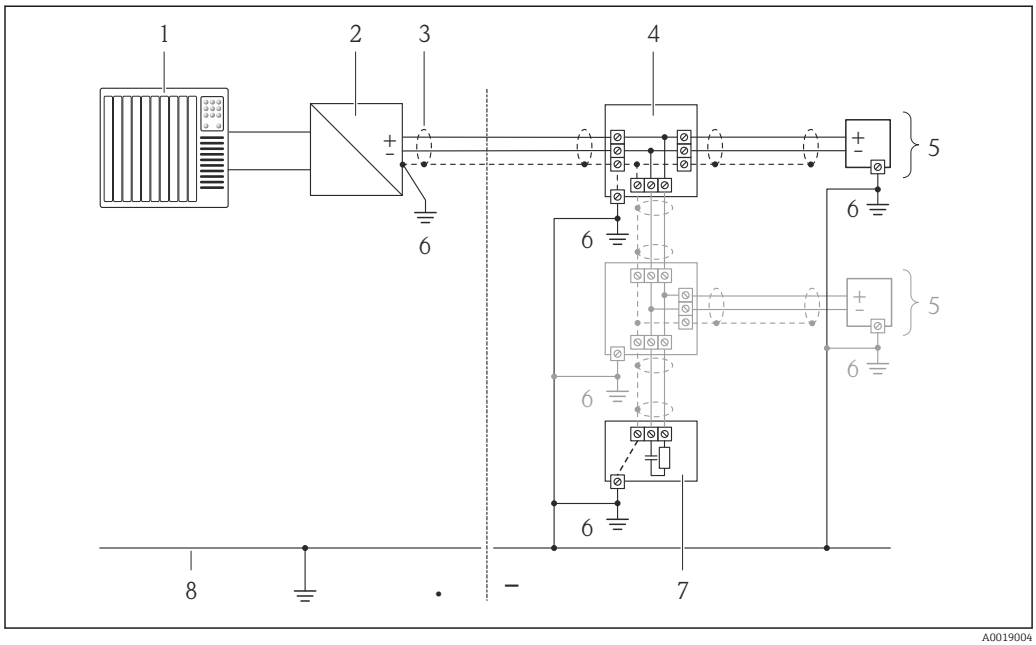
Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground. In systems without potential equalization, therefore, cable shielding of fieldbus systems should only be grounded on one side, for example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



1 Controller (e.g. PLC)
2 Power Conditioner (FOUNDATION Fieldbus)
3 Cable shield
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

1. Remove dummy plug if present.
2. **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.
   If measuring device is delivered without cable glands:
   Provide suitable cable gland for corresponding connecting cable .
3. If measuring device is delivered with cable glands:
   Observe cable specification .

7.2 Connecting the measuring device

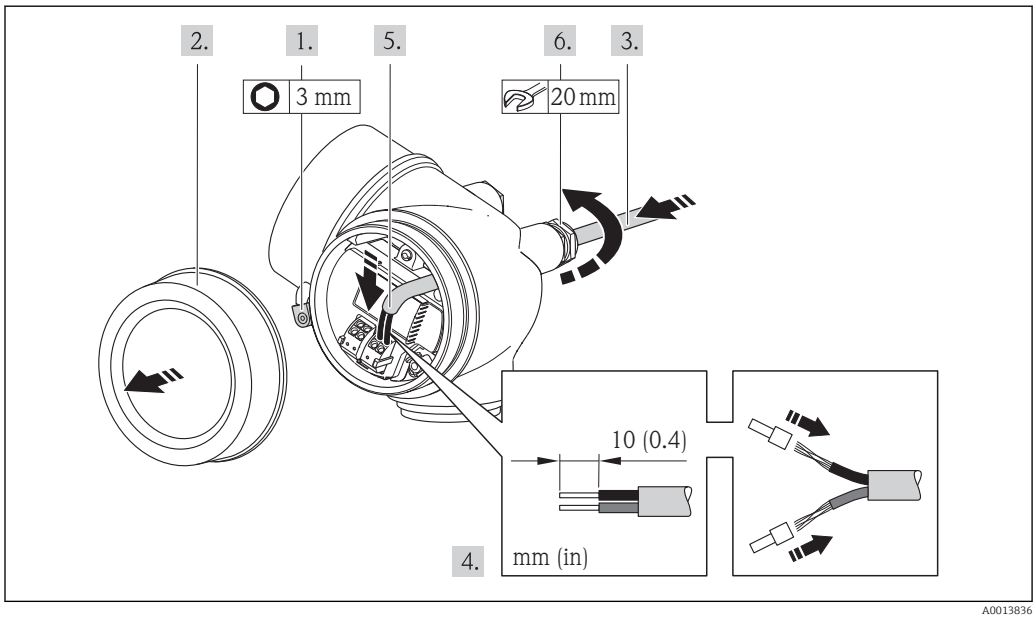
NOTICE

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.
- For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.

7.2.1 Connecting the transmitter

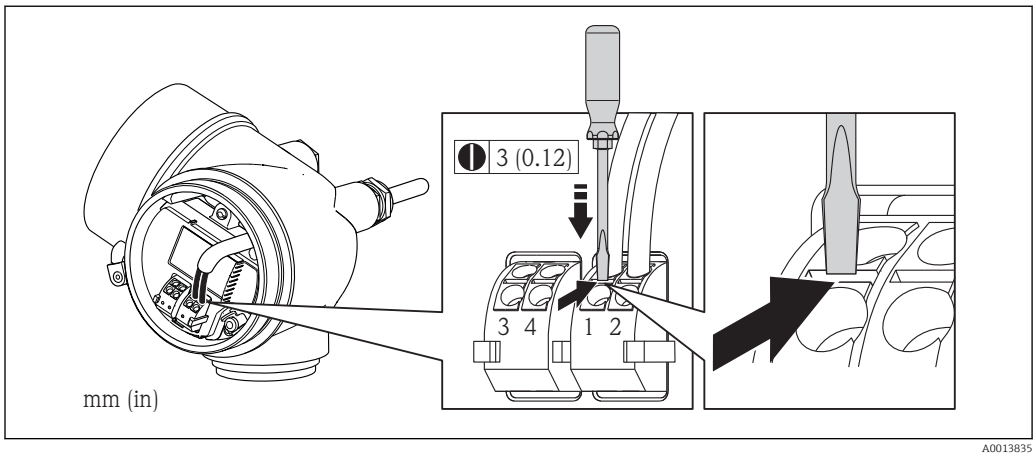
Connection via terminals



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



- 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

⚠ CAUTION

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

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

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

Connection example, standard scenario

Metal process connections

Potential equalization is generally via the metal process connections that are in contact with the medium and mounted directly on the sensor. Therefore there is generally no need for additional potential equalization measures.

Connection example in special situations

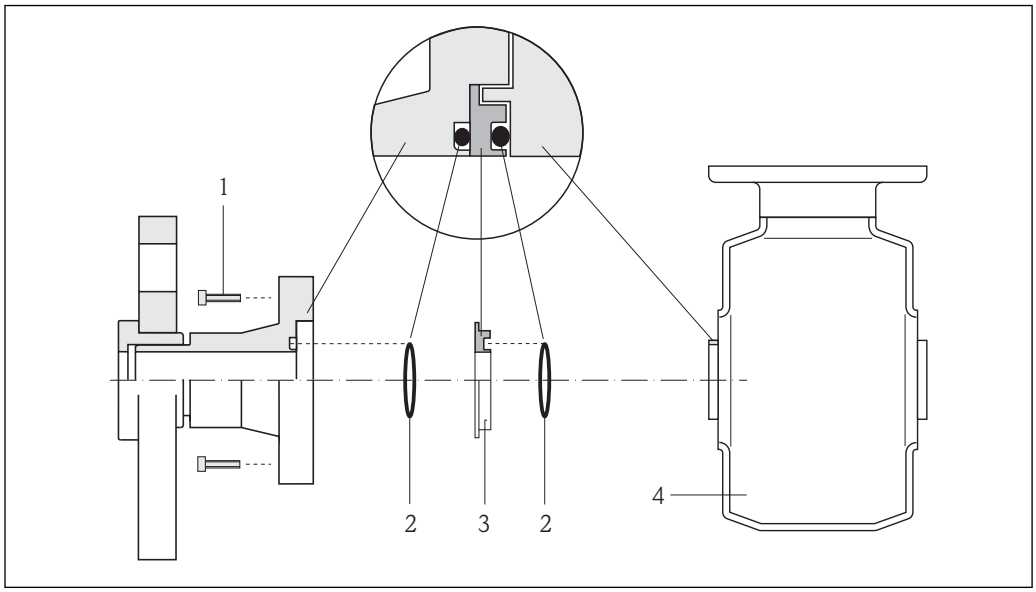
Plastic process connections

In the case of plastic process connections, additional grounding rings or process connections with an integrated grounding electrode must be used to ensure potential matching between the sensor and the fluid. If there is no potential matching, this can affect the measuring accuracy or cause the destruction of the sensor as a result of the electrochemical decomposition of the electrodes.

Note the following when using grounding rings:

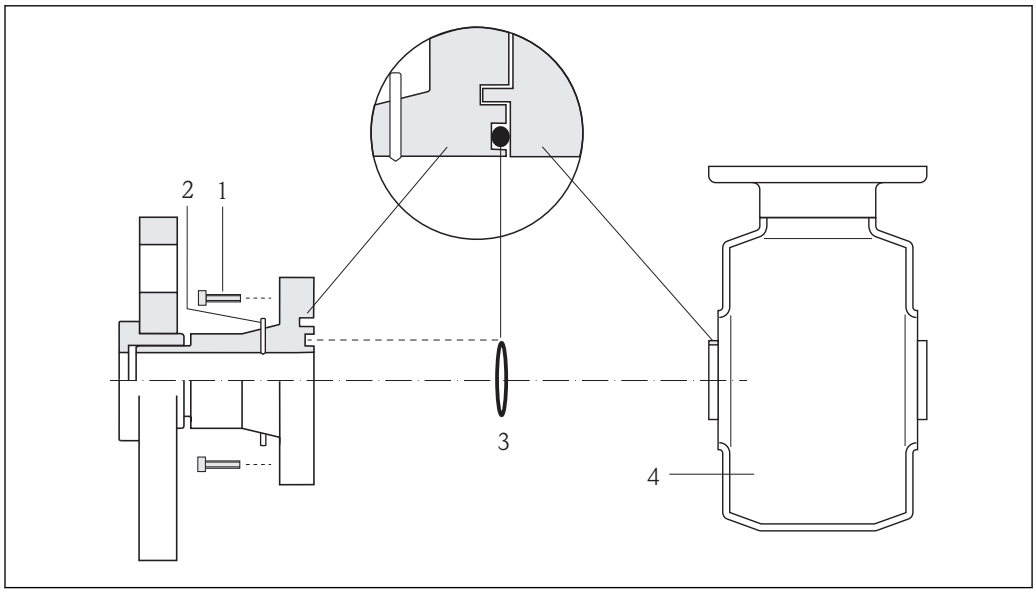
- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. These plastic disks only act as "spacers" and do not have any potential matching function. Furthermore, they also perform a significant sealing function at the sensor/connection interface. Therefore, in the case of process connections without metal grounding rings, these plastic disks/seals should never be removed and should always be installed!
- Grounding rings can be ordered separately as an accessory from Endress+Hauser . When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion!
- Grounding rings, including seals, are mounted inside the process connections. Therefore the installation length is not affected.

Potential equalization via additional grounding ring



1 Hexagonal-headed bolts of process connection
2 O-ring seals
3 Plastic disk (spacer) or grounding ring
4 Sensor

Potential equalization via grounding electrodes on process connection

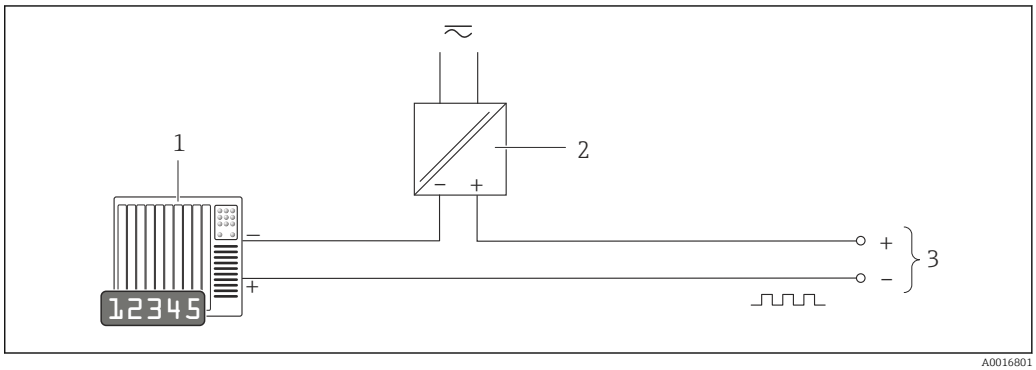


1 Hexagonal-headed bolts of process connection
2 Integrated grounding electrodes
3 O-ring seal
4 Sensor

7.3 Special connection instructions

7.3.1 Connection examples

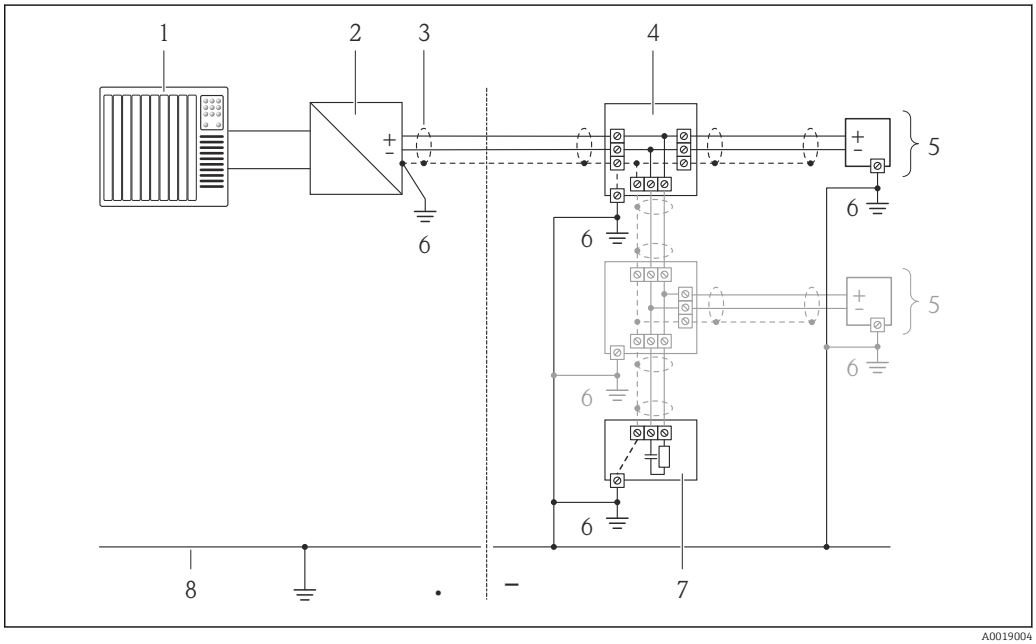
Pulse/frequency output



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* → 125

FOUNDATION Fieldbus



9 *Connection example for FOUNDATION Fieldbus*

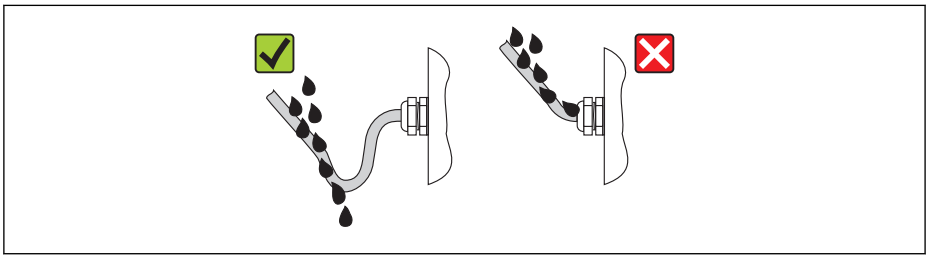
1 *Control system (e.g. PLC)*
2 *Power Conditioner (FOUNDATION Fieldbus)*
3 *Cable shield*
4 *T-box*
5 *Measuring device*
6 *Local grounding*
7 *Bus terminator*
8 *Potential matching line*

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. Dry, clean or replace the seals if necessary.
2. Tighten all housing screws and screw covers.
3. Firmly tighten the cable glands.
4. 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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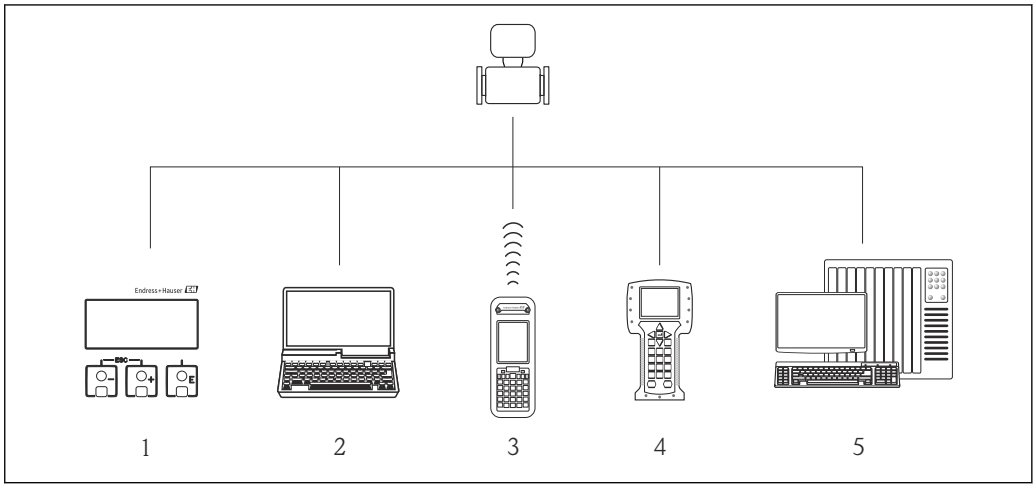
5. Insert dummy plugs into unused cable entries.

7.5 Post-connection check

Are cables or the device undamaged (visual inspection)?	❑
Do the cables comply with the requirements ?	❑
Do the cables have adequate strain relief?	❑
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 🖹 36 ?	❑
Depending on the device version: are all the device plugs firmly tightened ?	❑
Does the supply voltage match the specifications on the transmitter nameplate ?	❑
Is the terminal assignment correct ?	❑
If supply voltage is present, do values appear on the display module?	❑
Is the potential equalization established correctly → 🖹 33?	❑
Are all housing covers installed and firmly tightened?	❑
Is the securing clamp tightened correctly?	❑

8 Operating options

8.1 Overview of operating options

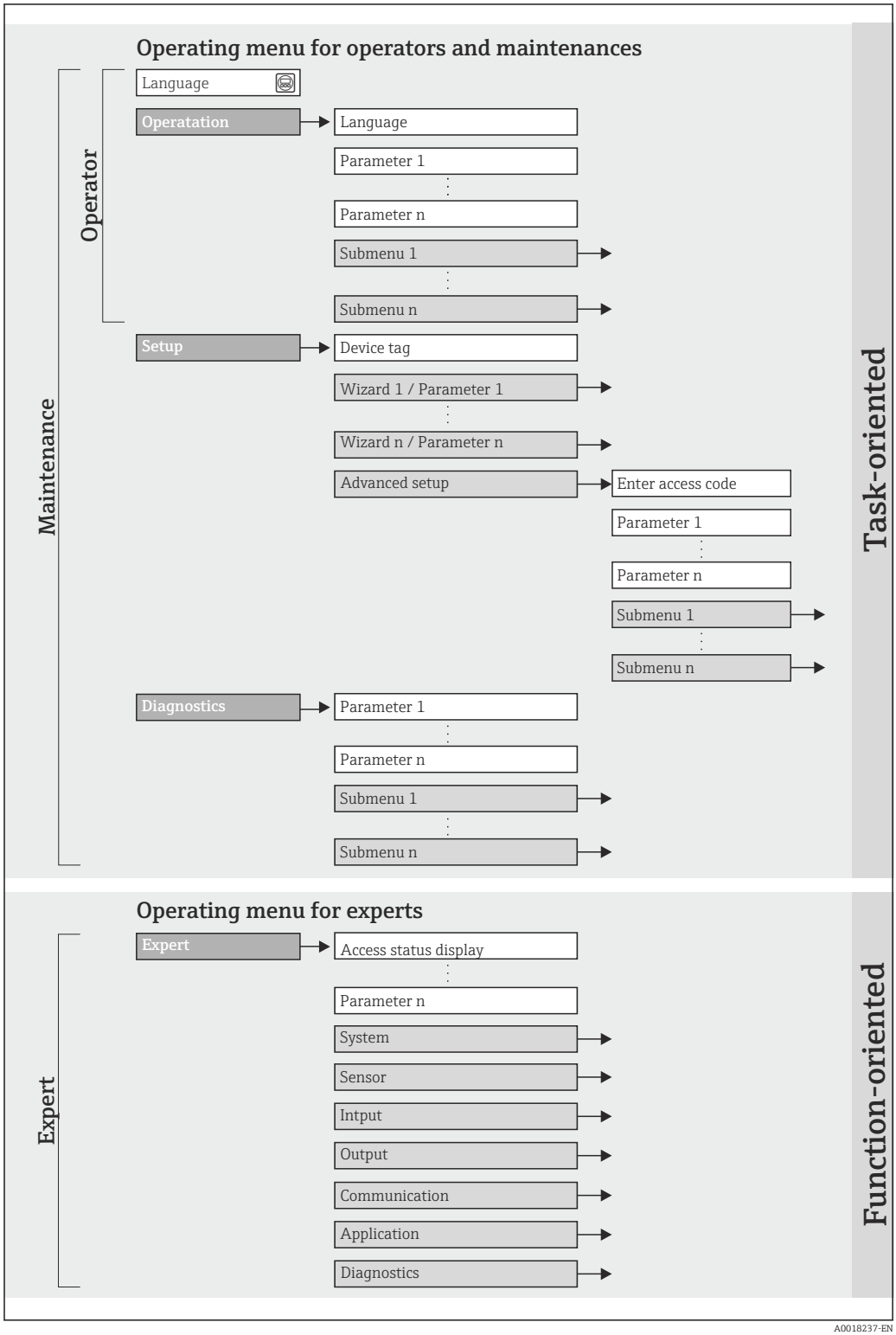


1 *Local operation via display module*
2 *Computer with operating tool (e.g. FieldCare, AMS Device Manager)*
3 *Field Xpert SFX350 or SFX370*
4 *Field Communicator 475*
5 *Automation system (e.g. PLC)*

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

For an overview of the operating menu with menus and parameters



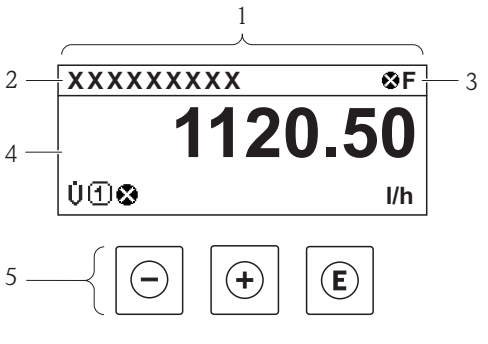
10 *Schematic structure of the operating menu*

8.2.2 Operating philosophy

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

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 → 43*

Status area

The following symbols appear in the status area of the operational display at the top right:
- Status signals→ 92
  - **F**: Failure
  - **C**: Function check
  - **S**: Out of specification
  - **M**: Maintenance required
- Diagnostic behavior→ 93
  - : Alarm
  - : Warning
- : Locking (the device is locked via the hardware)
- : Communication (communication via remote operation is active)

Display area

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

Measured variables

Symbol	Meaning
	Volume flow
	Mass flow
	Totalizer The measurement channel number indicates which of the three totalizers is displayed.

Measurement channel numbers

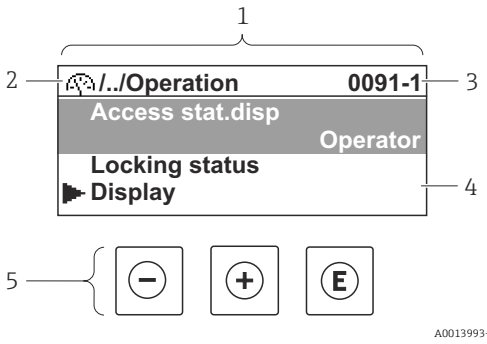
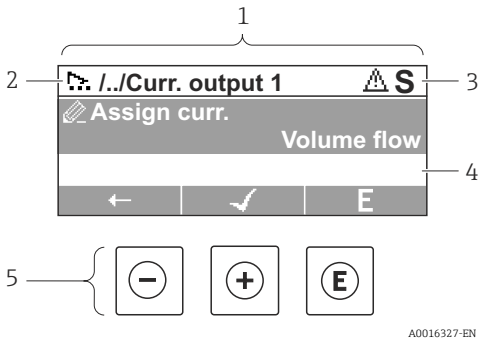
Symbol	Meaning
1 ... 4	Measurement channel 1 to 4
The measurement channel number is displayed only if more than one channel is present for the same measured variable type (e.g. totalizer 1-3).	

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols → 93

The number and display format of the measured values can be configured via the **"Format display" parameter** → 61. "Operation" menu → Display → Format display

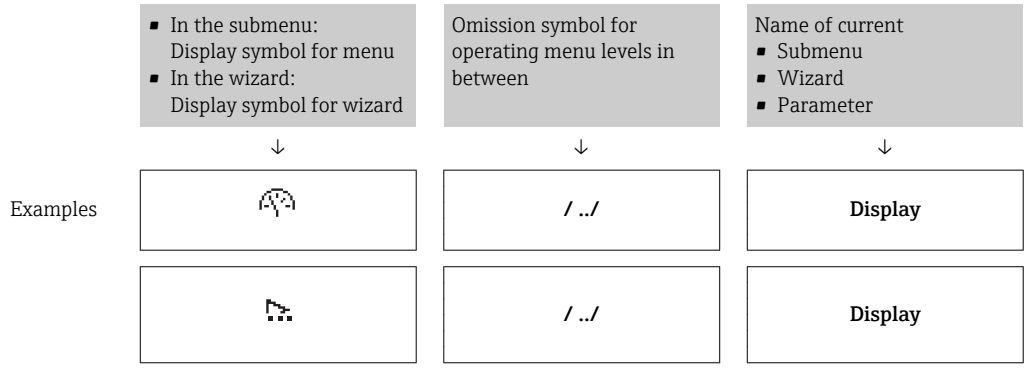
8.3.2 Navigation view

In the submenu	In the wizard
	

1 Navigation view
2 Navigation path to current position
3 Status area
4 Display area for navigation
5 Operating elements → 43

Navigation path

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



For more information about the menu icons, refer to the "Display area" section → 41

Status area

The following appears in the status area of the navigation view in the top right corner:
- Of 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 → 92
- For information on the function and entry of the direct access code → 46

Display area

Menus

Symbol	Meaning
	Operation Appears: ▪ In the menu next to the "Operation" selection ▪ At the left in the navigation path in the "Operation" menu
	Setup Appears: ▪ In the menu next to the "Setup" selection ▪ At the left in the navigation path in the "Setup" menu
	Diagnostics Appears: ▪ In the menu next to the "Diagnostics" selection ▪ At the left in the navigation path in the "Diagnostics" menu
	Expert Appears: ▪ In the menu next to the "Expert" selection ▪ At the left in the navigation path in the "Expert" menu

Submenus, wizards, parameters

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

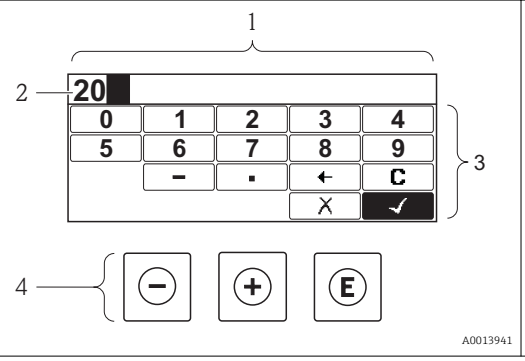
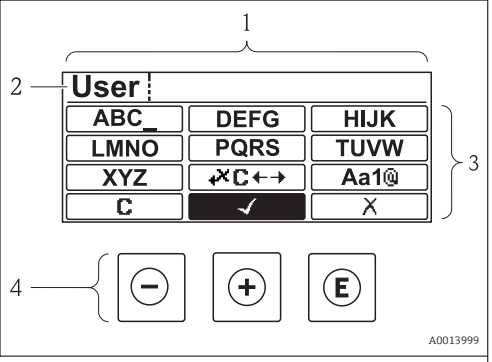
Locking

Symbol	Meaning
	Parameter locked When displayed in front of a parameter name, indicates that the parameter is locked. ▪ 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.
E	Opens the editing view of the parameter.

8.3.3 Editing view

Numeric editor	Text editor
	

1 Editing view
2 Display area of the entered values
3 Input mask
4 Operating elements → 📄 43

Input mask

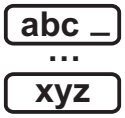
The following input symbols are available in the input mask of the numeric and text editor:

Numeric editor

Symbol	Meaning
0 … 9	Selection of numbers from 0 to 9.
.	Inserts decimal separator at the input position.
–	Inserts minus sign at the input position.
✓	Confirms selection.
←	Moves the input position one position to the left.
✗	Exits the input without applying the changes.
C	Clears all entered characters.

Text editor

Symbol	Meaning
Aa1@	Toggle ▪ Between upper-case and lower-case letters ▪ For entering numbers ▪ For entering special characters
ABC_ … XYZ	Selection of letters from A to Z.

	Selection of letters from a to z.
	Selection of special characters.
	Confirms selection.
	Switches to the selection of the correction tools.
	Exits the input without applying the changes.
	Clears all entered characters.

Correction symbols under 

Symbol	Meaning
	Clears all entered characters.
	Moves the input position one position to the right.
	Moves the input position one position to the left.
	Deletes one character immediately to the left of the input position.

8.3.4 Operating elements

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

Key	Meaning
E	**Enter key** *For operational display* ▪ Pressing the key briefly opens the operating menu. ▪ Pressing the key for 2 s opens the context menu. *In a menu, submenu* ▪ Pressing the key briefly: – Opens the selected menu, submenu or parameter. – Starts the wizard. – If help text is open, closes the help text of the parameter. ▪ Pressing the key for 2 s for parameter: If present, opens the help text for the function of the parameter. *With a Wizard* Opens the editing view of the parameter. *With a text and numeric editor* ▪ Pressing the key briefly: – 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)** *In a menu, submenu* ▪ Pressing the key briefly: – Exits the current menu level and takes you to the next higher level. – If help text is open, closes the help text of the parameter. ▪ Pressing the key for 2 s returns you to the operational display ("home position"). *With a Wizard* Exits the wizard and takes you to the next higher level. *With a text and numeric editor* Closes the text or numeric editor without applying changes.
− + E	**Minus/Enter key combination (press the keys simultaneously)** Reduces the contrast (brighter setting).
+ + E	**Plus/Enter key combination (press and hold down the keys simultaneously)** Increases the contrast (darker setting).
− + + E	**Minus/Plus/Enter key combination (press the keys simultaneously)** *For operational display* Enables or disables the keypad lock (only SD02 display module).

8.3.5 Opening the context menu

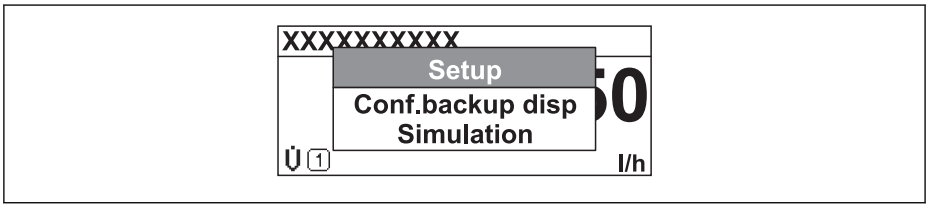
Using the context menu, the user can call up the following menus quickly and directly from the operational display:

- Setup
- Conf. backup disp.
- Simulation

Calling up and closing the context menu

The user is in the operational display.

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



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

Calling up the menu via the context menu

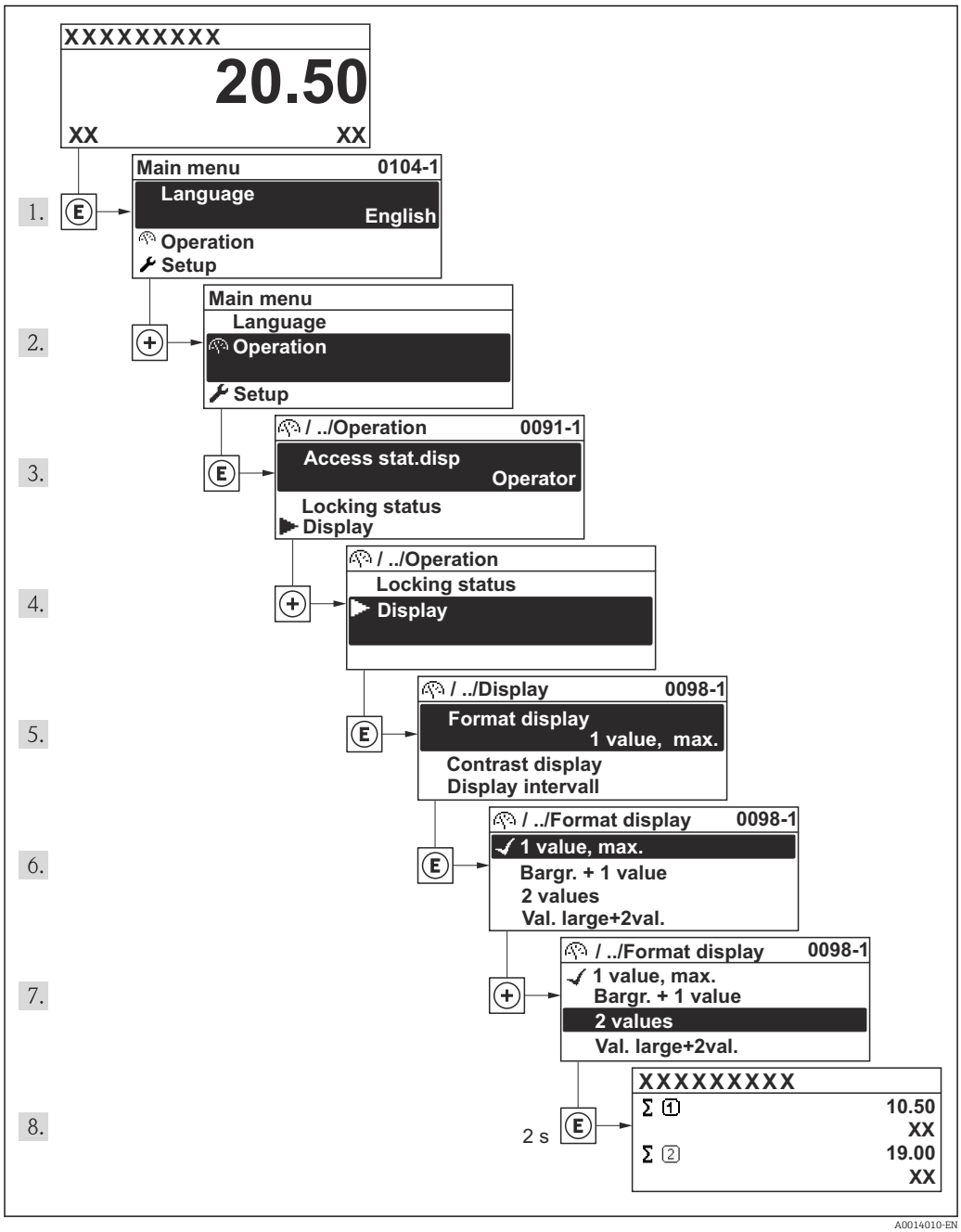
1. Open the context menu.
2. Press ⊞ to navigate to the desired menu.
3. Press Ⓔ to confirm the selection.
   ↳ The selected menu opens.

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
→ 40

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

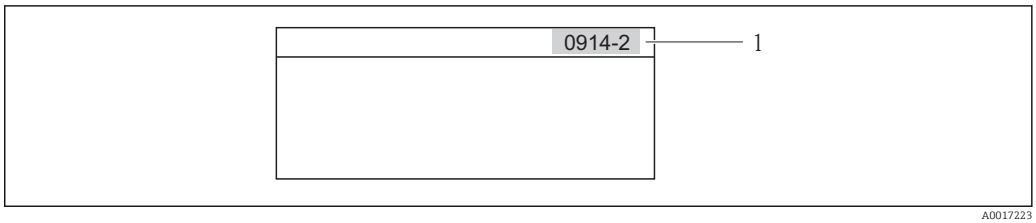


8.3.7 Calling the parameter directly

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

Navigation path
"Expert" menu → 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: Input of "0914" → Parameter **Totalizer 1**
- If a different channel is jumped to: Enter the direct access code with the corresponding channel number.
  Example: Input of "0914-2" → Parameter **Totalizer 2**

For the direct access codes of the individual parameters

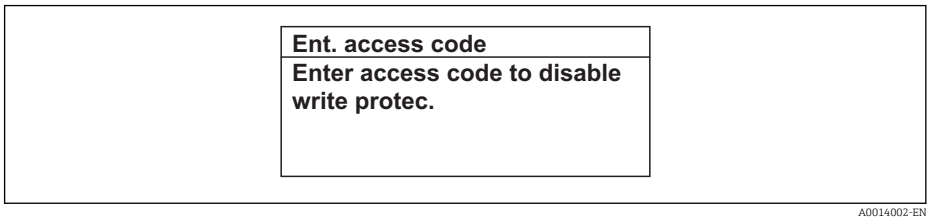
8.3.8 Calling up help text

For some parameters, help texts exist, which the user can call up from the navigation view. These briefly describe the function of the parameter and thus support fast and reliable commissioning.

Calling up and closing the help text

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

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



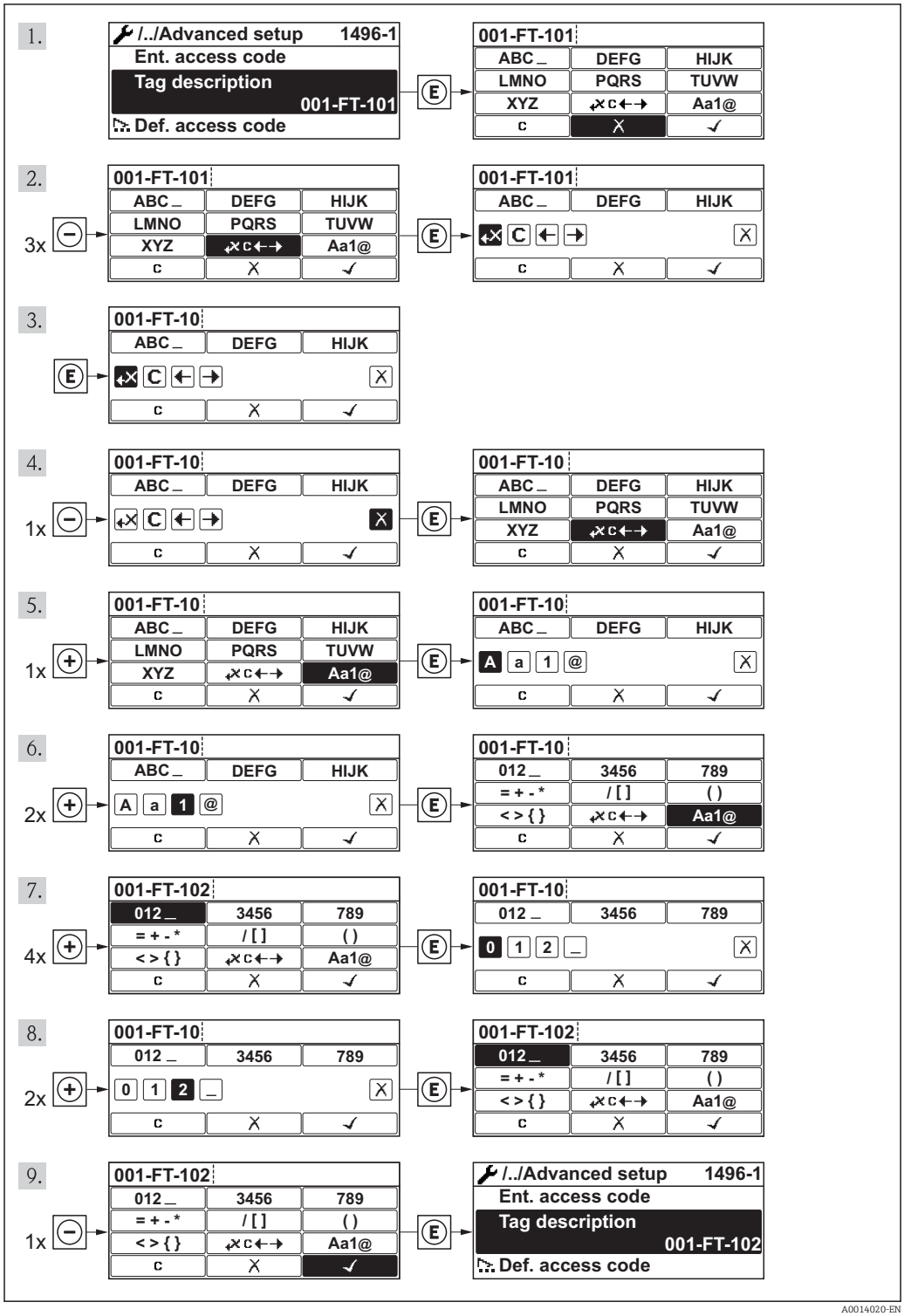
11 Example: Help text for parameter "Enter access code"

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

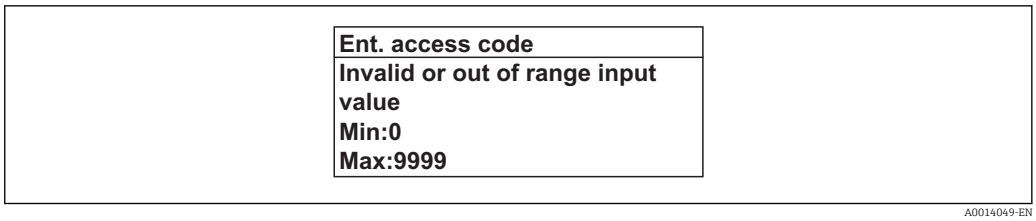
8.3.9 Changing the parameters

For a description of the editing display - consisting of text editor and numeric editor - with symbols → 42, for a description of the operating elements → 43

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.



A0014049-EN

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

User role	Read access		Write access	
	Without access code (from the factory)	With access code	Without access code (from the factory)	With access code
Operator	✔	✔	✔	-- [1]
Maintenance	✔	✔	✔	✔

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

If an incorrect access code is entered, the user obtains the access rights of the "Operator" 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 the local display .

The locking of the write access via local operation can be disabled by entering the customer-defined access code via the respective access option.

1. After you press E, the input prompt for the access code appears.
2. Enter the access code.
   ↳ The -symbol in front of the parameters disappears; all previously write-protected parameters are now re-enabled.

8.3.12 Enabling and disabling the keypad lock

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

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 the Ⓔ key for longer than 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 the Ⓔ key for longer than 2 seconds.
↳ A context menu appears.
2. In the context menu, select the **Keylock off** option.
↳ The keypad lock is switched off.

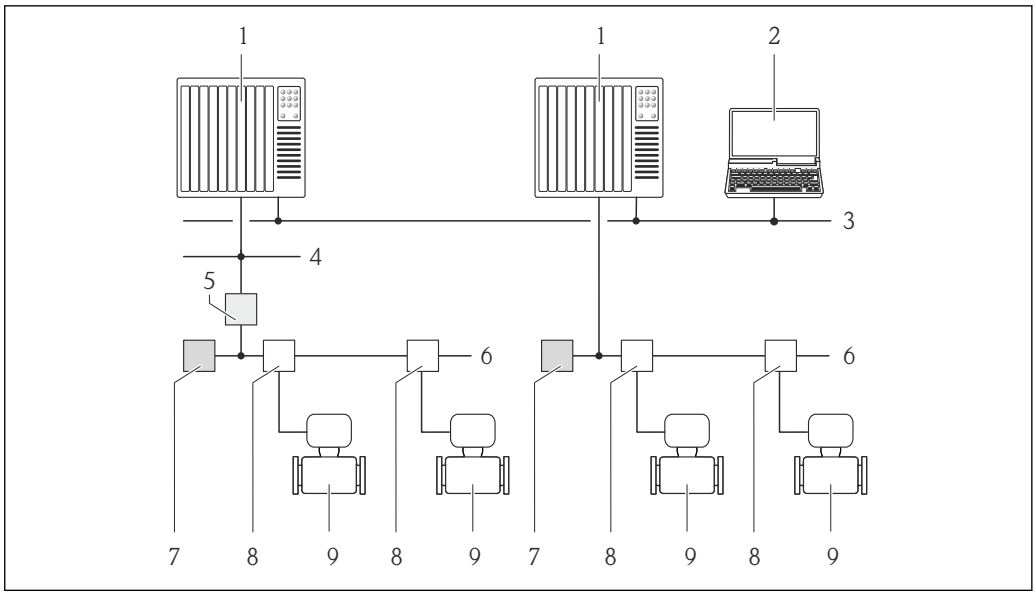
8.4 Access to the operating menu via the operating tool

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

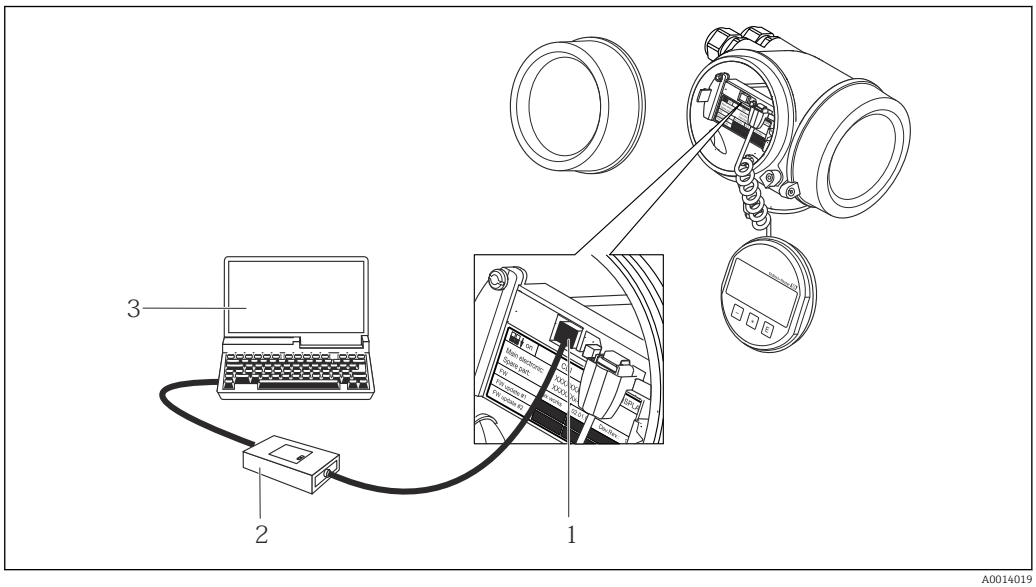
This communication interface is available in device versions with FOUNDATION Fieldbus.



12 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)



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 details, see Operating Instructions BA00027S and BA00059S

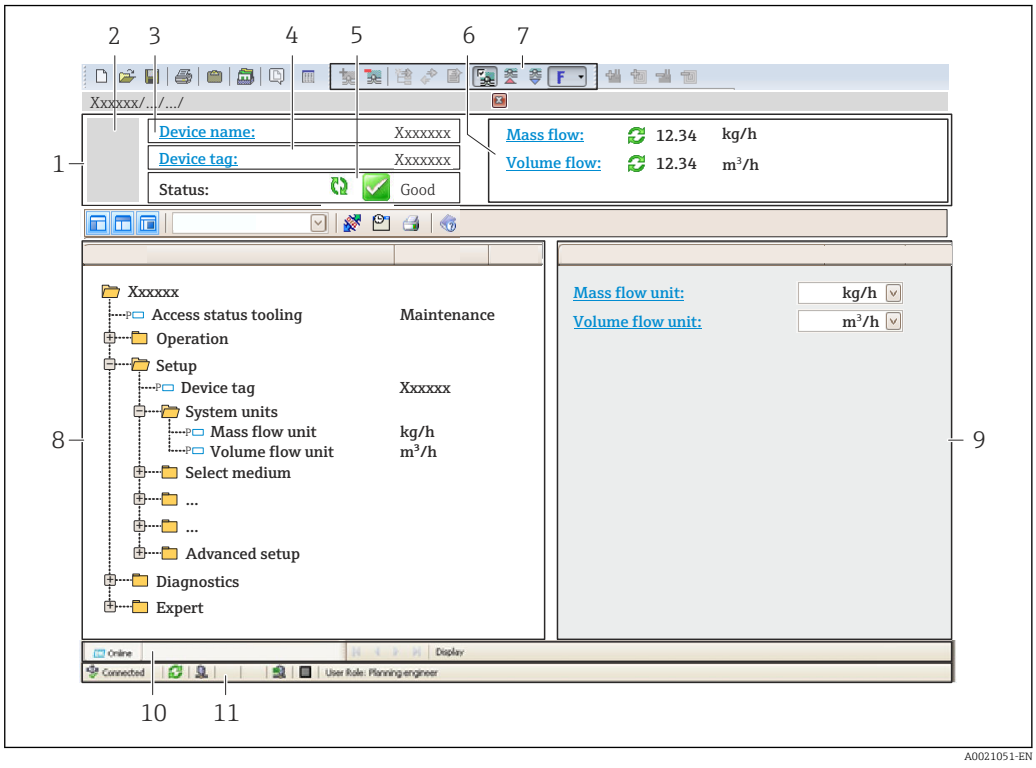
Source for device description files

See data → 54

Establishing a connection

For details, see Operating Instructions BA00027S and BA00059S

User interface



1 *Header*
2 *Picture of device*
3 *Device name*
4 *Tag name*
5 *Status area with status signal*
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 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

8.4.5 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	▪ On the title page of the Operating instructions ▪ On the transmitter nameplate → 🖹 13 ▪ Firmware version "Diagnostics" menu → Device information → Firmware version
Release date of firmware version	06.2015	---
Manufacturer ID	0x11	Manufacturer ID "Diagnostics" menu → Device information → Manufacturer ID
Device type ID	0x????	Device type "Diagnostics" menu → Device information → Device type
Device revision	1	▪ On the transmitter nameplate → 🖹 14 ▪ Device revision "Diagnostics" menu → Device information → Device revision
DD revision	Information and files under: ▪ www.endress.com ▪ www.fieldbus.org	
CFF revision		

For an overview of the different firmware versions for the device → 🖹 116

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
▪ Field Xpert SFX350 ▪ Field Xpert SFX370	Use update function of handheld terminal
FieldCare	▪ www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
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_ xxxxxxxxxxx	400	Resource block
SETUP_ xxxxxxxxxxx	600	"Setup" Transducer block
ADVANCED_SETUP_ xxxxxxxxxxx	800	"Advanced setup" Transducer block
DISPLAY_ xxxxxxxxxxx	1000	"Display" Transducer block
HISTOROM_ xxxxxxxxxxx	1200	"HistoROM" Transducer block
DIAGNOSTIC_ xxxxxxxxxxx	1400	"Diagnostic" Transducer block
EXPERT_CONFIG_xxxxxxxxxxx	1600	"Expert configuration" Transducer block
EXPERT_INFO_xxxxxxxxxxx	1800	"Expert information" Transducer block
SERVICE_SENSOR_xxxxxxxxxxx	2000	"Service sensor" Transducer block
SERVICE_INFO_xxxxxxxxxxx	2200	"Service info" Transducer block
TOTAL_INVENTORY_COUNTER_xxxxxxxxxxx	2400	"Totalizer" Transducer block
HEARTBEAT_RESULTS1_ xxxxxxxxxxx	2600	"Heartbeat results 1" Transducer block
HEARTBEAT_RESULTS2_ xxxxxxxxxxx	2800	"Heartbeat results 2" Transducer block
HEARTBEAT_RESULTS3_ xxxxxxxxxxx	3000	"Heartbeat results 3" Transducer block
HEARTBEAT_RESULTS4_ xxxxxxxxxxx	3200	"Heartbeat results 4" Transducer block
HEARTBEAT_TECHNOLOGY_ xxxxxxxxxxx	3400	"Heartbeat" Transducer block
ANALOG_INPUT_1_xxxxxxxxxxx	3600	Analog Input function block 1 (AI)
ANALOG_INPUT_2_xxxxxxxxxxx	3800	Analog Input function block 2 (AI)
ANALOG_INPUT_3_xxxxxxxxxxx	4000	Analog Input function block 3 (AI)
ANALOG_INPUT_4_xxxxxxxxxxx	4200	Analog Input function block 4 (AI)
DIGITAL_INPUT_1_ xxxxxxxxxxx	4400	Digital Input function block 1 (DI)
DIGITAL_INPUT_2_ xxxxxxxxxxx	4600	Digital Input function block 2 (DI)
MULTI_DIGITAL_OUTPUT_ xxxxxxxxxxx	4800	Multiple Digital Output block (MDO)
PID_ xxxxxxxxxxx	5000	PID function block (PID)
INTEGRATOR_xxxxxxxxxxx	5200	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

Four Analog Input blocks are available.

CHANNEL	Measured variable
0	Uninitialized (factory setting)
7	Temperature
9	Volume flow
11	Mass flow

CHANNEL	Measured variable
16	Totalizer 1
17	Totalizer 2
18	Totalizer 3

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
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	Not assigned	–
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 → 27
- "Post-connection check" checklist → 36

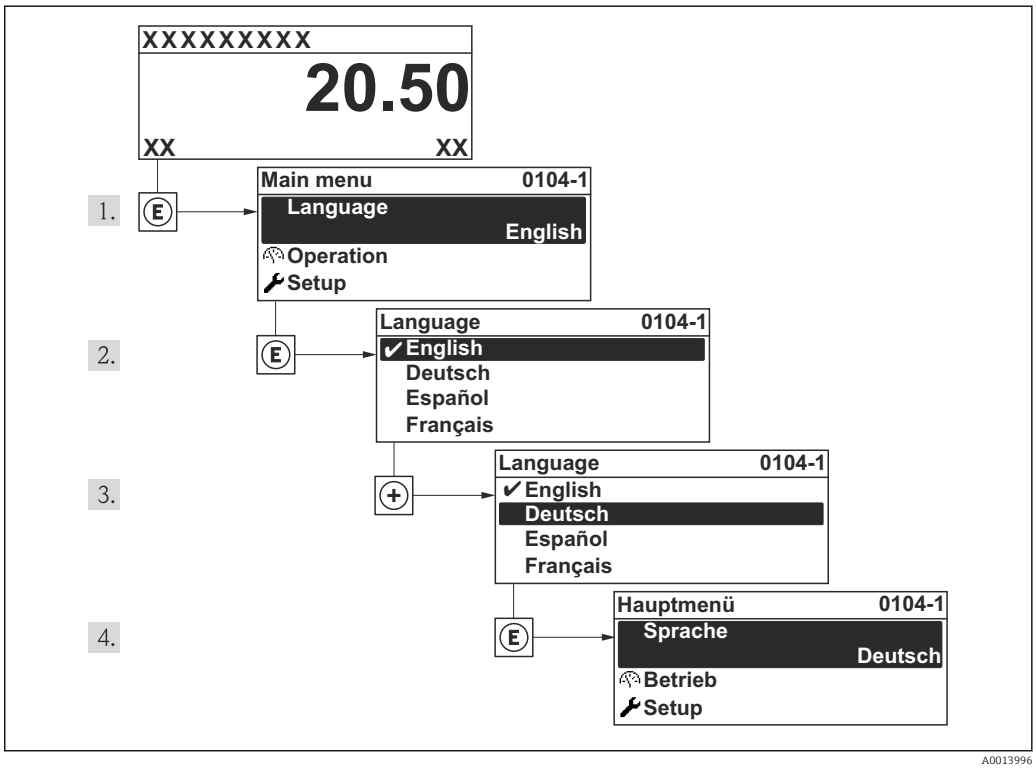
10.2 Switching on the measuring device

▶ 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" → 90.

10.3 Setting the operating language

Factory setting: English or ordered local language

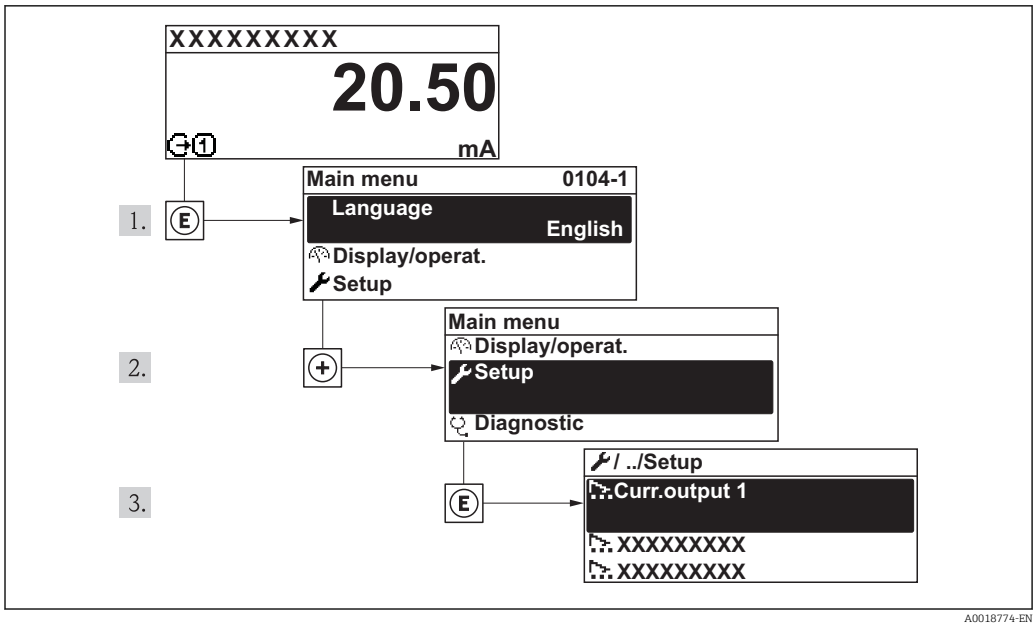


13 *Taking the example of the local display*

10.4 Configuring the measuring device

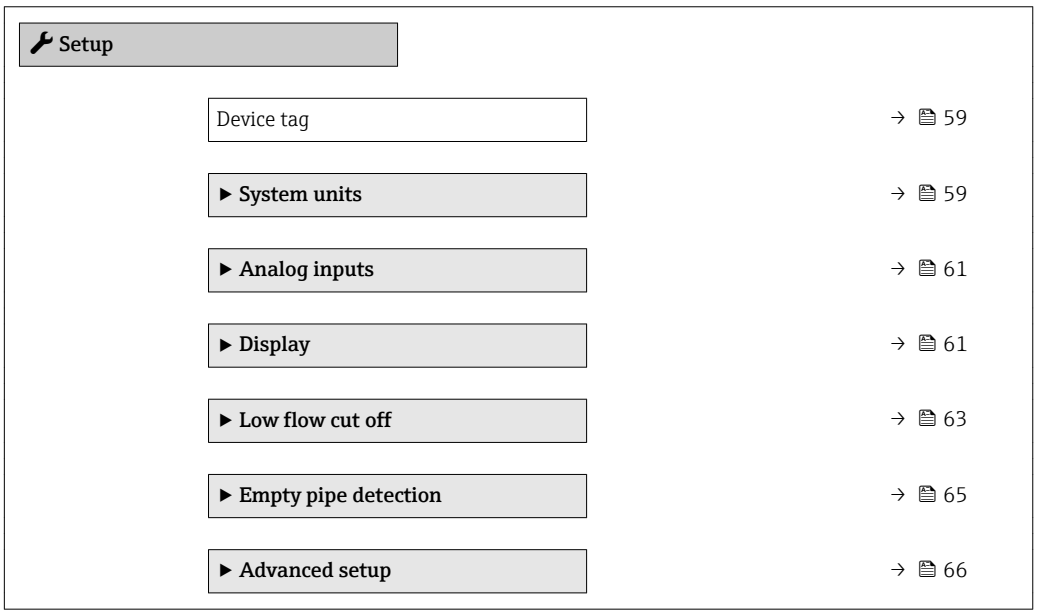
The **Setup** menuwith its guided wizards contains all the parameters needed for standard operation.

Navigation to the **Setup** menu



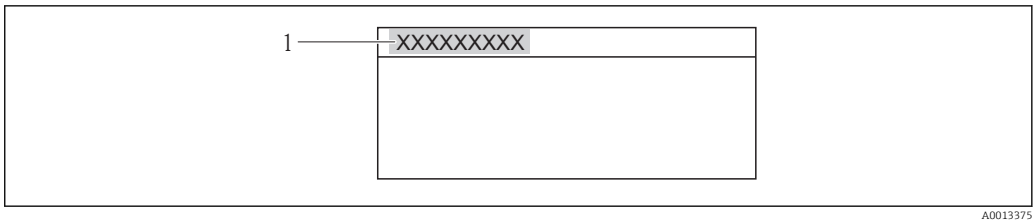
14 *Illustrated using the example of the local display*

Navigation
"Setup" menu



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.



15 Header of the operational display with tag name

1 Device tag

- The number of characters displayed depends on the characters used.
- Enter the tag name in the "FieldCare" operating tool → 53

Navigation
"Setup" menu → Device tag

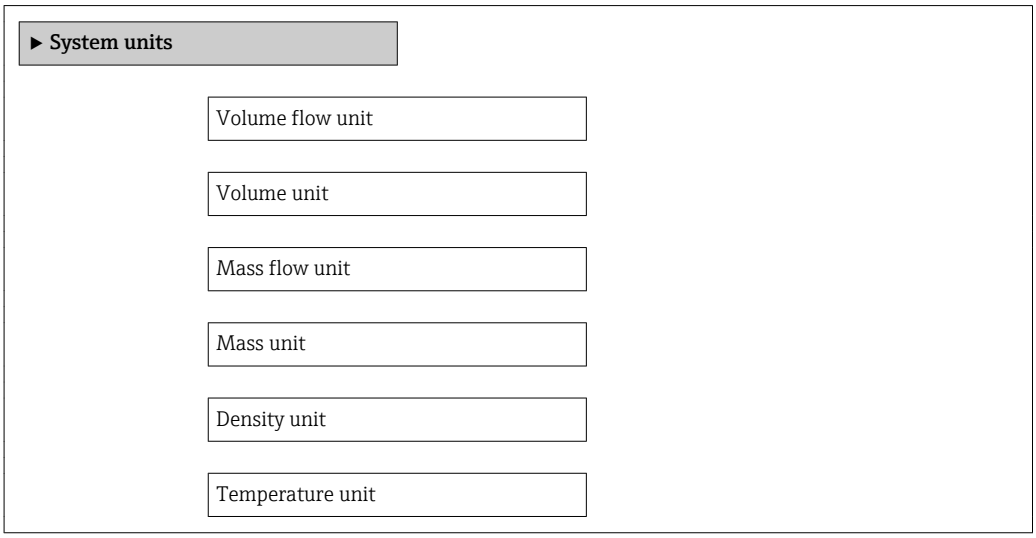
Parameter overview with brief description

Parameter	Description	User entry	Factory setting
Device tag	Enter the name for the measuring point.	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /)	Promag 200

10.4.2 Setting the system units

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

Navigation
"Setup" menu → System units

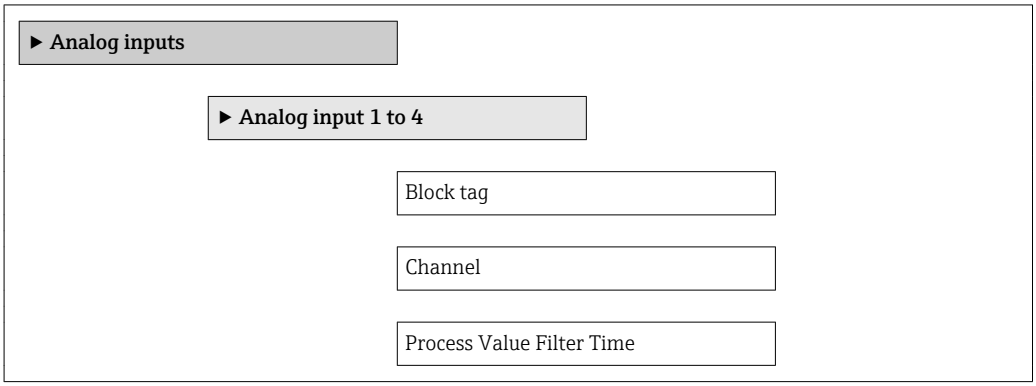


Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Volume flow unit	Select volume flow unit. *Result* The selected unit applies for: ▪ Output ▪ Low flow cut off ▪ Simulation process variable	Unit choose list	Country-specific: ▪ l/h ▪ gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: ▪ m^3 ▪ gal (us)
Mass flow unit	Select mass flow unit. *Result* The selected unit applies for: ▪ Output ▪ Low flow cut off ▪ Simulation process variable	Unit choose list	Country-specific: ▪ kg/h ▪ lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific: ▪ kg ▪ lb
Density unit	Select density unit. *Result* The selected unit applies for: ▪ Output ▪ Simulation process variable	Unit choose list	Country-specific: ▪ kg/l ▪ lb/ft^3
Temperature unit	Select temperature unit. *Result* The selected unit applies for: ▪ Maximum value ▪ Minimum value ▪ Maximum value ▪ Minimum value ▪ Average value	Unit choose list	Country-specific: ▪ °C ▪ °F

10.4.3 Configuring the analog inputs

Navigation
"Setup" menu → Analog inputs



Parameter overview with brief description

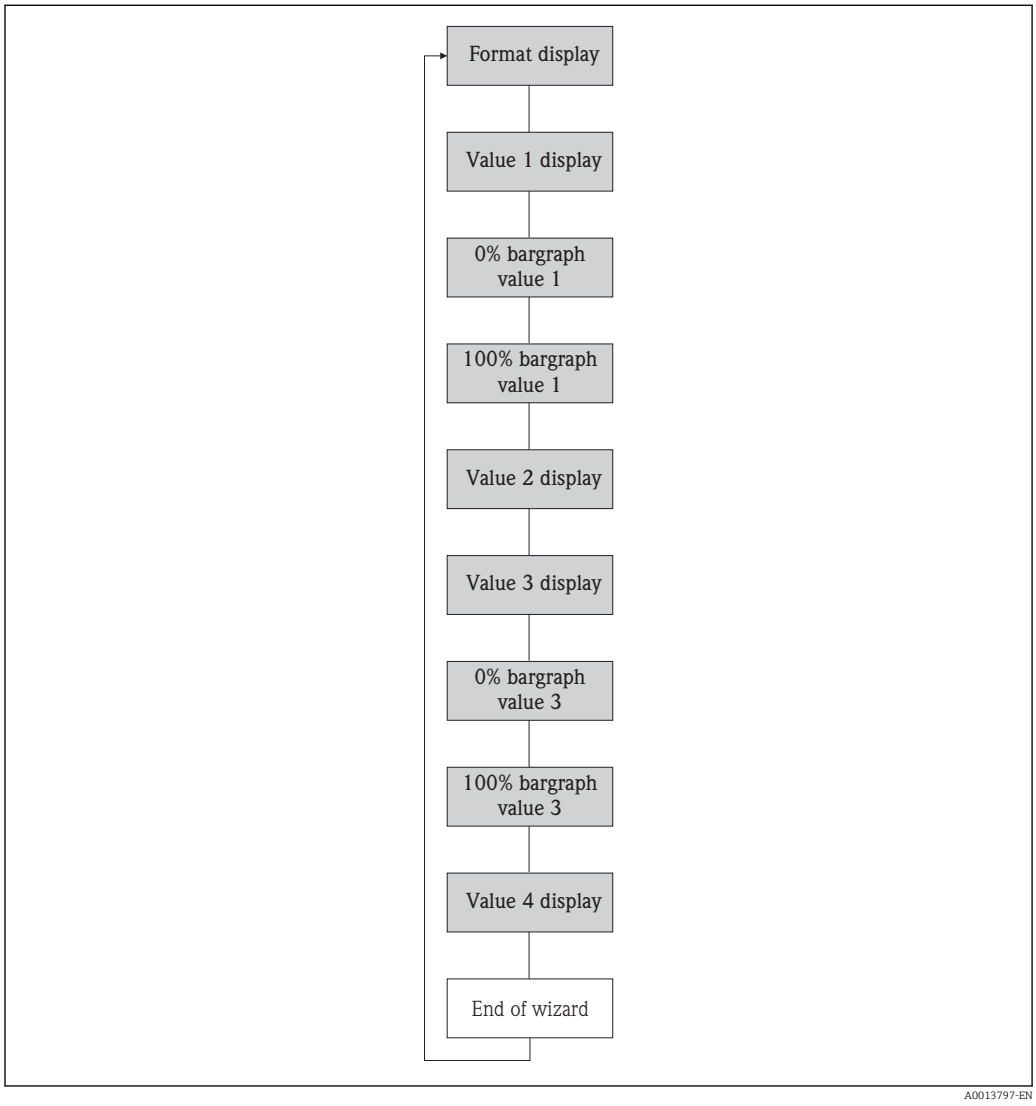
Parameter	Description	User entry / Selection	Factory setting
Block tag	Unique name of the measuring device.	Character string composed of letters, numbers and certain punctuation marks.	–
Channel	Select the process variable.	▪ Uninitialized ▪ Volume flow ▪ Mass flow ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3	Uninitialized
Process Value Filter Time	Specify a time to suppress signal peaks. During the specified time the totalizer does not respond to an erratic increase in the process variable.	Positive floating-point number	0 s

10.4.4 Configuring the local display

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

Navigation
"Setup" menu → Display

Structure of the wizard



16 "Display" wizard in the "Setup" menu

Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	▪ 1 value, max. size ▪ 1 bargraph + 1 value ▪ 2 values ▪ 1 value large + 2 values ▪ 4 values	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	▪ Volume flow ▪ Mass flow ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3	Volume flow

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see **Value 1 display** parameter	None
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see **Value 1 display** parameter	None
0% bargraph value 3	A selection has been made in the **Value 3 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
100% bargraph value 3	An option was selected in the **Value 3 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see **Value 1 display** parameter	None

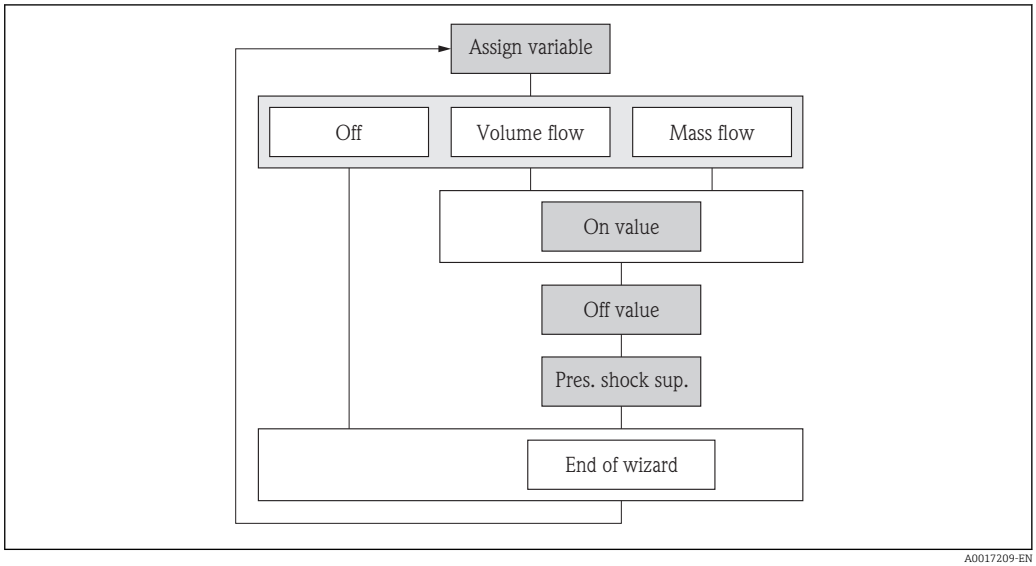
10.4.5 Configuring the low flow cut off

The **Low flow cut off** wizard guides you systematically through all the parameters that have to be set for configuring the low flow cut off.

Navigation

"Setup" menu → Low flow cut off

Structure of the wizard



17 *"Low flow cut off" wizard in the "Setup" menu*

Parameter overview with brief description

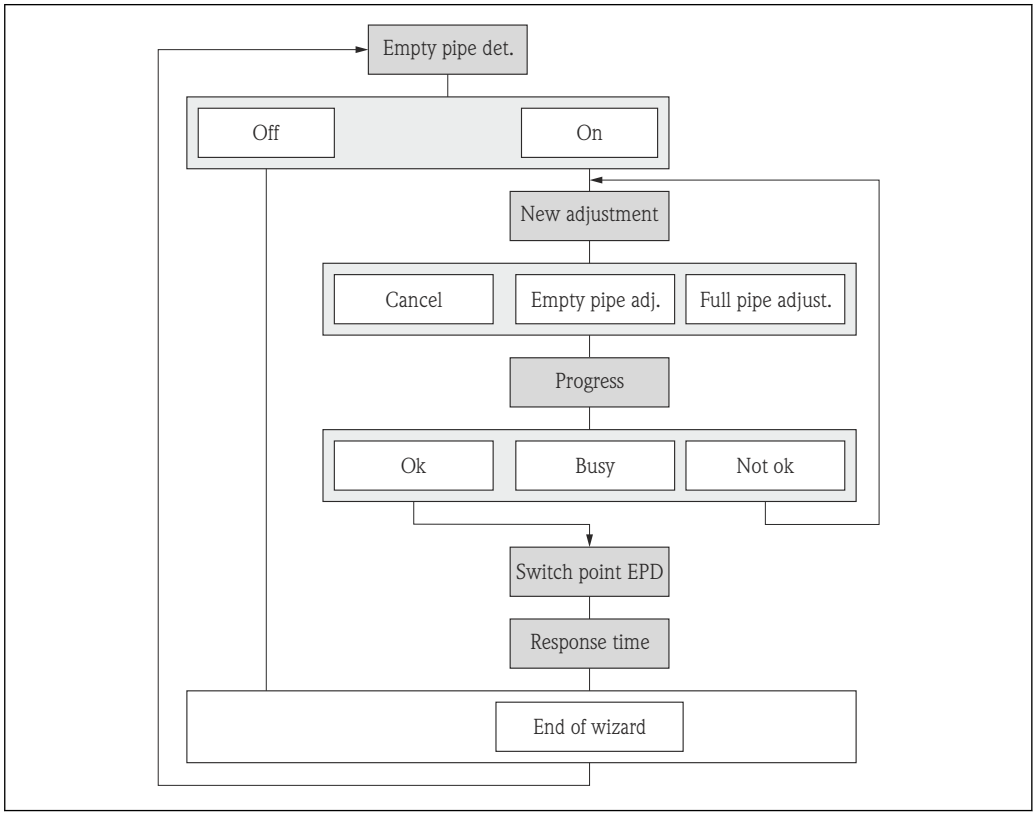
Parameter	Description	Selection / User entry	Factory setting
Assign process variable	Select process variable for low flow cut off.	▪ Off ▪ Volume flow ▪ Mass flow	Volume flow
On value low flow cutoff	Enter on value for low flow cut off.	Signed floating-point number	0 l/h
Off value low flow cutoff	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.4.6 Configuring empty pipe detection

The **Empty pipe detection** wizard guides you systematically through all the parameters that have to be set for configuring empty pipe detection.

Navigation
"Setup" menu → Empty pipe detection

Structure of the wizard



18 *"Empty pipe detection" wizard in the "Setup" menu*

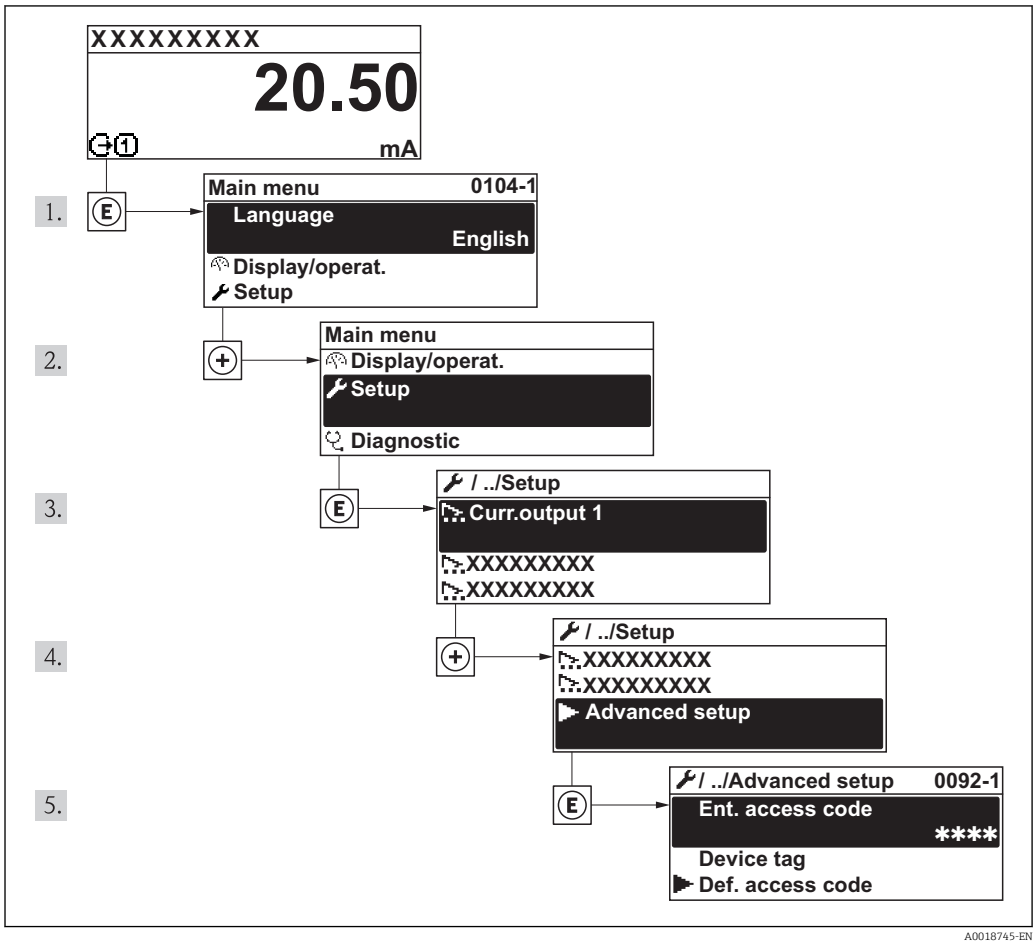
Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User interface / User entry	Factory setting
Empty pipe detection	–	Switch empty pipe detection on and off.	▪ Off ▪ On	Off
New adjustment	–	Select type of adjustment.	▪ Cancel ▪ Empty pipe adjust ▪ Full pipe adjust	Cancel
Progress	The **On** option is selected in the **Empty pipe detection** parameter.	Shows the progress.	▪ Ok ▪ Busy ▪ Not ok	–
Switch point empty pipe detection	–	Enter hysteresis in %, below this value the measuring tube will detected as empty.	1 to 99 %	10 %
Response time empty pipe detection	–	Enter the time before diagnostic message S862 "Pipe empty" is displayed for empty pipe detection.	0 to 100 s	1 s

10.5 Advanced settings

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

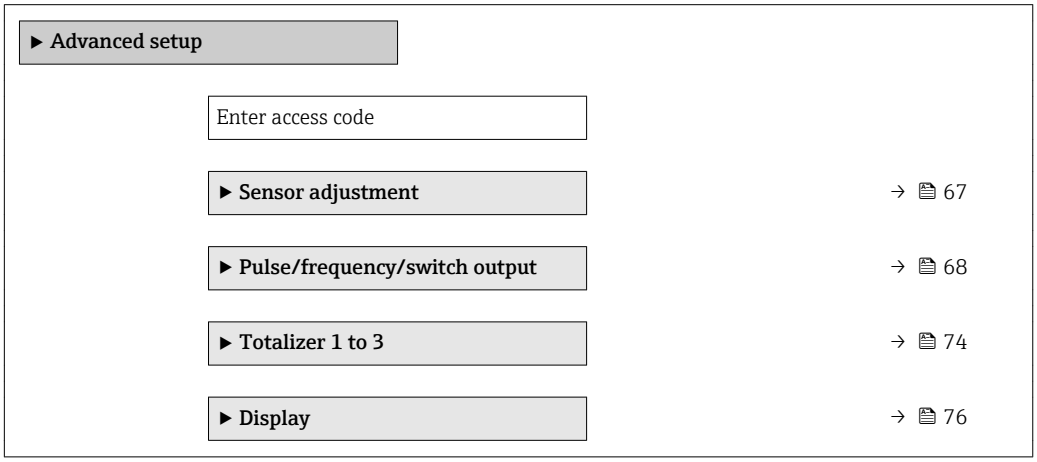
Navigation to the "Advanced setup" submenu

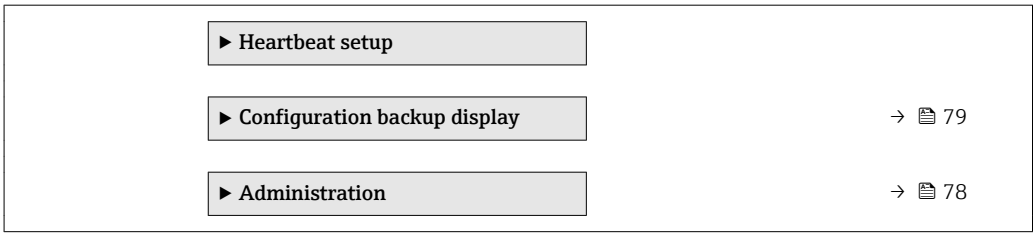


A0018745-EN

For detailed information on the parameter descriptions of the **Heartbeat Verification** application package, see the Special Documentation for the device

Navigation
"Setup" menu → Advanced setup

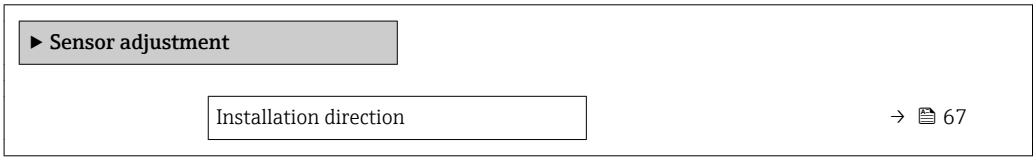




10.5.1 Carrying out a sensor adjustment

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

Navigation
"Setup" menu → Advanced setup → Sensor adjustment



Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	▪ Flow in arrow direction ▪ Flow against arrow direction	Flow in arrow direction
Zero point adjustment control	Start zero point adjustment.	▪ Cancel ▪ Busy ▪ Zero point adjust failure ▪ Start	Cancel

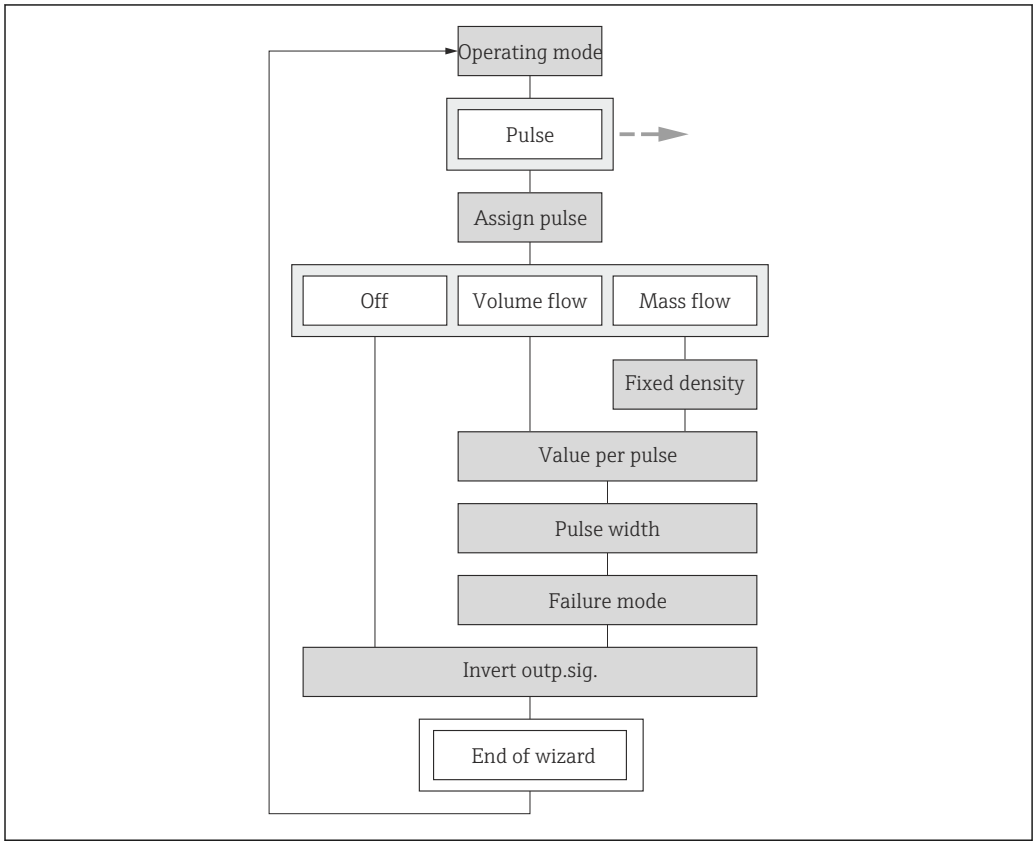
10.5.2 Configuring the pulse/frequency/switch output

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

Configuring the pulse output

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

Structure of the wizard for the pulse output



19 "Pulse/frequency/switch output" wizard in the "Setup" menu: "Operating mode" parameter"Pulse" option

Parameter overview with brief description

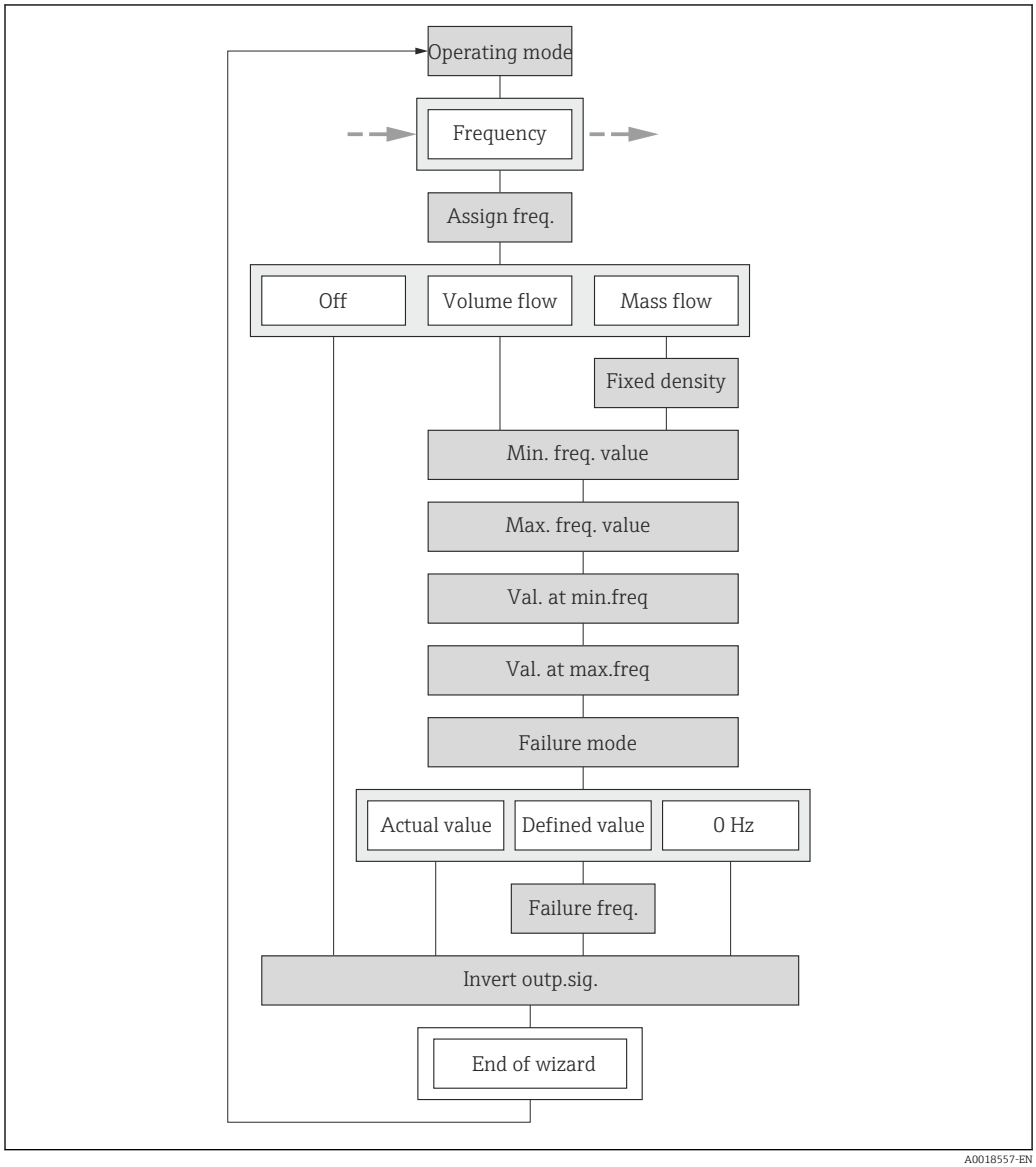
Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	▪ Pulse ▪ Frequency ▪ Switch	Pulse
Assign pulse output	In **Operating mode** parameter, the **Pulse** option is selected.	Select process variable for pulse output.	▪ Off ▪ Mass flow ▪ Volume flow	Off
Value per pulse	In the **Operating mode** parameter, the **Pulse** option is selected and one of the following options is selected in the **Assign pulse output** parameter (→ 🖹 68): ▪ Mass flow ▪ Volume flow	Enter measured value at which a pulse is output.	Signed floating-point number	0

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
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 (→ 🖹 68): ▪ Mass flow ▪ Volume flow	Define time width of the output pulse.	5 to 2 000 ms	100 ms
Failure mode	In the **Operating mode** parameter, the **Pulse** option is selected and one of the following options is selected in the **Assign pulse output** parameter (→ 🖹 68): ▪ Mass flow ▪ Volume flow	Define output behavior in alarm condition.	▪ Actual value ▪ No pulses	No pulses
Invert output signal	–	Invert the output signal.	▪ No ▪ Yes	No

Configuring the frequency output

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

Structure of the wizard for the frequency output



20 "Pulse/frequency/switch output" wizard in the "Advanced setup" submenu: "Operating mode" parameter"Frequency" option

Parameter overview with brief description

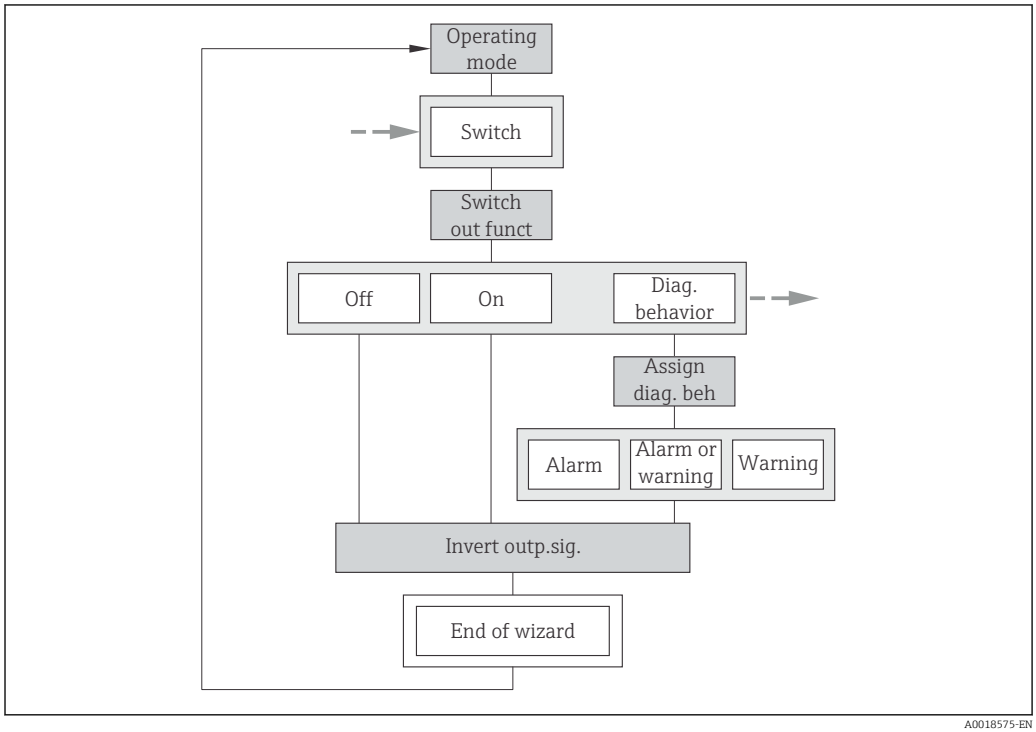
Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	▪ Pulse ▪ Frequency ▪ Switch	Pulse
Assign frequency output	In **Operating mode** parameter (→ 68), the **Frequency** option is selected.	Select process variable for frequency output.	▪ Off ▪ Volume flow ▪ Mass flow	Off

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
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 (→ 🖹 70): ▪ Volume flow ▪ Mass flow	Enter minimum frequency.	0 to 1 000 Hz	0 Hz
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 (→ 🖹 70): ▪ Volume flow ▪ Mass flow	Enter maximum frequency.	0 to 1 000 Hz	1 000 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 (→ 🖹 70): ▪ Volume flow ▪ Mass flow	Enter measured value for minmum 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 (→ 🖹 70): ▪ Volume flow ▪ Mass flow	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	In the **Operating mode** parameter (→ 🖹 68), the **Frequency** option is selected and one of the following options is selected in the **Assign frequency output** parameter (→ 🖹 70): ▪ Volume flow ▪ Mass flow	Define output behavior in alarm condition.	▪ Actual value ▪ Defined value ▪ 0 Hz	0 Hz
Failure frequency	In the **Operating mode** parameter (→ 🖹 68), the **Frequency** option is selected and one of the following options is selected in the **Assign frequency output** parameter (→ 🖹 70): ▪ Volume flow ▪ Mass flow	Enter frequency output value in alarm condition.	0.0 to 1 250.0 Hz	0.0 Hz
Invert output signal	–	Invert the output signal.	▪ No ▪ Yes	No

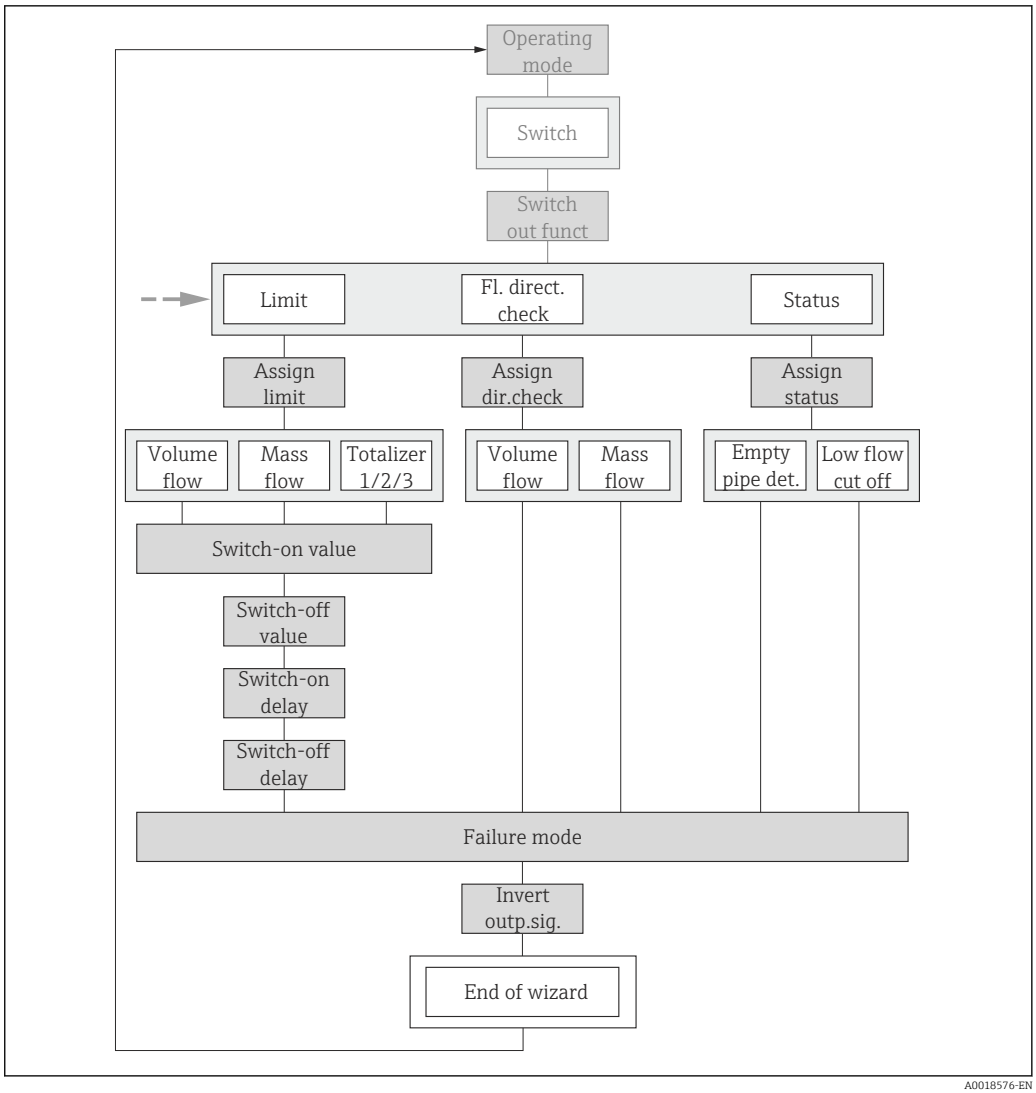
Configuring the switch output

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

Structure of the wizard for the switch output



21 "Pulse/frequency/switch output" wizard in the "Advanced setup" submenu: "Operating mode" parameter "Switch" option (part 1)



22 *"Pulse/frequency/switch output" wizard in the "Advanced setup" submenu: "Operating mode" parameter"Switch" option (part 2)*

Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	▪ Pulse ▪ Frequency ▪ Switch	Pulse
Switch output function	The **Switch** option is selected in the **Operating mode** parameter.	Select function for switch output.	▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit ▪ Flow direction check ▪ Status	Off
Assign diagnostic behavior	The **Diagnostic behavior** option is selected in the **Switch output function** parameter.	Select diagnostic behavior for switch output.	▪ Alarm ▪ Alarm or warning ▪ Warning	Alarm

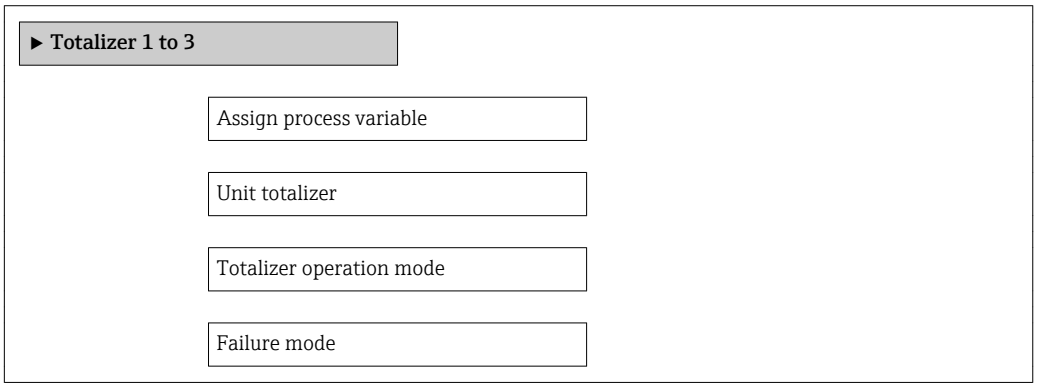
Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign limit	In **Switch output function** parameter, the **Limit** option is selected.	Select process variable for limit function.	▪ Volume flow ▪ Mass flow ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3	Volume flow
Assign flow direction check	The **Flow direction check** option is selected in the **Switch output function** parameter.	Select process variable for flow direction monitoring.	▪ Volume flow ▪ Mass flow	Volume flow
Assign status	The **Status** option is selected in the **Switch output function** parameter.	Select device status for switch output.	▪ Empty pipe detection ▪ Low flow cut off ▪ Digital output 6	Empty pipe detection
Switch-on value	In **Switch output function** parameter, the **Limit** option is selected.	Enter measured value for the switch-on point.	Signed floating-point number	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
Switch-off value	In **Switch output function** parameter, the **Limit** option is selected.	Enter measured value for the switch-off point.	Signed floating-point number	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
Switch-on delay	The **Limit** option is selected in the **Switch output function** parameter.	Define delay for the switch-on of status output.	0.0 to 100.0 s	0.0 s
Switch-off delay	The **Limit** option is selected in the **Switch output function** parameter.	Define delay for the switch-off of status output.	0.0 to 100.0 s	0.0 s
Failure mode	–	Define output behavior in alarm condition.	▪ Actual status ▪ Open ▪ Closed	Open
Invert output signal	–	Invert the output signal.	▪ No ▪ Yes	No

10.5.3 Configuring the totalizer

In the **"Totalizer 1 to 3" submenu** the individual totalizer can be configured.

Navigation

"Setup" menu → Advanced setup → Totalizer 1 to 3



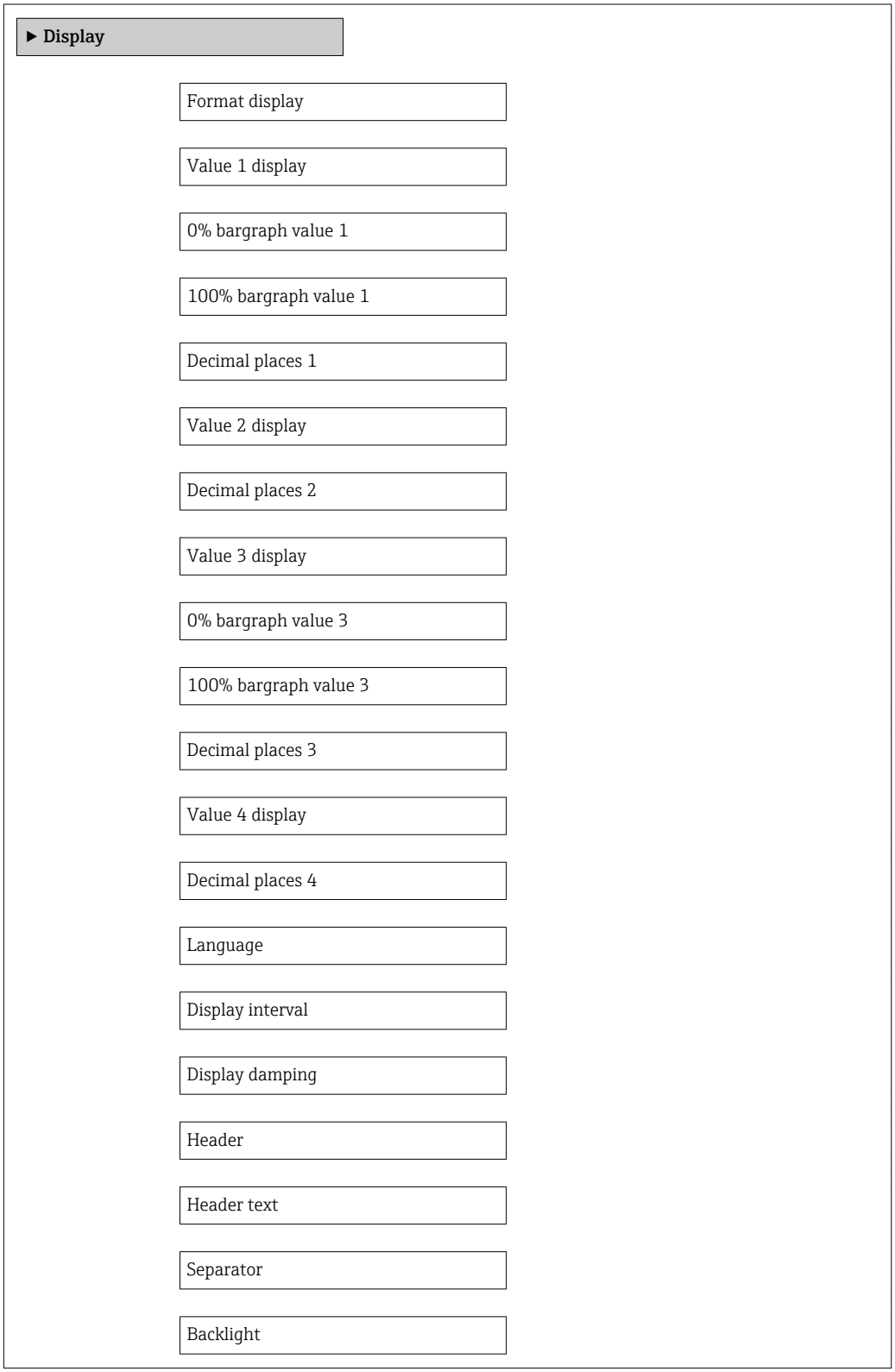
Parameter overview with brief description

Parameter	Prerequsite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	▪ Off ▪ Volume flow ▪ Mass flow	Volume flow
Unit totalizer	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Select process variable totalizer unit.	Unit choose list	Country-specific: ▪ l ▪ gal (us)
Totalizer operation mode	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Select totalizer calculation mode.	▪ Net flow total ▪ Forward flow total ▪ Reverse flow total	Net flow total
Failure mode	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Define totalizer behavior in alarm condition.	▪ Stop ▪ Actual value ▪ Last valid value	Stop

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



Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	▪ 1 value, max. size ▪ 1 bargraph + 1 value ▪ 2 values ▪ 1 value large + 2 values ▪ 4 values	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	▪ Volume flow ▪ Mass flow ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3	Volume flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 1	A measured value is specified in the **Value 1 display** parameter.	Select the number of decimal places for the display value.	▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see **Value 1 display** parameter	None
Decimal places 2	A measured value is specified in the **Value 2 display** parameter.	Select the number of decimal places for the display value.	▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx	x.xx
Value 3 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see **Value 1 display** parameter	None
0% bargraph value 3	A selection has been made in the **Value 3 display** parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: ▪ 0 l/h ▪ 0 gal/min (us)
100% bargraph value 3	An option was selected in the **Value 3 display** parameter.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter
Decimal places 3	A measured value is specified in the **Value 3 display** parameter.	Select the number of decimal places for the display value.	▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx	x.xx
Value 4 display	A local display is provided.	Select the measured value that is shown on the local display.	Picklist see **Value 1 display** parameter	None
Decimal places 4	A measured value is specified in the **Value 4 display** parameter.	Select the number of decimal places for the display value.	▪ x ▪ x.x ▪ x.xx ▪ x.xxx ▪ x.xxxx	x.xx

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Language	A local display is provided.	Set display language.	▪ English ▪ Deutsch * ▪ Français * ▪ Español * ▪ Italiano * ▪ Nederlands * ▪ Portuguesa * ▪ Polski * ▪ русский язык (Russian) * ▪ Svenska * ▪ Türkçe * ▪ 中文 (Chinese) * ▪ 日本語 (Japanese) * ▪ 한국어 (Korean) * ▪ العَرَبيّة (Arabic) * ▪ Bahasa Indonesia * ▪ ภาษาไทย (Thai) * ▪ 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	5 s
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	▪ Device tag ▪ Free text	Device tag
Header text	The **Free text** option is selected in the **Header** parameter.	Enter display header text.	Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)	----------
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	▪ . (point) ▪ , (comma)	. (point)
Backlight	–	Switch the local display backlight on and off. Only for device version with local display SD03 (touch control)	▪ Disable ▪ Enable	Disable

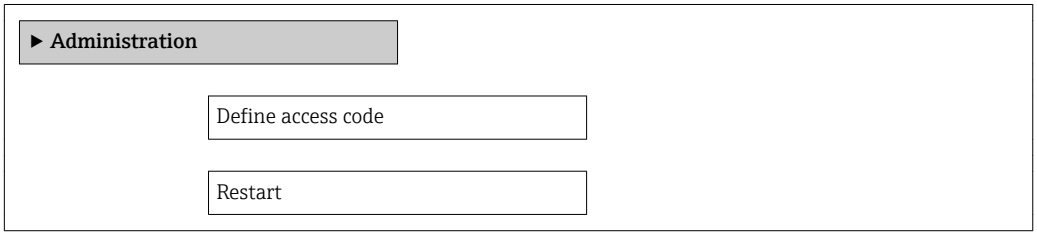
* Visibility depends on order options or device settings

10.5.5 Administration configuration

The **Administration** submenu contains administrative parameters.

Navigation

"Setup" menu → Advanced setup → Administration



Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Define access code	Restrict write-access to parameters to protect the configuration of the device against unintentional changes via the local display.	0 to 9 999	0
Device reset		▪ Cancel ▪ To factory defaults ▪ To delivery settings ▪ Restart device	Cancel

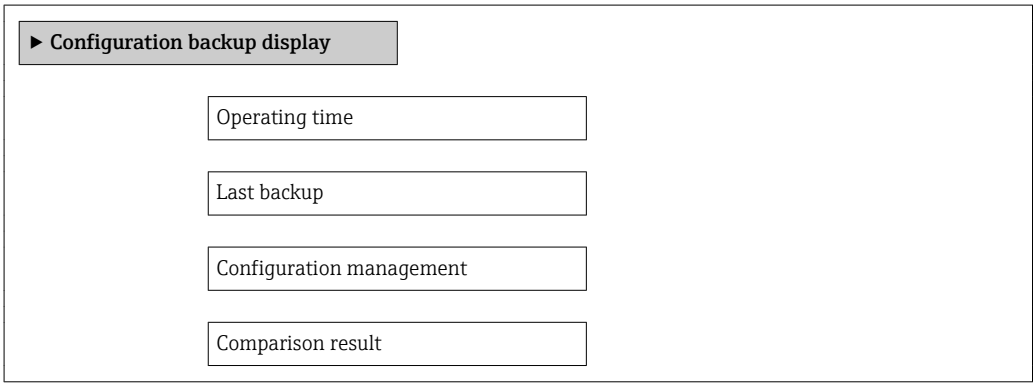
10.6 Configuration management

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



Parameter overview with brief description

Parameter	Prerequsite	Description	User interface / Selection	Factory setting
Operating time	–	Indicates how long the device has been in operation.	Days (d), hours (h), minutes (m) and seconds (s)	–
Last backup	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)	–

Parameter	Prerequsite	Description	User interface / Selection	Factory setting
Configuration management	A local display is provided.	Select action for managing the device data in the display module.	▪ Cancel ▪ Execute backup ▪ Restore ▪ Duplicate ▪ Compare ▪ Clear backup data ▪ Display incompatible	Cancel
Comparison result	A local display is provided.	Comparison between present device data and display backup.	▪ Settings identical ▪ Settings not identical ▪ No backup available ▪ Backup settings corrupt ▪ Check not done ▪ Dataset incompatible	Check not done

10.6.1 Function scope of the "Configuration management" parameter

Options	Description
Execute backup	The current device configuration is backed up from the integrated HistoROM to the device's display module. 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.
Duplicate	The transmitter configuration from another device is duplicated to the device using the display module.
Compare	The device configuration saved in the display module is compared with the current device configuration of the integrated HistoROM.
Clear backup data	The backup copy of the device configuration is deleted from the display module of the device.

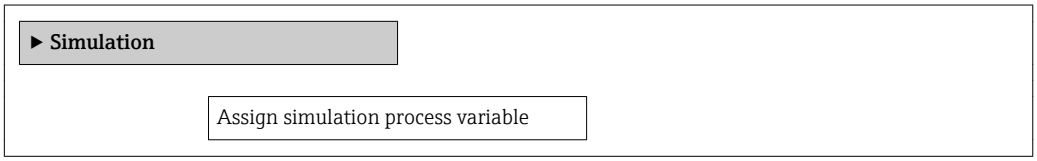
Integrated HistoROM
A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

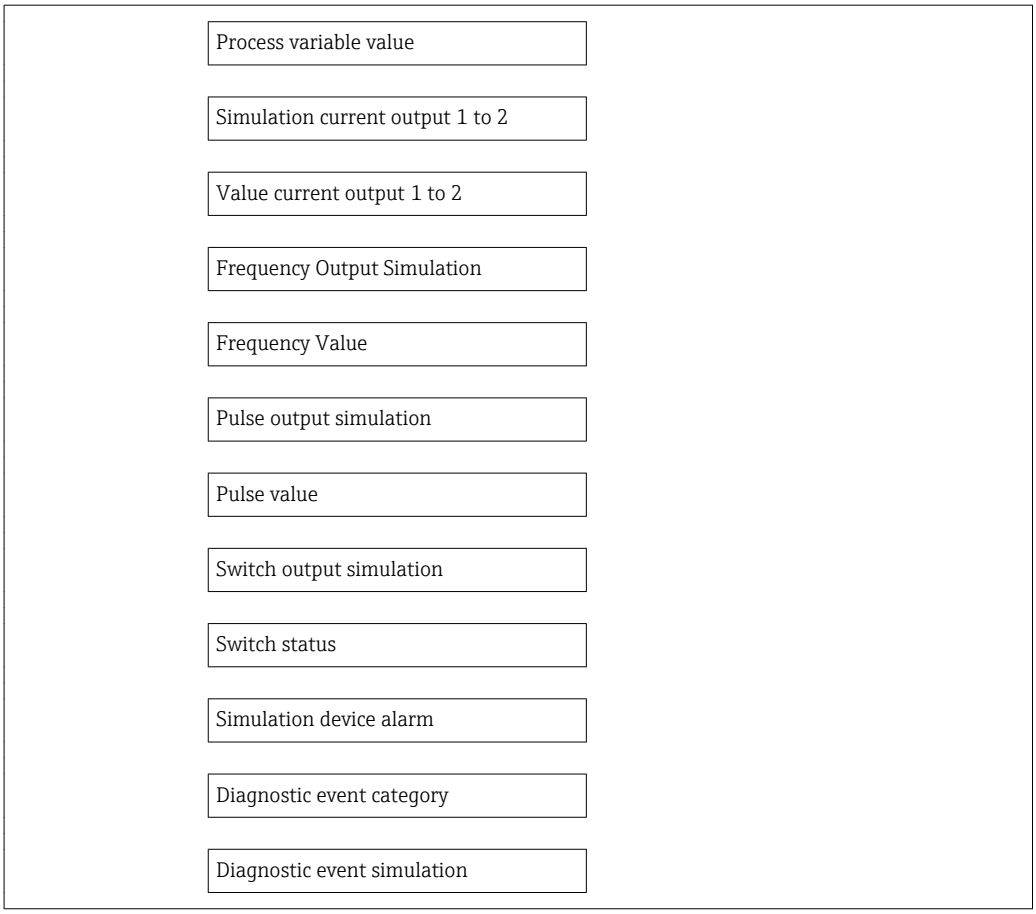
While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

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





Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	▪ Off ▪ Volume flow ▪ Mass flow	Off
Process variable value	One of the following options is selected in the **Assign simulation process variable** parameter (→ 🖹 81): ▪ Volume flow ▪ Mass flow	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Simulation current output 1 to 2	–		▪ Off ▪ On	Off
Value current output 1 to 2	In the **Simulation current output 1 to 2** parameter, the **On** option is selected.		3.59 to 22.5 mA	3.59 mA
Frequency Output Simulation	The **Frequency** option is selected in the **Operating mode** parameter.	Switch the simulation of the frequency output on and off.	▪ Off ▪ On	Off
Frequency Value	The **On** option is selected in the **Frequency Output Simulation** parameter.	Enter the frequency value for the simulation.	0.0 to 1250.0 Hz	0.0 Hz

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Pulse output simulation	The **Pulse** option is selected in the **Operating mode** parameter.	Set and switch off the pulse output simulation. For **Fixed value** option: **Pulse width** parameter (→ 69) defines the pulse width of the pulses output.	▪ Off ▪ Fixed value ▪ Down-counting value	Off
Pulse value	In the **Pulse output simulation** parameter (→ 82), the **Down-counting value** option is selected.	Enter the number of pulses for simulation.	0 to 65 535	0
Switch output simulation	The **Switch** option is selected in the **Operating mode** parameter.	Switch the simulation of the switch output on and off.	▪ Off ▪ On	Off
Switch status	The **On** option is selected in the **Switch output simulation** parameter (→ 82).	Select the status of the status output for the simulation.	▪ Open ▪ Closed	Open
Simulation device alarm	–	Switch the device alarm on and off.	▪ Off ▪ On	Off
Diagnostic event category	–	Select a diagnostic event category.	▪ Sensor ▪ Electronics ▪ Configuration ▪ Process	Process
Diagnostic event simulation	–	Select a diagnostic event to simulate this event.	▪ Off ▪ Diagnostic event picklist (depends on the category selected)	Off

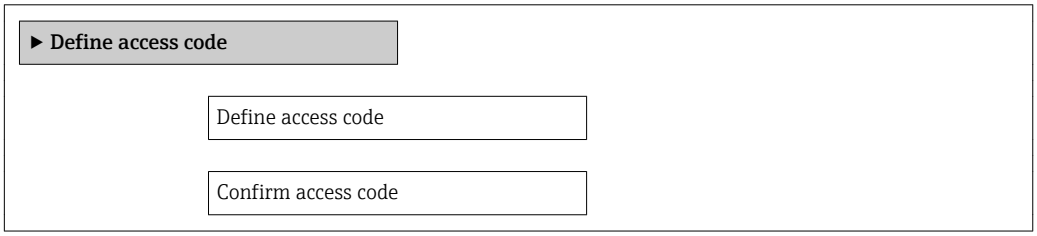
10.8 Protecting settings from unauthorized access

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 → 49
- FOUNDATION Fieldbus: write protection via block operation → 84

10.8.1 Write protection via access code

With the customer-specific access code, the parameters for the measuring device configuration are write-protected and their values can no longer be changed via local operation.

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



Defining the access code via local display

1. Navigate to the **Enter access code** parameter.
2. Max. Define a max. 4-digit numeric code as an access code.
3. Enter the access code again 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 write access is activated via access code, it can be also be deactivated only via the access code → 📄 49.
- The user role with which the user is currently logged on via the local display → 📄 49 is indicated by the **Access status display** parameter. Navigation path: "Operation" menu → Access status display

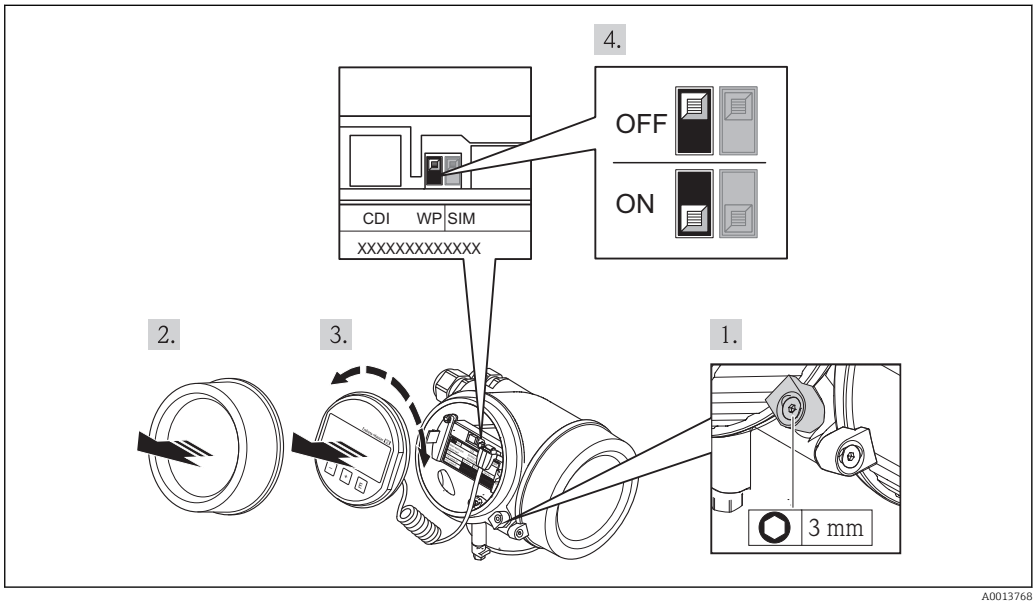
Parameters which can always be modified via the local display

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

10.8.2 Write protection via write protection switch

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

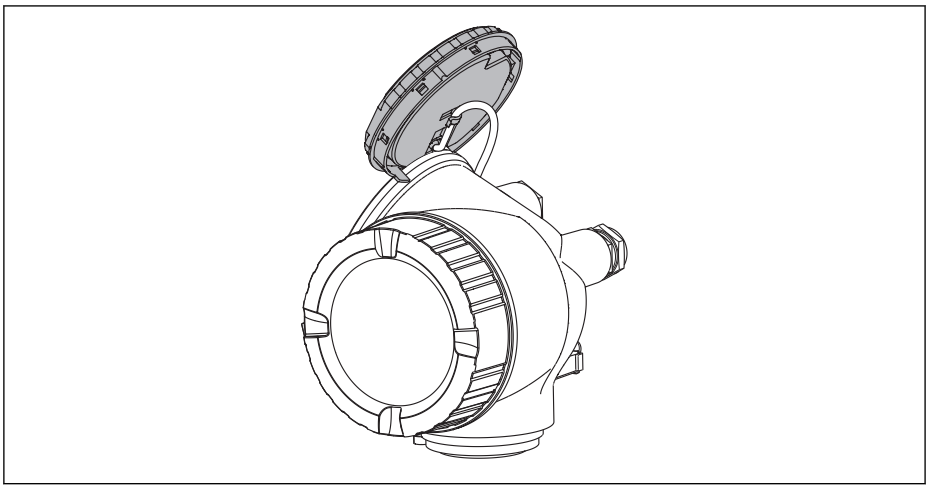
The parameter values are now read only and cannot be edited any more (exception **"Contrast display" parameter**):
- Via local display
- Via FOUNDATION Fieldbus



A0013768

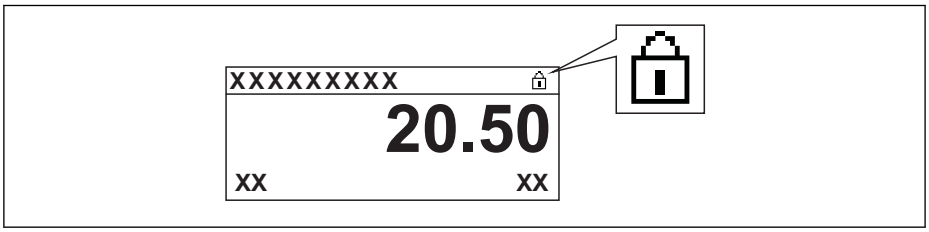
1. Loosen the securing clamp.
2. Unscrew the electronics compartment cover.

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.



A0013909

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 hardware write protection is enabled, the **Locking status** parameter displays the **Hardware locked** option . 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.



A0015870

   If hardware write protection is disabled, no option is displayed in the **Locking status** parameter . 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**

11 Operation

11.1 Reading the device locking status

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

Navigation
"Operation" menu → Locking status

Function scope of the "Locking status" parameter

Options	Description
None	The access status displayed in **"Access status display" parameter** applies → 49. 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	Write access to the parameters is temporarily lock due to device-internal processing (e.g. data upload/download, reset). Once the internal processing has been completed, the parameters can be changed once again.

11.2 Adjusting the operating language

Information → 57

For information on the operating languages supported by the measuring device → 139

11.3 Configuring the display

- Basic settings for local display → 61
- Advanced settings for local display → 76

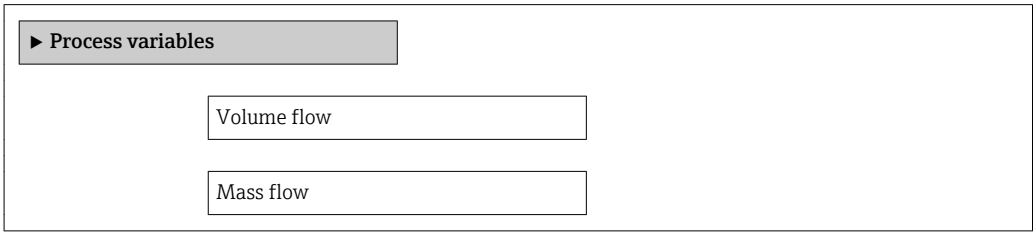
11.4 Reading measured values

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 every process variable.

Navigation
"Diagnostics" menu → Measured values → Process variables



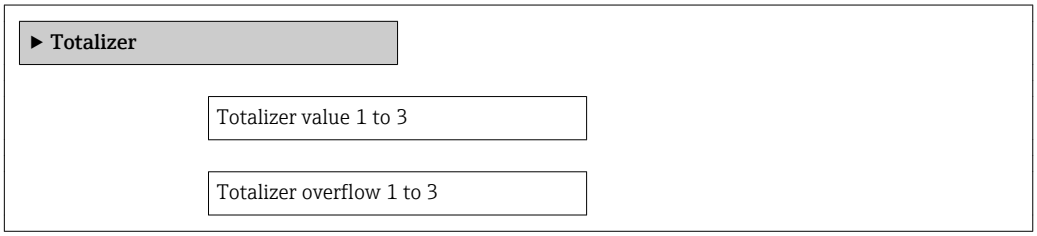
Parameter overview with brief description

Parameter	Description	User interface
Volume flow	Displays the volume flow currently measured. *Dependency* The unit is taken from the **Volume flow unit** parameter	Signed floating-point number
Mass flow	Displays the mass flow currently calculated. *Dependency* The unit is taken from the **Mass flow unit** parameter	Signed floating-point number

11.4.2 Totalizer

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

Navigation
"Diagnostics" menu → Measured values → Totalizer



Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Totalizer value 1 to 3	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to 3	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Displays the current totalizer overflow.	Integer with sign

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:
- Basic settings using the **Setup** menu
- Advanced settings using the **Advanced setup** submenu

11.6 Performing a totalizer reset

In the **Operation** submenu the totalizers are reset:
- Control Totalizer
- Reset all totalizers

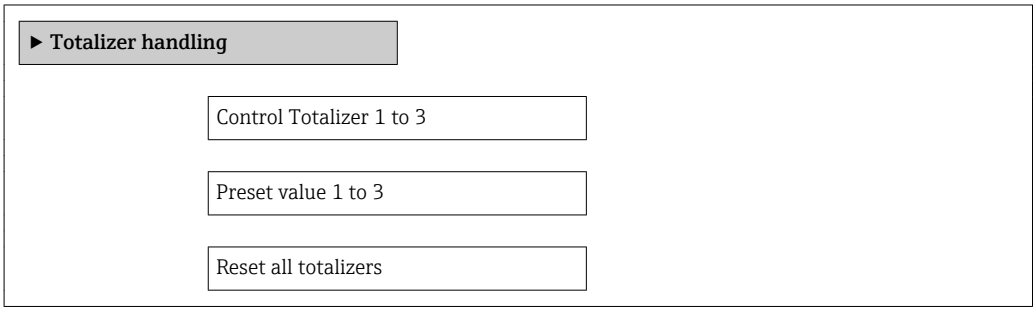
Function scope of the "Control Totalizer" parameter

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

Function scope of the "Reset all totalizers" parameter

Options	Description
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totalized.

Navigation
"Operation" menu → Totalizer handling



Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to 3	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Control totalizer value.	▪ Totalize ▪ Reset + hold ▪ Preset + hold ▪ Reset + totalize ▪ Preset + totalize ▪ Hold	Totalize
Preset value 1 to 3	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 75) of the **Totalizer 1 to 3** submenu: ▪ Volume flow ▪ Mass flow	Specify start value for totalizer. *Dependency* The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 🖹 75).	Signed floating-point number	Country-specific: ▪ 0 l ▪ 0 gal (us)
Reset all totalizers	–	Reset all totalizers to 0 and start.	▪ Cancel ▪ Reset + totalize	Cancel

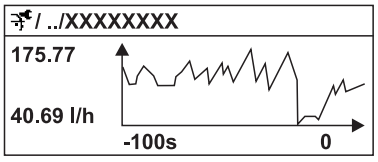
11.7 Showing data logging

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

The measured value history is also accessible via the FieldCare plant asset management tool → 52.

Function scope

- 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



A0016222

23 Chart of a measured value trend

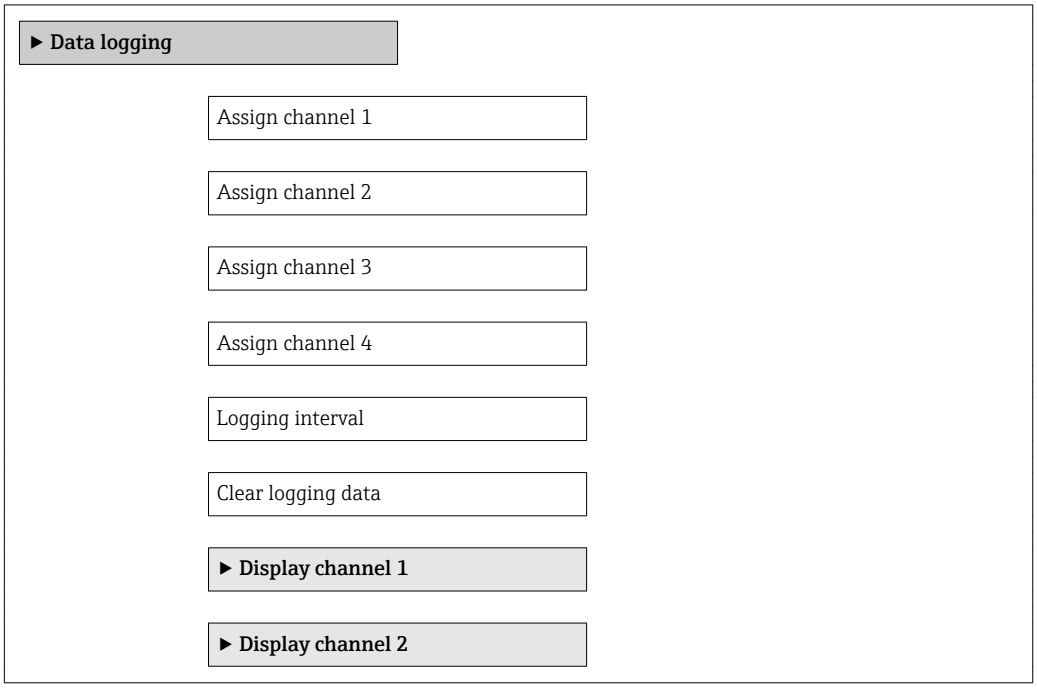
- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

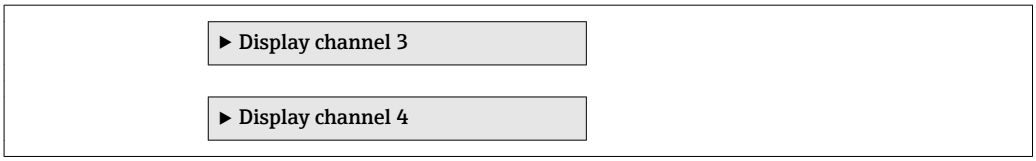
If the length of the logging interval or the assignment of the process variables to the channels is changed, the content of the data logging is deleted.

Navigation

"Diagnostics" menu → Data logging

"Data logging" submenu





Parameter overview with brief description

Parameter	Prerequsite	Description	Selection / User entry	Factory setting
Assign channel 1 to 4	The **Extended HistoROM** application package is available. The software options currently enabled are displayed in the **Software option overview** parameter.	Assign process variable to logging channel.	▪ Off ▪ Volume flow ▪ Mass flow ▪ Electronic temperature ▪ Current difference potential	Off
Logging interval	The **Extended HistoROM** application package is available. The software options currently enabled are displayed in the **Software option overview** parameter.	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	10.0 s
Clear logging data	The **Extended HistoROM** application package is available. The software options currently enabled are displayed in the **Software option overview** parameter.	Clear the entire logging data.	▪ Cancel ▪ Clear data	Cancel

12 Diagnostics and troubleshooting

12.1 General troubleshooting

For local display

Problem	Possible causes	Remedy
Local display dark and no output signals	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Local display dark and no output signals	The polarity of the supply voltage is wrong.	Correct the polarity.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part → 🖹 118.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	▪ Set the display brighter by simultaneously pressing ⊞ + Ⓔ. ▪ 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 → 🖹 118.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Perform remedial measures → 🖹 99
Text on local display appears in a foreign language and cannot be understood.	Incorrect operating language is configured.	1. Press 2 s ⊟ + ⊞ ("home position"). 2. Press Ⓔ. 3. Set the desired language in the **Language** parameter.
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	▪ Check the cable and the connector between the main electronics module and display module. ▪ Order spare part → 🖹 118.

For output signals

Problem	Possible causes	Remedy
Signal output outside the valid range	Main electronics module is defective.	Order spare part → 🖹 118.
Device shows correct value on local display, but signal output is incorrect, though in the valid range.	Configuration error	Check and correct the parameter configuration.
Device measures incorrectly.	Configuration error or device is operated outside the application.	1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".

For access

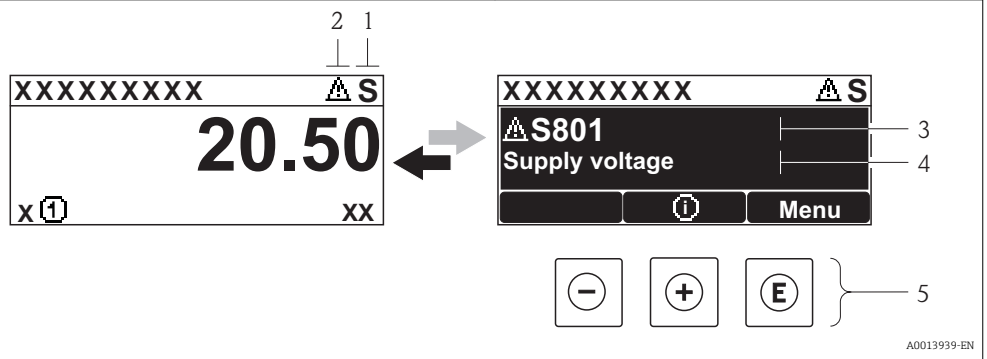
Problem	Possible causes	Remedy
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the main electronics module to the OFF position .
No write access to parameters	Current user role has limited access authorization	1. Check user role → 🖹 49. 2. Enter correct customer-specific access code → 🖹 49.
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



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

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

Other diagnostic events that have occurred can be called up in the **Diagnostics** menu:
- Via parameters → 111
- Via submenus → 112

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 A0013956	**Failure** A device error has occurred. 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 operated: Outside its technical specification limits (e.g. outside the process temperature range)
M A0013957	**Maintenance required** Maintenance is required. The measured value remains valid.

Diagnostic behavior

Symbol	Meaning
 A0013961	**Alarm** ▪ 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.
 A0013962	**Warning** Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.

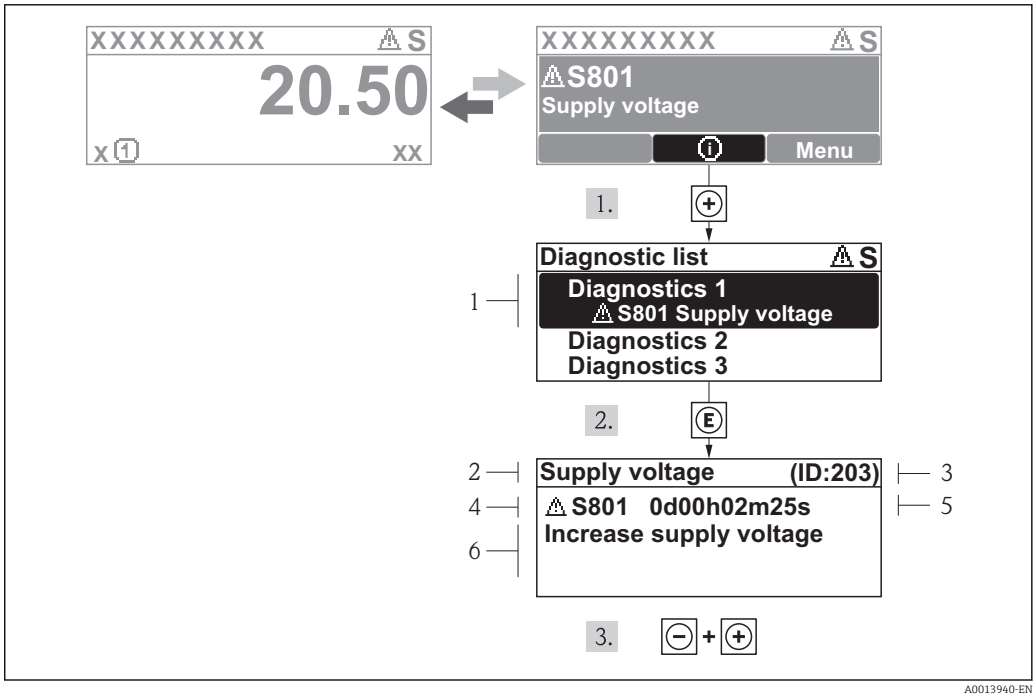
Diagnostic information

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
 A0013970	**Plus key** *In a menu, submenu* Opens the message about remedy information.
 A0013952	**Enter key** *In a menu, submenu* Opens the operating menu.

12.2.2 Calling up remedial measures



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

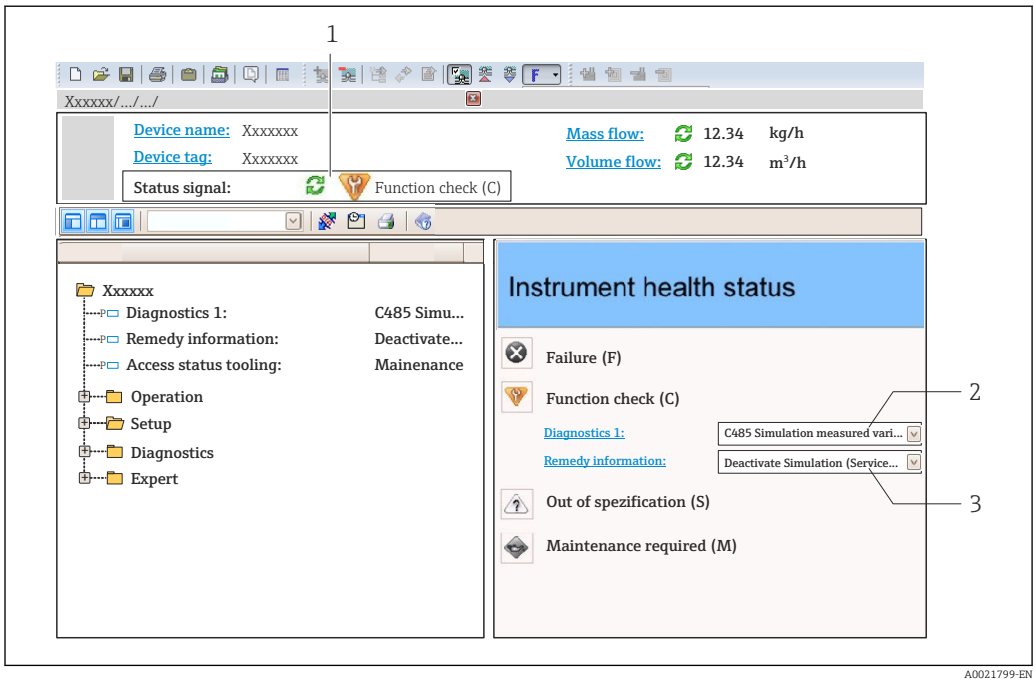
The user is in the **Diagnostics** menu at an entry for a diagnostics event, e.g. in the **Diagnostic list** submenu or the **Previous diagnostics** parameter.

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

12.3 Diagnostic information in 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 → 92*
2 *Diagnostic information → 93*
3 *Remedy information with Service ID*

Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostics** menu:
- Via parameter → 111
- Via submenu → 112

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 certain diagnostic information in the **Diagnostic behavior** submenu.

"Expert" menu → System → Diagnostic handling → Diagnostic behavior

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 certain diagnostic information in the **Diagnostic event category** submenu .

"Expert" menu → Communication → Diagnostic event category

Available status signals

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

Symbol	Meaning
 A0013956	**Failure** A device error has occurred. The measured value is no longer valid.
 A0013959	**Function check** The device is in service mode (e.g. during a simulation).
A0013958	**Out of specification** The device is operated: ▪ 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**)
 A0013957	**Maintenance required** Maintenance is required. The measured value remains 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 the **FEATURE_SEL** parameter select the **Multi-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 (default value)

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 → 97.

Some diagnostic information can be assigned individually, irrespective of their range → 98

Overview and description of all diagnostic information → 99

Weighting	Status signal (factory setting)	Allocation	Diagnostic information range
Highest weighting	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 weighting	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 weighting	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 weighting	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 → 98

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 weighting	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 weighting	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 weighting	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 weighting	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 → 98		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/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 status signal change does not affect diagnostic information that already exists. The new status signal is only assigned if this error occurs again after the change has been made.

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 (default value) 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.

12.5.1 Diagnostic of sensor

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
004	Sensor		1. Change sensor 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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.

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
004	Sensor		1. Change sensor 2. Contact service	–
	Measuring 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 measuring variables
No.	Short text			
082	Data storage		1. Change main electronic module 2. Change sensor	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
083	Memory content		1. Restart device 2. Restore S-Dat data 3. Change sensor	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Bad		
	Quality substatus	Sensor failure		
	Status signal [from the factory] [1]	F		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

12.5.2 Diagnostic of electronic

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
222	Electronic drift		Change main electronic module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
242	Software incompatible		1. Check software 2. Flash or change main electronics module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
252	Modules incompatible		1. Check electronic modules 2. Change I/O or main electronic module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
261	Electronic modules		1. Restart device 2. Check electronic modules 3. Change I/O Modul or main electronics	–
	Measuring 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 measuring variables
No.	Short text			
262	Module connection		1. Check module connections 2. Change electronic modules	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
270	Main electronics failure		Change main electronic module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
271	Main electronics failure		1. Restart device 2. Change main electronic module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
272	Main electronics failure		1. Restart device 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
273	Main electronics failure		1. Emergency operation via display 2. Change main electronics	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
275	I/O module failure		Change I/O module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
276	I/O module failure		1. Restart device 2. Change I/O module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
282	Data storage		1. Restart device 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
283	Memory content		1. Transfer data or reset device 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
302	Device verification active		Device verification active, please wait.	▪ Mass flow ▪ Volume flow
	Measuring variable status			
	Quality	Uncertain		
	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 measuring variables
No.	Short text			
311	Electronic failure		1. Transfer data or reset device 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
311	Electronic failure		Maintenance required! 1. Do not perform reset 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] 1)	M		
	Diagnostic behavior	Warning		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
323	Electronic drift		1. Perform verification manually 2. Change electronic	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Uncertain		
	Quality substatus	Non specific		
	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 measuring variables
No.	Short text			
410	Data transfer		1. Check connection 2. Retry data transfer	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
412	Processing download		Download active, please wait	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Uncertain		
	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 measuring variables
No.	Short text			
437	Configuration incompatible		1. Restart device 2. Contact service	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
438	Dataset		1. Check data set file 2. Check device configuration 3. Up- and download new configuration	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Bad		
	Quality substatus	Configuration error		
	Status signal [from the factory] [1]	M		
	Diagnostic behavior	Warning		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
442	Frequency output		1. Check process 2. Check frequency output settings	–
	Measuring variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] [1]	S		
	Diagnostic behavior [from the factory] [2]	Warning		

1) Status signal can be changed.
2) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
443	Pulse output		1. Check process 2. Check pulse output settings	–
	Measuring variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] [1]	S		
	Diagnostic behavior [from the factory] [2]	Warning		

1) Status signal can be changed.
2) Diagnostic behavior can be changed.

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
453	Flow override		Deactivate flow override	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Uncertain		
	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 measuring variables
No.	Short text			
484	Simulation Failure Mode		Deactivate simulation	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status			
	Quality	Good		
	Quality substatus	Non specific		
	Status signal [from the factory] [1]	C		
	Diagnostic behavior	Alarm		

1) Status signal can be changed.

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
485	Simulation measured variable		Deactivate simulation	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
492	Simulation frequency output		Deactivate simulation frequency output	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
493	Simulation pulse output		Deactivate simulation pulse output	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
494	Switch output simulation		Deactivate simulation switch output	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
495	Diagnostic event simulation		Deactivate simulation	–
	Measuring 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 measuring variables
No.	Short text			
497	Simulation block output		Deactivate simulation	–
	Measuring 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 measuring variables
No.	Short text			
531	Empty pipe detection		Execute EPD adjustment	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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.

12.5.4 Diagnostic of process

Diagnostic information			Remedy instructions	Influenced measuring variables
No.	Short text			
801	Supply voltage too low		Increase supply voltage	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
832	Electronic temperature too high		Reduce ambient temperature	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
833	Electronic temperature too low		Increase ambient temperature	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
842	Process limit		Low flow cut off active! 1. Check low flow cut off configuration	▪ Mass flow ▪ Volume flow
	Measuring variable status			
	Quality	Uncertain		
	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 measuring variables
No.	Short text			
861	Process fluid		Check process conditions	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring variable status [from the factory] 1)			
	Quality	Uncertain		
	Quality substatus	Non specific		
	Status signal [from the factory] 2)	F		
	Diagnostic behavior [from the factory] 3)	Alarm		

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 measuring variables
No.	Short text			
862	Empty pipe		1. Check for gas in process 2. Adjust empty pipe detection	▪ Mass flow ▪ Volume flow
	Measuring 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 measuring variables
No.	Short text			
937	EMC interference		Change main electronic module	▪ Empty pipe detection ▪ Low flow cut off ▪ Mass flow ▪ Switch output status ▪ Volume flow
	Measuring 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.

12.6 Pending diagnostic events

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

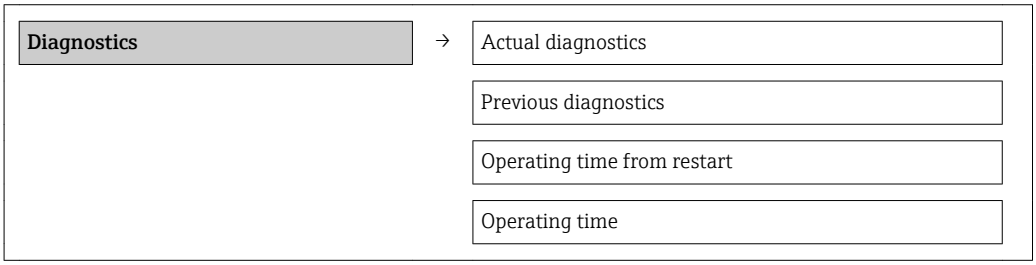
To call up the measures to rectify a diagnostic event:
- Via local display → 93
- Via "FieldCare" operating tool → 95

Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 112

Navigation

"Diagnostics" menu

Structure of the submenu



Parameter overview with brief description

Parameter	Prerequsite	Description	User interface
Actual diagnostics	A diagnostic event has occurred.	Shows the current occured 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)

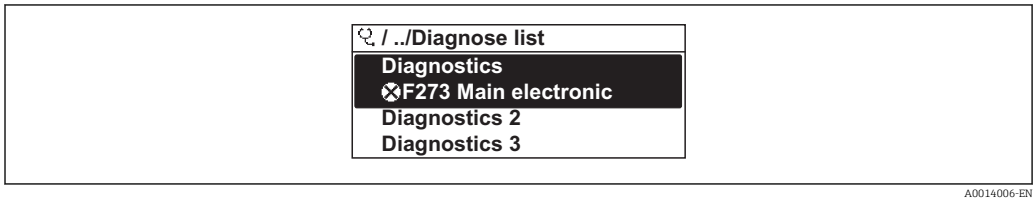
12.7 Diagnostic messages in the DIAGNOSTIC Transducer Block

- The **Actual Diagnostics** parameter shows the message with the highest priority.
- You can view a list of the active alarms via the **Diagnostics 1** to **Diagnostics 5** parameters. 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.

12.8 Diagnostic list

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

Navigation path
Diagnostics menu → **Diagnostic list** submenu

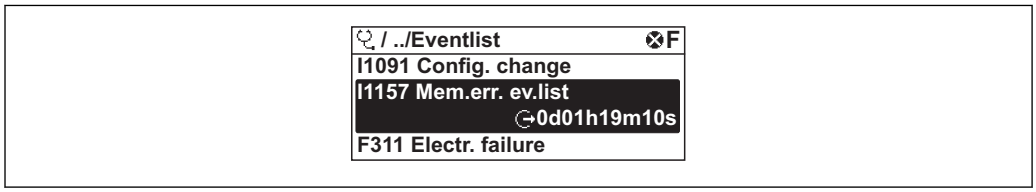


25 *Illustrated using the example of the local display*

To call up the measures to rectify a diagnostic event:
- Via local display → 93
- Via "FieldCare" operating tool → 95

12.9 Event logbook

12.9.1 Event history



26 *Taking the example of the local display*

To call up the measures to rectify a diagnostic event:
- Via local display → 93
- Via "FieldCare" operating tool → 95

For filtering the displayed event messages → 112

12.9.2 Filtering the event logbook

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

Navigation path
"Diagnostics" menu → 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
I1137	Electronic changed
I1151	History reset
I1154	Reset terminal voltage min/max
I1155	Reset electronics 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
I1227	Sensor emergency mode activated
I1228	Sensor emergency mode failed
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1440	Main electronic module changed
I1442	I/O module changed
I1444	Device verification passed
I1445	Device verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1552	Failed: Main electronic verification
I1554	Safety sequence started

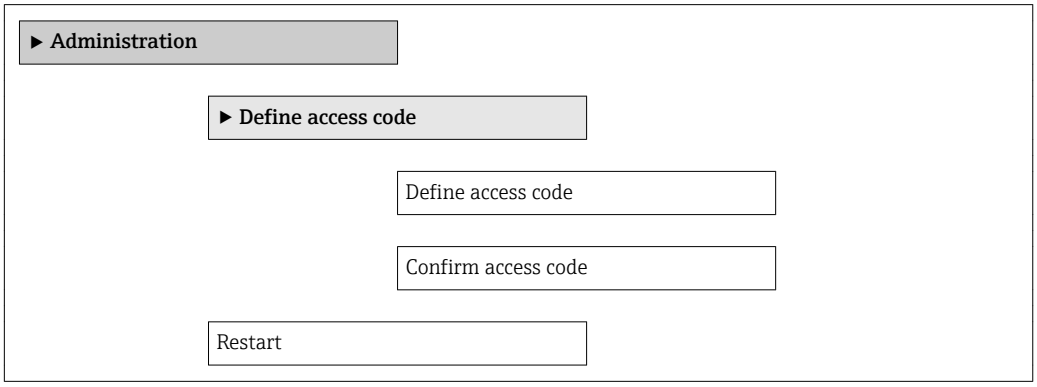
Info number	Info name
I1555	Safety sequence confirmed
I1556	Safety mode off

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.

Navigation

"Setup" menu → Advanced setup → Administration → Restart



Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Restart	Restart or reset device manually.	▪ Uninitialized ▪ Run ▪ Resource ▪ Defaults ▪ Processor ▪ To factory defaults ▪ To delivery settings ▪ ENP restart ▪ To transducer defaults ▪ Factory Default Blocks	Uninitialized

12.10.1 Function scope of the "Restart" parameter

Options	Description
Uninitialized	Has no effect on the device.
Run	Has no effect on the device.
Resource	Has no effect on the device.
Defaults	All FOUNDATION Fieldbus blocks are reset to their default values. Example: AI channel to the value "Uninitialized".
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 the factory settings.
To delivery settings	The extended FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information) and the device parameters are reset to the as-delivered settings.

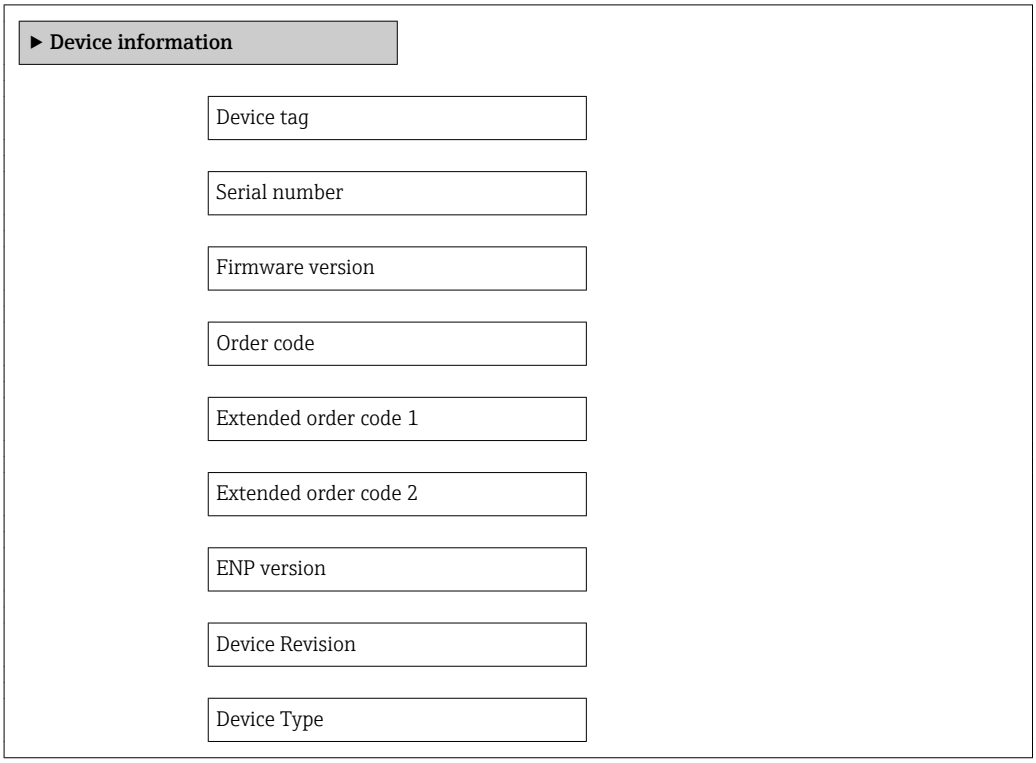
Options	Description
ENP restart	The parameters of the electronic name plate are reset. The device is restarted.
To transducer defaults	Certain device parameters are reset. The parameters of the FOUNDATION Fieldbus blocks remain unchanged.
Factory Default Blocks	The extended FOUNDATION Fieldbus parameters (FOUNDATION Fieldbus blocks, schedule information) are reset to the default settings.

12.11 Device information

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

Navigation

"Diagnostics" menu → Device information



Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Serial number		A maximum of 11-digit character string comprising letters and numbers.	–
Firmware version		Character string with the following format: xx.yy.zz	01.01.zz
Device name		Promag 200	–
Order code		Character string composed of letters, numbers and certain punctuation marks (e.g. /).	–
Extended order code 1		Character string	–

Parameter	Description	User interface	Factory setting
Extended order code 2		Character string	–
Extended order code 3		Character string	–
ENP version			2.02.00

12.12 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
06.2015	01.00.zz	Option **76**	Original firmware	Operating Instructions	BA01377D/06/EN/01.15

Flashing the firmware to the current version or to the previous version is possible via the service interface (CDI) .

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 Internet site: www.endress.com → Download
- Specify the following details:
  - Text search: Manufacturer's information
  - Search range: documentation

13 Maintenance

13.1 Maintenance tasks

No special maintenance work is required.

13.1.1 Exterior cleaning

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

13.1.2 Interior cleaning

No interior cleaning is planned for the device.

13.1.3 Replacing seals

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

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

Replacement seals (accessory) → 141

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.

For a list of some of the measuring and test equipment, refer to the "Accessories" chapter of the "Technical Information" document for the device.

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 Repair

14.1 General notes

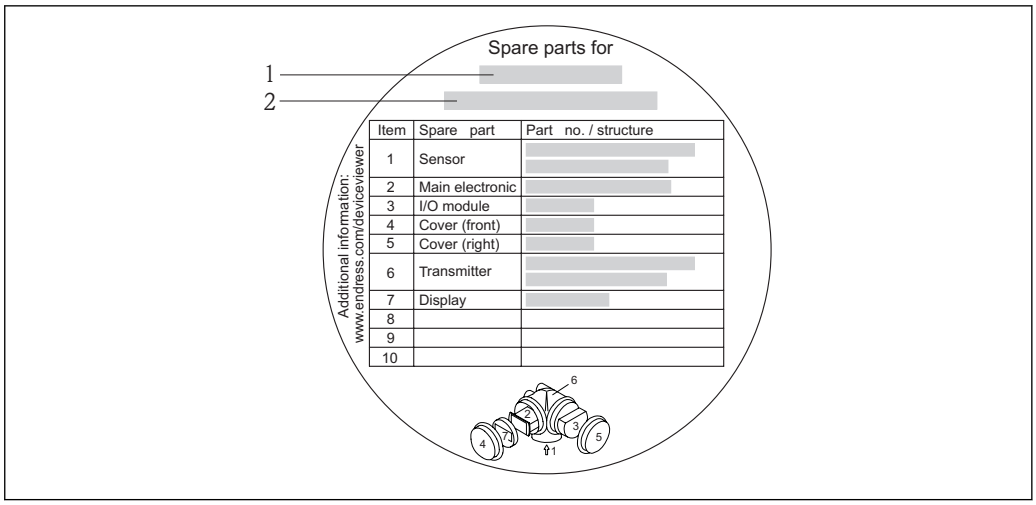
Repair and conversion concept
The Endress+Hauser repair and conversion concept provides for the following:
- The measuring devices have a modular design.
- Spare parts are grouped into logical kits with the associated Installation Instructions.
- Repairs are carried out by Endress+Hauser Service or by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

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.



27 *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

1. Switch off the device.
2. **WARNING!** Danger to persons from process conditions. Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive fluids.

   Carry out the mounting and connection steps from the chapters "Mounting the measuring device" and "Connecting the measuring device" in the logically reverse sequence. 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
Remote display FHX50	FHX50 housing to accommodate a display module → 138. ▪ FHX50 housing suitable for: – SD02 display module (push buttons) – SD03 display module (touch control) ▪ Housing material: – 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)) 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: ▪ 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): – Option C: for an SD02 display module (push buttons) – Option E: for an SD03 display module (touch control) 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: ▪ Feature 050 (measuring device version): option B "Not prepared for FHX50 display" ▪ Feature 020 (display, operation): option A "None, existing displayed used" For details, see Special Documentation SD01007F
Overvoltage protection for 2-wire devices	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. ▪ OVP10: For 1-channel devices (characteristic 020, option A): ▪ OVP20: For 2-channel devices (characteristic 020, options B, C, E or G) For details, see Special Documentation SD01090F.
Weather protection cover	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. For details, see Special Documentation SD00333F

15.1.2 For the sensor

Accessories	Description
Seal set	For the regular replacement of seals for the sensor.
Welding jig	Welded connection as process connection: welding jig for installation in pipe.

Grounding rings	Are used to ground the fluid in lined measuring tubes to ensure proper measurement. For details, see Installation Instructions EA00070D
Mounting kit	Consists of: ▪ 2 process connections ▪ Screws ▪ Seals

15.2 Communication-specific accessories

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

15.3 Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the data needed to determine the optimum flowmeter: e.g. nominal diameter, pressure drop, performance characteristics or process connections. ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters throughout the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://wapps.endress.com/applicator ▪ On CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant information is available for every measuring device over time entire life cycle, such as the device status, spare parts, device-specific documentation, etc. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details, see Operating Instructions BA00027S and BA00059S

15.4 System components

Accessories	Description
Memograph M graphic display recorder	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. For details, see "Technical Information" TI00133R and Operating Instructions BA00247R

16 Technical data

16.1 Application

The measuring device is only suitable for flow measurement of liquids with a minimum conductivity of 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 adequately resistant.

16.2 Function and system design

Measuring principle

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

Measuring system

The device consists of a transmitter and a sensor.

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

For information on the structure of the measuring device → 📄 12

16.3 Input

Measured variable

Direct measured variables

Volume flow (proportional to induced voltage)

Calculated measured variables

Mass flow

Measuring range

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

Flow characteristic values in SI units

Nominal diameter		Recommended flow	Factory settings		
		Min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
2	1/12	0.06 to 1.8	0,5	0.005	0,01
4	1/8	0.25 to 7	2	0.025	0,05
8	3/8	1 to 30	8	0.1	0,1
15	½	4 to 100	25	0.2	0,5
25	1	9 to 300	75	0.5	1

Flow characteristic values in US units

Nominal diameter		Recommended flow	Factory settings		
		Min./max. full scale value (v ~ 0.3/10 m/s)	Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1/12	2	0.015 to 0.5	0,1	0,001	0,002
1/8	4	0.07 to 2	0,5	0,005	0,008
3/8	8	0.25 to 8	2	0,02	0,025
½	15	1 to 27	6	0,05	0,1
1	25	2.5 to 80	18	0,2	0,25

Recommended measuring range

"Flow limit" section → 🖹 134

Operable flow range

Over 1000 : 1

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	▪ DC 35 V ▪ 50 mA
Voltage drop	▪ 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	▪ Volume flow ▪ Mass flow
Frequency output	
Output frequency	Adjustable: 0 to 1 000 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	▪ Volume flow ▪ Mass flow
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s

Number of switching cycles	Unlimited
Assignable functions	▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit value – Volume flow – Mass flow ▪ Flow direction monitoring ▪ Status – Empty pipe detection – Low flow cut off

FOUNDATION Fieldbus

Signal encoding	Manchester Bus Powered (MBP)
Data transfer	31.25 KBit/s, Voltage mode

Signal on alarm

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

Pulse/frequency/switch output

Pulse output

Failure mode	Choose from: ▪ Actual value ▪ No pulses

Frequency output

Failure mode	Choose from: ▪ Actual value ▪ 0 Hz ▪ Defined value: 0 to 1 250 Hz

Switch output

Failure mode	Choose from: ▪ Current status ▪ Open ▪ Closed

FOUNDATION Fieldbus

Status and alarm messages	Diagnostics in accordance with FF-912
Error 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

Operating tool

- Via digital communication:
  FOUNDATION Fieldbus
- Via 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

FOUNDATION Fieldbus

Manufacturer ID	0x452B48
Ident number	0x1048
Device revision	1
DD revision	Information and files under: ▪ 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: ▪ 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

Transducer Blocks

Block	Contents	Output values
Setup Transducer Block (TRDSUP)	All parameters for standard commissioning.	No output values
Advanced Setup Transducer Block (TRDASUP)	All parameters for more accurate measurement configuration.	No output values
Display Transducer Block (TRDDISP)	Parameters for configuring the local display.	No output values
HistoROM Transducer Block (TRDHROM)	Parameters for using the HistoROM function.	No output values
Diagnostic Transducer Block (TRDDIAG)	Diagnostics information.	Process variables (AI Channel) ▪ Temperature (7) ▪ Volume flow (9) ▪ Mass flow (11)
Expert Configuration Transducer Block (TRDEXP)	Parameters that require the user to have in-depth knowledge of the operation of the device in order to configure the parameters appropriately.	No output values
Expert Information Transducer Block (TRDEXPIN)	Parameters that provide information about the state of the device.	No output values
Service Sensor Transducer Block (TRDSRVS)	Parameters that can only be accessed by Endress +Hauser Service.	No output values
Service Information Transducer Block (TRDSRVIF)	Parameters that provide Endress+Hauser Service with information about the state of the device.	No output values
Total Inventory Counter Transducer Block (TRDTIC)	Parameters for configuring all the totalizers and the inventory counter.	Process variables (AI Channel) ▪ Totalizer 1 (16) ▪ Totalizer 2 (17) ▪ Totalizer 3 (18)
Heartbeat Technology Transducer Block (TRDHBT)	Parameters for the configuration and comprehensive information about the results of the verification.	No output values
Heartbeat Results 1 Transducer Block (TRDHBTR1)	Information about the results of the verification.	No output values
Heartbeat Results 2 Transducer Block (TRDHBTR2)	Information about the results of the verification.	No output values
Heartbeat Results 3 Transducer Block (TRDHBTR3)	Information about the results of the verification.	No output values
Heartbeat Results 4 Transducer Block (TRDHBTR4)	Information about the results of the verification.	No output values

Function blocks

Block	Number of blocks	Contents	Process variables (Channel)
Resource Block (RB)	1	This Block (extended functionality) contains all the data that uniquely identify the device; it is the equivalent of an electronic nameplate for the device.	–
Analog Input Block (AI)	4	This Block (extended functionality) receives the measurement data provided by the Sensor Block (can be selected via a channel number) and makes the data available for other blocks at the output. **Execution time:** 25 ms	Process variables (AI Channel) ▪ Temperature (7) ▪ Volume flow (9) ▪ Mass flow (11)
Discrete Input Block (DI)	2	This Block (standard functionality) receives a discrete value (e.g. indicator that measuring range has been exceeded) and makes the value available for other blocks at the output. **Execution time:** 19 ms	▪ Switch output state (101) ▪ Empty pipe detection (102) ▪ Low flow cut off (103) ▪ Status verification (105)
PID Block (PID)	1	This Block (standard functionality) acts as a proportional-integral-differential controller and can be used universally for control in the field. It enables cascading and feedforward control. **Execution time:** 25 ms	–
Multiple Digital Output Block (MDO)	1	This Block (standard functionality) receives several discrete values and makes them available for other blocks at the output. **Execution time:** 19 ms	Channel_DO (122) ▪ Value 1: Reset totalizer 1 ▪ Value 2: Reset totalizer 2 ▪ Value 3: Reset totalizer 3 ▪ Value 4: Flow override ▪ Value 5: Start heartbeat verification ▪ Value 6: Status switch output ▪ Value 7: Not assigned ▪ Value 8: Not assigned
Integrator Block (IT)	1	This Block (standard functionality) integrates a measured variable over time or totalizes the pulses from a Pulse Input Block. The Block can be used as a totalizer that totalizes until a reset, or as a batch totalizer whereby the integrated value is compared against a target value generated before or during the control routine and generates a binary signal when the target value is reached. **Execution time:** 21 ms	–

16.5 Power supply

Terminal assignment → 29

Pin assignment, device plug → 29

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"	Maximum power consumption
Option **E**: FOUNDATION Fieldbus, pulse/ frequency/switch output	▪ Operation with output 1: 576 mW ▪ Operation with output 1 and 2: 2 576 mW

Current consumption

FOUNDATION Fieldbus

16 mA

Power supply failure

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

Electrical connection

→ 31

Potential equalization

→ 33

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 Φ6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"

Cable specification

→ 28

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 [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 separate document entitled "Safety Instructions" (XA) for the device.

16.6 Performance characteristics

Reference operating conditions

In accordance with DIN EN 29104
- Water, typically 15 to 45 °C (59 to 113 °F); 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol ±5 °C (±41 °F) and ±2 bar (±29 psi)
- Accuracy based on accredited calibration rigs traced to ISO 17025
- Medium temperature: +28 ± 2 °C (+82 ± 4 °F)
- Ambient temperature: +22 ± 2 °C (+72 ± 4 °F)
- Warm-up period: 30 min

Installation
- Inlet run > 10 × DN
- Outlet run > 5 × DN
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.

Maximum measured error

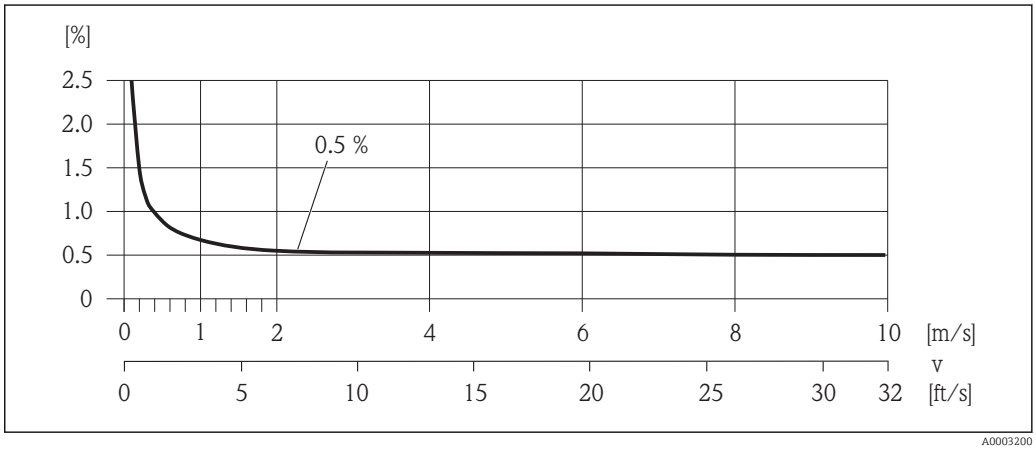
Error limits under reference operating conditions

o.r. = of reading

Volume flow

±0.5 % o.r. ± 2 mm/s (0.08 in/s)

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



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

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

Volume flow
Max. ±0.2 % o.r. ± 2 mm/s (0.08 in/s)

Influence of ambient temperature

Pulse/frequency output

o.r. = of reading

Temperature coefficient	Max. ±100 ppm o.r.

16.7 Installation

"Mounting requirements" → 19

16.8 Environment

Ambient temperature range

→ 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

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.

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

Degree of protection

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

Shock resistance

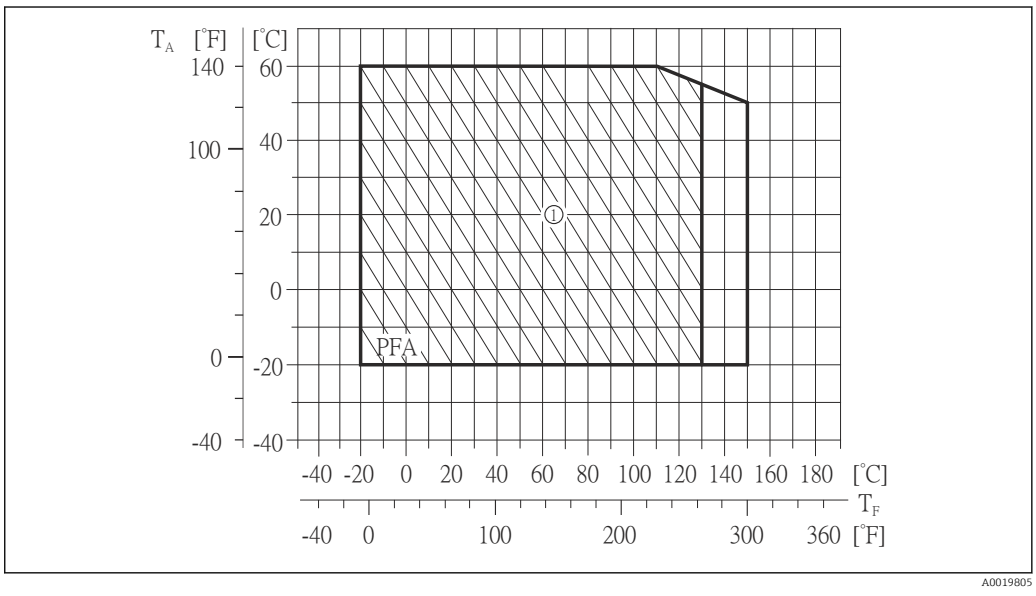
As per IEC/EN 60068-2-31

Vibration resistance	Acceleration up to 2 g, according to IEC 60068-2-6
Mechanical load	▪ Protect the transmitter housing against mechanical effects, such as shock or impact. ▪ Never use the transmitter housing as a ladder or climbing aid.
Electromagnetic compatibility (EMC)	As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21) For details, refer to the Declaration of Conformity.

16.9 Process

Medium temperature range

−20 to +150 °C (−4 to +302 °F) for PFA



T_A Ambient temperature

T_F Medium temperature

1 Hatched area: harsh environment only up to +130 °C (+266 °F)

Conductivity	≥ 20 µS/cm for liquids in general
Pressure-temperature ratings	An overview of the pressure-temperature ratings for the process connections is provided in the "Technical Information" document

Pressure tightness

Liner: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:				
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 °C (+212 °F)	+130 °C (+266 °F)	+150 °C (+302 °F)
2 to 25	1/12 to 1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:
- v < 2 m/s (6.56 ft/s): for abrasive fluids
- v > 2 m/s (6.56 ft/s): for fluids producing buildup

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

For an overview of the measuring range full scale values, see the "Measuring range" section → 124

Pressure loss

- No pressure loss occurs as of nominal diameter DN 8 (3/8") if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → 22

System pressure

→ 21

Vibrations

→ 22

16.10 Mechanical construction

Design, dimensions

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

Weight

Compact version

- Including the transmitter (1.9 kg (4.2 lbs))
- Weight specifications apply to standard pressure ratings and without packaging material.

Nominal diameter		Weight	
[mm]	[in]	[kg]	[lbs]
2	1/12	3.7	8.2
4	1/8	3.7	8.2
8	3/8	3.8	8.4
15	1/2	3.9	8.6
25	1	4.0	8.8

Measuring tube specification

Nominal diameter		Pressure rating [1] EN (DIN)	Process connection internal diameter PFA	
[mm]	[in]	[bar]	[mm]	[in]
2	1/12	PN 16/40	2.25	0.09
4	1/8	PN 16/40	4.5	0.18
8	3/8	PN 16/40	9.0	0.35
15	½	PN 16/40	16.0	0.63

Nominal diameter		Pressure rating [1]	Process connection internal diameter
		EN (DIN)	PFA
[mm]	[in]	[bar]	[mm]	[in]
–	1	PN 16/40	22.6	0.89
25	–	PN 16/40	26.0	1.02

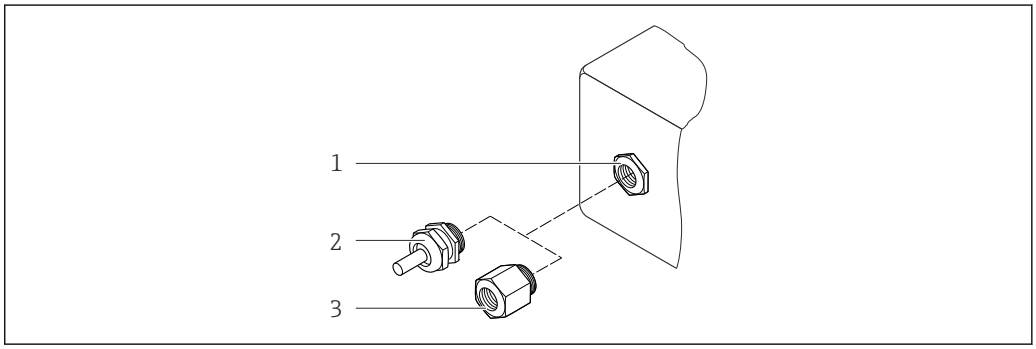
1) Depending on process connection and seals used

Materials

Transmitter housing

- Order code for "Housing", option **C** "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
- Window material: glass

Cable entries/cable glands



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29 *Possible cable entries/cable glands*

1 Cable entry in transmitter housing with internal thread M20 x 1.5
2 Cable gland M20 x 1.5
3 Adapter for cable entry with internal thread G ½" or NPT ½"

Order code for "Housing", option C "GT20 two-chamber, aluminum coated"

Cable entry/cable gland	Type of protection	Material
Cable gland M20 × 1.5	▪ Non-Ex ▪ Ex ia ▪ Ex ic	Plastic
	Adapter for cable entry with internal thread G ½"	Nickel-plated brass
Adapter for cable entry with internal 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	▪ Socket: stainless steel, 1.4401/316 ▪ Contact housing: plastic, PUR, black ▪ Contacts: metal, CuZn, gold-plated ▪ Threaded connection seal: NBR

Sensor housing

Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel 1.4301 (304)

Liner

PFA (USP Class VI, FDA 21 CFR 177.1550, 3A)

Process connections

- Stainless steel 1.4404 (F316L)
- PVDF
- PVC adhesive sleeve

Electrodes

- Standard: 1.4435 (316L)
- Optional: Alloy C22, tantalum, platinum

Seals

- O-ring seal: EPDM, FKM, Kalrez
- Aseptic molded seal: EPDM [1], FKM, silicone [1]

Accessories

Weather protection cover

Stainless steel 1.4404 (316L)

Grounding rings

- Standard: 1.4435 (F316L)
- Optional: Alloy C22, tantalum

Wall mounting kit

Stainless steel 1.4301 (304)

Fitted electrodes	Measuring electrodes and empty pipe detection electrodes (only DN 25 (1")): 1.4435 (316L), Alloy C22, platinum, tantalum
Process connections	With O-ring seal ▪ Weld-in nipple (DIN EN ISO 1127, ODT/SMS, ISO 2037) ▪ Flange (EN (DIN), ASME, JIS) ▪ Flange from PVDF (EN (DIN), ASME, JIS) ▪ External thread ▪ Internal thread ▪ Hose connection ▪ PVC adhesive sleeve

1) USP Class VI, FDA 21 CFR 177.2600, 3A

With aseptic molded seal:
- Weld-in nipple (EN 10357 (DIN 11850), ODT/SMS, ISO 2037)
- Clamp (ISO 2852, DIN 32676, L14 AM7)
- Coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145)
- Flange DIN 11864-2

For information on the materials of the process connections → 136

Surface roughness

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

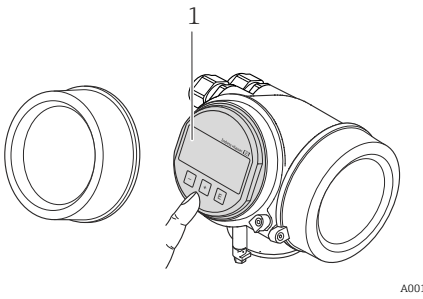
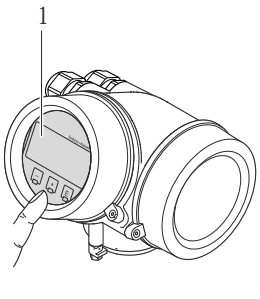
Liner with PFA:
≤ 0.4 µm (15.7 µin)
(All data relate to parts in contact with fluid)

Stainless steel process connections:
≤ 0.8 µm (31 µin)
(All data relate to parts in contact with fluid)

16.11 Operability

Local operation

Via display module

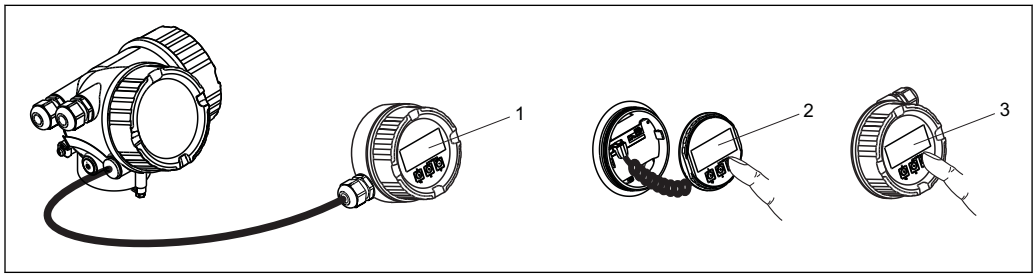
Order code for "Display; Operation", option **C** "SD02"	Order code for "Display; Operation", option **E** "SD03"
	
1 Operation with pushbuttons	*1 Operation with touch control*

Display elements
- 4-line display
- With order code for "Display; operation", option **E**:
  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
- With order code for "Display; operation", option **C**:
  Local operation with 3 push buttons: ⊕, ⊖, Ⓔ
- With order code for "Display; operation", option **E**:
  External operation via touch control; 3 optical keys: ⊕, ⊖, Ⓔ
- Operating elements also accessible in various hazardous areas

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 and operating module FHX50



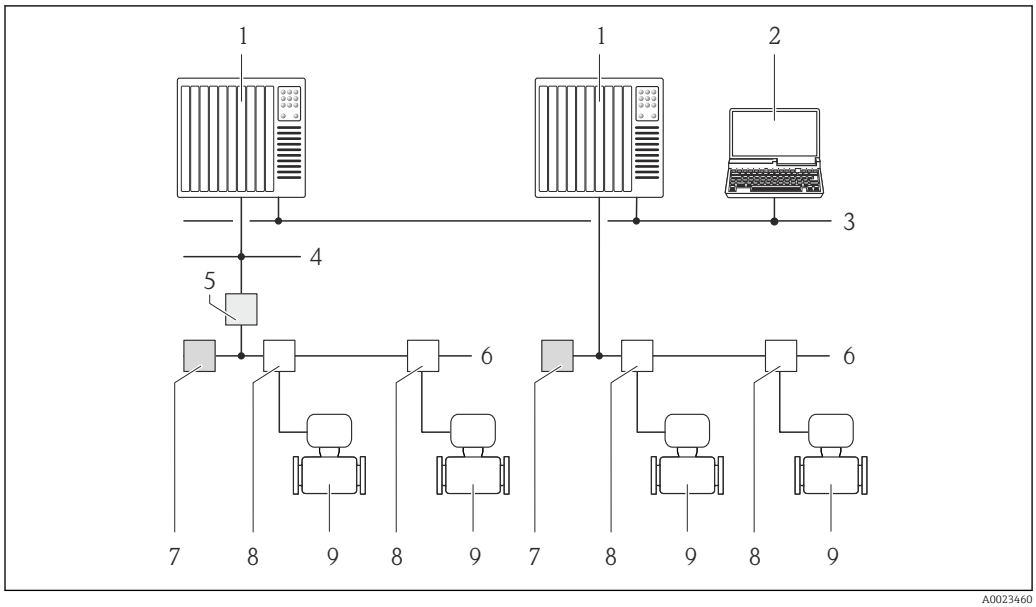
30 Operating options via FHX50

1 Housing of remote display and operating module FHX50
2 SD02 display and operating module, push buttons: cover must be opened for operation
3 SD03 display and operating module, optical buttons: operation possible through cover glass

Remote operation

Via FOUNDATION Fieldbus network

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

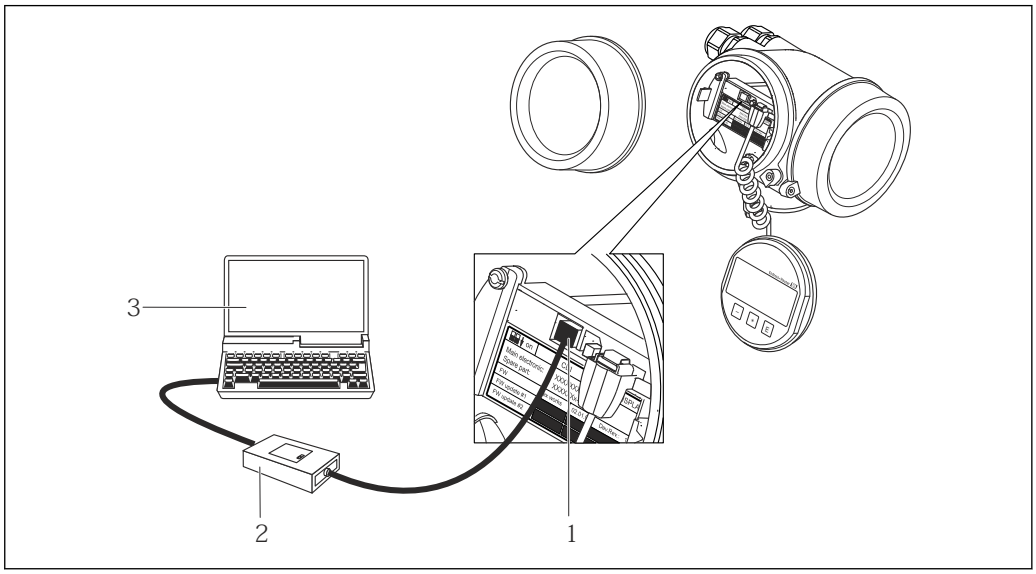


31 Options for remote operation via FOUNDATION Fieldbus network

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

Service interface

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"

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

16.12 Certificates and approvals

CE mark

The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC 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

- 3A approval and EHEDG-certified
- Seals → in conformity with FDA (apart from Kalrez seals)

FOUNDATION Fieldbus certification	**FOUNDATION Fieldbus interface** The measuring device is certified and registered by the Fieldbus FOUNDATION. The measuring system meets all the requirements of the following specifications: ▪ 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)
Other standards and guidelines	▪ EN 60529 Degrees of protection provided by enclosures (IP code) ▪ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use ▪ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ▪ ANSI/ISA-61010-1 (82.02.01): 2004 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements ▪ CAN/CSA-C22.2 No. 61010-1-04 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements ▪ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment ▪ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors ▪ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ▪ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ▪ NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices ▪ NAMUR NE 107 Self-monitoring and diagnosis of field devices ▪ NAMUR NE 131 Requirements for field devices for standard applications

16.13 Application packages

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

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

Diagnostics functions

Package	Description
HistoROM extended function	Comprises extended functions concerning the event log and the activation of the measured value memory. Event log: Memory volume is extended from 20 message entries (basic version) to up to 100 entries. Data logging (line recorder): ▪ Memory capacity for up to 1000 measured values is activated. ▪ 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user. ▪ Data logging is visualized via the local display or FieldCare.

Heartbeat Technology

Package	Description
Heartbeat Verification	**Heartbeat Verification:** Makes it possible to check the device functionality on demand when the device is installed, without having to interrupt the process. ▪ Access via local operation or other operating interfaces, such as FieldCare for instance. ▪ Documentation of device functionality within the framework of manufacturer specifications, for proof testing for instance. ▪ End-to-end, traceable documentation of the verification results, including report. ▪ Makes it possible to extend calibration intervals in accordance with operator's risk assessment.

16.14 Accessories

Overview of accessories available for order → 121

16.15 Documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The CD-ROM provided for the device (depending on the device version, the CD-ROM might not be part of the delivery!)
- The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

Standard documentation

Brief Operating Instructions

Measuring device	Documentation code
Promag H 200	KA01120D

Device Parameters

Measuring device	Documentation code		
	HART	FOUNDATION Fieldbus	PROFIBUS PA
Promag 200	GP01026D	GP01028D	GP01027D

Technical Information

Measuring device	Documentation code
Promag H 200	TI01061D

Supplementary device-dependent documentation

Safety Instructions

Contents	Documentation code
ATEX/IECEx Ex d[ia], Ex tb	XA01015D
ATEX/IECEx Ex ia, Ex tb	XA01016D
ATEX/IECEx Ex nA, Ex ic	XA01017D
cCSAus XP (Ex d)	XA01018D
cCSAus IS (Ex i)	XA01019D
NEPSI Ex d	XA01179D
NEPSI Ex i	XA01178D
NEPSI Ex nA, Ex ic	XA01180D
INMETRO Ex d	XA01309D
INMETRO Ex i	XA01310D
INMETRO Ex nA	XA01311D

Special Documentation

Contents	Documentation code
Heartbeat Technology	SD01452D

Installation Instructions

Contents	Documentation code
Installation Instructions for spare part sets	Overview of accessories available for order → 121

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