

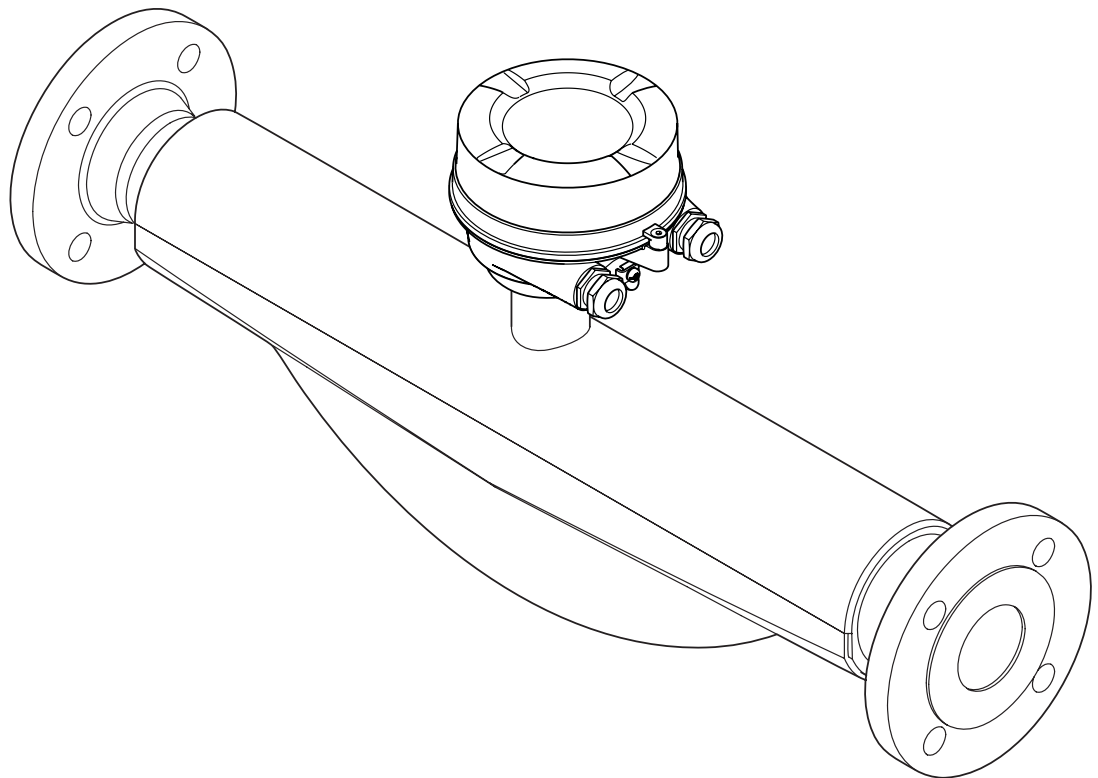
Proline Promass F 100 Coriolis Flowmeter HART

Operating Instructions Manual

BA01657O/06/EN/02.17

Valid as of version 01.01 zz (Device firmware)

71382653



- 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.

Important

All information and technical specifications in this documentation have been carefully checked and compiled by the author. However, we cannot completely exclude the possibility of errors. TechnipFMC is always grateful to be informed of any errors. Contact us on the website.

Smith Meter® is a registered trademark of TechnipFMC.

Technical Support

Contact Information:

Field Service Response Center

24/7 Technical Support/Schedule a Technician: 1-844-798-3819

System Installation Supervision, Start-Up, and Commissioning Services Available

Customer Support

Contact Information:

Customer Service

TechnipFMC

1602 Wagner Avenue

Erie, Pennsylvania 16510 USA

P: +1 814 898-5000

F: +1 814 899-8927

measurement.solutions@TechnipFMC.com

TechnipFMC.com

Literature Library:

<http://fmctechnologies.com/en/MeasurementSolutions/OnlineServices.aspx>

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1 About this document

1.1 Document function






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

1.2 Symbols used



1.2.1 Safety symbols

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













1.2.2 Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: <ul style="list-style-type: none"> ▪ Inner ground terminal: Connects the protective earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.

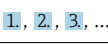



1.2.3 Tool symbols

Symbol	Meaning
	Allen key
	Open-ended wrench


1.2.4 Symbols for certain types of information

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



1.2.5 Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
	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 *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
→  146

1.3.1 Standard documentation

Document type	Purpose and content of the document
Technical Information	Planning aid for your device The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Sensor Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 1 The Sensor Brief Operating Instructions are aimed at specialists with responsibility for installing the measuring device. <ul style="list-style-type: none"> ■ Incoming acceptance and product identification ■ Storage and transport ■ Installation
Transmitter Brief Operating Instructions	Guides you quickly to the 1st measured value - Part 2 The Transmitter Brief Operating Instructions are aimed at specialists with responsibility for commissioning, configuring and parameterizing the measuring device (until the first measured value). <ul style="list-style-type: none"> ■ Product description ■ Installation ■ Electrical connection ■ Operation options ■ System integration ■ Commissioning ■ Diagnostic information
Description of Device Parameters	Reference for your parameters The document provides a detailed explanation of each individual parameter in the Expert operating menu. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

1.3.2 Supplementary device-dependent documentation

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

1.4 Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, Texas, USA

Microsoft®

Registered trademark of the Microsoft Corporation, Redmond, Washington, USA

TRI-CLAMP®

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

2 Basic safety instructions

2.1 Requirements for the personnel

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

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

The operating personnel must fulfill the following requirements:

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

2.2 Designated use

Application and media

The measuring device described in these Brief Operating Instructions is intended only for flow measurement of liquids and gases.

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

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

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

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

Incorrect use

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

⚠ WARNING**Danger of breakage due to corrosive or abrasive fluids!**

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

NOTICE**Verification for borderline cases:**

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

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

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

⚠ WARNING**Danger of housing breaking due to measuring tube breakage!**

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

2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

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

2.4 Operational safety

Risk of injury.

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

Conversions to the device

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

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

Repair

To ensure continued operational safety and reliability,

- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to repair of an electrical device.

- Use original spare parts and accessories from Endress+Hauser only.

2.5 Product safety

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

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

2.6 IT security

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

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

3 Product description

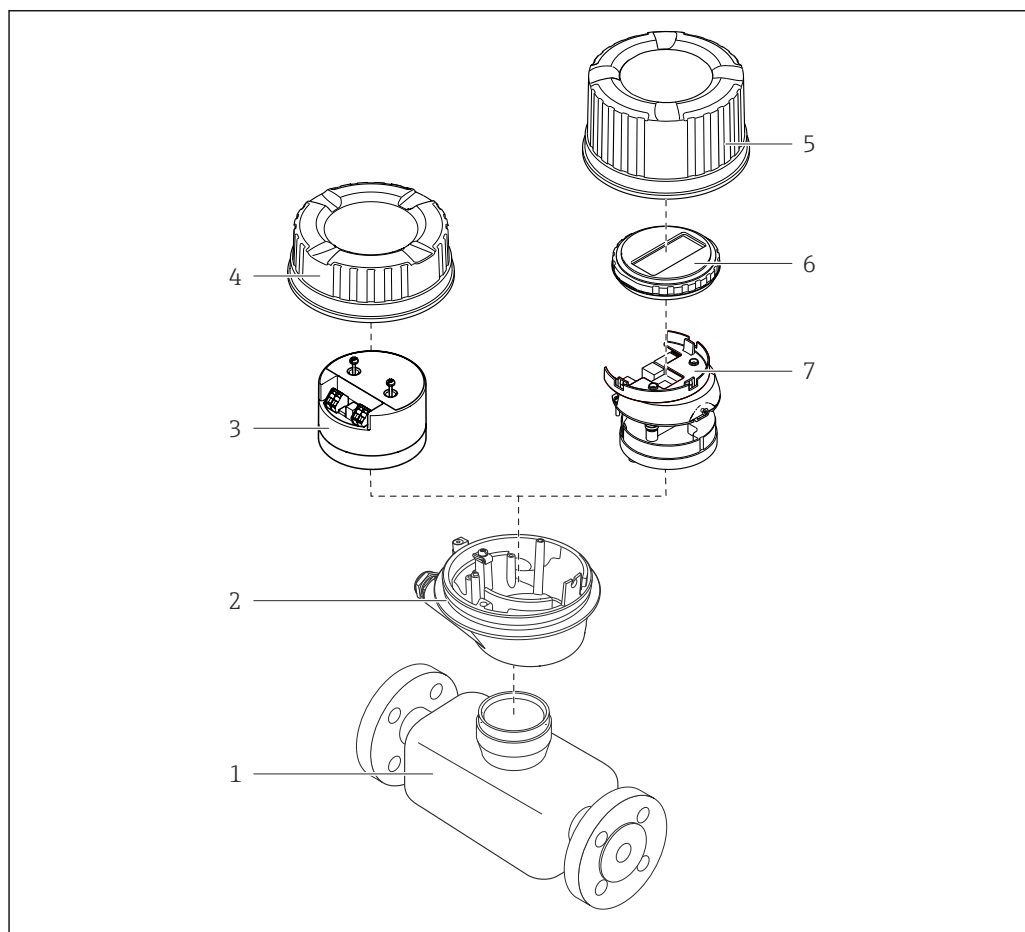
The device consists of a transmitter and a sensor.

The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

3.1 Product design

3.1.1 Device version with HART communication type



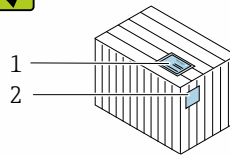
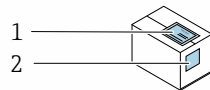
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 1 Important components of a measuring device

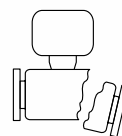
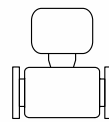
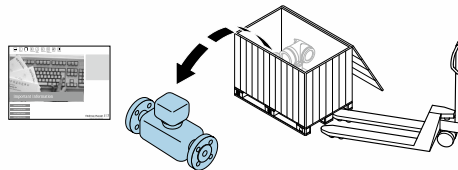
- 1 Sensor
- 2 Transmitter housing
- 3 Main electronics module
- 4 Transmitter housing cover
- 5 Transmitter housing cover (version for optional onsite display)
- 6 Onsite display (optional)
- 7 Main electronics module (with bracket for optional onsite display)

4 Incoming acceptance and product identification

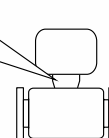
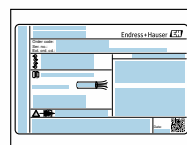
4.1 Incoming acceptance



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 → 15.

4.2 Product identification

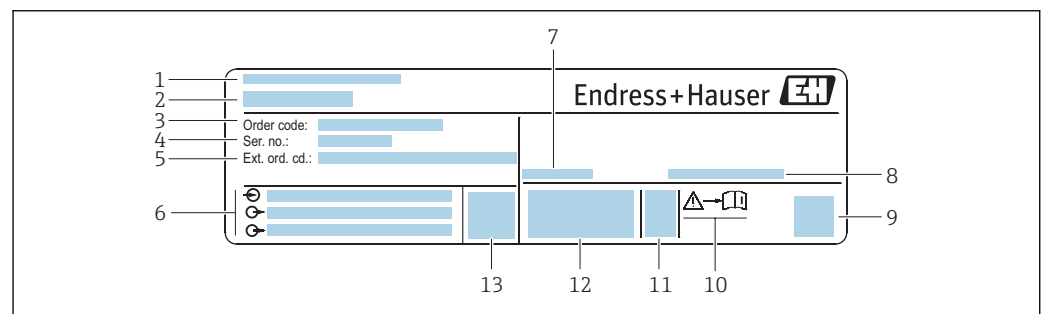
The following options are available for identification of the measuring device:

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

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

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

4.2.1 Transmitter nameplate

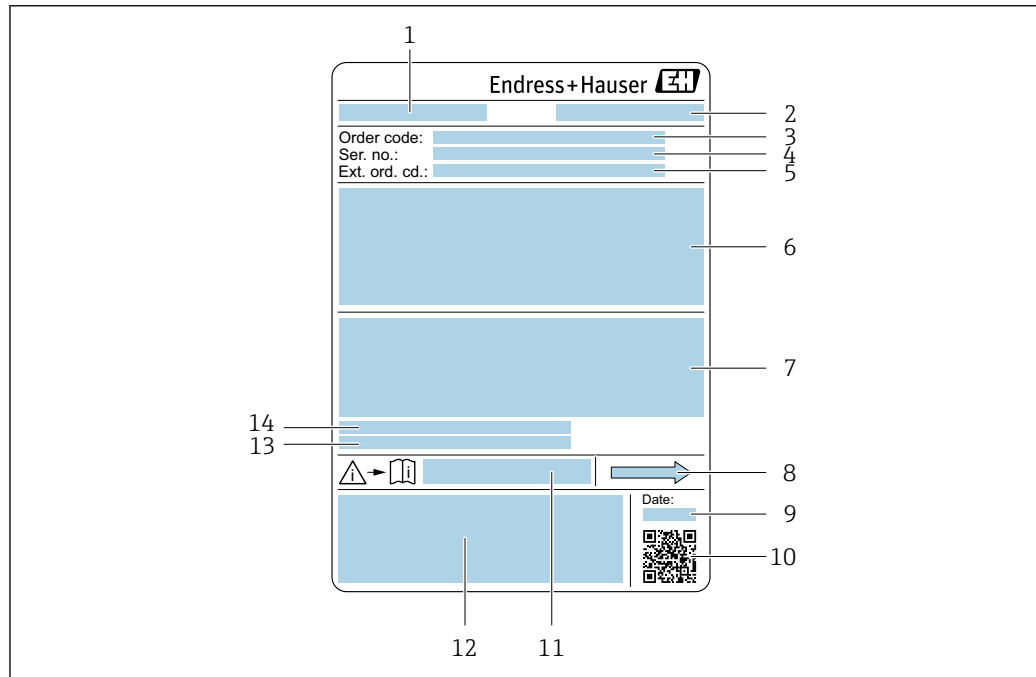


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2 Example of a transmitter nameplate

- 1 Manufacturing location
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number (ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 7 Permitted ambient temperature (T_a)
- 8 Degree of protection
- 9 2-D matrix code
- 10 Document number of safety-related supplementary documentation → 147
- 11 Manufacturing date: year-month
- 12 CE mark, C-Tick
- 13 Firmware version (FW)

4.2.2 Sensor nameplate



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3 Example of a sensor nameplate

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






Order code

The measuring device is reordered using the order code.

Extended order code

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

4.2.3 Symbols on measuring device


Symbol	Meaning
	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
	Reference to documentation Refers to the corresponding device documentation.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.

5 Storage and transport

5.1 Storage conditions

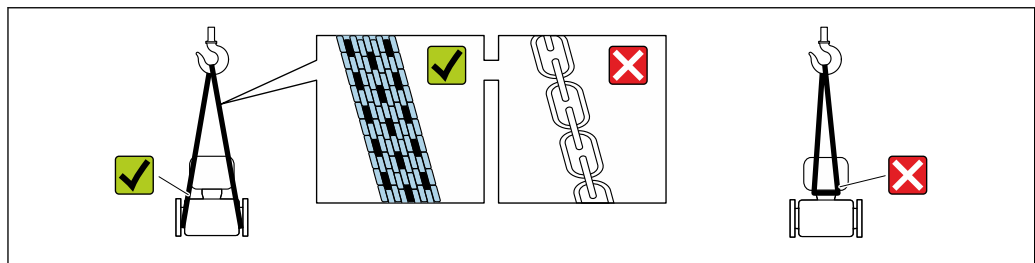
Observe the following notes for storage:

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

Storage temperature →  133

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.

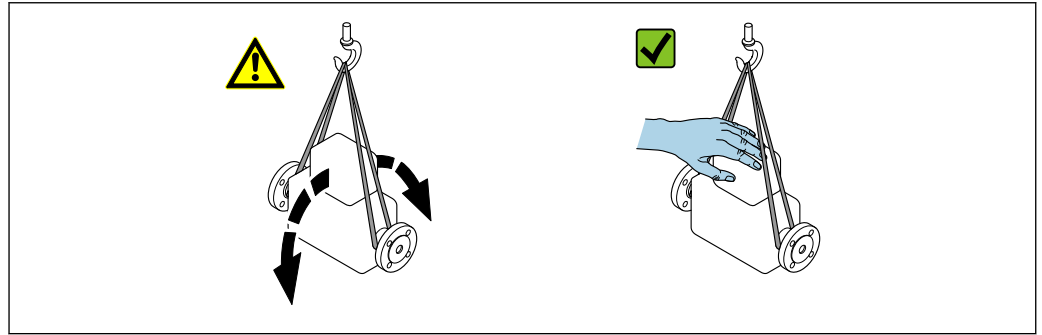
5.2.1 Measuring devices without lifting lugs

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.

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100% recyclable:

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

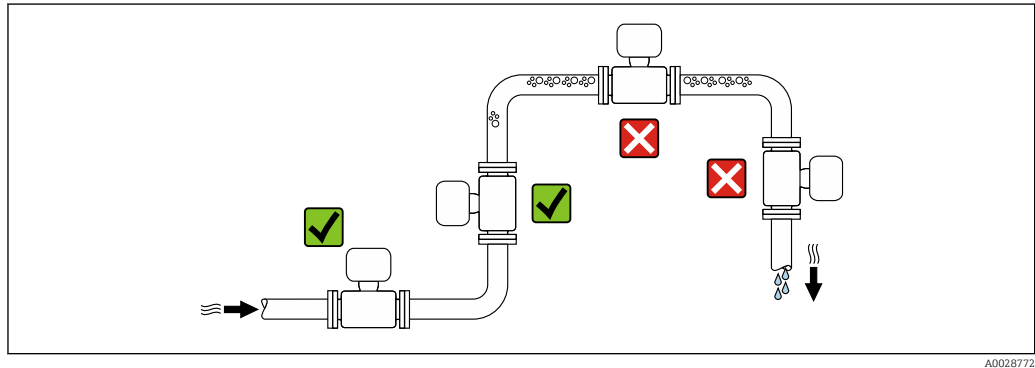
6 Installation

6.1 Installation conditions

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

6.1.1 Mounting position

Mounting location

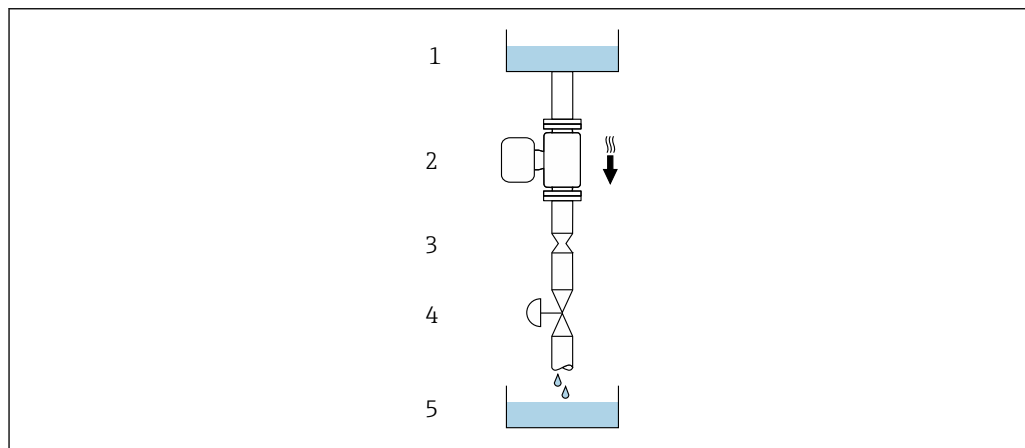


To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

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

Installation in down pipes

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



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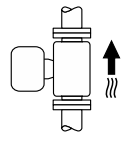
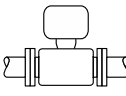
4 Installation in a down pipe (e.g. for batching applications)

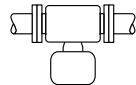






- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Batching tank

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	$\frac{3}{8}$	6	0.24
15	$\frac{1}{2}$	10	0.40
25	1	14	0.55
40	$1\frac{1}{2}$	22	0.87
50	2	28	1.10
80	3	50	1.97
100	4	65	2.60
150	6	90	3.54
250	10	150	5.91

Orientation

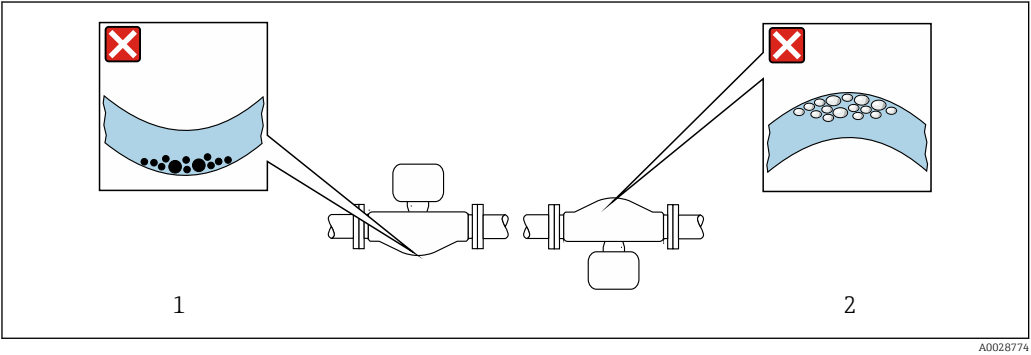
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).


Orientation			Recommendation
A	Vertical orientation	 A0015591	✓✓
B	Horizontal orientation, transmitter at top	 A0015589	✓✓✓ ¹⁾ Exceptions: → 5, 22

Orientation			Recommendation
C	Horizontal orientation, transmitter at bottom	 A0015590	  ²⁾ Exceptions: →  5,  22
D	Horizontal orientation, transmitter at side	 A0015592	

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

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




-  5
- Orientation of sensor with curved measuring tube
- 1
- Avoid this orientation for fluids with entrained solids: Risk of solids accumulating.
- 2
- Avoid this orientation for outgassing fluids: Risk of gas accumulating.

Inlet and outlet runs

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs →  23.



Installation dimensions

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

6.1.2 Requirements from environment and process

Ambient temperature range

Measuring device	<ul style="list-style-type: none"> ■ -40 to +60 °C (-40 to +140 °F) ■ Order code for "Test, certificate", option JM: -50 to +60 °C (-58 to +140 °F)
------------------	--

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

System pressure

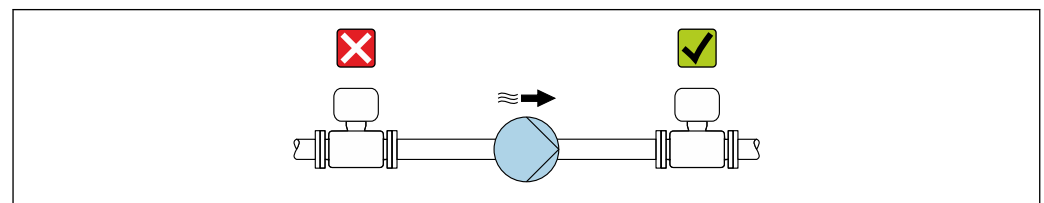
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

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

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

For this reason, the following mounting locations are recommended:

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



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Thermal insulation

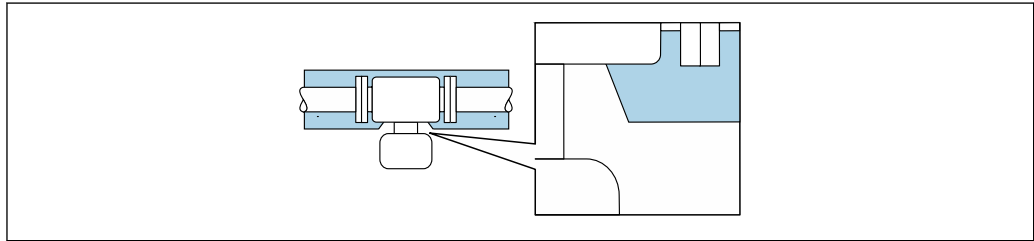
In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

The following device versions are recommended for versions with thermal insulation:

- Version with extended neck for insulation:
Order code for "Sensor option", option **CG** with an extended neck length of 105 mm (4.13 in).
- Extended temperature version:
Order code for "Measuring tube material", option **SD**, **SE**, **SF** or **TH** with an extended neck length of 105 mm (4.13 in).

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

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



A0034391

6 Thermal insulation with extended neck free

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

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

NOTICE**Danger of overheating when heating**

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

Heating options

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

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

Using an electrical trace heating system

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

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

The sheet must have the following properties:

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

Vibrations

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

6.1.3 Special mounting instructions

Rupture disk

Information that is relevant to the process: →  136.

WARNING

Limited functional reliability of the rupture disk.

Danger to persons from escaping fluids!

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

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

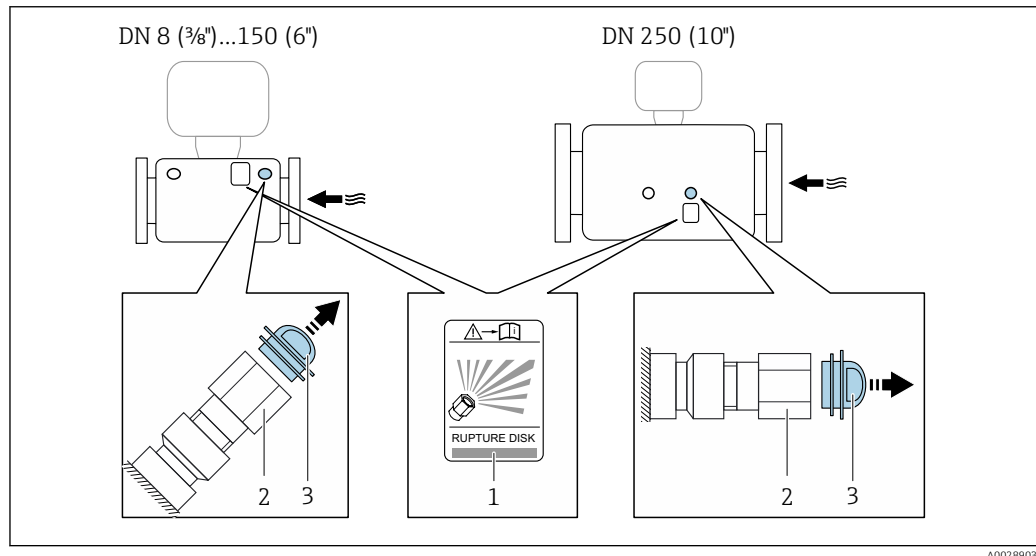
The transportation guard must be removed.



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

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

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



- 1 Rupture disk label
- 2 Rupture disk with 1/2" NPT internal thread with 1" width across flat
- 3 Transport protection

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 128. Therefore, a zero point adjustment in the field is generally not required.

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

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

6.2 Mounting the measuring device

6.2.1 Required tools

For sensor

For flanges and other process connections: Corresponding mounting tools

6.2.2 Preparing the measuring device

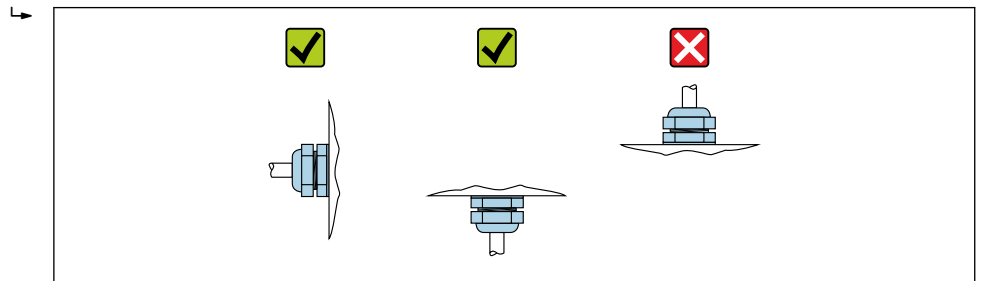
1. Remove all remaining transport packaging.
2. Remove any protective covers or protective caps present from the sensor.
3. Remove stick-on label on the electronics compartment cover.

6.2.3 Mounting the measuring device

⚠ WARNING

Danger due to improper process sealing!

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



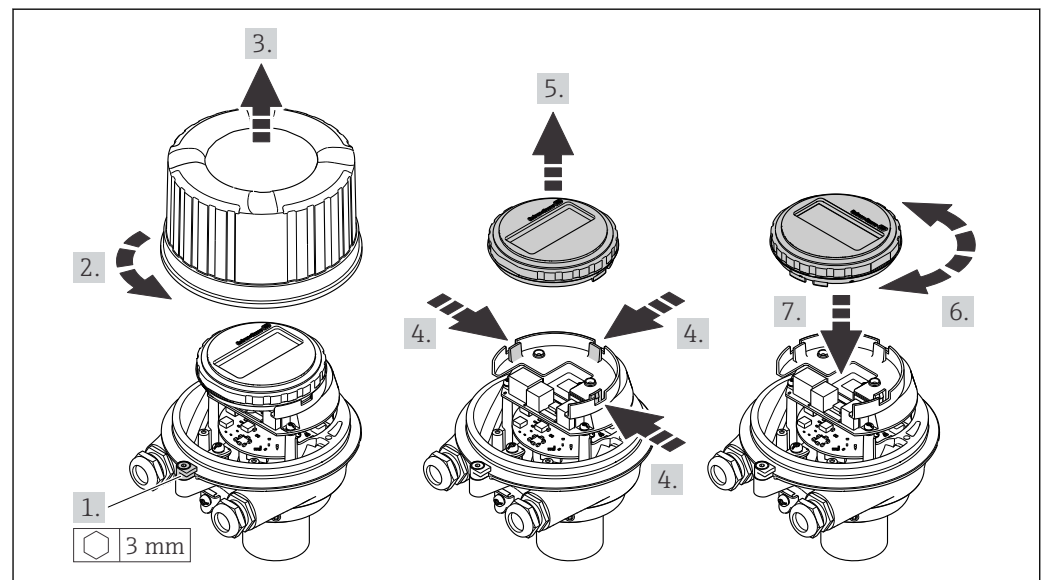
A0029263

6.2.4 Turning the display module

The local display is only available with the following device version:
Order code for "Display; Operation", option **B**: 4-line; lit, via communication

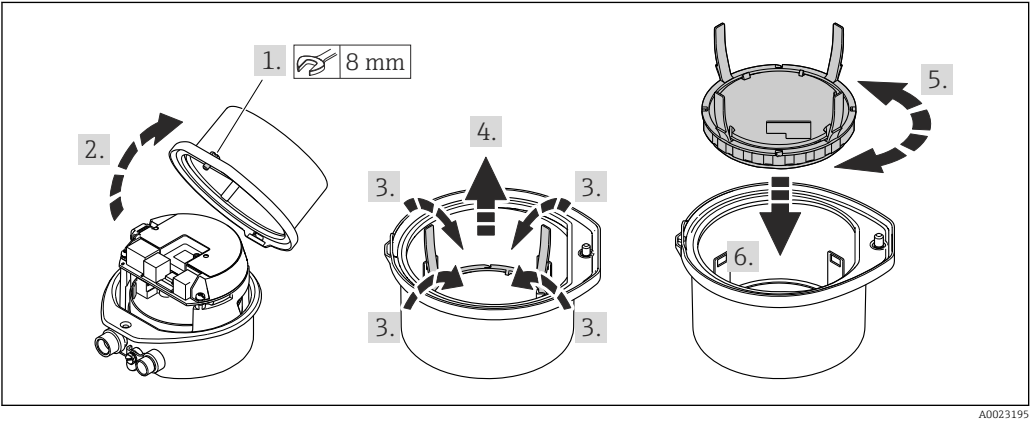
The display module can be turned to optimize display readability.

Aluminum housing version, AlSi10Mg, coated



A0023192

Compact and ultra-compact housing version, hygienic, stainless



6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none">■ Process temperature → 134■ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document)■ Ambient temperature■ Measuring range	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none">■ According to sensor type■ According to medium temperature■ According to medium properties (outgassing, with entrained solids)	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 21?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Are the securing screw and securing clamp tightened securely?	<input type="checkbox"/>

7 Electrical connection

NOTICE

The measuring device does not have an internal circuit breaker.

- ▶ For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.
- ▶ Although the measuring device is equipped with a fuse, additional overcurrent protection (maximum 16 A) should be integrated into the system installation.

7.1 Connection conditions

7.1.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp (on aluminum housing): Allen screw 3 mm
- For securing screw (for stainless steel housing): open-ended wrench 8 mm
- Wire stripper
- When using stranded cables: crimper for wire end ferrule

7.1.2 Requirements for connecting cable

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

Electrical safety

In accordance with applicable federal/national regulations.

Permitted temperature range

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

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output 4 to 20 mA HART

A shielded cable is recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Cable diameter

- Cable glands supplied:
M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Spring terminals:
Wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)




7.1.3 Terminal assignment

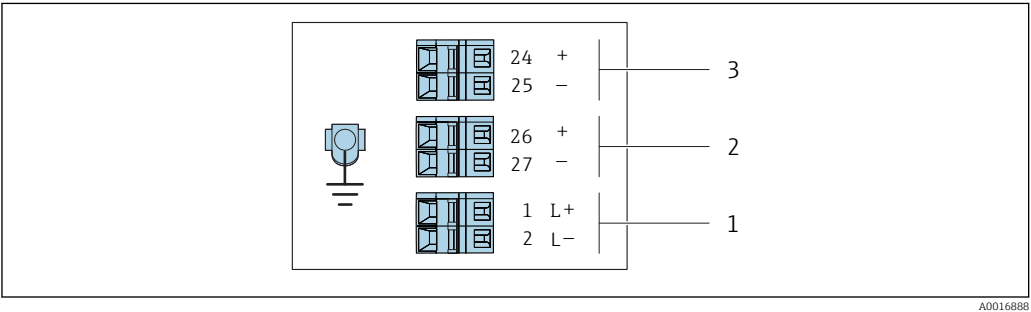
Transmitter

Connection version 4-20 mA HART with pulse/frequency/switch output

Order code for "Output", option **B**

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Outputs	Power supply	
Options A, B	Terminals	Terminals	<div>■ Option A: coupling M20x1</div> <div>■ Option B: thread M20x1</div> <div>■ Option C: thread G ½"</div> <div>■ Option D: thread NPT ½"</div>
Options A, B	Device plugs →  31	Terminals	<div>■ Option L: plug M12x1 + thread NPT ½"</div> <div>■ Option N: plug M12x1 + coupling M20</div> <div>■ Option P: plug M12x1 + thread G ½"</div> <div>■ Option U: plug M12x1 + thread M20</div>
Options A, B, C	Device plugs →  31	Device plugs →  31	Option Q: 2 x plug M12x1
Order code for "Housing": <div>■ Option A: compact, coated aluminum</div> <div>■ Option B: compact, hygienic, stainless</div> <div>■ Option C ultra-compact, hygienic, stainless</div>			



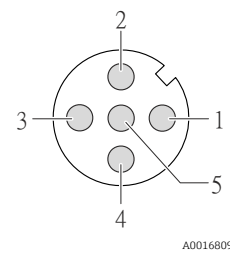
 7 Terminal assignment 4-20 mA HART with pulse/frequency/switch output

- 1 Power supply: DC 24 V
- 2 Output 1: 4-20 mA HART (active)
- 3 Output 2: pulse/frequency/switch output (passive)

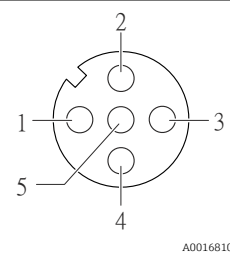
Order code "Output"	Terminal number					
	Power supply		Output 1		Output 2	
	2 (L-)	1 (L+)	27 (-)	26 (+)	25 (-)	24 (+)
Option B	DC 24 V		4-20 mA HART (active)		Pulse/frequency/switch output (passive)	
Order code for "Output": Option B: 4-20 mA HART with pulse/frequency/switch output						

7.1.4 Pin assignment, device plug

Supply voltage

	Pin	Assignment	
	1	L+	DC 24 V
	2		Not assigned
	3		Not assigned
	4	L-	DC 24 V
	5		Grounding/shielding
	Coding	Plug/socket	
	A	Plug	

Device plug for signal transmission (device side)

	Pin	Assignment	
	1	+	4-20 mA HART (active)
	2	-	4-20 mA HART (active)
	3	+	Pulse/frequency/switch output (passive)
	4	-	Pulse/frequency/switch output (passive)
	5		Grounding/shielding
	Coding	Plug/socket	
	A	Socket	

7.1.5 Preparing the measuring device

NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

► Use suitable cable glands corresponding to the degree of protection.

1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
Observe requirements for connecting cables → 29.

7.2 Connecting the measuring device

NOTICE

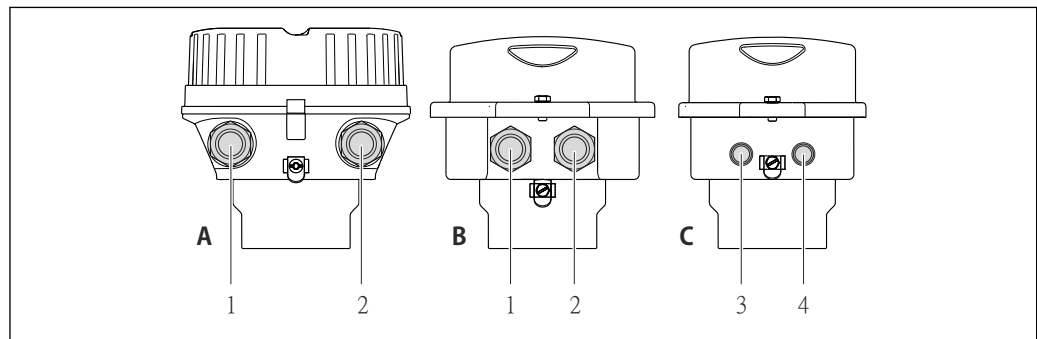
Limitation of electrical safety due to incorrect connection!

- ▶ Have electrical connection work carried out by appropriately trained specialists only.
- ▶ Observe applicable federal/national installation codes and regulations.
- ▶ Comply with local workplace safety regulations.
- ▶ Always connect the protective ground cable \oplus before connecting additional cables.
- ▶ For use in potentially explosive atmospheres, observe the information in the device-specific Ex documentation.
- ▶ The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

7.2.1 Connecting the transmitter

The connection of the transmitter depends on the following order codes:

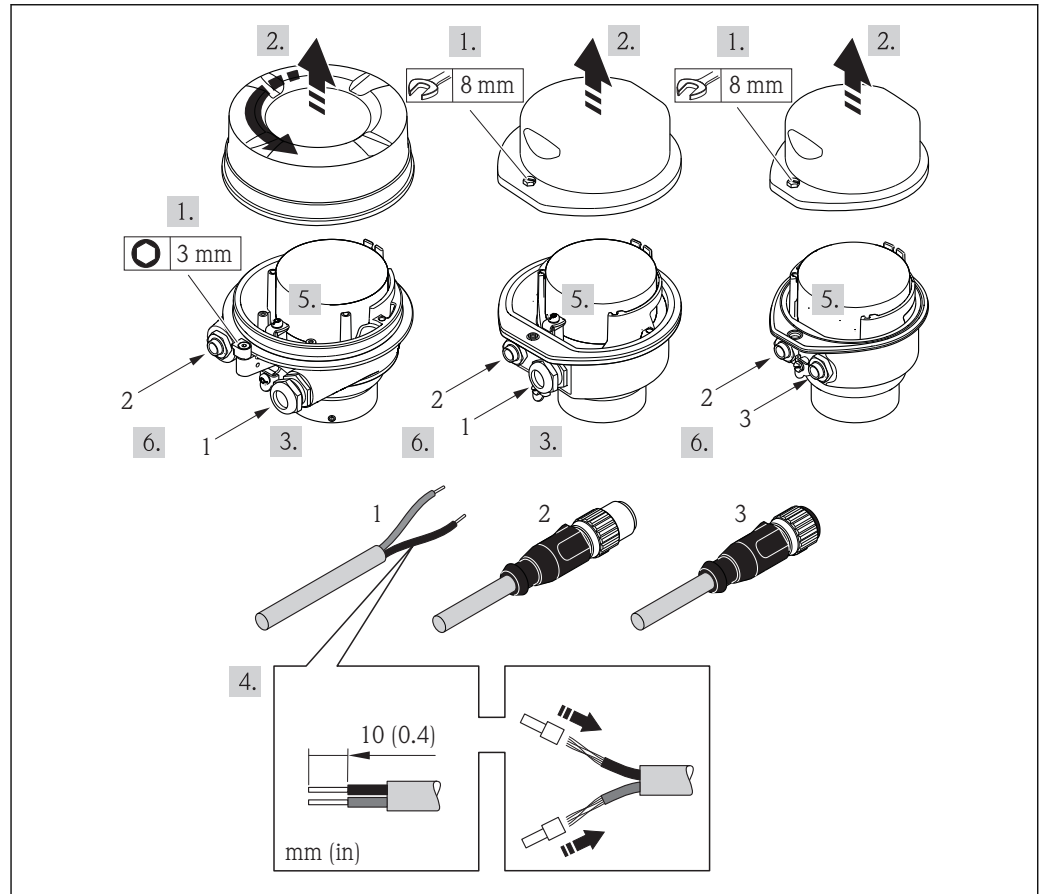
- Housing version: compact or ultra-compact
- Connection version: device plug or terminals



A0016924

8 Housing versions and connection versions

- A Compact, coated aluminum
- B Compact hygienic, stainless or compact, stainless
- 1 Cable entry or device plug for signal transmission
- 2 Cable entry or device plug for supply voltage
- C Ultra-compact hygienic, stainless or ultra-compact, stainless
- 3 Device plug for signal transmission
- 4 Device plug for supply voltage



9 Device versions with connection examples

- 1 Cable
- 2 Device plug for signal transmission
- 3 Device plug for supply voltage

i Depending on the housing version disconnect the local display from the main electronics module: Operating Instructions for the device .

- Connect the cable in accordance with the terminal assignment or the device plug pin assignment .

7.2.2 Ensure potential equalization

Requirements

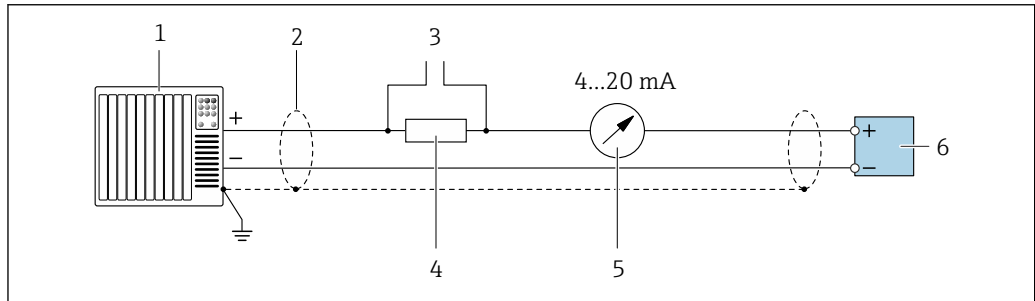
No special measures for potential equalization are required.

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

7.3 Special connection instructions

7.3.1 Connection examples

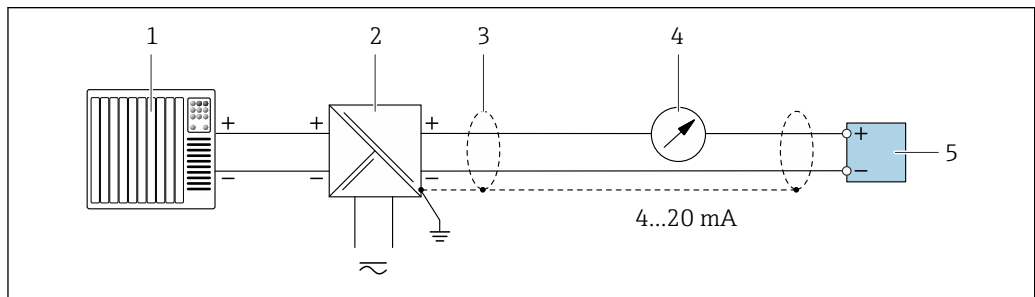
Current output 4 to 20 mA HART



A0029055

10 Connection example for 4 to 20 mA HART current output (active)

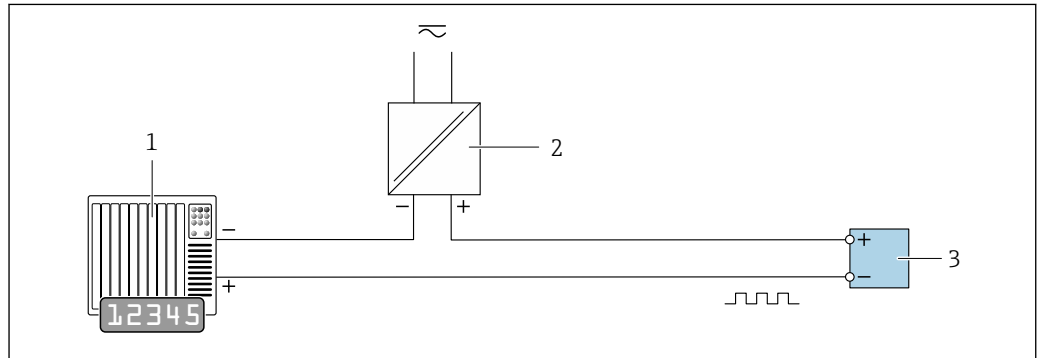
- 1 Automation system with current input (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Connection for HART operating devices → 47
- 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 5 Analog display unit: observe maximum load
- 6 Transmitter



A0028762

11 Connection example for 4 to 20 mA HART current output (passive)

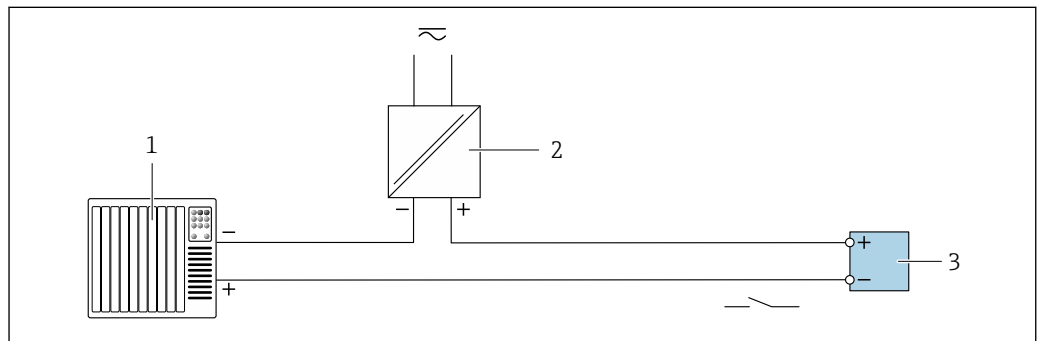
- 1 Automation system with current input (e.g. PLC)
- 2 Power supply
- 3 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 Analog display unit: observe maximum load
- 5 Transmitter

Pulse/frequency output

A0028761

12 Connection example for pulse/frequency output (passive)

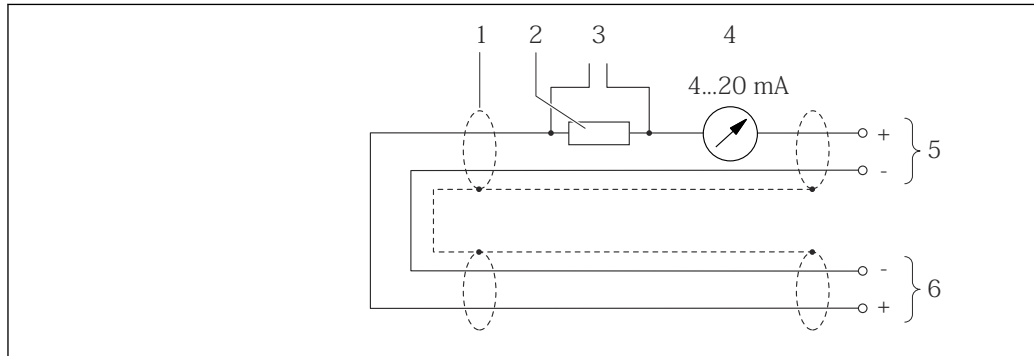
- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values

Switch output

A0028760

13 Connection example for switch output (passive)

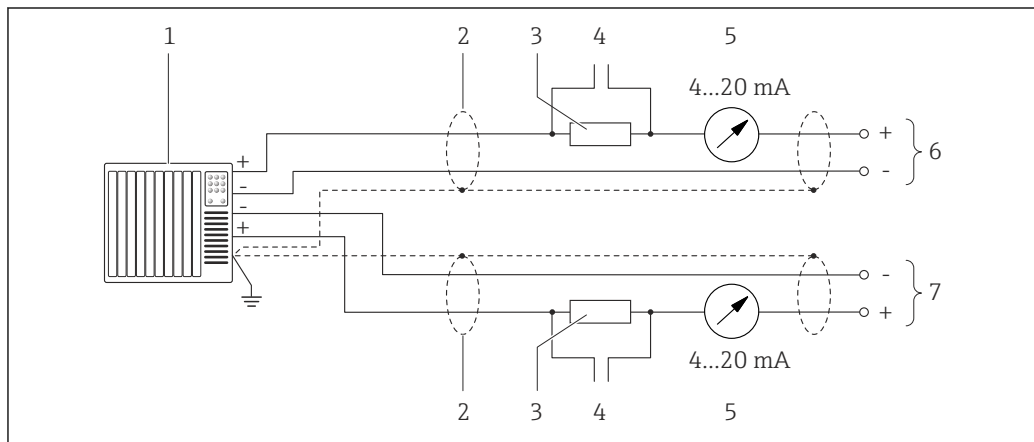
- 1 Automation system with switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values

HART input

A0019828

14 Connection example for HART input (burst mode) via current output (active)

- 1 Cable shield, observe cable specifications
- 2 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 3 Connection for HART operating devices
- 4 Analog display unit
- 5 Transmitter
- 6 Sensor for external measured variable



A0019830

15 Connection example for HART input (master mode) via current output (active)

- 1 Automation system with current input (e.g. PLC).
Prerequisite: automation system with HART version 6, HART commands 113 and 114 can be processed.
- 2 Cable shield, observe cable specifications
- 3 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 4 Connection for HART operating devices
- 5 Analog display unit
- 6 Transmitter
- 7 Sensor for external measured variable

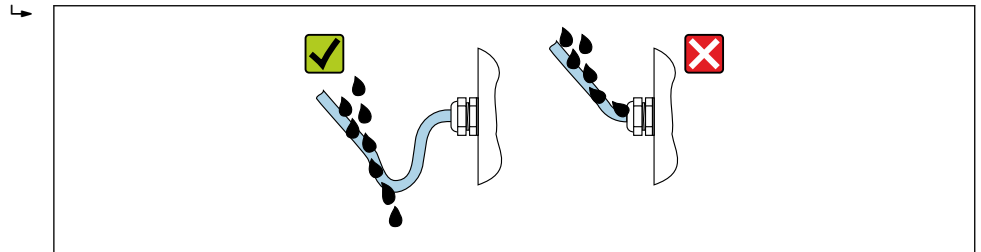
7.4 Ensuring the degree of protection

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

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

1. Check that the housing seals are clean and fitted correctly.







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



A0029278

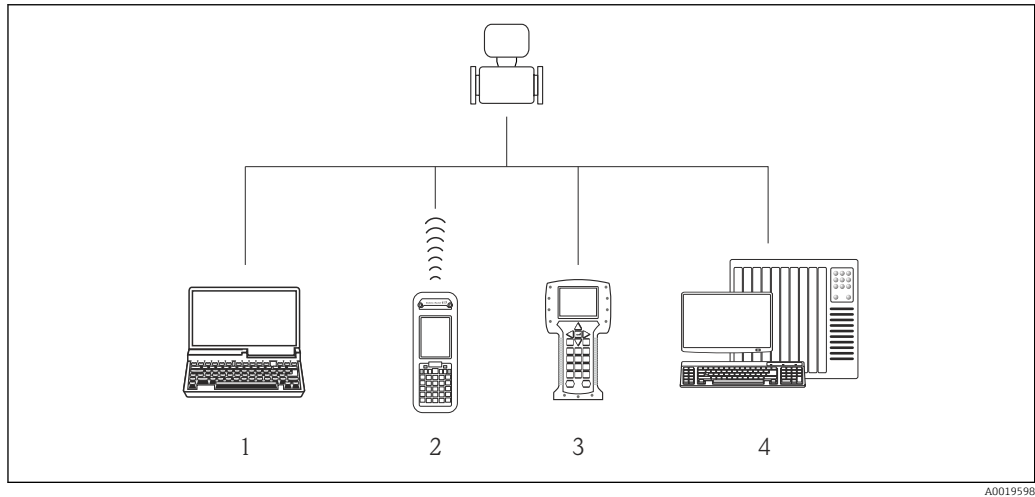
6. Insert dummy plugs into unused cable entries.

7.5 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements →  29?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" →  36?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened?	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate →  127?	<input type="checkbox"/>
Is the terminal assignment →  30 or pin assignment of the connector →  31 correct?	<input type="checkbox"/>
If supply voltage is present, is the power LED on the electronics module of the transmitter lit green →  13?	<input type="checkbox"/>
Depending on the device version, is the securing clamp or fixing screw firmly tightened?	<input type="checkbox"/>

8 Operation options

8.1 Overview of operating options




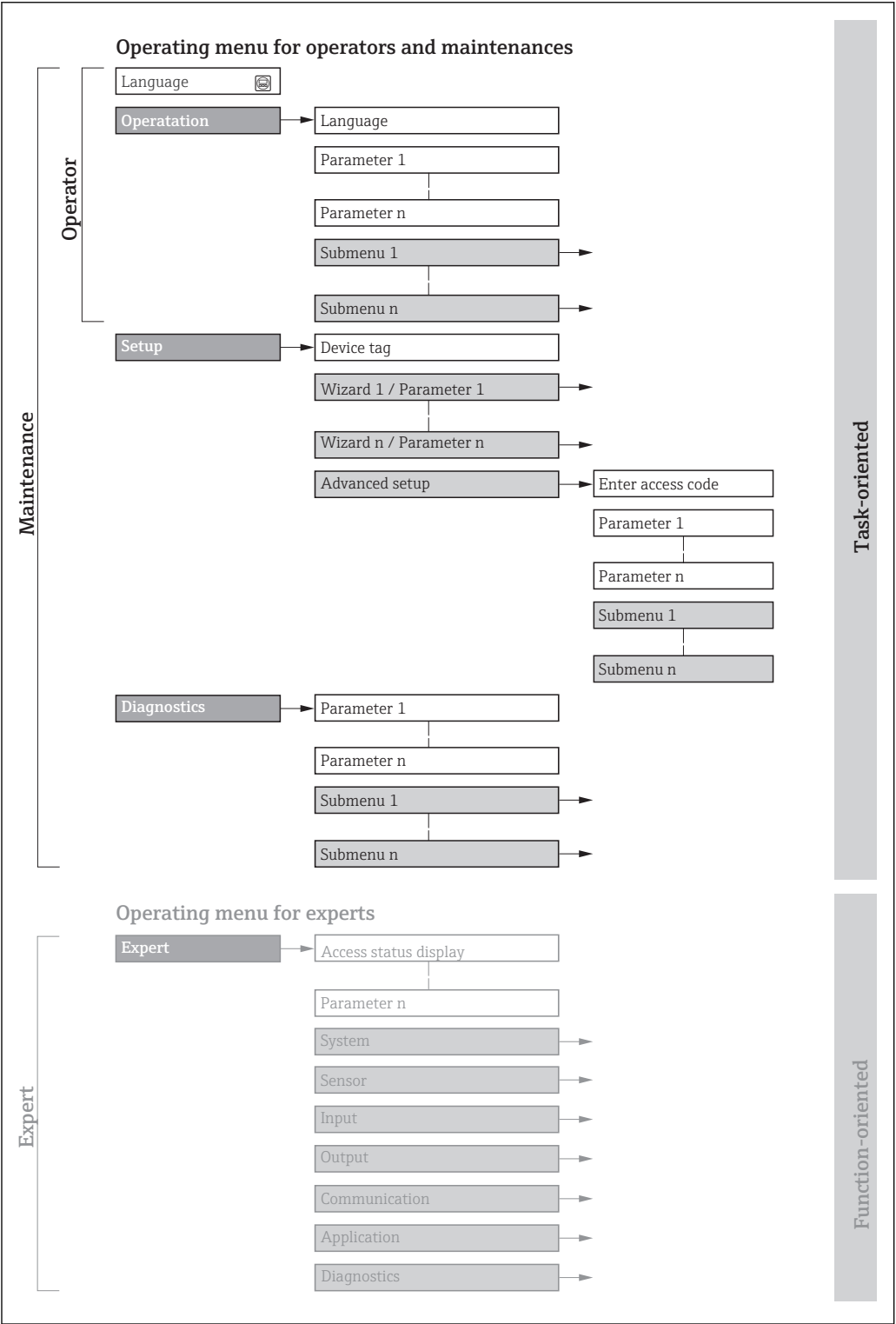
- 1 Computer with Web browser (e.g. Internet Explorer) or with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 2 Field Xpert SFX350 or SFX370
- 3 Field Communicator 475
- 4 Control system (e.g. PLC)

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu



For an overview of the operating menu for experts: "Description of Device Parameters" document supplied with the device →  147



A0018237-EN

16 Schematic structure of the operating menu

8.2.2 Operating philosophy

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

Menu/parameter		User role and tasks	Content/meaning
Language	task-oriented	Role "Operator", "Maintenance" Tasks during operation: <ul style="list-style-type: none"> Configuring the operational display Reading measured values 	<ul style="list-style-type: none"> Defining the operating language Defining the Web server operating language Resetting and controlling totalizers
Operation			<ul style="list-style-type: none"> Configuring the operational display (e.g. display format, display contrast) Resetting and controlling totalizers
Setup		"Maintenance" role Commissioning: <ul style="list-style-type: none"> Configuration of the measurement Configuration of the outputs 	Submenus for fast commissioning: <ul style="list-style-type: none"> Set the system units Define the medium Configure the outputs Configuring the operational display Define the output conditioning Set the low flow cut off Configure partial and empty pipe detection Advanced setup <ul style="list-style-type: none"> For more customized configuration of the measurement (adaptation to special measuring conditions) Configuration of totalizers Configure the WLAN settings Administration (define access code, reset measuring device)
Diagnostics		"Maintenance" role Fault elimination: <ul style="list-style-type: none"> Diagnostics and elimination of process and device errors Measured value simulation 	Contains all parameters for error detection and analyzing process and device errors: <ul style="list-style-type: none"> Diagnostics list Contains up to 5 currently pending diagnostic messages. Event logbook Contains event messages that have occurred. Device information Contains information for identifying the device. Measured values Contains all current measured values. Heartbeat The functionality of the device is checked on demand and the verification results are documented. Simulation Is used to simulate measured values or output values.
Expert	function-oriented	Tasks that require detailed knowledge of the function of the device: <ul style="list-style-type: none"> Commissioning measurements under difficult conditions Optimal adaptation of the measurement to difficult conditions Detailed configuration of the communication interface Error diagnostics in difficult cases 	Contains all the parameters of the device and makes it possible to access these parameters directly using an access code. The structure of this menu is based on the function blocks of the device: <ul style="list-style-type: none"> System Contains all higher-order device parameters which do not concern the measurement or the communication interface. Sensor Configuration of the measurement. Output Configuring of the analog current outputs as well as the pulse/frequency and switch output. Communication Configuration of the digital communication interface and the Web server. Application Configure the functions that go beyond the actual measurement (e.g. totalizer). Diagnostics Error detection and analysis of process and device errors and for device simulation and Heartbeat Technology.

8.3 Access to the operating menu via the web browser

8.3.1 Function range

Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) . In addition to the measured values, status information on the device is also displayed and allows the user to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.




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

8.3.2 Prerequisites


Computer hardware

Interface	The computer must have an RJ45 interface.
Connection	Standard Ethernet cable with RJ45 connector.
Screen	Recommended size: ≥12" (depends on the screen resolution)

Computer software

Recommended operating systems	Microsoft Windows 7 or higher.  Microsoft Windows XP is supported.
Web browsers supported	<ul style="list-style-type: none"> ■ Microsoft Internet Explorer 8 or higher ■ Microsoft Edge ■ Mozilla Firefox ■ Google Chrome ■ Safari



Computer settings

User rights	Appropriate user rights (e.g. administrator rights) for TCP/IP and proxy server settings are necessary (for adjusting the IP address, subnet mask etc.).
Proxy server settings of the Web browser	The Web browser setting <i>Use a Proxy Server for Your LAN</i> must be deselected .
JavaScript	JavaScript must be enabled.  If JavaScript cannot be enabled: enter <code>http://XXX.XXX.X.XXX/basic.html</code> in the address line of the Web browser, e.g. <code>http://192.168.1.212/basic.html</code> . A fully functional but simplified version of the operating menu structure starts in the Web browser.
Network connections	Only the active network connections to the measuring device should be used. Switch off all other network connections such as WLAN.



In the event of connection problems: →  100

Measuring device: Via CDI-RJ45 service interface

Device	CDI-RJ45 service interface
Measuring device	The measuring device has an RJ45 interface.
Web server	Web server must be enabled; factory setting: ON  For information on enabling the Web server →  46

8.3.3 Establishing a connection


Via service interface (CDI-RJ45)

Preparing the measuring device

Configuring the Internet protocol of the computer

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

IP address of the device: 192.168.1.212 (factory setting)

1. Switch on the measuring device.
2. Connect to the computer using a cable →  142.
3. If a 2nd network card is not used, close all the applications on the notebook.
 ↳ Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.
4. Close any open Internet browsers.
5. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

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

Starting the Web browser

1. Start the Web browser on the computer.

2. Enter the IP address of the Web server in the address line of the Web browser:
192.168.1.212



↳ The login page appears.

The screenshot shows the login interface of the Proline Promass F 100 HART. It features a top section with device information and a bottom section for user login. Numbered callouts identify the following elements:

- 1: Picture of device
- 2: Device name input field
- 3: Device tag input field
- 4: Status signal indicator (yellow triangle with exclamation mark)
- 5: Current measured values (Volume flow, Mass flow, Conductivity)
- 6: Web server language dropdown menu (set to English)
- 7: Maintenance checkbox
- 8: Access code input field
- 9: Login button
- 10: Reset access code button

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- 1 Picture of device
- 2 Device name
- 3 Device tag (→ 58)
- 4 Status signal
- 5 Current measured values
- 6 Operating language
- 7 User role
- 8 Access code
- 9 Login
- 10 Reset access code

 If a login page does not appear, or if the page is incomplete →  100

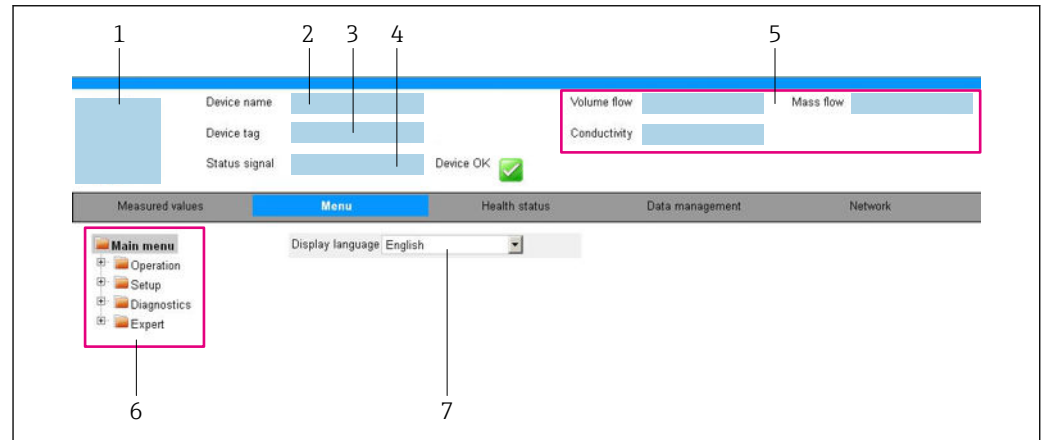
8.3.4 Logging on

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

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

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

8.3.5 User interface



A0032879

- 1 Picture of device
- 2 Device name
- 3 Device tag
- 4 Status signal
- 5 Current measured values
- 6 Navigation area
- 7 Local display language

Header

The following information appears in the header:

- Device tag
- Device status with status signal → 101
- Current measured values

Function row

Functions	Meaning
Measured values	Displays the measured values of the measuring device
Menu	<ul style="list-style-type: none"> ■ Access to the operating menu from the measuring device ■ The structure of the operating menu is the same as for the operating tools For detailed information on the structure of the operating menu, see the Operating Instructions for the measuring device
Device status	Displays the diagnostic messages currently pending, listed in order of priority
Data management	Data exchange between PC and measuring device: <ul style="list-style-type: none"> ■ Device configuration: <ul style="list-style-type: none"> – Load settings from the device (XML format, save configuration) – Save settings to the device (XML format, restore configuration) ■ Logbook - Export Event logbook (.csv file) ■ Documents - Export documents: <ul style="list-style-type: none"> – Export backup data record (.csv file, create documentation of the measuring point configuration) – Verification report (PDF file, only available with the "Heartbeat Verification" application package)

Functions	Meaning
Network configuration	Configuration and checking of all the parameters required for establishing the connection to the measuring device: <ul style="list-style-type: none"> ▪ Network settings (e.g. IP address, MAC address) ▪ Device information (e.g. serial number, firmware version)
Logout	End the operation and call up the login page

Navigation area

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

Working area

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

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

8.3.6 Disabling the Web server

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

Navigation

"Expert" menu → Communication → Web server

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Web server functionality	Switch the Web server on and off.	<ul style="list-style-type: none"> ▪ Off ▪ On 	On

Function scope of the "Web server functionality" parameter

Option	Description
Off	<ul style="list-style-type: none"> ▪ The web server is completely disabled. ▪ Port 80 is locked.
On	<ul style="list-style-type: none"> ▪ The complete functionality of the web server is available. ▪ JavaScript is used. ▪ The password is transferred in an encrypted state. ▪ Any change to the password is also transferred in an encrypted state.

Enabling the Web server

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

- Via Bedientool "FieldCare"
- Via "DeviceCare" operating tool

8.3.7 Logging out

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

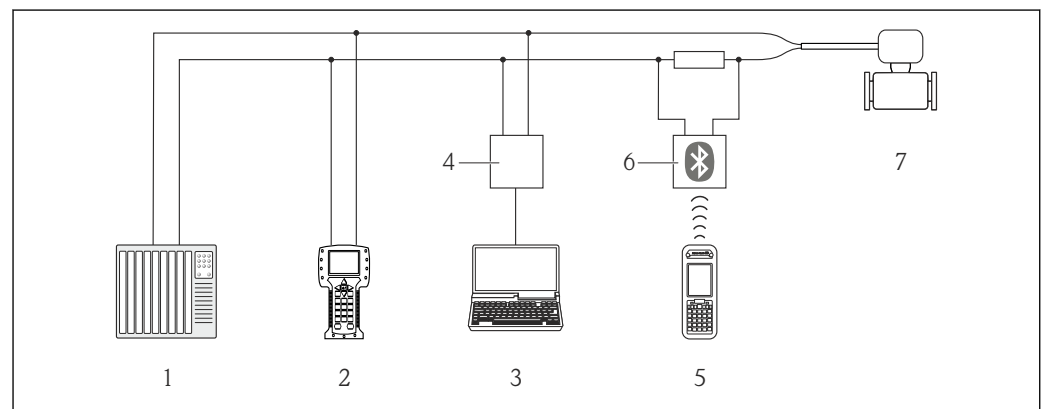
1. Select the **Logout** entry in the function row.
 ↳ The home page with the Login box appears.
2. Close the Web browser.
3. If no longer needed:
 Reset modified properties of the Internet protocol (TCP/IP) → 43.

8.4 Access to the operating menu via the operating tool

8.4.1 Connecting the operating tool

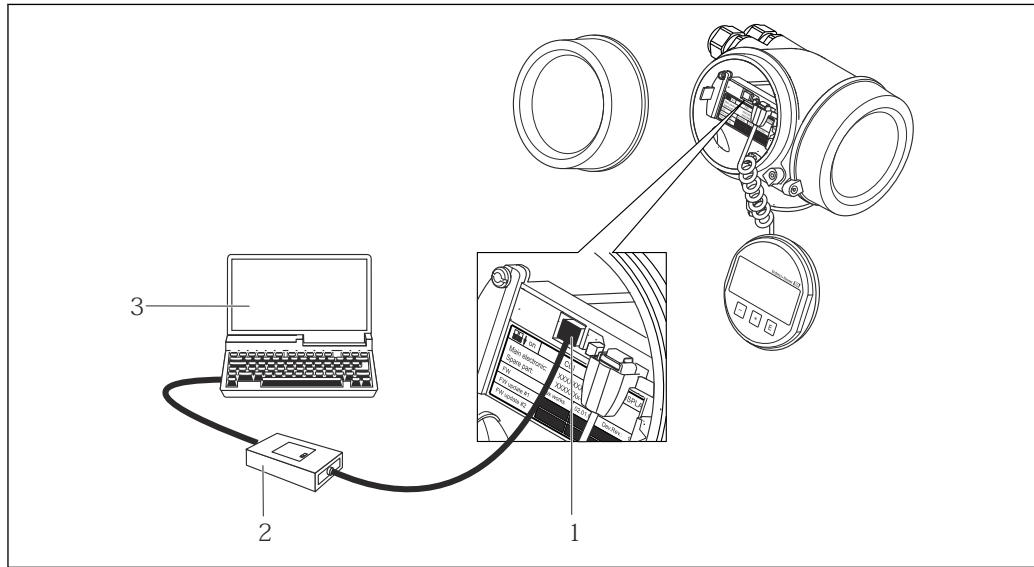
Via HART protocol

This communication interface is available in device versions with a HART output.



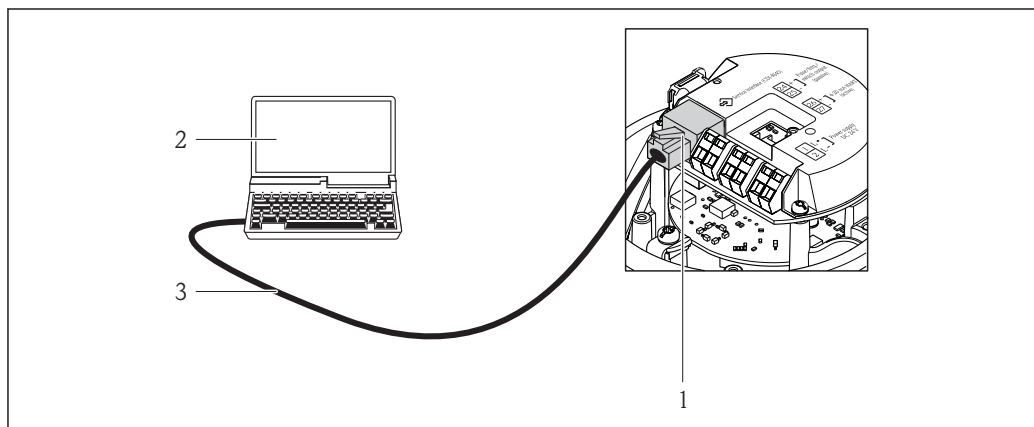
17 Options for remote operation via HART protocol

- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 VIATOR Bluetooth modem with connecting cable
- 7 Transmitter

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

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

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- 18 Connection for the order code for "Output", option B: 4-20 mA HART, pulse/frequency/switch output

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

8.4.2 Field Xpert SFX350, SFX370**Function range**

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-hazardous area** (SFX350, SFX370) and **hazardous area** (SFX370).



For details, see Operating Instructions BA01202S

Source for device description files

See information → 52

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:

- HART protocol
- CDI-RJ45 service interface

Typical functions:

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



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

Source for device description files

See information → 52

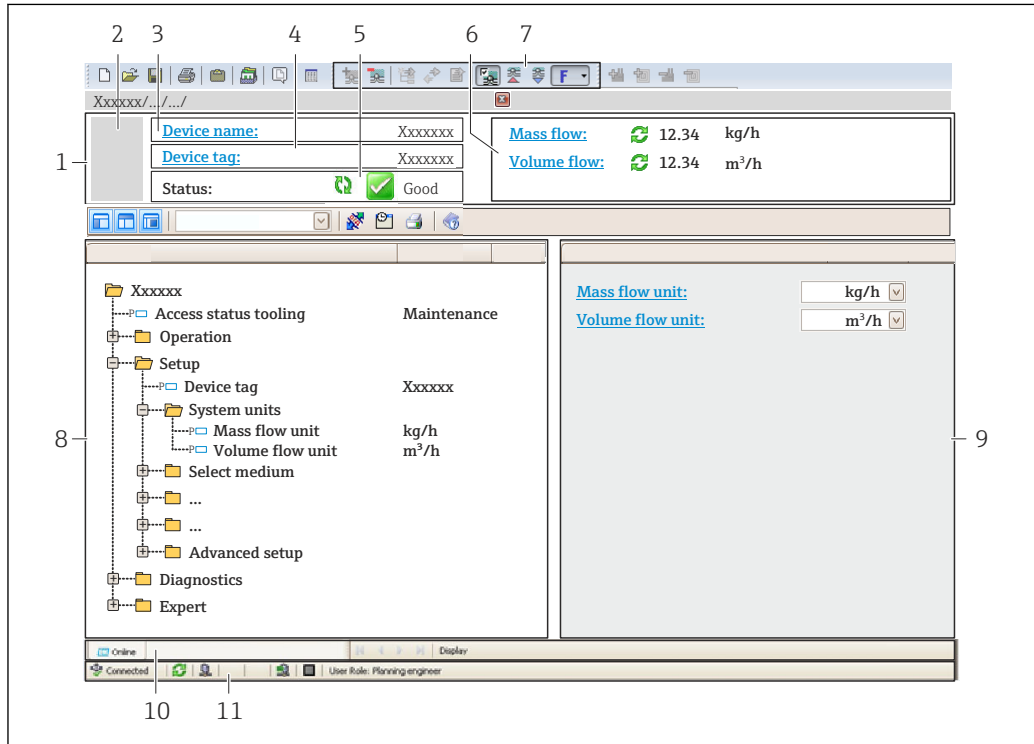
Establishing a connection

1. Start FieldCare and launch the project.
2. In the network: Add a device.
 - ↳ The **Add device** window opens.
3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.
4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.
5. Select the desired device from the list and press **OK** to confirm.
 - ↳ The **CDI Communication TCP/IP (Configuration)** window opens.
6. Enter the device address in the **IP address** field and press **Enter** to confirm: 192.168.1.212 (factory setting); if the IP address is not known .
7. Establish the online connection to the device.



For additional information, see Operating Instructions BA00027S and BA00059S

User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Tag name
- 5 Status area with status signal → 101
- 6 Display area for current measured values
- 7 Edit toolbar with additional functions such as save/restore, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Working area
- 10 Range of action
- 11 Status area

8.4.4 DeviceCare

Function scope

Tool to connect and configure Endress+Hauser field devices.

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



For details, see Innovation Brochure IN01047S

Source for device description files


See information → 52

8.4.5 AMS Device Manager

Function scope

Program from Emerson Process Management for operating and configuring measuring devices via HART protocol.

Source for device description files


See data →  52

8.4.6 SIMATIC PDM

Function scope

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

Source for device description files


See data →  52

8.4.7 Field Communicator 475

Function scope

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

Source for device description files

See data →  52

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.01.zz	<ul style="list-style-type: none"> On the title page of the Operating Instructions On the transmitter nameplate Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	10.2014	---
Manufacturer ID	0x11	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x4A	Device type Diagnostics → Device information → Device type
HART protocol revision	7	---
Device revision	2	<ul style="list-style-type: none"> On the transmitter nameplate Device revision Diagnostics → Device information → Device revision



For an overview of the different firmware versions for the device → 115

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

9.2 Measured variables via HART protocol

The following measured variables (HART device variables) are assigned to the dynamic variables at the factory:

Dynamic variables	Measured variables (HART device variables)
Primary dynamic variable (PV)	Mass flow
Secondary dynamic variable (SV)	Totalizer 1
Tertiary dynamic variable (TV)	Density
Quaternary dynamic variable (QV)	Temperature

The assignment of the measured variables to the dynamic variables can be modified and assigned as desired via the operating tool using the following parameters:

- Expert → Communication → HART output → Output → Assign PV
- Expert → Communication → HART output → Output → Assign SV
- Expert → Communication → HART output → Output → Assign TV
- Expert → Communication → HART output → Output → Assign QV

The following measured variables can be assigned to the dynamic variables:

Measured variables for PV (primary dynamic variable)

- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Carrier pipe temperature
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation damping 0
- Oscillation damping fluctuation 0
- Signal asymmetry
- Exciter current 0

Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)

- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Carrier pipe temperature
- Electronic temperature
- Oscillation frequency
- Oscillation amplitude
- Oscillation damping
- Signal asymmetry
- External pressure
- Totalizer 1...3



The range of options increases if the measuring device has one or more application packages.

Heartbeat Technology application package

Additional measured variables are available with the Heartbeat Technology application package:

- Carrier pipe temperature
- Oscillation amplitude 0

Device variables

The device variables are permanently assigned. A maximum of 8 device variables can be transmitted:

- 0 = mass flow
- 1 = volume flow
- 2 = corrected volume flow
- 3 = density
- 4 = reference density
- 5 = temperature
- 6 = totalizer 1
- 7 = totalizer 2
- 8 = totalizer 3
- 13 = target mass flow
- 14 = carrier mass flow
- 15 = concentration

9.3 Other settings

Burst mode functionality in accordance with HART 7 Specification:

Navigation

"Expert" menu → Communication → HART output → Burst configuration → Burst configuration 1 to n

► Burst configuration

► Burst configuration 1 to n

Burst mode 1 to n

→ 55

Burst command 1 to n

→ 55

Burst variable 0

→ 55

Burst variable 1

→ 55

Burst variable 2

→ 55

Burst variable 3







→ 55

Burst variable 4

→ 55

Burst variable 5

→ 56

Burst variable 6	→  56
Burst variable 7	→  56
Burst trigger mode	→  56
Burst trigger level	→  56
Min. update period	→  56
Max. update period	→  56

Parameter overview with brief description

Parameter	Description	Selection / User entry	Factory setting
Burst mode 1 to n	Activate the HART burst mode for burst message X.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Burst command 1 to n	Select the HART command that is sent to the HART master.	<ul style="list-style-type: none"> ■ Command 1 ■ Command 2 ■ Command 3 ■ Command 9 ■ Command 33 ■ Command 48 	Command 2
Burst variable 0	For HART command 9 and 33: select the HART device variable or the process variable.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Sensor integrity ■ Pressure ■ HART input ■ Percent of range ■ Measured current ■ Primary variable (PV) ■ Secondary variable (SV) ■ Tertiary variable (TV) ■ Quaternary variable (QV) ■ Not used 	Volume flow
Burst variable 1	For HART command 9 and 33: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used
Burst variable 2	For HART command 9 and 33: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used
Burst variable 3	For HART command 9 and 33: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used
Burst variable 4	For HART command 9: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used



Parameter	Description	Selection / User entry	Factory setting
Burst variable 5	For HART command 9: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used
Burst variable 6	For HART command 9: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used
Burst variable 7	For HART command 9: select the HART device variable or the process variable.	See the Burst variable 0 parameter.	Not used
Burst trigger mode	Select the event that triggers burst message X.	<ul style="list-style-type: none"> ■ Continuous ■ Window ■ Rising ■ Falling ■ On change 	Continuous
Burst trigger level	Enter the burst trigger value. Together with the option selected in the Burst trigger mode parameter the burst trigger value determines the time of burst message X.	Positive floating-point number	–
Min. update period	Enter the minimum time span between two burst commands of burst message X.	Positive integer	1 000 ms
Max. update period	Enter the maximum time span between two burst commands of burst message X.	Positive integer	2 000 ms

* Visibility depends on order options or device settings

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 →  28
- "Post-connection check" checklist →  37

10.2 Setting the operating language

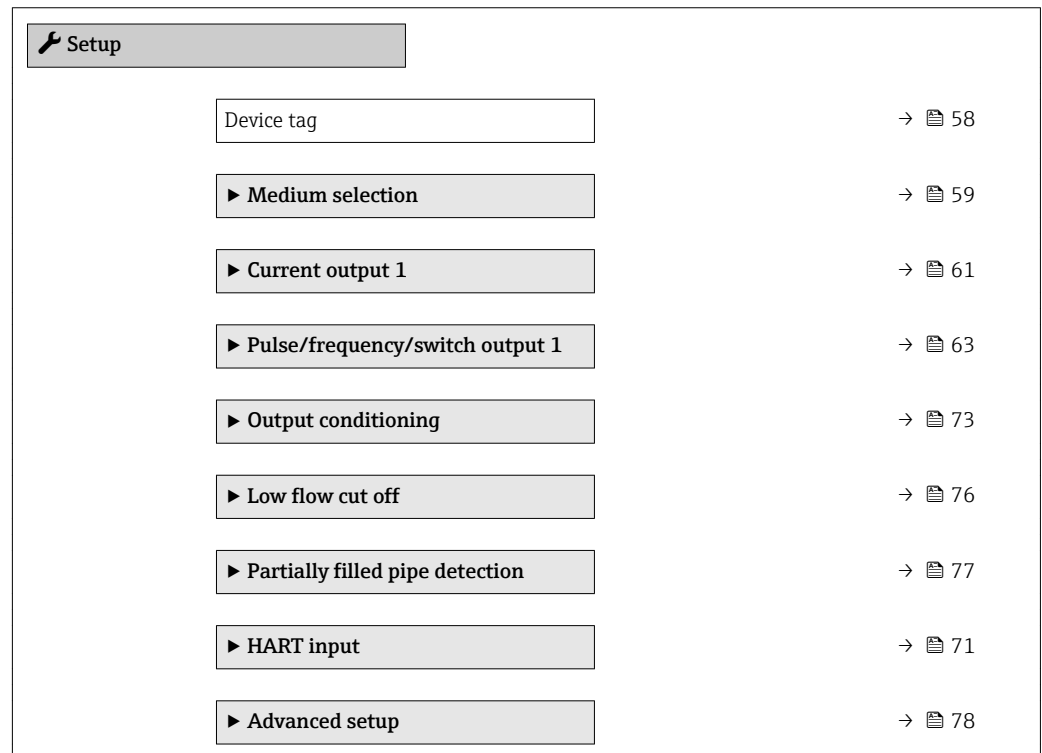
Factory setting: English or ordered local language

The operating language can be set in FieldCare, DeviceCare or via the Web server:

Operation → Display language

10.3 Configuring the measuring device


The **Setup** menu with its submenus contains all the parameters needed for standard operation.



10.3.1 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.



Enter the tag name in the "FieldCare" operating tool →  50

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. @, %, /).	Promass

10.3.2 Selecting and setting the medium

The **Select medium** wizard submenu contains parameters that must be configured in order to select and set the medium.

Navigation

"Setup" menu → Medium selection

► Medium selection	
Select medium	→ ⓘ 60
Select gas type	→ ⓘ 60
Reference sound velocity	→ ⓘ 60
Temperature coefficient sound velocity	→ ⓘ 60
Pressure compensation	→ ⓘ 60
Pressure value	→ ⓘ 60
External pressure	→ ⓘ 60

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry / User interface	Factory setting
Select medium	–	Select medium type.	<ul style="list-style-type: none"> ■ Liquid ■ Gas 	Liquid
Select gas type	The Gas option is selected in the Select medium parameter.	Select measured gas type.	<ul style="list-style-type: none"> ■ Air ■ Ammonia NH₃ ■ Argon Ar ■ Sulfur hexafluoride SF₆ ■ Oxygen O₂ ■ Ozone O₃ ■ Nitrogen oxide NO_x ■ Nitrogen N₂ ■ Nitrous oxide N₂O ■ Methane CH₄ ■ Hydrogen H₂ ■ Helium He ■ Hydrogen chloride HCl ■ Hydrogen sulfide H₂S ■ Ethylene C₂H₄ ■ Carbon dioxide CO₂ ■ Carbon monoxide CO ■ Chlorine Cl₂ ■ Butane C₄H₁₀ ■ Propane C₃H₈ ■ Propylene C₃H₆ ■ Ethane C₂H₆ ■ Others 	Methane CH ₄
Reference sound velocity	In the Select gas type parameter, the Others option is selected.	Enter sound velocity of gas at 0 °C (32 °F).	1 to 99 999.9999 m/s	415.0 m/s
Temperature coefficient sound velocity	The Others option is selected in the Select gas type parameter.	Enter temperature coefficient for the gas sound velocity.	Positive floating-point number	0 (m/s)/K
Pressure compensation	–	Select pressure compensation type.	<ul style="list-style-type: none"> ■ Off ■ Fixed value ■ External value 	Off
Pressure value	The Fixed value option is selected in the Pressure compensation parameter.	Enter process pressure to be used for pressure correction.	Positive floating-point number	0 bar
External pressure	The External value option is selected in the Pressure compensation parameter.		Positive floating-point number	0 bar







10.3.3 Configuring the current output

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

Navigation

"Setup" menu → Current output 1

Structure of the submenu

► Current output 1		
Assign current output	→	 62
Current span	→	 62
0/4 mA value	→	 62
20 mA value	→	 62
Failure mode	→	 63
Failure current	→	 63

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign current output	–	Select process variable for current output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Oscillation amplitude 0 * ■ Frequency fluctuation 0 ■ Oscillation damping 0 ■ Tube damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Mass flow
Current span	–	Select current range for process value output and upper/lower level for alarm signal.	<ul style="list-style-type: none"> ■ 4...20 mA NAMUR ■ 4...20 mA US ■ 4...20 mA ■ 0...20 mA ■ Fixed current 	Country-specific: <ul style="list-style-type: none"> ■ 4...20 mA NAMUR ■ 4...20 mA US
0/4 mA value	One of the following options is selected in the Current span parameter (→ 62): <ul style="list-style-type: none"> ■ 4...20 mA NAMUR ■ 4...20 mA US ■ 4...20 mA ■ 0...20 mA 	Enter 4 mA value.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 kg/h ■ 0 lb/min
20 mA value	One of the following options is selected in the Current span parameter (→ 62): <ul style="list-style-type: none"> ■ 4...20 mA NAMUR ■ 4...20 mA US ■ 4...20 mA ■ 0...20 mA 	Enter 20 mA value.	Signed floating-point number	Depends on country and nominal diameter

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Failure mode	<p>One of the following options is selected in the Assign current output parameter (→ 62):</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Oscillation amplitude 0 * ■ Frequency fluctuation 0 ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 <p>One of the following options is selected in the Current span parameter (→ 62):</p> <ul style="list-style-type: none"> ■ 4...20 mA NAMUR ■ 4...20 mA US ■ 4...20 mA ■ 0...20 mA 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Min. ■ Max. ■ Last valid value ■ Actual value ■ Defined value 	Max.
Failure current	The Defined value option is selected in the Failure mode parameter.	Enter current output value in alarm condition.	0 to 22.5 mA	22.5 mA

* Visibility depends on order options or device settings

10.3.4 Configuring the pulse/frequency/switch output

The **Pulse/frequency/switch output** submenu contains all the parameters that must be configured for the configuration of the selected output type.

Navigation

"Setup" menu → Pulse/frequency/switch output 1

Structure of the "Pulse/frequency/switch output 1" submenu

▶ Pulse/frequency/switch output 1

Operating mode



















→ 65

Assign pulse output

→ 65

Assign frequency output

→ 66

Switch output function	→  70
Assign diagnostic behavior	→  70
Assign limit	→  70
Assign flow direction check	→  70
Assign status	→  70
Value per pulse	→  65
Pulse width	→  65
Failure mode	→  65
Minimum frequency value	→  66
Maximum frequency value	→  67
Measuring value at minimum frequency	→  67
Measuring value at maximum frequency	→  68
Failure mode	→  69
Failure frequency	→  69
Switch-on value	→  71
Switch-off value	→  71
Failure mode	→  71
Invert output signal	→  65

Configuring the pulse output

Navigation

"Setup" menu → Pulse/frequency/switch output 1

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	Pulse
Assign pulse output	The Pulse option is selected in the Operating mode parameter.	Select process variable for pulse output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass 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 (→ 65): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	In the Operating mode parameter, the Pulse option is selected, and one of the following options is selected in the Assign pulse output parameter (→ 65): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Define time width of the output pulse.	0.05 to 2 000 ms	100 ms
Failure mode	In the Operating mode parameter, the Pulse option is selected, and one of the following options is selected in the Assign pulse output parameter (→ 65): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Actual value ■ No pulses 	No pulses
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ■ No ■ Yes 	No

* Visibility depends on order options or device settings

Configuring the frequency output

Navigation

"Setup" menu → Pulse/frequency/switch output 1

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	<ul style="list-style-type: none"> ■ Pulse ■ Frequency ■ Switch 	Pulse
Assign frequency output	The Frequency option is selected in the Operating mode parameter (→ 65).	Select process variable for frequency output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Tube damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Off
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 (→ 66): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Maximum frequency value	<p>In the Operating mode parameter, the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 66):</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at minimum frequency	<p>In the Operating mode parameter, the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 66):</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Enter measured value for minimum frequency.	Signed floating-point number	Depends on country and nominal diameter

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Measuring value at maximum frequency	<p>In the Operating mode parameter, the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 66):</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Damping output	<p>In the Operating mode parameter the Frequency option is selected and in the Assign frequency output parameter (→ 66) one of the following options is selected:</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Set reaction time for output signal to fluctuations in the measured value.	0 to 999.9 s	0.0 s

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Failure mode	<p>In the Operating mode parameter, the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 66):</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Define output behavior in alarm condition.	<ul style="list-style-type: none"> ■ Actual value ■ Defined value ■ 0 Hz 	0 Hz
Failure frequency	<p>In the Operating mode parameter, the Frequency option is selected, and one of the following options is selected in the Assign frequency output parameter (→ 66):</p> <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Oscillation damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Enter frequency output value in alarm condition.	0.0 to 12 500.0 Hz	0.0 Hz
Invert output signal	–	Invert the output signal.	<ul style="list-style-type: none"> ■ No ■ Yes 	No

* Visibility depends on order options or device settings

Configuring the switch output

Navigation

"Setup" menu → Pulse/frequency/switch output 1

Parameter overview with brief description

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

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

* Visibility depends on order options or device settings

10.3.5 Configuring the HART input

The **HART input** wizard contains all the parameters that must be configured for the configuration of the HART input.

Navigation

"Setup" menu → HART input

► HART input

Capture mode

→ 72

Device ID

→ 72

Device type





→ 72

Manufacturer ID


→ 72

Burst command

→ 72

Slot number	→  72
Timeout	→  72
Failure mode	→  73
Failure value	→  73

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Capture mode	–	Select capture mode via burst or master communication.	<ul style="list-style-type: none"> Off Burst network Master network 	Off
Device ID	The Master network option is selected in the Capture mode parameter.	Enter device ID of external device.	6-digit value: <ul style="list-style-type: none"> Via local operation: enter as hexadecimal or decimal number Via operating tool: enter as decimal number 	0
Device type	In the Capture mode parameter, the Master network option is selected.	Enter device type of external device.	2-digit hexadecimal number	0x00
Manufacturer ID	The Master network option is selected in the Capture mode parameter.	Enter manufacture ID of external device.	2-digit value: <ul style="list-style-type: none"> Via local operation: enter as hexadecimal or decimal number Via operating tool: enter as decimal number 	0
Burst command	The Burst network option or the Master network option are selected in the Capture mode parameter.	Select command to read in external process variable.	<ul style="list-style-type: none"> Command 1 Command 3 Command 9 Command 33 	Command 1
Slot number	The Burst network option or the Master network option is selected in the Capture mode parameter.	Define position of external process variable in burst command.	1 to 4	1
Timeout	The Burst network option or the Master network option is selected in the Capture mode parameter.	Enter deadline for process variable of external device.  If the waiting time is exceeded, the diagnostic message F410 Data transfer is displayed.	1 to 120 s	5 s

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Failure mode	In the Capture mode parameter, the Burst network option or Master network option is selected.	Define behavior if external process variable is missed.	<ul style="list-style-type: none"> Alarm Last valid value Defined value 	Alarm
Failure value	The following conditions are met: <ul style="list-style-type: none"> In the Capture mode parameter, the Burst network option or Master network option is selected. In the Failure mode parameter, the Defined value option is selected. 	Enter value to be used by the device if input value from external device is missing.	Signed floating-point number	0

10.3.6 Configuring the output conditioning

The **Output conditioning** submenu contains all the parameters that must be configured for the configuration of output conditioning.

Navigation

"Setup" menu → Output conditioning

Structure of the "Output conditioning" submenu

► Output conditioning		
Assign current output		→ 74
Damping output 1		→ 74
Measuring mode output 1		→ 74
Assign frequency output		→ 75
Damping output 1		→ 75
Measuring mode output 1		→ 75
Assign pulse output		→ 75
Measuring mode output 1		→ 75
Operating mode totalizer 1		→ 75

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign current output	–	Select process variable for current output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Oscillation amplitude 0 * ■ Frequency fluctuation 0 ■ Oscillation damping 0 ■ Tube damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Mass flow
Damping output	–	Set reaction time for output signal to fluctuations in the measured value.	0 to 999.9 s	1 s
Measuring mode output	–	Select measuring mode for output.	<ul style="list-style-type: none"> ■ Forward flow ■ Forward/Reverse flow ■ Reverse flow compensation 	Forward flow

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign frequency output	The Frequency option is selected in the Operating mode parameter (→ 65).	Select process variable for frequency output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Frequency fluctuation 0 ■ Oscillation amplitude 0 * ■ Oscillation damping 0 ■ Tube damping fluctuation 0 ■ Signal asymmetry ■ Exciter current 0 	Off
Damping output	–	Set reaction time for output signal to fluctuations in the measured value.	0 to 999.9 s	1 s
Measuring mode output	–	Select measuring mode for output.	<ul style="list-style-type: none"> ■ Forward flow ■ Forward/Reverse flow ■ Reverse flow ■ Reverse flow compensation 	Forward flow
Assign pulse output	The Pulse option is selected in the Operating mode parameter.	Select process variable for pulse output.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Off
Measuring mode output	–	Select measuring mode for output.	<ul style="list-style-type: none"> ■ Forward flow ■ Forward/Reverse flow ■ Reverse flow ■ Reverse flow compensation 	Forward flow
Operating mode totalizer	–	Select totalizer calculation mode.	<ul style="list-style-type: none"> ■ Net flow total ■ Forward flow total ■ Reverse flow total 	Net flow total

* Visibility depends on order options or device settings

10.3.7 Configuring the low flow cut off

The **Low flow cut off** submenu contains the parameters that must be set in order to configure the low flow cut off.

Navigation

"Setup" menu → Low flow cut off

► Low flow cut off	
Assign process variable	→ 76
On value low flow cutoff	→ 76
Off value low flow cutoff	→ 76
Pressure shock suppression	→ 76

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> Off Mass flow Volume flow Corrected volume flow 	Mass flow
On value low flow cutoff	One of the following options is selected in the Assign process variable parameter (→ 76): <ul style="list-style-type: none"> Mass flow Volume flow Corrected volume flow 	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	One of the following options is selected in the Assign process variable parameter (→ 76): <ul style="list-style-type: none"> Mass flow Volume flow Corrected volume flow 	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	One of the following options is selected in the Assign process variable parameter (→ 76): <ul style="list-style-type: none"> Mass flow Volume flow Corrected volume flow 	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.3.8 Configuring the partial filled pipe detection

The **Partially filled pipe detection** submenu contains parameters that have to be set for configuring empty pipe detection.

Navigation

"Setup" menu → Partially filled pipe detection

▶ Partially filled pipe detection

Assign process variable

→ 77

Low value partial filled pipe detection

→ 77

High value partial filled pipe detection

→ 77

Response time part. filled pipe detect.


→ 77

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for partially filled pipe detection.	<ul style="list-style-type: none"> ■ Off ■ Density ■ Reference density 	Off
Low value partial filled pipe detection	One of the following options is selected in the Assign process variable parameter (→ 77): <ul style="list-style-type: none"> ■ Density ■ Reference density 	Enter lower limit value for deactivating partially filled pipe detection.	Signed floating-point number	200
High value partial filled pipe detection	One of the following options is selected in the Assign process variable parameter (→ 77): <ul style="list-style-type: none"> ■ Density ■ Reference density 	Enter upper limit value for deactivating partially filled pipe detection.	Signed floating-point number	6 000
Response time part. filled pipe detect.	One of the following options is selected in the Assign process variable parameter (→ 77): <ul style="list-style-type: none"> ■ Density ■ Reference density 	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s	1 s

10.4 Advanced settings

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

 The number of submenus can vary depending on the device version, e.g. viscosity is available only with the Promass I.

Navigation

"Setup" menu → Advanced setup

▶ Advanced setup

Enter access code

▶ System units→ 78

▶ Calculated values→ 80

▶ Sensor adjustment→ 82

▶ Totalizer 1 to n→ 83

▶ Display→ 85

▶ Viscosity

▶ Concentration

▶ Heartbeat setup

▶ Administration→ 88

10.4.1 Using the parameter to enter the access code

Navigation


"Setup" menu → Advanced setup

Parameter overview with brief description

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

10.4.2 Setting the system units

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

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




Navigation

"Setup" menu → Advanced setup → System units

► System units	
Mass flow unit	→ ⓘ 79
Mass unit	→ ⓘ 79
Volume flow unit	→ ⓘ 79
Volume unit	→ ⓘ 79
Corrected volume flow unit	→ ⓘ 80
Corrected volume unit	→ ⓘ 80
Density unit	→ ⓘ 80
Reference density unit	→ ⓘ 80
Temperature unit	→ ⓘ 80
Pressure unit	→ ⓘ 80

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Low flow cut off Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg/h lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg lb
Volume flow unit	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Low flow cut off Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> l/h gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> l (DN > 150 (6"): m³) gal (us)

Parameter	Description	Selection	Factory setting
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: Corrected volume flow parameter (→  94)	Unit choose list	Country-specific: ■ NI/h ■ Sft ³ /min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: ■ NI ■ Sft ³
Density unit	Select density unit. <i>Result</i> The selected unit applies for: ■ Output ■ Simulation process variable ■ Density adjustment (Expert menu)	Unit choose list	Country-specific: ■ kg/l ■ lb/ft ³
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent ■ kg/NI ■ lb/Sft ³
Temperature unit	Select temperature unit. <i>Result</i> The selected unit applies for: ■ Electronic temperature parameter (6053) ■ Maximum value parameter (6051) ■ Minimum value parameter (6052) ■ External temperature parameter (6080) ■ Maximum value parameter (6108) ■ Minimum value parameter (6109) ■ Carrier pipe temperature parameter (6027) ■ Maximum value parameter (6029) ■ Minimum value parameter (6030) ■ Reference temperature parameter (1816) ■ Temperature parameter	Unit choose list	Country-specific: ■ °C ■ °F
Pressure unit	Select process pressure unit. <i>Result</i> The unit is taken from: ■ Pressure value parameter (→  60) ■ External pressure parameter (→  60) ■ Pressure value	Unit choose list	Country-specific: ■ bar a ■ psi a

10.4.3 Calculated values

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

Navigation

"Setup" menu → Advanced setup → Calculated values

► Calculated values

► Corrected volume flow calculation

Corrected volume flow calculation → 81

External reference density → 81

Fixed reference density → 81

Reference temperature → 81

Linear expansion coefficient → 82

Square expansion coefficient → 82

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Corrected volume flow calculation	–	Select reference density for calculating the corrected volume flow.	<ul style="list-style-type: none"> Fixed reference density Calculated reference density Reference density by API table 53 	Calculated reference density
External reference density	–	Shows external reference density.	Floating point number with sign	–
Fixed reference density	The Fixed reference density option is selected in the Corrected volume flow calculation parameter.	Enter fixed value for reference density.	Positive floating-point number	1 kg/Nl
Reference temperature	The Calculated reference density option is selected in the Corrected volume flow calculation parameter.	Enter reference temperature for calculating the reference density.	–273.15 to 99 999 °C	Country-specific: <ul style="list-style-type: none"> +20 °C +68 °F

Parameter	Prerequisite	Description	Selection / User interface / User entry	Factory setting
Linear expansion coefficient	The Calculated reference density option is selected in the Corrected volume flow calculation parameter parameter.	Enter linear, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0
Square expansion coefficient	The Calculated reference density option is selected in the Corrected volume flow calculation parameter parameter.	For media with a non-linear expansion pattern: enter the quadratic, medium-specific expansion coefficient for calculating the reference density.	Signed floating-point number	0.0

10.4.4 Carrying out a sensor adjustment

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

Navigation

"Setup" menu → Advanced setup → Sensor adjustment

► Sensor adjustment	
Installation direction	→ 82
► Zero point adjustment	→ 82

Parameter overview with brief description

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

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 128. Therefore, a zero point adjustment in the field is generally not required.

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

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

Navigation

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

► Zero point adjustment	
Zero point adjustment control	→ 83
Progress	→ 83

Parameter overview with brief description

Parameter	Description	Selection / User interface	Factory setting
Zero point adjustment control	Start zero point adjustment.	<ul style="list-style-type: none"> ■ Cancel ■ Busy ■ Zero point adjust failure ■ Start 	Cancel
Progress	Shows the progress of the process.	0 to 100 %	–

10.4.5 Configuring the totalizer

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

Navigation

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

► Totalizer 1 to n	
Assign process variable	→ 84
Unit totalizer	→ 84
Totalizer operation mode	→ 84
Failure mode	→ 84

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow[*] ■ Carrier mass flow[*] 	Mass flow
Unit totalizer	One of the following options is selected in the Assign process variable parameter (→ 84) of the Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow[*] ■ Carrier mass flow[*] 	Select process variable totalizer unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg ■ lb
Totalizer operation mode	One of the following options is selected in the Assign process variable parameter (→ 84) of the Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow[*] ■ Carrier mass flow[*] 	Select totalizer calculation mode.	<ul style="list-style-type: none"> ■ 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 (→ 84) of the Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow[*] ■ Carrier mass flow[*] 	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> ■ Stop ■ Actual value ■ Last valid value 	Stop



















* Visibility depends on order options or device settings

10.4.6 Carrying out additional display configurations

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

Navigation



"Setup" menu → Advanced setup → Display

► Display		
Format display	→	 86
Value 1 display	→	 86
0% bargraph value 1	→	 86
100% bargraph value 1	→	 86
Decimal places 1	→	 87
Value 2 display	→	 87
Decimal places 2	→	 87
Value 3 display	→	 87
0% bargraph value 3	→	 87
100% bargraph value 3	→	 87
Decimal places 3	→	 87
Value 4 display	→	 87
Decimal places 4	→	 87
Display language	→	 87
Display interval	→	 87
Display damping	→	 88
Header	→	 88
Header text	→	 88

Separator	→ 88
Backlight	

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Format display	A local display is provided.	Select how measured values are shown on the display.	<ul style="list-style-type: none"> ■ 1 value, max. size ■ 1 bargraph + 1 value ■ 2 values ■ 1 value large + 2 values ■ 4 values 	1 value, max. size
Value 1 display	A local display is provided.	Select the measured value that is shown on the local display.	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * ■ Density ■ Reference density ■ Concentration * ■ Temperature ■ Carrier pipe temperature * ■ Electronic temperature ■ Oscillation frequency 0 ■ Oscillation amplitude 0 * ■ Frequency fluctuation 0 ■ Oscillation damping 0 ■ Tube damping fluctuation 0 ■ Tube damping fluctuation 1 ■ Signal asymmetry ■ Exciter current 0 ■ None ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 ■ Current output 1 	Mass flow
0% bargraph value 1	A local display is provided.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 kg/h ■ 0 lb/min
100% bargraph value 1	A local display is provided.	Enter 100% value for bar graph display.	Signed floating-point number	Depends on country and nominal diameter

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Decimal places 1	A measured value is specified in the Value 1 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	x.xx
Value 2 display	A local display is provided.	Select the measured value that is shown on the local display.	For the picklist, see the Value 1 display parameter	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.	<ul style="list-style-type: none"> ■ 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.	For the picklist, see the Value 1 display parameter (→  86)	None
0% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 0% value for bar graph display.	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 kg/h ■ 0 lb/min
100% bargraph value 3	A selection was made in the Value 3 display parameter.	Enter 100% value for bar graph display.	Signed floating-point number	0
Decimal places 3	A measured value is specified in the Value 3 display parameter.	Select the number of decimal places for the display value.	<ul style="list-style-type: none"> ■ 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.	For the picklist, see the Value 1 display parameter (→  86)	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.	<ul style="list-style-type: none"> ■ x ■ x.x ■ x.xx ■ x.xxx ■ x.xxxx 	x.xx
Display language	A local display is provided.	Set display language.	<ul style="list-style-type: none"> ■ English ■ Deutsch * ■ Français * ■ Español * ■ Italiano * ■ Nederlands * ■ Portuguesa * ■ Polski * ■ русский язык (Russian) * ■ Svenska * ■ Türkçe * ■ 中文 (Chinese) * ■ 日本語 (Japanese) * ■ 한국어 (Korean) * ■ Bahasa Indonesia * ■ tiếng Việt (Vietnamese) * ■ čeština (Czech) * 	English (alternatively, the ordered language is preset in the device)
Display interval	A local display is provided.	Set time measured values are shown on display if display alternates between values.	1 to 10 s	5 s

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Display damping	A local display is provided.	Set display reaction time to fluctuations in the measured value.	0.0 to 999.9 s	0.0 s
Header	A local display is provided.	Select header contents on local display.	<ul style="list-style-type: none"> ■ Device tag ■ Free text 	Device tag
Header text	In the Header parameter, the Free text option is selected.	Enter display header text.	Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)	-----
Separator	A local display is provided.	Select decimal separator for displaying numerical values.	<ul style="list-style-type: none"> ■ . (point) ■ , (comma) 	. (point)

* Visibility depends on order options or device settings

10.4.7 Using parameters for device administration

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

Navigation

"Setup" menu → Advanced setup → Administration

▶ Administration

Define access code

→ ⓘ 88

Device reset

→ ⓘ 88

Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Define access code	Define release code for write access to parameters.	0 to 9999	0
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<ul style="list-style-type: none"> ■ Cancel ■ To delivery settings ■ Restart device 	Cancel

10.5 Simulation


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

Navigation

"Diagnostics" menu → Simulation

► Simulation		
Assign simulation process variable	→	📄 90
Value process variable	→	📄 90
Simulation current output 1	→	📄 90
Value current output 1	→	📄 90
Frequency simulation 1	→	📄 90
Frequency value 1	→	📄 90
Pulse simulation 1	→	📄 90
Pulse value 1	→	📄 90
Switch output simulation 1	→	📄 90
Switch status 1	→	📄 91
Simulation device alarm	→	📄 91
Diagnostic event category	→	📄 91
Simulation diagnostic event	→	📄 91

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Concentration * ■ Target mass flow * ■ Carrier mass flow * 	Off
Value process variable	One of the following options is selected in the Assign simulation process variable parameter (→ 90): <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Concentration * ■ Target mass flow * ■ Carrier mass flow * 	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Simulation current output 1	–	Switch the simulation of the current output on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Value current output 1	In the Simulation current output parameter, the On option is selected.	Enter the current value for simulation.	3.59 to 22.5 mA	3.59 mA
Frequency simulation 1	In the Operating mode parameter, the Frequency option is selected.	Switch the simulation of the frequency output on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Frequency value 1	In the Frequency simulation parameter, the On option is selected.	Enter the frequency value for the simulation.	0.0 to 12 500.0 Hz	0.0 Hz
Pulse simulation 1	In the Operating mode parameter, the Pulse option is selected.	Set and switch off the pulse output simulation.  For Fixed value option: Pulse width parameter (→ 65) defines the pulse width of the pulses output.	<ul style="list-style-type: none"> ■ Off ■ Fixed value ■ Down-counting value 	Off
Pulse value 1	In the Pulse simulation parameter (→ 90), the Down-counting value option is selected.	Enter the number of pulses for simulation.	0 to 65 535	0
Switch output simulation 1	In the Operating mode parameter, the Switch option is selected.	Switch the simulation of the switch output on and off.	<ul style="list-style-type: none"> ■ Off ■ On 	Off

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Switch status 1	In the Switch output simulation parameter (→ 90) Switch output simulation 1 to n parameter Switch output simulation 1 to n parameter, the On option is selected.	Select the status of the status output for the simulation.	<ul style="list-style-type: none"> Open Closed 	Open
Simulation device alarm	–	Switch the device alarm on and off.	<ul style="list-style-type: none"> Off On 	Off
Diagnostic event category	–	Select a diagnostic event category.	<ul style="list-style-type: none"> Sensor Electronics Configuration Process 	Process
Simulation diagnostic event	–	Select a diagnostic event for the simulation process that is activated.	<ul style="list-style-type: none"> Off Diagnostic event picklist (depends on the category selected) 	Off

* Visibility depends on order options or device settings

10.6 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 for Web browser → 91
- Write protection via write protection switch → 92

10.6.1 Write protection via access code

With the customer-specific access code, access to the measuring device via the Web browser is protected, as are the parameters for the measuring device configuration.

Navigation

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



► Administration

Define access code → 88

Device reset → 88

Defining the access code via the Web browser

1. Navigate to the **Define access code** parameter.
2. Define a max. 16-digit numeric code as an access code.

3. Enter the access code again in the to confirm the code.
 - ↳ The Web browser switches to the login page.
-  If no action is performed for 10 minutes, the Web browser automatically returns to the login page.
- 
 - If parameter write protection is activated via an access code, it can also only be deactivated via this access code .
 - The user role with which the user is currently logged on via Web browser is indicated by the **Access status tooling** parameter. Navigation path: Operation → Access status tooling


10.6.2 Write protection via write protection switch

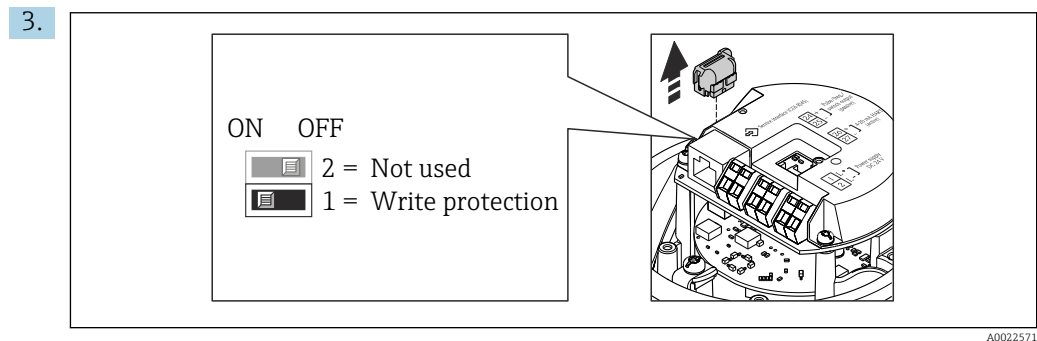
The write protection switch makes it possible to block write access to the entire operating menu with the exception of the following parameters:

- External pressure
- External temperature
- Reference density
- All parameters for configuring the totalizer

The parameter values are now read only and cannot be edited any more:

- Via service interface (CDI)
- Via HART protocol

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary
→  141.



Disconnect the T-DAT from the main electronics module.

4. Setting the write protection switch on the main electronics module to the **ON** position enables the hardware write protection. Setting the write protection switch on the main electronics module to the **OFF** position (factory setting) disables the hardware write protection.
 - ↳ If hardware write protection is enabled: the **Locking status** parameter displays the **Hardware locked** option ; if disabled, the **Locking status** parameter does not display any option .
5. Reverse the removal procedure to reassemble the transmitter.

11 Operation

11.1 Reading the device locking status

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

Navigation

"Operation" menu → Locking status

Function scope of "Locking status" parameter

Options	Description
Hardware locked	The locking switch (DIP switch) for locking the hardware is activated on the main electronic module. This prevents write access to the parameters .
Temporarily locked	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again.

11.2 Adjusting the operating language



Detailed information:

- To configure the operating language → 57
- For information on the operating languages supported by the measuring device → 143

11.3 Configuring the display

Detailed information:

On the advanced settings for the local display → 85

11.4 Reading measured values

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

Navigation

"Diagnostics" menu → Measured values

► Measured values	
► Process variables	→ 94
► Totalizer	→ 95
► Output values	→ 96

11.4.1 "Measured variables" submenu

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




Navigation

"Diagnostics" menu → Measured values → Measured variables

► Measured variables	
Mass flow	→ ⓘ 94
Volume flow	→ ⓘ 94
Corrected volume flow	→ ⓘ 94
Density	→ ⓘ 95
Reference density	→ ⓘ 95
Temperature	→ ⓘ 95
Pressure value	→ ⓘ 95
Concentration	→ ⓘ 95
Target mass flow	→ ⓘ 95
Carrier mass flow	→ ⓘ 95

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Mass flow	–	Displays the mass flow currently measured. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→ ⓘ 79).	Signed floating-point number
Volume flow	–	Displays the volume flow currently calculated. <i>Dependency</i> The unit is taken from the Volume flow unit parameter (→ ⓘ 79).	Signed floating-point number
Corrected volume flow	–	Displays the corrected volume flow currently calculated. <i>Dependency</i> The unit is taken from the Corrected volume flow unit parameter (→ ⓘ 80).	Signed floating-point number

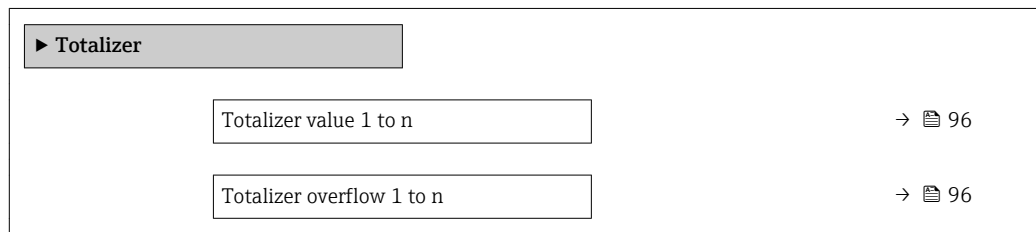
Parameter	Prerequisite	Description	User interface
Density	–	Shows the density currently measured. <i>Dependency</i> The unit is taken from the Density unit parameter (→ 80).	Signed floating-point number
Reference density	–	Displays the reference density currently calculated. <i>Dependency</i> The unit is taken from the Reference density unit parameter (→ 80).	Signed floating-point number
Temperature	–	Shows the medium temperature currently measured. <i>Dependency</i> The unit is taken from the Temperature unit parameter (→ 80).	Signed floating-point number
Pressure value	–	Displays either a fixed or external pressure value. <i>Dependency</i> The unit is taken from the Pressure unit parameter (→ 80).	Signed floating-point number
Concentration	For the following order code: "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the concentration currently calculated. <i>Dependency</i> The unit is taken from the Concentration unit parameter.	Signed floating-point number
Target mass flow	With the following conditions: ▪ Order code for "Application package", option ED "Concentration" ▪ The WT-% option or the User conc. option is selected in the Concentration unit parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the target fluid mass flow currently measured. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→ 79).	Signed floating-point number
Carrier mass flow	With the following conditions: ▪ Order code for "Application package", option ED "Concentration" ▪ The WT-% option or the User conc. option is selected in the Concentration unit parameter.  The software options currently enabled are displayed in the Software option overview parameter.	Displays the carrier fluid mass flow currently measured. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→ 79).	Signed floating-point number

11.4.2 "Totalizer" submenu

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

Navigation

"Diagnostics" menu → Measured values → Totalizer

**Parameter overview with brief description**

Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	One of the following options is selected in the Assign process variable parameter (→ 84) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to n	One of the following options is selected in the Assign process variable parameter (→ 84) Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Displays the current totalizer overflow.	Integer with sign

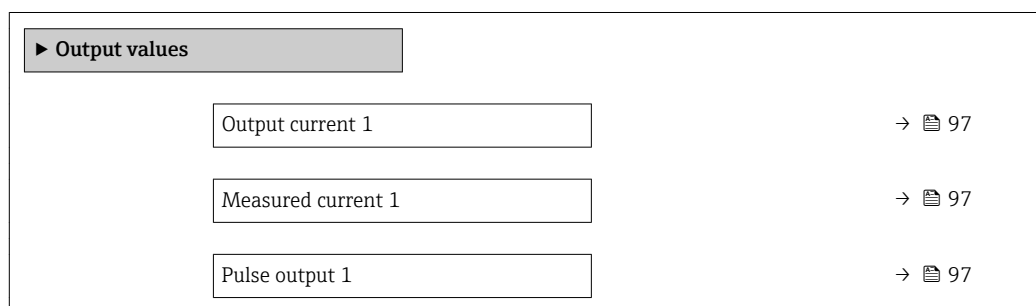
* Visibility depends on order options or device settings

11.4.3 Output values

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

Navigation

"Diagnostics" menu → Measured values → Output values



Output frequency 1	→ 97
Switch status 1	→ 97

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Output current 1	–	Displays the current value currently calculated for the current output.	3.59 to 22.5 mA
Measured current 1	–	Displays the current value currently measured for the current output.	0 to 30 mA
Pulse output 1	In the Operating mode parameter, the Pulse option is selected.	Displays the pulse frequency currently output.	Positive floating-point number
Output frequency 1	In the Operating mode parameter, the Frequency option is selected.	Displays the value currently measured for the frequency output.	0.0 to 12 500.0 Hz
Switch status 1	The Switch option is selected in the Operating mode parameter.	Displays the current switch output status.	<ul style="list-style-type: none"> ■ Open ■ Closed

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→ 57)
- Advanced settings using the **Advanced setup** submenu (→ 78)

11.6 Performing a totalizer reset

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


- Control Totalizer
- Reset all totalizers

Navigation

"Operation" menu → Totalizer handling

► Totalizer handling	
Control Totalizer 1 to n	→ 98
Preset value 1 to n	→ 98
Reset all totalizers	→ 98

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	One of the following options is selected in the Assign process variable parameter (→ 84) of the Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow[*] ■ Carrier mass flow[*] 	Control totalizer value.	<ul style="list-style-type: none"> ■ Totalize ■ Reset + hold ■ Preset + hold ■ Reset + totalize ■ Preset + totalize 	Totalize
Preset value 1 to n	One of the following options is selected in the Assign process variable parameter (→ 84) of the Totalizer 1 to n submenu: <ul style="list-style-type: none"> ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow[*] ■ Carrier mass flow[*] 	Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→ 84).	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 kg ■ 0 lb
Reset all totalizers	–	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize 	Cancel

* Visibility depends on order options or device settings

11.6.1 Function scope of the "Control Totalizer" parameter

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

11.6.2 Function scope of the "Reset all totalizers" parameter

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

12 Diagnostics and troubleshooting

12.1 General troubleshooting







For local display

Error	Possible causes	Solution
Local display dark and no output signals	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Local display dark and no output signals	The polarity of the supply voltage is wrong.	Correct the polarity.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part → 117.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul style="list-style-type: none"> Set the display brighter by simultaneously pressing + . Set the display darker by simultaneously pressing + .
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 117.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul style="list-style-type: none"> Check the cable and the connector between the main electronics module and display module. Order spare part → 117.

For output signals

Error	Possible causes	Solution
Green power LED on the main electronics module of the transmitter is dark	Supply voltage does not match the value indicated on the nameplate.	Apply the correct supply voltage .
Device measures incorrectly.	Configuration error or device is operated outside the application.	<ol style="list-style-type: none"> 1. Check and correct parameter configuration. 2. Observe limit values specified in the "Technical Data".

For access

Error	Possible causes	Solution
No write access to parameters	Hardware write protection enabled	Set the write protection switch on main electronics module to the OFF position →  92.
No connection via HART protocol	Communication resistor missing or incorrectly installed.	Install the communication resistor (250 Ω) correctly. Observe the maximum load.
No connection via HART protocol	Commubox <ul style="list-style-type: none"> Connected incorrectly Configured incorrectly Drivers not installed correctly USB interface on computer configured incorrectly 	Observe the documentation for the Commubox.  FXA195 HART: Document "Technical Information" TI00404F
Not connecting to Web server	Web server disabled	Using the "FieldCare" or "DeviceCare" operating tool, check whether the Web server of the measuring device is enabled, and enable it if necessary →  46.
	Incorrect setting for the Ethernet interface of the computer	1. Check the properties of the Internet protocol (TCP/IP) →  43. 2. Check the network settings with the IT manager.
Not connecting to Web server	Incorrect IP address	Check the IP address: 192.168.1.212 →  43
Web browser frozen and operation no longer possible	Data transfer active	Wait until data transfer or current action is finished.
	Connection lost	1. Check cable connection and power supply. 2. Refresh the Web browser and restart if necessary.
Content of Web browser incomplete or difficult to read	Not using optimum version of Web server.	1. Use the correct Web browser version →  42. 2. Clear the Web browser cache and restart the Web browser.
	Unsuitable view settings.	Change the font size/display ratio of the Web browser.
No or incomplete display of contents in the Web browser	<ul style="list-style-type: none"> JavaScript not enabled JavaScript cannot be enabled 	1. Enable JavaScript. 2. Enter http://XXX.XXX.X.XXX/basic.html as the IP address.
Operation with FieldCare or DeviceCare via CDI-RJ45 service interface (port 8000)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.
Flashing of firmware with FieldCare or DeviceCare via CDI-RJ45 service interface (via port 8000 or TFTP ports)	Firewall of computer or network is preventing communication	Depending on the settings of the firewall used on the computer or in the network, the firewall must be adapted or disabled to allow FieldCare/DeviceCare access.

12.2 Diagnostic information via light emitting diodes

12.2.1 Transmitter

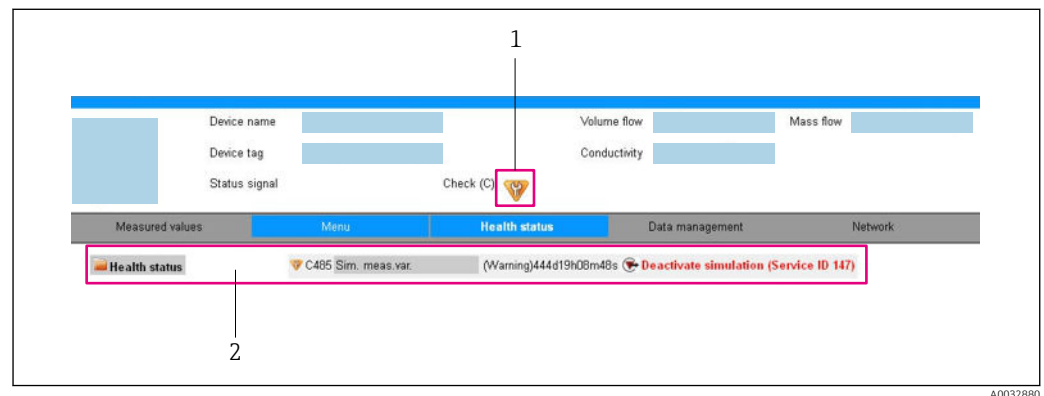
Different LEDs in the transmitter provide information on the device status.

LED	Color	Meaning
Supply voltage	Off	Supply voltage is off or too low
	Green	Supply voltage is ok
Link/Activity	Orange	Link available but no activity
	Flashing orange	Activity present
Communication	Flashing white	HART communication is active.

12.3 Diagnostic information in the Web browser

12.3.1 Diagnostic options

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







- 1 Status area with status signal
- 2 Diagnostic information → 102 and remedial measures with Service ID


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

- Via parameter
- Via submenu → 109

Status signals

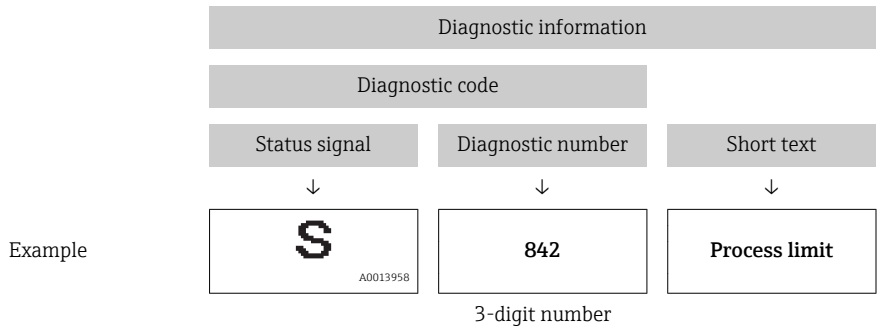
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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

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

Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault.



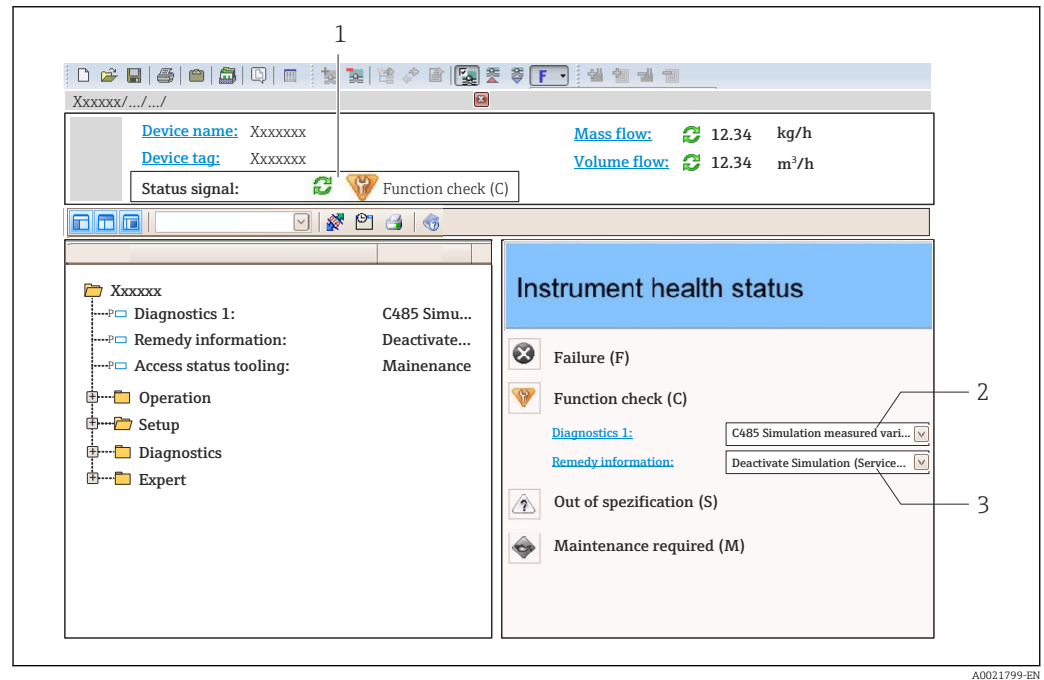
12.3.2 Calling up remedy information

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

12.4 Diagnostic information in DeviceCare or FieldCare

12.4.1 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.



A0021799-EN

- 1 Status area with status signal
- 2 Diagnostic information → 102
- 3 Remedy information with Service ID

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

- Via parameter
- Via submenu → 109

Status signals

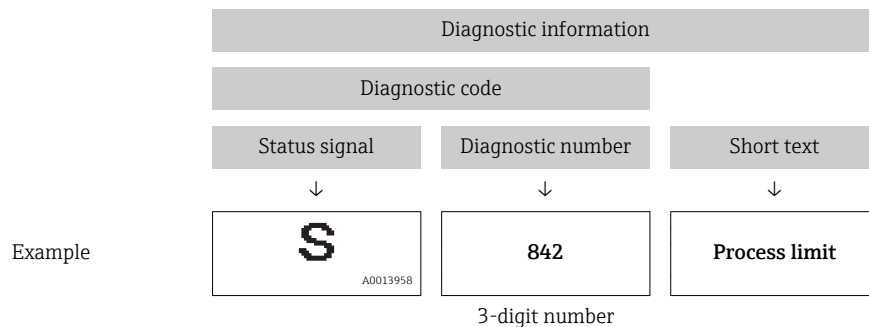
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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

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

Diagnostic information

The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault.



12.4.2 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.

12.5 Adapting the diagnostic information

12.5.1 Adapting the diagnostic behavior

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

Expert → System → Diagnostic handling → Diagnostic behavior

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

Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is entered only in the Event logbook submenu (Event list submenu) and is not displayed in alternation with the measured value display. The device continues to measure. The diagnostic message is entered only in the Event logbook submenu.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.5.2 Adapting the status signal

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





Expert → Communication → Diagnostic event category

Available status signals

Configuration as per HART 7 Specification (Condensed Status), in accordance with NAMUR NE107.

Symbol	Meaning
F A0013956	Failure A device error is present. The measured value is no longer valid.
C A0013959	Function check The device is in service mode (e.g. during a simulation).
S A0013958	Out of specification The device is being operated: <ul style="list-style-type: none"> Outside its technical specification limits (e.g. outside the process temperature range) Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
M A0013957	Maintenance required Maintenance is required. The measured value is still valid.
N A0023076	Has no effect on the condensed status.

12.6 Overview of diagnostic information

-  The amount of diagnostic information and the number of measured variables affected increase if the measuring device has one or more application packages.
-  In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Change the diagnostic information →  104
-  In the case of some items of diagnostic information, the diagnostic behavior can be changed. Change the diagnostic information

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of sensor				
022	Sensor temperature	1. Change main electronic module 2. Change sensor	F	Alarm
046	Sensor limit exceeded	1. Inspect sensor 2. Check process condition	S	Alarm
062	Sensor connection	1. Change main electronic module 2. Change sensor	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
082	Data storage	1. Check module connections 2. Contact service	F	Alarm
083	Memory content	1. Restart device 2. Contact service	F	Alarm
140	Sensor signal	1. Check or change main electronics 2. Change sensor	S	Alarm
144	Measuring error too high	1. Check or change sensor 2. Check process conditions	F	Alarm
190	Special event 1	Contact service	F	Alarm
191	Special event 5	Contact service	F	Alarm
192	Special event 9	Contact service	F	Alarm ¹⁾
Diagnostic of electronic				
201	Device failure	1. Restart device 2. Contact service	F	Alarm
242	Software incompatible	1. Check software 2. Flash or change main electronics module	F	Alarm
252	Modules incompatible	1. Check electronic modules 2. Change electronic modules	F	Alarm
262	Module connection	1. Check module connections 2. Change main electronics	F	Alarm
270	Main electronic failure	Change main electronic module	F	Alarm
271	Main electronic failure	1. Restart device 2. Change main electronic module	F	Alarm
272	Main electronic failure	1. Restart device 2. Contact service	F	Alarm
273	Main electronic failure	Change electronic	F	Alarm
274	Main electronic failure	Change electronic	S	Warning
283	Memory content	1. Reset device 2. Contact service	F	Alarm
311	Electronic failure	1. Reset device 2. Contact service	F	Alarm
311	Electronic failure	1. Do not reset device 2. Contact service	M	Warning
375	I/O communication failed	1. Restart device 2. Change main electronic module	F	Alarm
382	Data storage	1. Insert DAT module 2. Change DAT module	F	Alarm
383	Memory content	1. Restart device 2. Check or change DAT module 3. Contact service	F	Alarm
390	Special event 2	Contact service	F	Alarm
391	Special event 6	Contact service	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
392	Special event 10	Contact service	F	Alarm ¹⁾
Diagnostic of configuration				
410	Data transfer	1. Check connection 2. Retry data transfer	F	Alarm
411	Up-/download active	Up-/download active, please wait	C	Warning
431	Trim 1	Carry out trim	C	Warning
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
441	Current output 1	1. Check process 2. Check current output settings	S	Warning ¹⁾
442	Frequency output	1. Check process 2. Check frequency output settings	S	Warning ¹⁾
443	Pulse output	1. Check process 2. Check pulse output settings	S	Warning ¹⁾
453	Flow override	Deactivate flow override	C	Warning
484	Simulation failure mode	Deactivate simulation	C	Alarm
485	Simulation measured variable	Deactivate simulation	C	Warning
491	Simulation current output 1	Deactivate simulation	C	Warning
492	Simulation frequency output	Deactivate simulation frequency output	C	Warning
493	Simulation pulse output	Deactivate simulation pulse output	C	Warning
494	Switch output simulation	Deactivate simulation switch output	C	Warning
495	Simulation diagnostic event	Deactivate simulation	C	Warning
537	Configuration	1. Check IP addresses in network 2. Change IP address	F	Warning
590	Special event 3	Contact service	F	Alarm
591	Special event 7	Contact service	F	Alarm
592	Special event 11	Contact service	F	Alarm ¹⁾
Diagnostic of process				
803	Current loop	1. Check wiring 2. Change I/O module	F	Alarm
830	Sensor temperature too high	Reduce ambient temp. around the sensor housing	S	Warning
831	Sensor temperature too low	Increase ambient temp. around the sensor housing	S	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
832	Electronic temperature too high	Reduce ambient temperature	S	Warning ¹⁾
833	Electronic temperature too low	Increase ambient temperature	S	Warning ¹⁾
834	Process temperature too high	Reduce process temperature	S	Warning ¹⁾
835	Process temperature too low	Increase process temperature	S	Warning ¹⁾
842	Process limit	Low flow cut off active! 1. Check low flow cut off configuration	S	Warning
843	Process limit	Check process conditions	S	Warning
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning
882	Input signal	1. Check input configuration 2. Check external device or process conditions	F	Alarm
910	Tubes not oscillating	1. Check electronic 2. Inspect sensor	F	Alarm
912	Medium inhomogeneous	1. Check process cond. 2. Increase system pressure	S	Warning
912	Inhomogeneous		S	Warning
913	Medium unsuitable	1. Check process conditions 2. Check electronic modules or sensor	S	Alarm
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning
948	Tube damping too high	Check process conditions	S	Warning
990	Special event 4	Contact service	F	Alarm
991	Special event 8	Contact service	F	Alarm
992	Special event 12	Contact service	F	Alarm ¹⁾

1) Diagnostic behavior can be changed.

12.7 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 Web browser → 102
- Via "FieldCare" operating tool → 104
- Via "DeviceCare" operating tool → 104




Other pending diagnostic events can be displayed in the **Diagnostic list** submenu
→ 109

Navigation

"Diagnostics" menu

 Diagnostics	
Actual diagnostics	→  109
Previous diagnostics	→  109
Operating time from restart	→  109
Operating time	→  109

Parameter overview with brief description

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

12.8 Diagnostic list




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

Navigation path

Diagnostics → Diagnostic list



To call up the measures to rectify a diagnostic event:

- Via Web browser →  102
- Via "FieldCare" operating tool →  104
- Via "DeviceCare" operating tool →  104

12.9 Event logbook

12.9.1 Reading out the event logbook



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

Navigation path




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


A maximum of 20 event messages can be displayed in chronological order.




The event history includes entries for:

- Diagnostic events →  105
- Information events →  110

In addition to the operation time of its occurrence, each event is also assigned a symbol that indicates whether the event has occurred or is ended:

- Diagnostic event
 - : Occurrence of the event
 - : End of the event
- Information event
 - : Occurrence of the event

 To call up the measures to rectify a diagnostic event:

- Via Web browser →  102
- Via "FieldCare" operating tool →  104
- Via "DeviceCare" operating tool →  104

 For filtering the displayed event messages →  110

12.9.2 Filtering the event logbook

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

Navigation path

Diagnostics → Event logbook → Filter options

Filter categories

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


12.9.3 Overview of information events

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


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

Info number	Info name
I1110	Write protection switch changed
I1111	Density adjust failure
I1137	Electronic changed
I1151	History reset
I1155	Reset electronic temperature
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared
I1189	Backup compared
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1256	Display: access status changed
I1264	Safety sequence aborted
I1278	I/O module reset detected
I1335	Firmware changed
I1361	Web server: login failed
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1444	Device verification passed
I1445	Device verification failed
I1446	Device verification active
I1447	Record application reference data
I1448	Application reference data recorded
I1449	Recording application ref. data failed
I1450	Monitoring off
I1451	Monitoring on
I1457	Failed:Measured error verification
I1459	Failed: I/O module verification
I1460	Failed: Sensor integrity verification
I1461	Failed: Sensor verification
I1462	Failed:Sensor electronic module verific.

12.10 Resetting the measuring device

Using the **Device reset** parameter (→  88) it is possible to reset the entire device configuration or some of the configuration to a defined state.

12.10.1 Function scope of the "Device reset" parameter













Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	<p>Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.</p> <p> This option is not visible if no customer-specific settings have been ordered.</p>
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.





12.11 Device information

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






Navigation

"Diagnostics" menu → Device information

► Device information		
Device tag	→	 113
Serial number	→	 113
Firmware version	→	 113
Device name	→	 113
Order code	→	 113
Extended order code 1	→	 113
Extended order code 2	→	 113
Extended order code 3	→	 113
ENP version	→	 113
Device revision	→	 113
Device ID	→	 113
Device type	→	 114

Manufacturer ID	→  114
IP address	→  114
Subnet mask	→  114
Default gateway	→  114


Parameter overview with brief description


Parameter	Description	User interface	Factory setting
Device tag	Shows name of measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Promass 100
Serial number	Shows the serial number of the measuring device.	A maximum of 11-digit character string comprising letters and numbers.	–
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	–
Device name	Shows the name of the transmitter.  The name can be found on the nameplate of the transmitter.	Max. 32 characters such as letters or numbers.	Promass 100
Order code	Shows the device order code.  The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	–
Extended order code 1	Shows the 1st part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 2	Shows the 2nd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
Extended order code 3	Shows the 3rd part of the extended order code.  The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.	Character string	–
ENP version	Shows the version of the electronic nameplate (ENP).	Character string	2.02.00
Device revision	Shows the device revision with which the device is registered with the HART Communication Foundation.	2-digit hexadecimal number	2
Device ID	Enter device ID of external device.	6-digit hexadecimal number	–


Parameter	Description	User interface	Factory setting
Device type	Displays the device type with which the measuring device is registered with the HART Communication Foundation.	2-digit hexadecimal number	0x4A
Manufacturer ID	Displays the manufacturer ID with which the measuring device is registered with the HART Communication Foundation.	2-digit hexadecimal number	0x11 (for Endress+Hauser)
IP address	Displays the IP address of the Web server of the measuring device.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Subnet mask	Displays the subnet mask.	4 octet: 0 to 255 (in the particular octet)	255.255.255.0
Default gateway	Displays the default gateway.	4 octet: 0 to 255 (in the particular octet)	0.0.0.0

12.12 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
04.2013	01.00.00	Option 76	Original firmware	Operating Instructions	BA016570/06/EN/01.13
10.2014	01.01.zz	Option 70	<ul style="list-style-type: none"> ■ In accordance with HART 7 Specification ■ Integration of optional local display ■ New unit "Beer Barrel (BBL)" ■ Monitoring of measuring tube damping ■ Simulation of diagnostic events ■ External verification of current and PFS output via Heartbeat application package ■ Fixed value for simulation pulses 	Operating Instructions	BA016570/06/EN/02.14

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

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

 The manufacturer's information is available:

- In the Download Area of the Endress+Hauser web site: www.endress.com → Downloads
- Specify the following details:
 - Product root, e.g. 8E1B
The product root is the first part of the order code: see the nameplate on the device.
 - Text search: Manufacturer's information
 - Media type: Documentation – Technical Documentation

13 Maintenance

13.1 Maintenance tasks


No special maintenance work is required.

13.1.1 Exterior cleaning

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


13.1.2 Interior cleaning


Observe the following points for CIP and SIP cleaning:

- Use only cleaning agents to which the process-wetted materials are adequately resistant.
- Observe the maximum permitted medium temperature for the measuring device
→  134.

13.2 Measuring and test equipment

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

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

List of some of the measuring and testing equipment: →  119

13.3 Endress+Hauser services

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

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

14 Repairs

14.1 General notes

14.1.1 Repair and conversion concept

The Endress+Hauser repair and conversion concept provides for the following:

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

14.1.2 Notes for repair and conversion

For repair and modification of a measuring device, observe the following notes:

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


14.2 Spare parts

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

All the spare parts for the measuring device, along with the order code, are listed here and can be ordered. If available, users can also download the associated Installation Instructions.



Measuring device serial number:

- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→  113) in the **Device information** submenu.

14.3 Endress+Hauser services

Endress+Hauser offers a wide range of services.



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

14.4 Return

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

To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at

<http://www.endress.com/support/return-material>

14.5 Disposal

14.5.1 Removing the measuring device

1. Switch off the device.

WARNING

Danger to persons from process conditions.

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

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

14.5.2 Disposing of the measuring device

WARNING

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

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

Observe the following notes during disposal:


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

15 Accessories







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



15.1 Device-specific accessories

15.1.1 For the sensor



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

15.2 Communication-specific accessories



Accessories	Description
Commubox FXA195 HART	<p>For intrinsically safe HART communication with FieldCare via the USB interface.</p> <p> For details, see "Technical Information" TI00404F</p>
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> For details, see the "Technical Information" document TI405C/07</p>
HART Loop Converter HMX50	<p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.</p> <p> For details, see "Technical Information" TI00429F and Operating Instructions BA00371F</p>
Wireless HART adapter SWA70	<p>Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity.</p> <p> For details, see Operating Instructions BA00061S</p>
Fieldgate FXA320	<p>Gateway for the remote monitoring of connected 4 to 20 mA measuring devices via a Web browser.</p> <p> For details, see "Technical Information" TI00025S and Operating Instructions BA00053S</p>
Fieldgate FXA520	<p>Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.</p> <p> For details, see "Technical Information" TI00025S and Operating Instructions BA00051S</p>

Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART devices and can be used in non-hazardous areas.  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 devices and can be used in the non-hazardous area and in the hazardous area.  For details, see Operating Instructions BA01202S

15.3 Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: <ul style="list-style-type: none"> Choice of measuring devices for industrial requirements Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. Graphic illustration of the calculation results Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: <ul style="list-style-type: none"> Via the Internet: https://wapps.endress.com/applicator As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.  For details, see Operating Instructions BA00027S and BA00059S
DeviceCare	Tool for connecting and configuring Endress+Hauser field devices.  For details, see Innovation brochure IN01047S

15.4 System components

Accessories	Description
Memograph M graphic data manager	<p>The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p>
iTEMP	<p>The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.</p> <p> For details, see "Fields of Activity", FA00006T</p>

16 Technical data


16.1 Application

The measuring device is suitable for flow measurement of liquids and gases only.

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

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

16.2 Function and system design

Measuring principle	Mass flow measurement based on the Coriolis measuring principle
Measuring system	<p>The device consists of a transmitter and a sensor.</p> <p>The device is available as a compact version: The transmitter and sensor form a mechanical unit.</p> <p>For information on the structure of the device →  13</p>

16.3 Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring ranges for liquids

DN		Measuring range full scale values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0 to 2 000	0 to 73.50
15	$\frac{1}{2}$	0 to 6 500	0 to 238.9
25	1	0 to 18 000	0 to 661.5
40	$1\frac{1}{2}$	0 to 45 000	0 to 1 654
50	2	0 to 70 000	0 to 2 573
80	3	0 to 180 000	0 to 6 615
100	4	0 to 350 000	0 to 12 860
150	6	0 to 800 000	0 to 29 400
250	10	0 to 2 200 000	0 to 80 850

Measuring ranges for gases

The full scale values depend on the density of the gas and can be calculated with the formula below:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_G : x$$

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

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

DN		x
[mm]	[in]	[kg/m ³]
40	1½	90
50	2	90
80	3	110
100	4	130
150	6	200
250	10	200

Calculation example for gas

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

Maximum possible full scale value:

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

Recommended measuring range

"Flow limit" section →  136

Operable flow range


Over 1000 : 1.

Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly.



16.4 Output

Output signal

Current output

Current output	4-20 mA HART (active)
Maximum output values	<ul style="list-style-type: none"> ■ DC 24 V (no flow) ■ 22.5 mA
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Adjustable: 0.07 to 999 s
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature <p> The range of options increases if the measuring device has one or more application packages.</p>

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	<ul style="list-style-type: none"> ■ DC 30 V ■ 25 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Adjustable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow
Frequency output	
Output frequency	Adjustable: 0 to 12 500 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature <p> The range of options increases if the measuring device has one or more application packages.</p>
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ■ Off ■ On ■ Diagnostic behavior ■ Limit value <ul style="list-style-type: none"> – Mass flow – Volume flow – Corrected volume flow – Density – Reference density – Temperature – Totalizer 1-3 ■ Flow direction monitoring ■ Status <ul style="list-style-type: none"> – Partially filled pipe detection – Low flow cut off <p> The range of options increases if the measuring device has one or more application packages.</p>

Signal on alarm

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

Current output 4 to 20 mA*4 to 20 mA*

Failure mode	Choose from: <ul style="list-style-type: none"> ■ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ■ 4 to 20 mA in accordance with US ■ Min. value: 3.59 mA ■ Max. value: 22.5 mA ■ Freely definable value between: 3.59 to 22.5 mA ■ Actual value ■ Last valid value
---------------------	--

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ No pulses
Frequency output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Actual value ■ 0 Hz ■ Defined value: 0 to 12 500 Hz
Switch output	
Failure mode	Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed

Local display

Plain text display	With information on cause and remedial measures
Backlight	Red backlighting indicates a device error.



Status signal as per NAMUR recommendation NE 107

Interface/protocol


- Via digital communication:
 - HART protocol
- Via service interface
 - CDI-RJ45 service interface

Plain text display	With information on cause and remedial measures
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Web server

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

Light emitting diodes (LED)


Status information	Status indicated by various light emitting diodes The following information is displayed depending on the device version: <ul style="list-style-type: none"> ▪ Supply voltage active ▪ Data transmission active ▪ Device alarm/error has occurred  Diagnostic information via light emitting diodes
---------------------------	--

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

Galvanic isolation The following connections are galvanically isolated from each other:

- Outputs
- Power supply

Protocol-specific data **Protocol-specific data**

- For information on the device description files
- For information on the dynamic variables and measured variables (HART device variables) →  52

16.5 Power supply

Terminal assignment →  30

Pin assignment, device plug →  31

Supply voltage The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

Transmitter




DC 20 to 30 V

Power consumption **Transmitter**





Order code for "Output"	Maximum Power consumption
Option B: 4-20 mA HART with pulse/frequency/switch output	3.5 W

Current consumption **Transmitter**

Order code for "Output"	Maximum Current consumption	Maximum switch-on current
Option B: 4-20mA HART, pul./freq./switch output	145 mA	18 A (< 0.125 ms)

Power supply failure	<ul style="list-style-type: none"> ■ Totalizers stop at the last value measured. ■ Depending on the device version, the configuration is retained in the device memory or in the plug-in memory (HistoROM DAT). ■ Error messages (incl. total operated hours) are stored.
Electrical connection	→  32
Potential equalization	→  33
Terminals	Transmitter Spring terminals for wire cross-sections 0.5 to 2.5 mm ² (20 to 14 AWG)
Cable entries	<ul style="list-style-type: none"> ■ Cable gland: M20 × 1.5 with cable Ø6 to 12 mm (0.24 to 0.47 in) ■ Thread for cable entry: <ul style="list-style-type: none"> – M20 – G ½" – NPT ½"
Cable specification	→  29

16.6 Performance characteristics

reference operating conditions	<ul style="list-style-type: none"> ■ Error limits based on ISO 11631 ■ Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi) ■ Specifications as per calibration protocol ■ Accuracy based on accredited calibration rigs that are traced to ISO 17025. <p> To obtain measured errors, use the <i>Applicator</i> sizing tool →  120</p>
Maximum measured error	o.r. = of reading; 1 g/cm ³ = 1 kg/l; T = medium temperature Base accuracy <p> Design fundamentals →  132</p> <p><i>Mass flow and volume flow (liquids)</i></p> <p>±0.05 % o.r. (PremiumCal; order code for "Calibration flow", option D, for mass flow)</p> <p>±0.10 % o.r.</p> <p><i>Mass flow (gases)</i></p> <p>±0.35 % o.r.</p>

Density (liquids)

Under reference operating conditions [g/cm ³]	Standard density calibration ¹⁾ [g/cm ³]	Wide-range Density specification ^{2) 3)} [g/cm ³]
±0.0005	±0.01	±0.001

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

Temperature

$$\pm 0.5\text{ °C} \pm 0.005 \cdot T\text{ °C} (\pm 0.9\text{ °F} \pm 0.003 \cdot (T - 32)\text{ °F})$$

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0.030	0.001
15	$\frac{1}{2}$	0.200	0.007
25	1	0.540	0.019
40	1½	2.25	0.083
50	2	3.50	0.129
80	3	9.0	0.330
100	4	14.0	0.514
150	6	32.0	1.17
250	10	88.0	3.23

Flow values

Flow values as turndown parameter depending on nominal diameter.

SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
8	2 000	200	100	40	20	4
15	6 500	650	325	130	65	13
25	18 000	1 800	900	360	180	36
40	45 000	4 500	2 250	900	450	90
50	70 000	7 000	3 500	1 400	700	140
80	180 000	18 000	9 000	3 600	1 800	360
100	350 000	35 000	17 500	7 000	3 500	700
150	800 000	80 000	40 000	16 000	8 000	1 600
250	2 200 000	220 000	110 000	44 000	22 000	4 400

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
$\frac{3}{8}$	73.50	7.350	3.675	1.470	0.735	0.147
$\frac{1}{2}$	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
1½	1654	165.4	82.70	33.08	16.54	3.308
2	2573	257.3	128.7	51.46	25.73	5.146
3	6615	661.5	330.8	132.3	66.15	13.23
4	12860	1286	643.0	257.2	128.6	25.72
6	29400	2940	1470	588	294	58.80
10	80850	8085	4043	1617	808.5	161.7

Accuracy of outputs

The output accuracy must be factored into the measured error if analog outputs are used, but can be ignored for fieldbus outputs (e.g. Modbus RS485, EtherNet/IP).

The outputs have the following base accuracy specifications.

Current output

Accuracy	Max. $\pm 5 \mu\text{A}$
-----------------	--------------------------

Pulse/frequency output

o.r. = of reading

Accuracy	Max. $\pm 50 \text{ ppm o.r.}$ (over the entire ambient temperature range)
-----------------	--

Repeatability

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

Base repeatability

Design fundamentals → 132

Mass flow and volume flow (liquids)

$\pm 0.025 \text{ \% o.r.}$ (PremiumCal, for mass flow)

$\pm 0.05 \text{ \% o.r.}$

Mass flow (gases)

$\pm 0.25 \text{ \% o.r.}$

Density (liquids)

$\pm 0.00025 \text{ g/cm}^3$

Temperature

$\pm 0.25 \text{ }^\circ\text{C} \pm 0.0025 \cdot T \text{ }^\circ\text{C}$ ($\pm 0.45 \text{ }^\circ\text{F} \pm 0.0015 \cdot (T-32) \text{ }^\circ\text{F}$)

Response time The response time depends on the configuration (damping).

Influence of ambient temperature

Current output

o.r. = of reading

Temperature coefficient	Max. ± 0.005 % o.r./°C
-------------------------	----------------------------

Pulse/frequency output

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

Influence of medium temperature

Mass flow and volume flow

o.f.s. = of full scale value

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

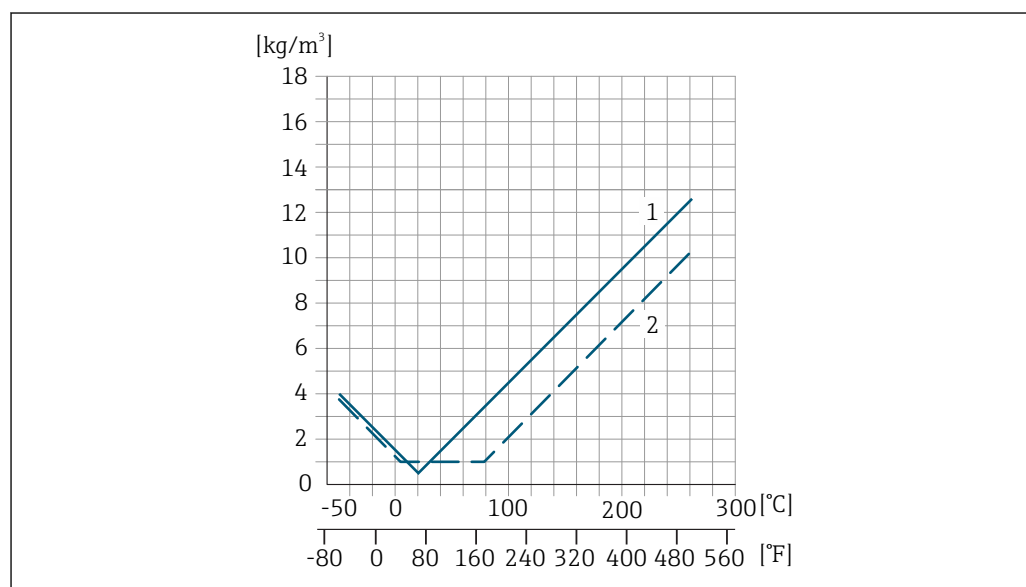
The effect is reduced if zero point adjustment is performed at process temperature.

Density

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

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range (\rightarrow 128) the measured error is ± 0.00005 g/cm³ /°C (± 0.000025 g/cm³ /°F)



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

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Temperature

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

Influence of medium pressure

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

o.r. = of reading



It is possible to compensate for the effect by:

- Reading in the current pressure measured value via the current input.
- Specifying a fixed value for the pressure in the device parameters.



Operating Instructions .

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	3/8	no influence	
15	½	no influence	
25	1	no influence	
40	1½	-0.003	-0.0002
50	2	-0.008	-0.0006
80	3	-0.009	-0.0006
100	4	-0.007	-0.0005
150	6	-0.009	-0.0006
250	10	-0.009	-0.0006

Design fundamentals

o.r. = of reading, o.f.s. = of full scale value

BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.

MeasValue = measured value; ZeroPoint = zero point stability

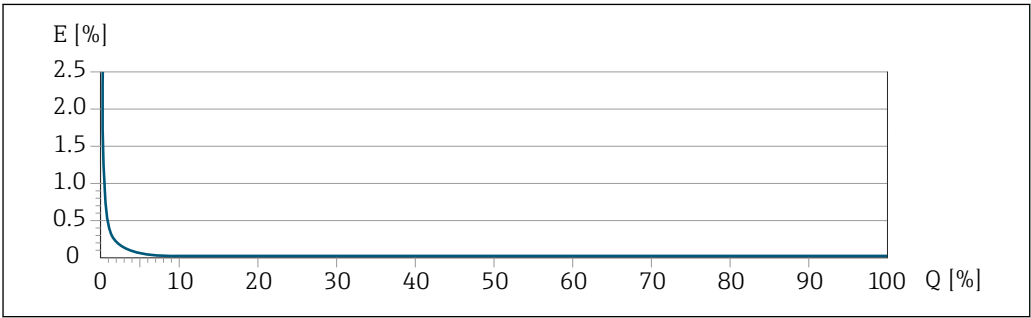
Calculation of the maximum measured error as a function of the flow rate

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

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

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021335	$\pm \text{BaseRepeat}$ A0021340
$< \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021336	$\pm 1/2 \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021337

Example for maximum measured error



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

16.7 Installation

"Mounting requirements" → 20

16.8 Environment

Ambient temperature range → 23

Temperature tables

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

Storage temperature -40 to +80 °C (-40 to +176 °F), preferably at +20 °C (+68 °F) (standard version)
 -50 to +80 °C (-58 to +176 °F) (Order code for "Test, certificate", option JM)

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

Degree of protection **Transmitter and sensor**

- As standard: IP66/67, type 4X enclosure
- With the order code for "Sensor options", option **CM**: IP69 can also be ordered
- When housing is open: IP20, type 1 enclosure
- Display module: IP20, type 1 enclosure

Vibration resistance

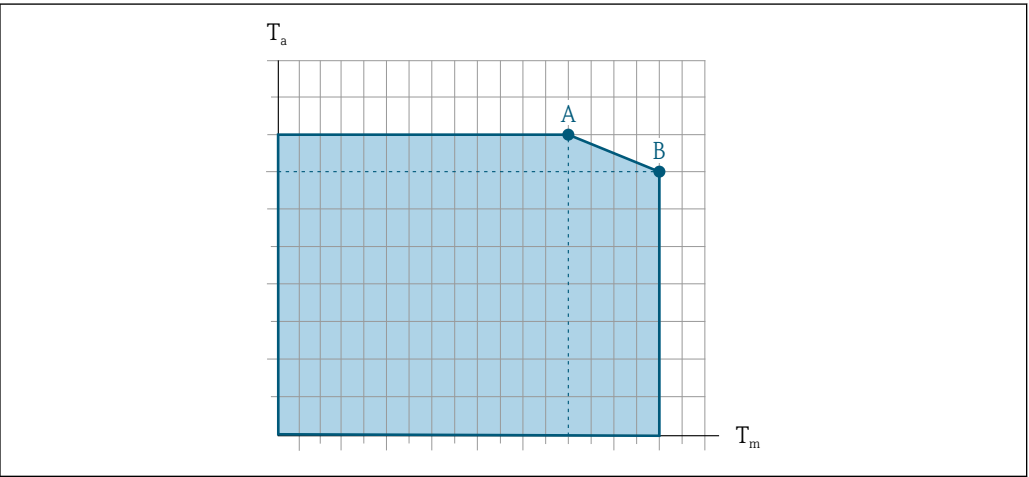
- Vibration, sinusoidal according to IEC 60068-2-6
 - 2 to 8.4 Hz, 3.5 mm peak
 - 8.4 to 2 000 Hz, 1 g peak
- Vibration broad-band random, according to IEC 60068-2-64
 - 10 to 200 Hz, 0.003 g²/Hz
 - 200 to 2 000 Hz, 0.001 g²/Hz
 - Total: 1.54 g rms

Shock resistance	Shock, half-sine according to IEC 60068-2-27 6 ms 30 g
Impact resistance	Rough handling shocks according to IEC 60068-2-31
Electromagnetic compatibility (EMC)	<div><div><div>■</div><div>As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)</div></div><div><div>■</div><div>Complies with emission limits for industry as per EN 55011 (Class A)</div></div><div><div><div><div></div></div></div><div>Details are provided in the Declaration of Conformity.</div></div></div>

16.9 Process

Medium temperature range	Standard version	-50 to +150 °C (-58 to +302 °F)	Order code for "Measuring tube mat., wetted surface", option HA, SA, SB, SC
	Extended temperature version	-50 to +240 °C (-58 to +464 °F)	Order code for "Measuring tube mat., wetted surface", option SD, SE, SF, TH

Dependency of ambient temperature on medium temperature



- 19

Exemplary representation, values in the table below.
- T_a

Ambient temperature

T_m

Medium temperature

A

Maximum permitted medium temperature T_m at T_{a max} = 60 °C (140 °F); higher medium temperatures T_m require a reduced ambient temperature T_a

B

Maximum permitted ambient temperature T_a for the maximum specified medium temperature T_m of the sensor

i

Values for devices used in the hazardous area:
Separate Ex documentation (XA) for the device .

134

Version	Not insulated				Insulated			
	A		B		A		B	
	T _a	T _m	T _a	T _m	T _a	T _m	T _a	T _m
Standard version	60 °C (140 °F)	150 °C (302 °F)	–	–	60 °C (140 °F)	110 °C (230 °F)	55 °C (131 °F)	150 °C (302 °F)
Extended temperature version	60 °C (140 °F)	170 °C (338 °F)	55 °C (131 °F)	240 °C (464 °F)	60 °C (140 °F)	110 °C (230 °F)	50 °C (122 °F)	240 °C (464 °F)

Density 0 to 5 000 kg/m³ (0 to 312 lb/cf)

Pressure-temperature ratings



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

Secondary containment

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

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

The following secondary containment pressure ratings/burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (never opened/as delivered).


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

If the device is fitted with a rupture disk (order code for "Sensor option", option **CA** "Rupture disk"), the rupture disk trigger pressure is decisive for the maximum nominal pressure → 136.

The secondary containment burst pressure refers to a typical internal pressure achieved prior to mechanical failure of the secondary containment as determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option **LN** "Type test containment").


DN		Secondary containment pressure rating (designed with a safety factor ≥ 4)		Secondary containment burst pressure	
[mm]	[in]	[bar]	[psi]	[bar]	[psi]
8	3/8	40	580	255	3 698
15	1/2	40	580	200	2 900
25	1	40	580	280	4 060
40	1 1/2	40	580	180	2 610
50	2	40	580	195	2 828
80	3	25	362	105	1 522
100	4	16	232	85	1 232

DN		Secondary containment pressure rating (designed with a safety factor ≥ 4)		Secondary containment burst pressure	
[mm]	[in]	[bar]	[psi]	[bar]	[psi]
150	6	16	232	80	1 160
250	10	10	145	57	826

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

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

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

 Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge. Maximum pressure: 5 bar (72.5 psi).

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


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

Rupture disk

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



Rupture disks cannot be combined with the separately available heating jacket .




Special mounting instructions: →  25

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



Flow limit

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

 For an overview of the full scale values for the measuring range, see the "Measuring range" section →  123

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
 - In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
 - A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
 - For gas measurement the following rules apply:
 - The flow velocity in the measuring tubes should not exceed half the sound velocity (0.5 Mach).
 - The maximum mass flow depends on the density of the gas: formula →  123
-  To calculate the flow limit, use the *Applicator* sizing tool →  120

Pressure loss

 To calculate the pressure loss, use the *Applicator* sizing tool →  120

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

System pressure

→  23

16.10 Mechanical construction

Design, dimensions



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

Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges. Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Different values due to different transmitter versions:

Weight in SI units


DN [mm]	Weight [kg]
8	9
15	10
25	12
40	17
50	28
80	53
100	94
150	152
250	398

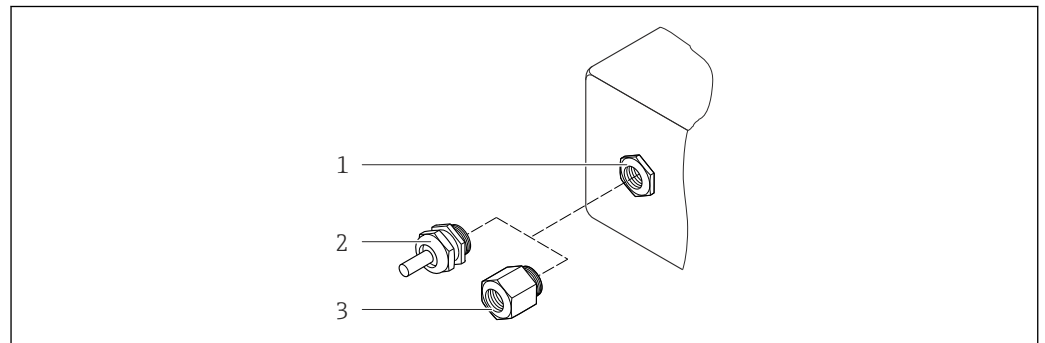
Weight in US units

DN [in]	Weight [lbs]
3/8	20
1/2	22
1	26
1 1/2	37
2	62
3	117
4	207
6	335
10	878


Materials

Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated":
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, hygienic, stainless":
 - Hygienic version, stainless steel 1.4301 (304)
 - Optional: order code for "Sensor feature", option CC
Hygienic version, for maximum corrosion resistance: stainless steel 1.4404 (316L)
- Order code for "Housing", option **C** "Ultra-compact, hygienic, stainless":
 - Hygienic version, stainless steel 1.4301 (304)
 - Optional: order code for "Sensor feature", option CC
Hygienic version, for maximum corrosion resistance: stainless steel 1.4404 (316L)
- Window material for optional local display (→  141):
 - For order code for "Housing", option **A**: glass
 - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands

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 20 Possible cable entries/cable glands

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

Order code for "Housing", option A "Compact, coated aluminum"

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

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Nickel-plated brass
Adapter for cable entry with internal thread G ½"	
Adapter for cable entry with internal thread NPT ½"	

Order code for "Housing", option B "Compact, hygienic, stainless"

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

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Stainless steel, 1.4404 (316L)
Adapter for cable entry with internal thread G ½"	
Adapter for cable entry with internal thread NPT ½"	

Device plug

Electrical connection	Material
Plug M12x1	<ul style="list-style-type: none"> Socket: Stainless steel, 1.4404 (316L) Contact housing: Polyamide Contacts: Gold-plated brass

Sensor housing

- Acid and alkali-resistant outer surface
- DN 08 to DN 150: stainless steel, 1.4301 (304)
Optional: order code for "Sensor option", option **CC**: stainless steel, 1.4404 (316L)
- DN 250:
– Order code for "Measuring tube material", option **SA, SD** (stainless steel, 1.4404 (316L)):
Stainless steel 1.4301 (304)
Optional: order code for "Sensor option", option **CC**: stainless steel, 1.4404 (316L)
– Order code for "Measuring tube material", option **HA, TH** (Alloy C22):
Stainless steel, 1.4404 (316L)

Measuring tubes

- DN 8 to 100 (3/8...4"): stainless steel, 1.4539 (904L);
Manifold: stainless steel, 1.4404 (316/316L)
- DN 150 (6"), DN 250 (10"): stainless steel, 1.4404 (316/316L);
Manifold: stainless steel, 1.4404 (316/316L)
- DN 8 to 250 (3/8 to 10"): Alloy C22, 2.4602 (UNS N06022);
Manifold: Alloy C22, 2.4602 (UNS N06022)

Process connections


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



List of all available process connections → 141


Seals

Welded process connections without internal seals

Process connections	<ul style="list-style-type: none"> ■ Fixed flange connections: <ul style="list-style-type: none"> – EN 1092-1 (DIN 2501) flange – EN 1092-1 (DIN 2512N) flange – Namur lengths in accordance with NE 132 – ASME B16.5 flange – JIS B2220 flange – DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch ■ Clamp connections <ul style="list-style-type: none"> Tri-Clamp (OD tubes), DIN 11866 series C ■ Thread: <ul style="list-style-type: none"> – DIN 11851 thread, DIN 11866 series A – SMS 1145 thread – ISO 2853 thread, ISO 2037 – DIN 11864-1 Form A thread, DIN 11866 series A ■ VCO connections <ul style="list-style-type: none"> – 8-VCO-4 – 12-VCO-4 <p> For information on the different materials used in the process connections</p>
---------------------	---

Surface roughness	<p>All data relate to parts in contact with fluid. The following surface roughness quality can be ordered.</p> <ul style="list-style-type: none"> ■ Not polished ■ $Ra_{\max} = 0.8 \mu\text{m}$ (32 μin) ■ $Ra_{\max} = 0.4 \mu\text{m}$ (16 μin)
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16.11 Operability

Local display	<p>The local display is only available with the following device order code: Order code for "Display; operation", option B: 4-line; illuminated, via communication</p> <p>Display element</p> <ul style="list-style-type: none"> ■ 4-line liquid crystal display with 16 characters per line. ■ 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. <p>Disconnecting the local display from the main electronics module</p> <p> In the case of the "Compact, aluminum coated" housing version, the local display must only be disconnected manually from the main electronics module. In the case of the "Compact, hygienic, stainless" and "Ultra-compact, hygienic, stainless" housing versions, the local display is integrated in the housing cover and is disconnected from the main electronics module when the housing cover is opened.</p>
---------------	--

"Compact, aluminum coated" housing version

The local display is plugged onto the main electronics module. The electronic connection between the local display and main electronics module is established via a connecting cable.

For some work performed on the measuring device (e.g. electrical connection), it is advisable to disconnect the local display from the main electronics module:

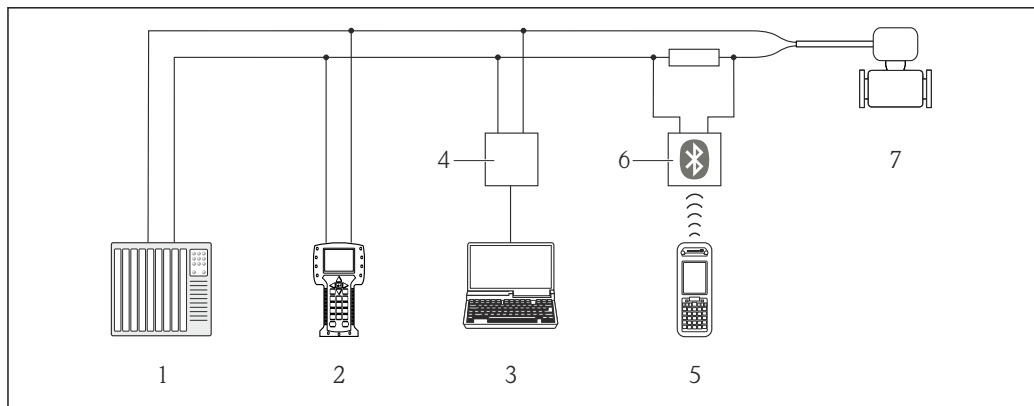
1. Press in the side latches of the local display.
2. Remove the local display from the main electronics module. Pay attention to the length of the connecting cable when doing so.

Once the work is completed, plug the local display back on.

Remote operation

Via HART protocol

This communication interface is available in device versions with a HART output.



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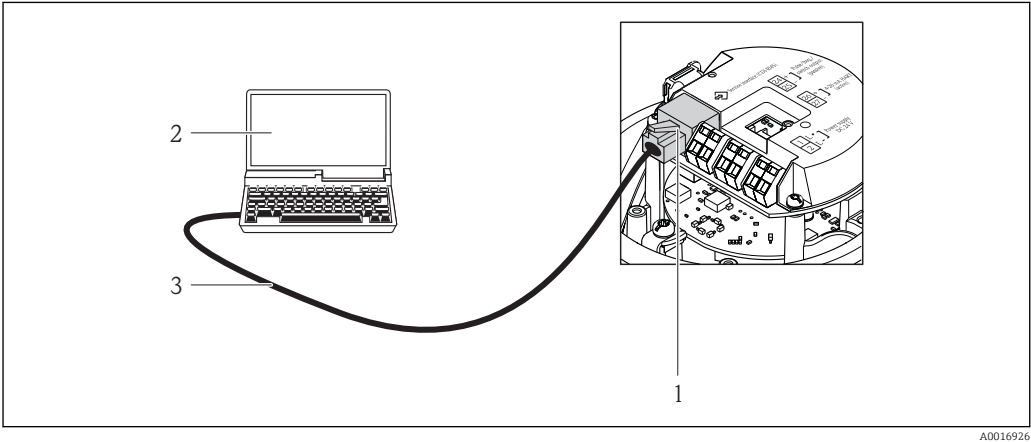
21 Options for remote operation via HART protocol

- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 VIATOR Bluetooth modem with connecting cable
- 7 Transmitter

Service interface

Via service interface (CDI-RJ45)

HART



- 22 Connection for the order code for "Output", option B: 4-20 mA HART, pulse/frequency/switch output
- 1 Service interface (CDI -RJ45) of the measuring device with access to the integrated Web server
 - 2 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"
 - 3 Standard Ethernet connecting cable with RJ45 plug

Languages	<p>Can be operated in the following languages:</p> <ul style="list-style-type: none">■ Via "FieldCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese■ Via Web browser English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish, Korean
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16.12 Certificates and approvals

CE mark	<p>The measuring system is in conformity with the statutory requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p>
C-Tick symbol	<p>The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".</p>
Ex approval	<p>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.</p>

Sanitary compatibility	<ul style="list-style-type: none"> ■ 3-A approval Only devices with the order code for "Additional approval", option LP "3A" have 3-A approval. ■ EHEDG-tested Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG. To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (www.ehedg.org).
HART certification	<p>HART interface</p> <p>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified according to HART 7 ■ The device can also be operated with certified devices of other manufacturers (interoperability)
Pressure Equipment Directive	<ul style="list-style-type: none"> ■ With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EC. ■ Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art. 4, Par. 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EC.
Other standards and guidelines	<ul style="list-style-type: none"> ■ EN 60529 Degrees of protection provided by enclosures (IP code) ■ IEC/EN 60068-2-6 Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal). ■ IEC/EN 60068-2-31 Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices. ■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements ■ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment ■ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 80 The application of the pressure equipment directive to process control devices

- NAMUR NE 105
Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
Self-monitoring and diagnosis of field devices
- NAMUR NE 131
Requirements for field devices for standard applications
- NAMUR NE 132
Coriolis mass meter
- NACE MR0103
Materials resistant to sulfide stress cracking in corrosive petroleum refining environments.
- NACE MR0175/ISO 15156-1
Materials for use in H₂S-containing Environments in Oil and Gas Production.

16.13 Application packages

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

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



Detailed information on the application packages:
Special Documentation for the device → 147

Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	<p>Heartbeat Verification Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> ■ Functional testing in the installed state without interrupting the process. ■ Traceable verification results on request, including a report. ■ Simple testing process via local operation or other operating interfaces. ■ Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications. ■ Extension of calibration intervals according to operator's risk assessment. <p>Heartbeat Monitoring Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:</p> <ul style="list-style-type: none"> ■ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time. ■ Schedule servicing in time. ■ Monitor the process or product quality, e.g. gas pockets.

Concentration

Package	Description
Concentration measurement and special density	<p>Calculation and outputting of fluid concentrations</p> <p>Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.</p> <p>The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.</p> <p>The observed density is converted to the concentration of a substance of a binary mixture using the "Concentration Measurement" application package:</p> <ul style="list-style-type: none"> ▪ Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.) ▪ Common or user-defined units ("Brix", "Plato", "% mass", "% volume", "mol/l etc.) for standard applications. ▪ Concentration calculation from user-defined tables. <p>The measured values are output via the digital and analog outputs of the device.</p>

16.14 Accessories



Overview of accessories available for order → 119

16.15 Supplementary documentation



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

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

Standard documentation

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Promass F	KA013570

Transmitter Brief Operating Instructions

Measuring device	Documentation code
Proline Promass 100	KA01334D

Technical Information

Measuring device	Documentation code
Proline Promass F 100	TI013180

Description of Device Parameters

Measuring device	Documentation code
Proline Promass 100	GP01102O

Supplementary device-
dependent documentation



Safety Instructions

Content	Documentation code
ATEX/IECEX Ex i	XA00159D
ATEX/IECEX Ex nA	XA01029D
cCSAus IS	XA00160D
INMETRO Ex i	XA01219D
INMETRO Ex nA	XA01220D
NEPSI Ex i	XA01249D
NEPSI Ex nA	XA01262D

Special Documentation

Content	Documentation code
Information on the Pressure Equipment Directive	SD00142D
Concentration measurement	SD01905O
Heartbeat Technology	SD01904O
Web server	SD01820D

Installation Instructions

Contents	Comment
Installation instructions for spare part sets and accessories	<ul style="list-style-type: none"> Access the overview of all the available spare part sets via <i>W@M Device Viewer</i> →  117 Accessories available for order with Installation Instructions →  119

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TechnipFMC
Measurement Solutions, Inc.
500 North Sam Houston Parkway West,
Suite 100
Houston, Texas 77067 USA
P:+1 281.260.2190

USA Operation
1602 Wagner Avenue
Erie, Pennsylvania 16510 USA
P:+1 814.898.5000

Germany Operation
Smith Meter GmbH
Regentstrasse 1
25474 Ellerbek, Germany
P:+49 4101 304.0