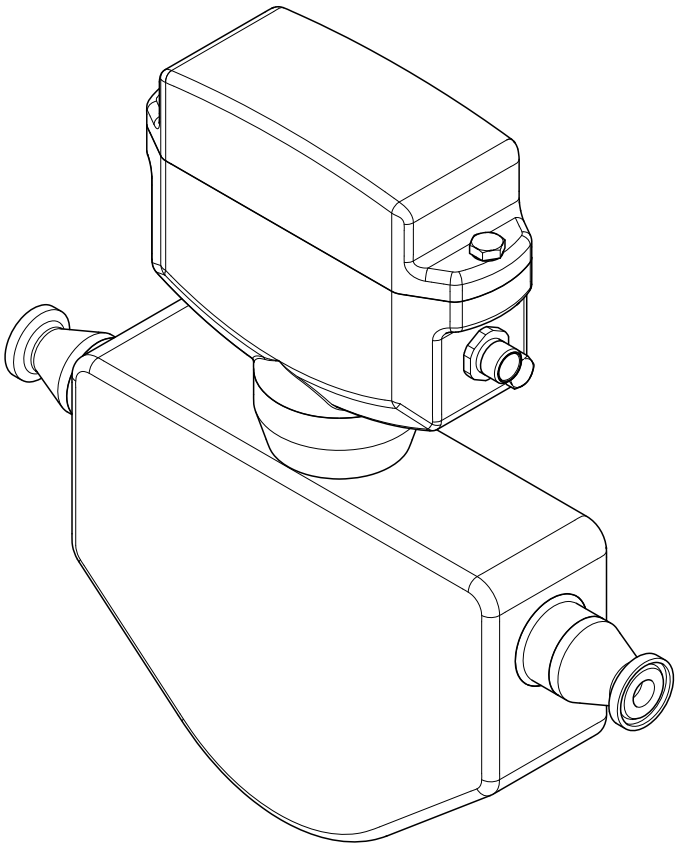
BA00097D/06/EN/18.19
71426479
2019-01-31

Valid as of version
03.00.zz (Device firmware)

Operating Instructions
Dosimass

Coriolis flowmeter



Endress+Hauser
People for Process Automation

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

Table of contents

1 About this document

1.1 Document function

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

1.2 Symbols used

1.2.1 Safety symbols

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

1.2.2 Electrical symbols

Symbol	Meaning
⎓	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: ▪ Inner ground terminal: Connects the protectiv earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.

1.2.3 Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Procedures, processes or actions that are permitted.
✓✓	**Preferred** Procedures, processes or actions that are preferred.

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

1.2.4 Symbols in graphics

Symbol	Meaning
1, 2, 3, ...	Item numbers
1., 2., 3., ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
	Hazardous area
	Safe area (non-hazardous area)
	Flow direction

1.3 Documentation

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

Detailed list of the individual documents along with the documentation code

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. ▪ 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). ▪ 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

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 ambient temperature of the measuring device is outside the atmospheric temperature, it is absolutely essential to comply with the relevant basic conditions as specified in the device documentation. → 6
- 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 and ambient conditions!
- Verify the compatibility of the process fluid with the sensor material.
- Ensure the resistance of all fluid-wetted materials in the process.
- Keep within the specified pressure and temperature range.

NOTICE

Verification for borderline cases:

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

Residual risks

⚠ WARNING

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

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

2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

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

2.4 Operational safety

Risk of injury.

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

Conversions to the device

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

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

Repair

To ensure continued operational safety and reliability,

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

2.5 Product safety

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

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

2.6 IT security

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

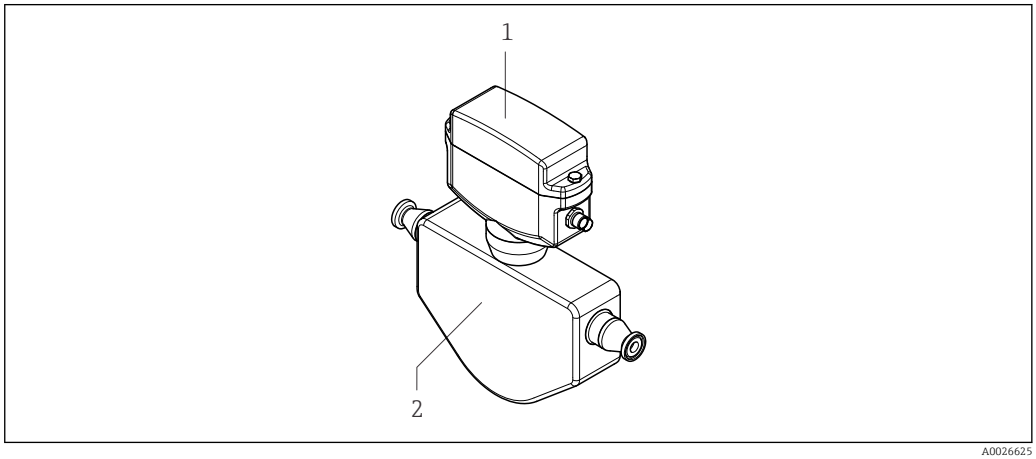
IT security measures, which provide additional protection for the device and associated data transfer, must be implemented by the operators themselves in line with their security standards.

3 Product description

The device consists of a transmitter and a sensor.

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

3.1 Product design



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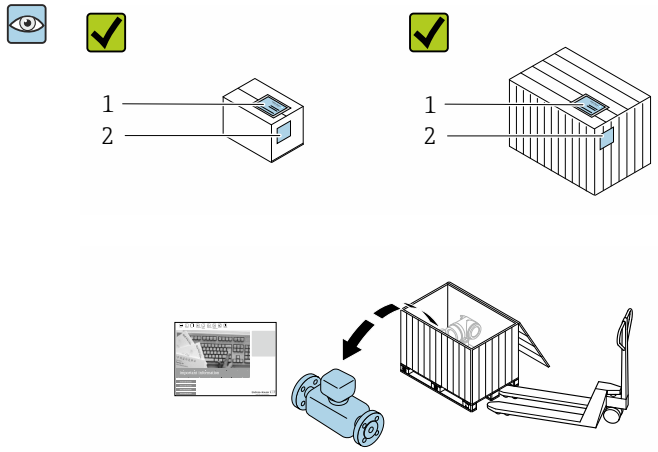
1 Important components of the measuring device

1 Transmitter
2 Sensor

4 Incoming acceptance and product identification

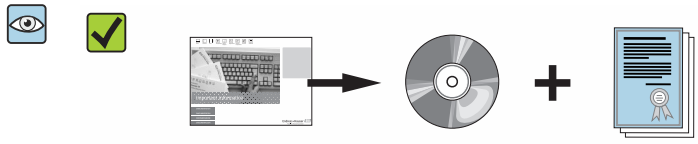
4.1 Incoming acceptance



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

Are the goods undamaged?

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



Is the document folder present with accompanying documents?
Is the optional CD-ROM with the Technical Documentation present?

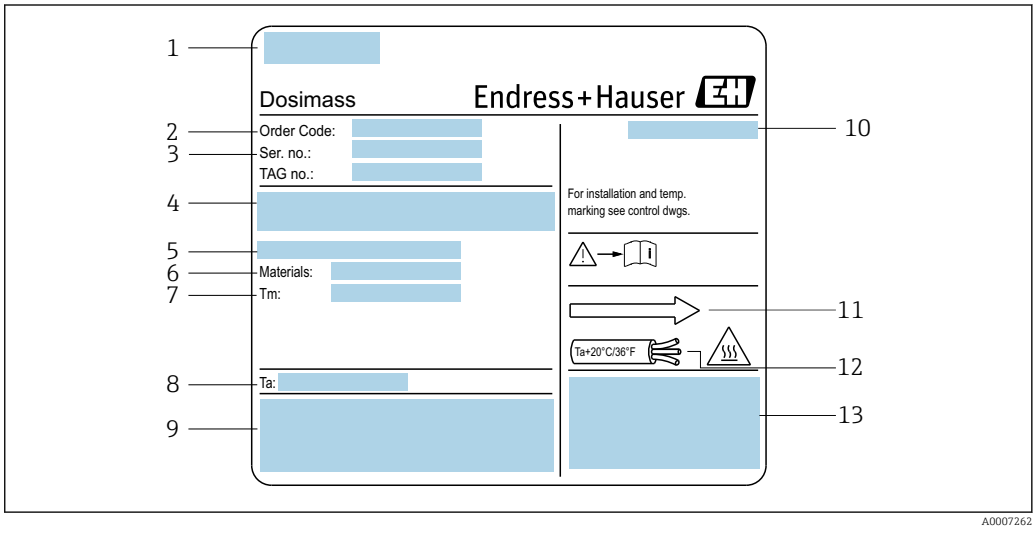
- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*, see the "Product identification" section → 13.

4.2 Product identification

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

For an overview of the scope of the associated Technical Documentation, refer to the following:
- The "Additional standard documentation on the device"→ 7 and "Supplementary device-dependent documentation"→ 7 sections
- The *W@M Device Viewer*: enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

4.2.1 Sensor nameplate



2 *Example of a sensor nameplate*

1 *Manufacturing location*
2 *Order code: see the specifications on the order confirmation for the meanings of the individual letters and digits*
3 *Serial number*
4 *Supply voltage and power consumption*
5 *Process connection*
6 *Wetted materials*
7 *Maximum process temperature*
8 *Permitted ambient temperature range*
9 *Space reserved for additional information on the device version (approvals, certificates, etc.)*
10 *Degree of protection*
11 *Flow direction*
12 *Cable temperature*
13 *Space reserved for additional information on the device version (approvals, certificates, etc.)*

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 +).

4.2.2 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: −40 to +80 °C (−40 to +176 °F),
preferably at +20 °C (+68 °F)

5.2 Transporting the product

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

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.

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:
- Outer packaging of device
  Polymer stretch wrap that complies with EU Directive 2002/95/EC (RoHS)
- Packaging
  - Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
  - Cardboard box in accordance with European packaging guideline 94/62EC, recyclability confirmed by Resy symbol
- Carrying and securing materials
  - Disposable plastic pallet
  - Plastic straps
  - Plastic adhesive strips
- Filler material
  Paper pads

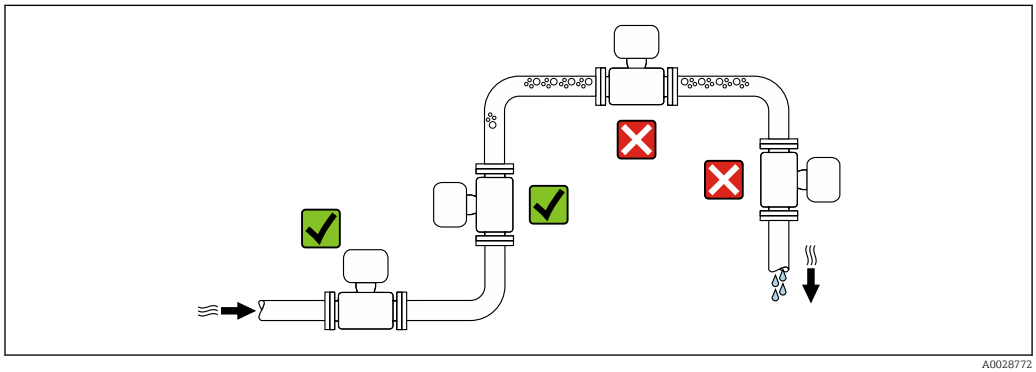
6 Mounting

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



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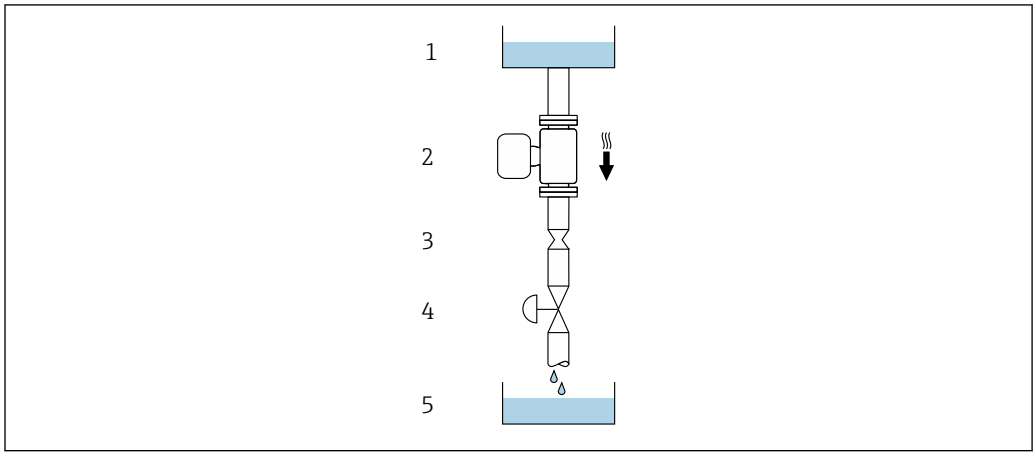
To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:
- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

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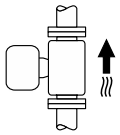
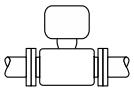
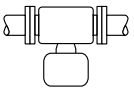
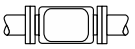
3 *Installation in a down pipe (e.g. for batching applications)*

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	⅜	6	0.24
15	½	10	0.40
25	1	14	0.55

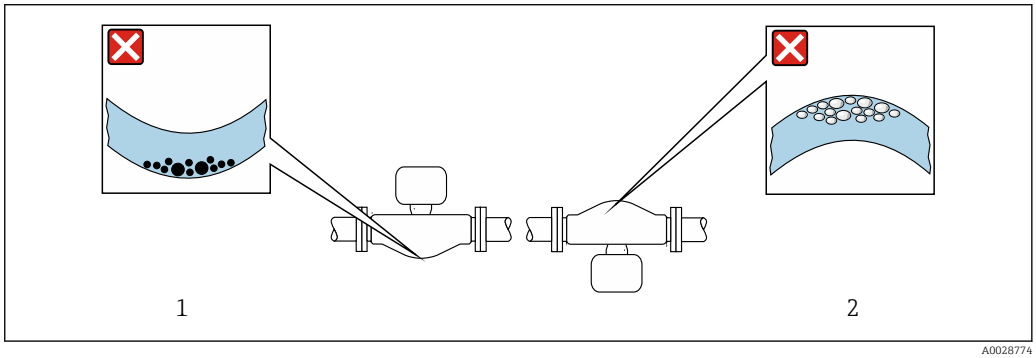
Orientation

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) → 4, 17
C	Horizontal orientation, transmitter at bottom	 A0015590	✓✓ 2) → 4, 17
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.



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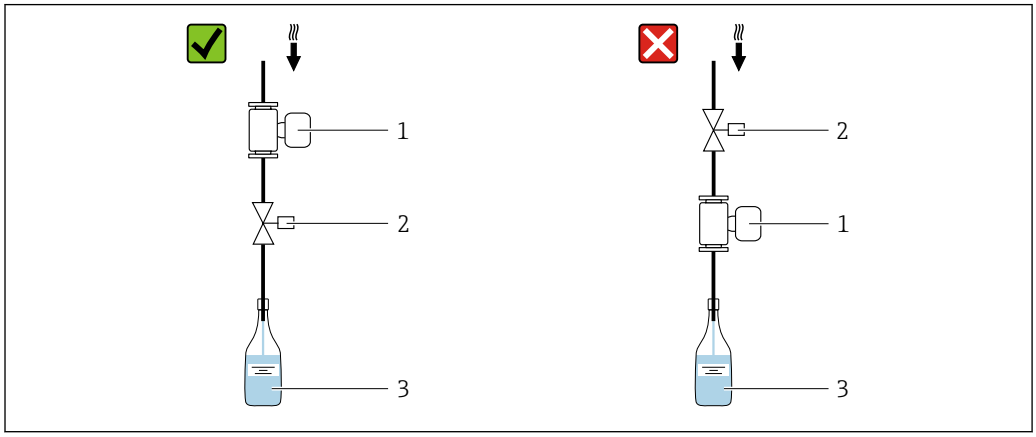
4 *Orientation of sensor with curved measuring tube*

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

Valves

Never install the sensor downstream from a filling valve. If the sensor is completely empty this corrupts the measured value.

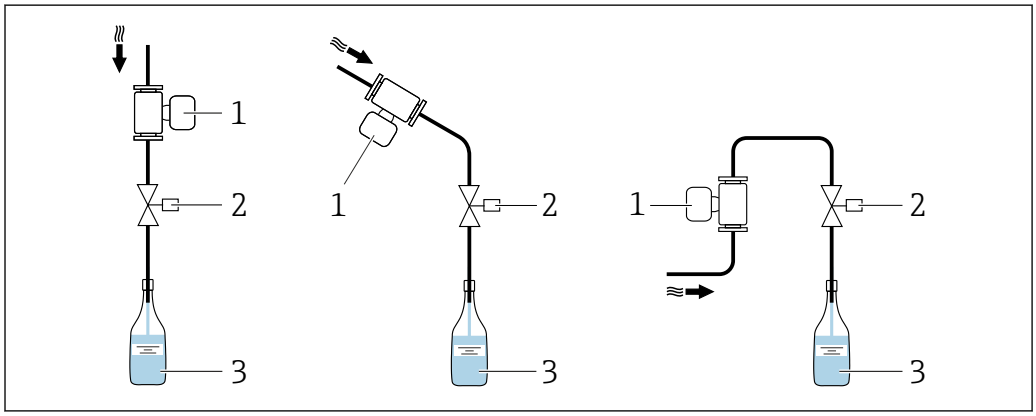
Correct measurement is only possible if the pipe is completely full. Perform sample fillings before commencing filling in production.



1 Measuring device
2 Filling valve
3 Container

Filling systems

The pipe system must be completely full to ensure optimum measurement.

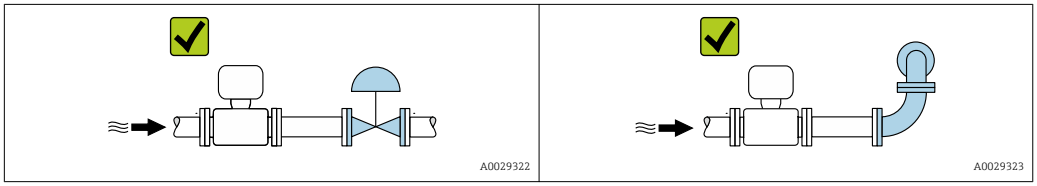


5 Filling system

1 Measuring device
2 Filling valve
3 Container

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 → 19.



Installation dimensions

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

6.1.2 Environment and process requirements

Ambient temperature range

Measuring device	–40 to +60 °C (–40 to +140 °F) (Sensor, transmitter) Install the measuring device in a shady location. Avoid direct sunlight, particularly in warm climatic regions.

Temperature tables

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

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

System pressure

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.

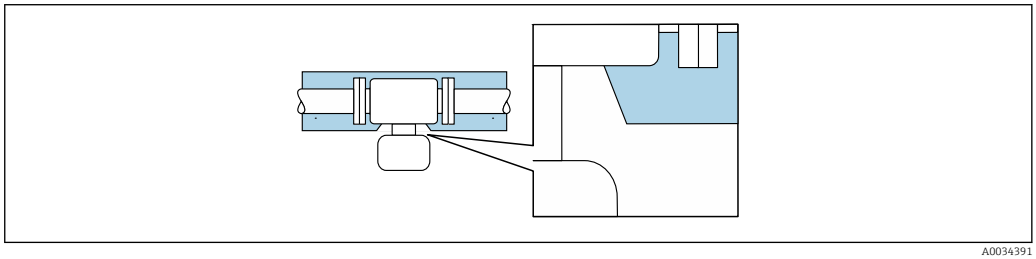
For this reason, the following mounting locations are recommended:
- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)

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.

NOTICE

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



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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 sufficient convection takes place at the transmitter neck.
- ▶ Ensure that a sufficiently large area of the transmitted neck 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 sensor 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 μr ≥ 300
- Plate thickness d ≥ 0.35 mm (d ≥ 0.014 in)

Vibrations

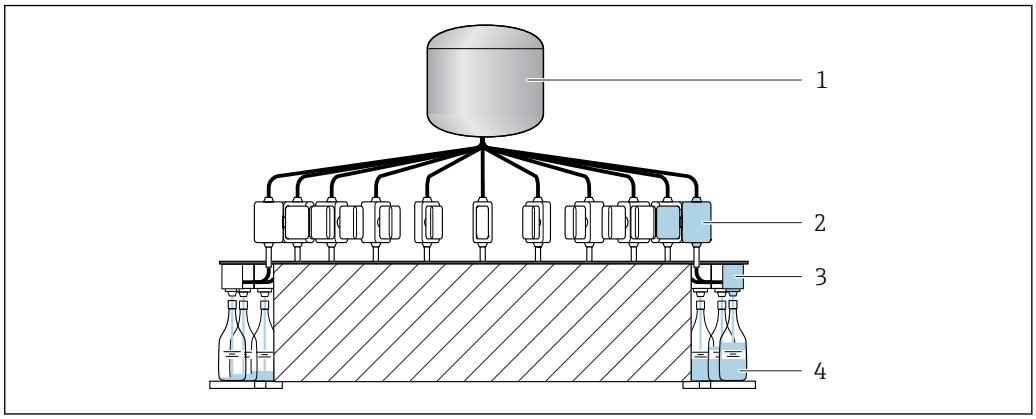
The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

6.1.3 Special mounting instructions

Information for filling systems

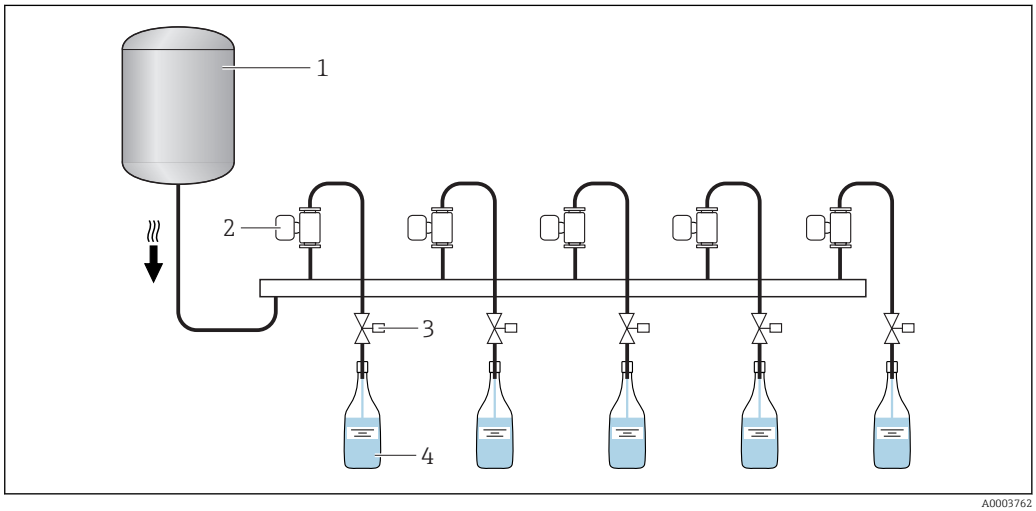
Correct measurement is possible only if the piping is completely filled. We therefore recommend that some test batches be carried out prior to production batching.

Circular filling system



1 *Tank*
2 *Measuring device*
3 *Batching valve*
4 *Vessel*

Linear filling system



1 *Tank*
2 *Measuring device*
3 *Batching valve*
4 *Vessel*

Zero point adjustment

The **Sensor adjustment** submenu contains parameters required for zero point adjustment.

NOTICE

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

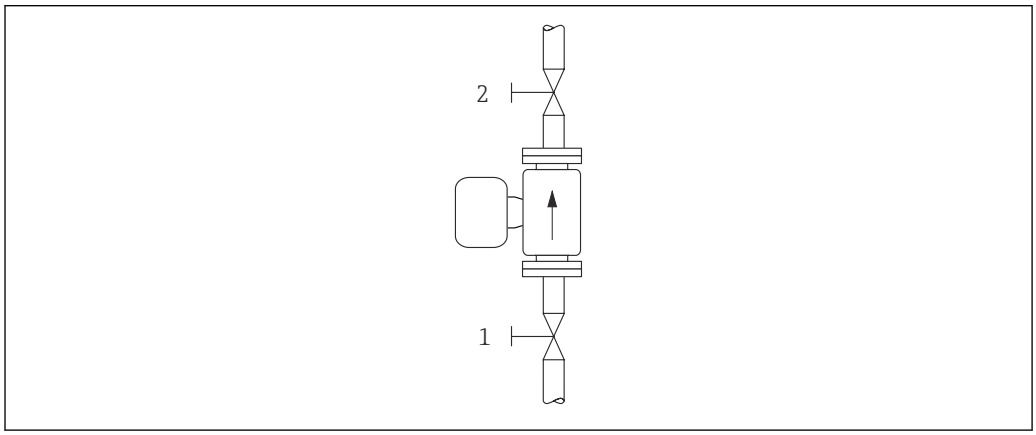
- ▶ Experience shows that a zero point adjustment is advisable only in special cases.
- ▶ When maximum accuracy is required and flow rates are very low.
- ▶ Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

Detailed information on reference conditions→ 65

Prerequisites for zero point adjustment

Note the following points before performing the adjustment:

- A zero point adjustment can be performed only with fluids that contain no gas or solid contents.
- A zero point adjustment takes place when the measuring tubes are completely filled and there is zero flow (v = 0 m/s (0 ft/s)). For this purpose, shut-off valves (for example) can be provided upstream or downstream from the sensor, or existing valves and gate valves may be used.
  – Normal operation → Valves 1 and 2 open
  – Zero point adjustment with pump pressure → Valve 1 open and valve 2 closed
  – Zero point adjustment without pump pressure → Valve 1 closed and valve 2 open



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Performing the zero point adjustment

1. Let the system run until normal operating conditions are present.
2. Stop the flow (v = 0 m/s (0 ft/s)).
3. Check the shutoff valves for leaks.
4. Check the necessary process pressure.
5. Perform the adjustment using the ZERO POINT ADJUSTMENT → 41 function.

6.2 Mounting the measuring device

6.2.1 Required tools

For process connections, use the appropriate installation tool.

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.

- ▶ Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the fluid.

6.3 Post-installation check

Is the device undamaged (visual inspection)?	❑
Does the measuring device conform to the measuring point specifications? For example: ▪ Process temperature ▪ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document) ▪ Ambient temperature ▪ Measuring range	❑
Has the correct orientation for the sensor been selected ? ▪ According to sensor type ▪ According to medium temperature ▪ According to medium properties (outgassing, with entrained solids)	❑
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 🖹 17?	❑
Are the measuring point identification and labeling correct (visual inspection)?	❑
Is the device adequately protected from precipitation and direct sunlight?	❑
Are the securing screw and securing clamp tightened securely?	❑

7 Electrical connection

The measuring device does not have an internal circuit breaker. For this reason, assign the measuring device a switch or power-circuit breaker so that the power supply line can be easily disconnected from the mains.

7.1 Connection conditions

7.1.1 Connecting cable requirements

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

Electrical safety

In accordance with applicable federal/national regulations.

Permitted temperature range

- 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.

Signal cable

Cables are not included in the scope of delivery; they can be ordered as an accessory → 60.

Pulse/frequency/switch output

Standard installation cable is sufficient.

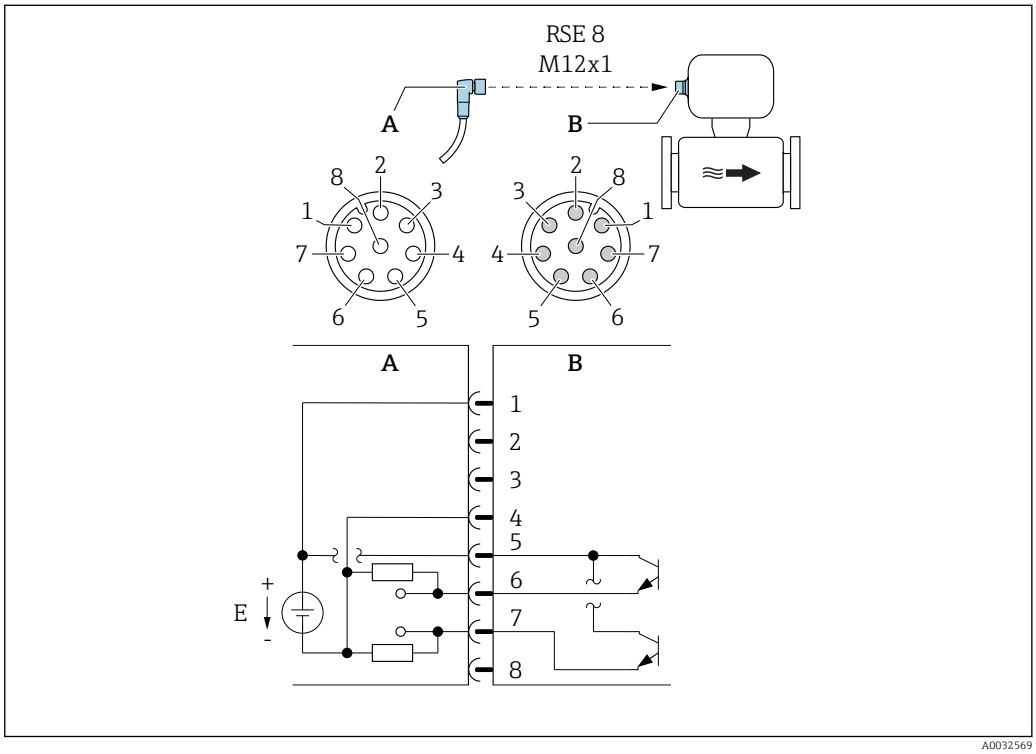
7.1.2 Terminal assignment

Connection is solely by means of device plug → 25.

7.1.3 Pin assignment, device plug

Device version: 2 pulse/frequency/switch outputs

Order code for "Output, input", option 3:
2 Pulse/frequency/switch output



8 Connection to device

A Coupling: Supply voltage, pulse/freq./switch output
B Connector: Supply voltage, pulse/freq./switch output
E PELV or SELV power supply
1 to 8 Pin assignment

Pin assignment

Connection: Coupling (A) – Connector (B)		
Pin	**Assignment**	
1	L+	Supply voltage
2	+	Service interface RX
3	+	Service interface TX
4	L-	Supply voltage
5	+	Pulse/frequency/switch output
6	–	Pulse/frequency/switch output 1
7	–	Pulse/frequency/switch output 2
8	–	Service interface GND

7.1.4 Requirements for the supply unit

Supply voltage

DC 24 V (nominal voltage: DC 20 to 30 V)

- The power unit must be tested to ensure that it meets safety requirements (e.g. PELV, SELV).
- The supply voltage must not exceed a maximum short-circuit current of 50 A.

7.2 Connecting the measuring device

NOTICE

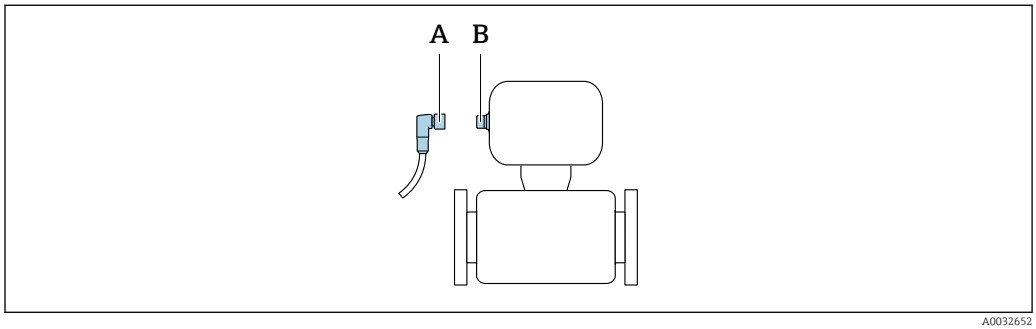
Limitation of electrical safety due to incorrect connection!

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

7.2.1 Connecting the transmitter

Connection by means of device plug

Connection is solely by means of device plug.



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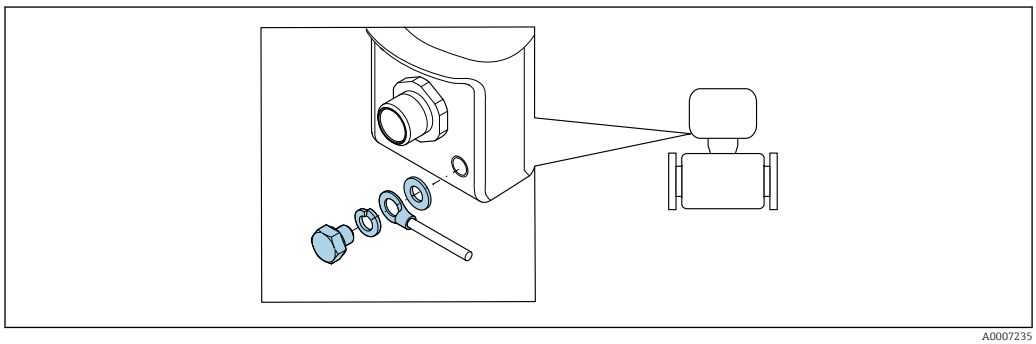
A Coupling
B Plug

Grounding

Grounding is by means of a cable socket.



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7.3 Ensuring the degree of protection

The measuring device fulfills all the requirements for IP67 degree of protection, Type 4X enclosure.

To guarantee IP67 degree of protection, Type 4X enclosure, carry out the following steps after the electrical connection:

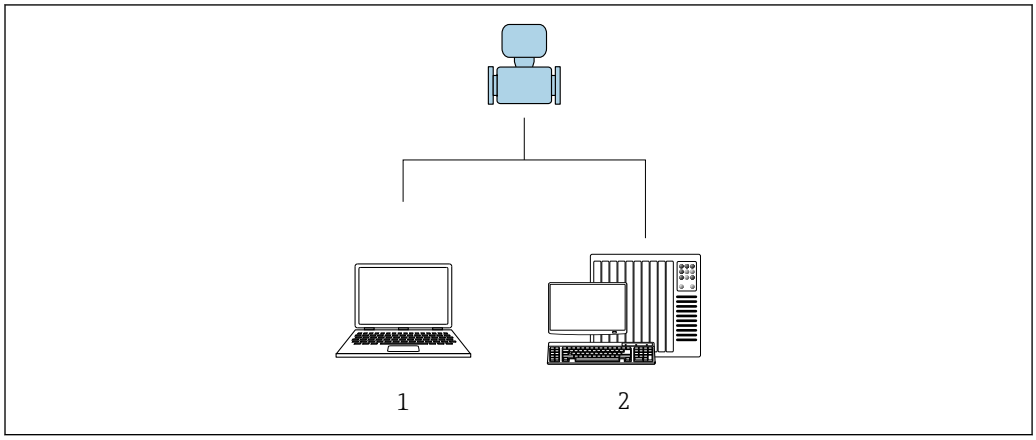
- ▶ Tighten all device plugs.

7.4 Post-connection check

Is the device undamaged (visual inspection)?	❑
Does the supply voltage in the system match the specifications on the device's nameplate?	❑
Do the cables used comply with the necessary specifications?	❑
Are the maximum values for voltage and current at the pulse and status output being observed? → 🖹 63	❑

8 Operation options

8.1 Overview of operation options



1 *Computer with "FieldCare" or "DeviceCare" operating tool*
2 *Control system (e.g. PLC)*

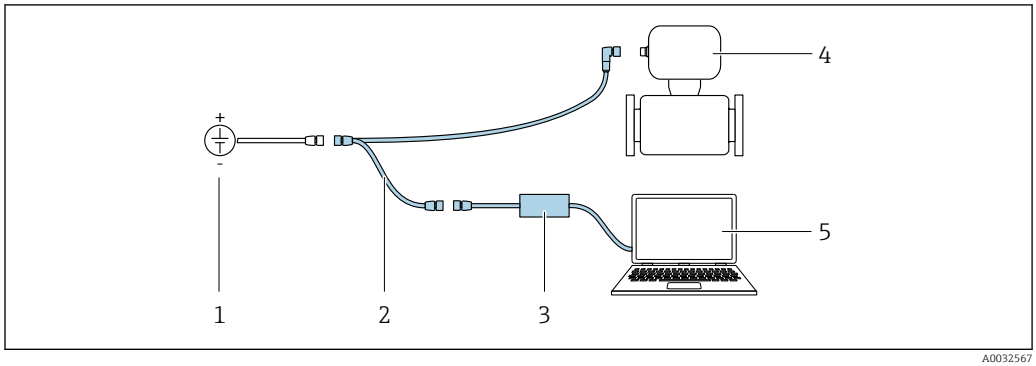
8.2 Access to the operating menu via the operating tool

8.2.1 Connecting the operating tool

Using the service adapter and Commubox FXA291

Operation and configuration can be performed using the Endress+Hauser FieldCare or DeviceCare service and configuration software.

The device is connected to the USB port of the computer via the service adapter and Commubox FXA291.



1 *Supply voltage 24 V DC*
2 *Service adapter*
3 *Dosimag*
4 *Commubox FXA291*
5 *Computer with "FieldCare" or "DeviceCare" operating tool*

The service adapter, cable and Commubox FXA291 are not included in the delivery. These components can be ordered as accessories → 60.

8.2.2 FieldCare

Function scope

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

Access is via:
Service adapter and Commubox FXA291

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 → 31

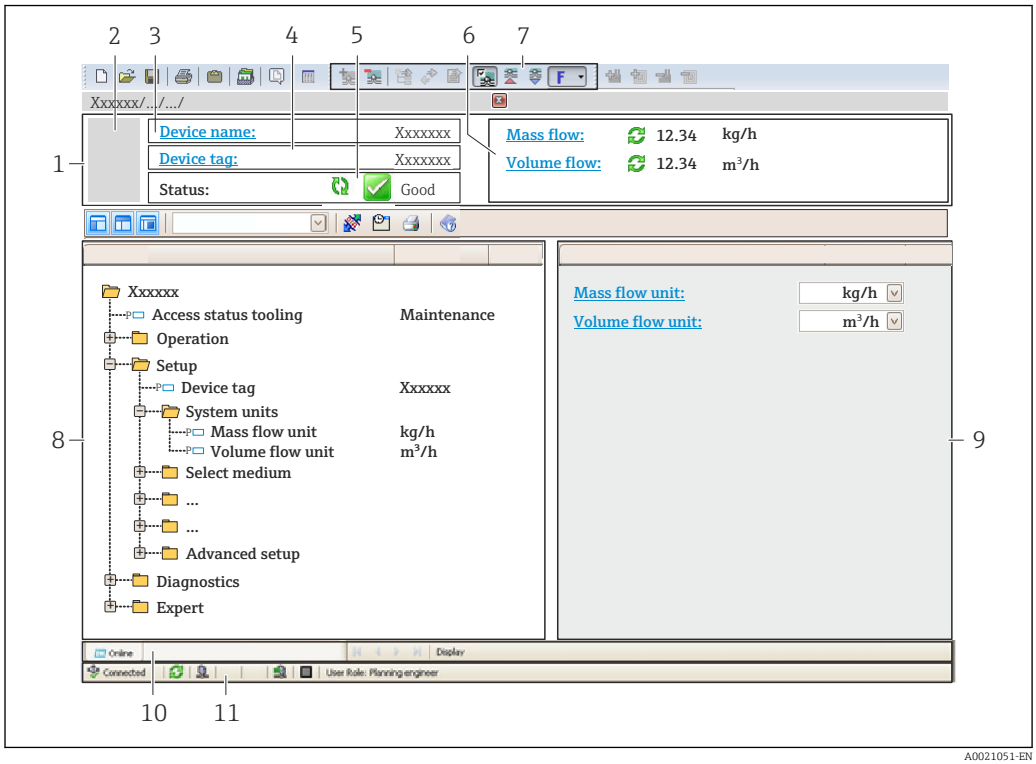
Establishing a connection

Service adapter, Commubox FXA291 and "FieldCare" operating tool

1. Start FieldCare and launch the project.
2. In the network: Add a device.
   ↳ The **Add device** window opens.
3. Select the **CDI Communication FXA291** option from the list and press **OK** to confirm.
4. Right-click **CDI Communication FXA291** 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.
6. Establish the online connection to the device.

For additional information, see Operating Instructions BA00027S and BA00059S

User interface



1 *Header*
2 *Picture of device*
3 *Device name*
4 *Device tag*
5 *Status area with status signal→ 50*
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*

8.2.3 DeviceCare

Function scope

Tool to connect and configure Endress+Hauser field devices.

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

For details, see Innovation Brochure IN01047S

Source for device description files

See information → 31

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	03.00.zz	▪ On the title page of the Operating Instructions ▪ On the transmitter nameplate ▪ Firmware version **Diagnostics** menu → **Device information** submenu → **Firmware version** parameter
Release date of firmware version	05.2015	---

For an overview of the different firmware versions for the device

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	Sources for obtaining device descriptions
FieldCare	▪ www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
DeviceCare	▪ www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)

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→ 📄 23
- "Post-connection check" checklist → 📄 27

10.2 Switching on the measuring device

▶ The function check has been completed successfully.
Switch on the supply voltage.
↳ The measuring device runs through internal test functions.

The device is operational and operation commences.

If the device does not start up successfully, depending on the cause, a diagnostic message is displayed in the system asset management tool "FieldCare" .

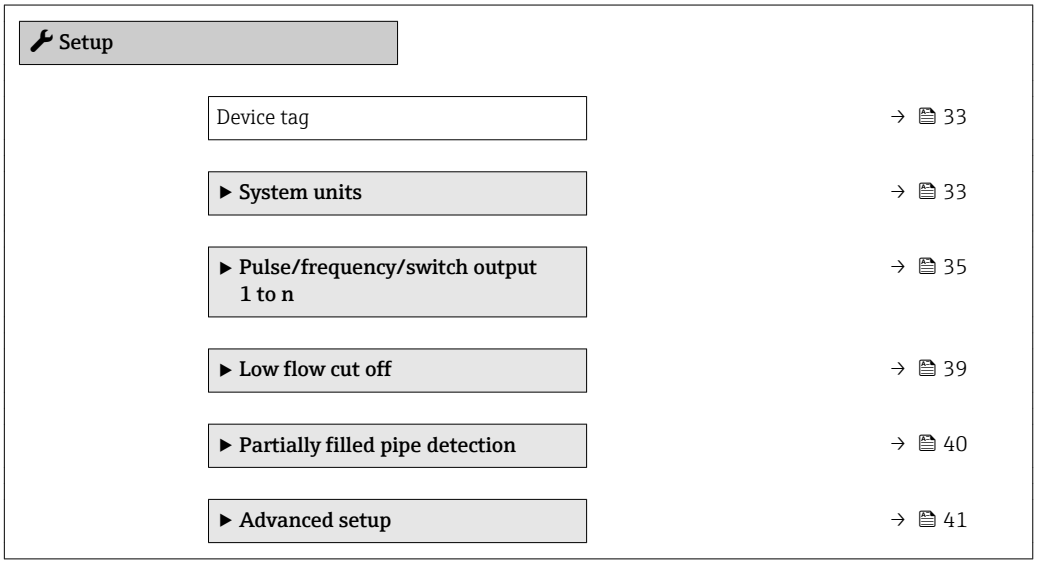
10.3 Connecting via FieldCare

- For FieldCare connection
- For connecting via FieldCare → 📄 29
- For the FieldCare → 📄 30 user interface

10.4 Configuring the measuring device

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

Navigation
"Setup" menu



10.4.1 Defining the tag name

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

Enter the tag name in the "FieldCare" operating tool → 30

Navigation
"Setup" menu → Device tag

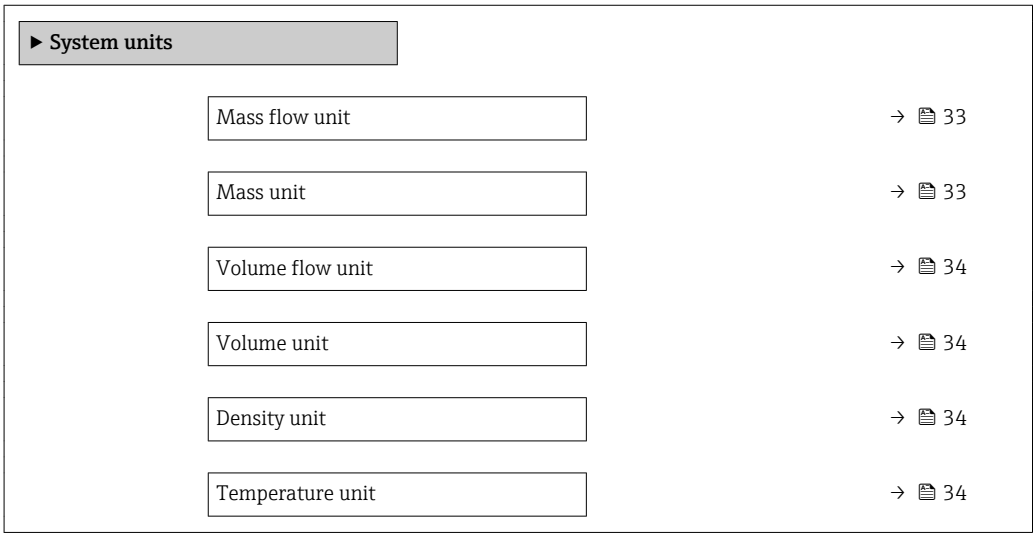
Parameter overview with brief description

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. @, %, /)	Dosimass

10.4.2 Setting the system units

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

Navigation
"Setup" menu → System units



Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. *Result* The selected unit applies for: ▪ Output ▪ Low flow cut off ▪ Simulation process variable	Unit choose list	Country-specific: ▪ g/s ▪ oz/s
Mass unit	Select mass unit.	Unit choose list	Country-specific: ▪ kg ▪ lb Country-specific: ▪ g ▪ oz

Parameter	Description	Selection	Factory setting
Volume flow unit	Select volume flow unit. *Result* The selected unit applies for: ▪ Output ▪ Low flow cut off ▪ Simulation process variable	Unit choose list	Country-specific: ▪ ml/s ▪ fl oz/s (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: ▪ l ▪ gal (us) Country-specific: ▪ ml ▪ fl oz (us)
Density unit	Select density unit. *Result* The selected unit applies for: ▪ Output ▪ Simulation process variable ▪ Density adjustment (**Expert** menu)	Unit choose list	Country-specific: ▪ kg/l ▪ g/cm³
Temperature unit	Select temperature unit. *Result* The selected unit applies for: ▪ **Maximum value** parameter (6108) ▪ **Minimum value** parameter (6109) ▪ **Temperature** parameter	Unit choose list	Country-specific: ▪ °C ▪ °F

10.4.3 Configuring the pulse/frequency/switch output

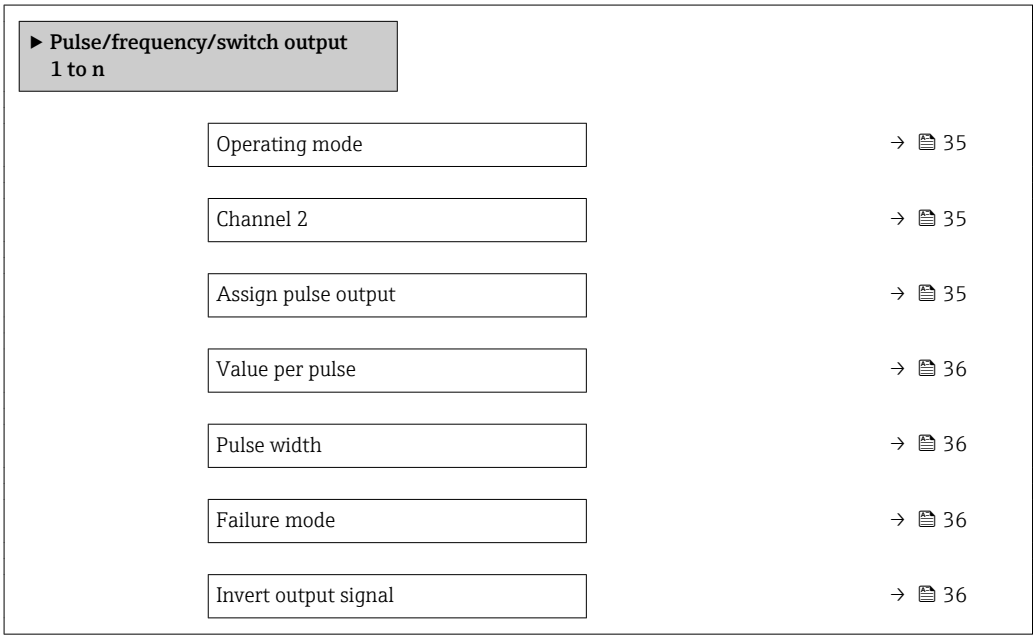
The **Pulse/frequency/switch output** submenu contains all the parameters that must be configured for the configuration of the selected output type.

Configuring the pulse output

In the **Operating mode** parameter (→ 35), one of the two options can be selected for the pulse output:
- **Pulse** option: Quantity-proportional pulse with pulse width to be configured.
- **Automatic pulse** option: Quantity-proportional pulse with on/off ratio of 1:1

Navigation
"Setup" menu → Pulse/frequency/switch output 1 to n

Structure of submenu for pulse output



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.	▪ Off ▪ Pulse ▪ Automatic pulse ▪ Frequency ▪ Switch	▪ Pulse/freq./switch output 1: **Pulse** option ▪ Pulse/freq./switch output 2: **Switch** option
Channel 2	The **Pulse** option is selected in the **Operating mode** parameter.	Select impulse with or without time offset.	▪ Off ▪ Redundant 0° ▪ Redundant 90° ▪ Redundant 180°	Off
Assign pulse output	One of the following options is selected in the **Operating mode** parameter: ▪ Pulse ▪ Automatic pulse	Select process variable for pulse output.	▪ Off ▪ Mass flow ▪ Volume flow	Off

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Value per pulse	The **Pulse** option is selected in the **Operating mode** parameter (→ 35) and a process variable is selected in the **Assign pulse output** parameter (→ 35).	Enter measured value at which a pulse is output.	Signed floating-point number	Depends on country and nominal diameter
Pulse width	The **Pulse** option is selected in the **Operating mode** parameter (→ 35) and a process variable is selected in the **Assign pulse output** parameter (→ 35).	Define time width of the output pulse.	0.05 to 3.75 ms	0.05 ms
Failure mode	The **Pulse** option is selected in the **Operating mode** parameter (→ 35) and a process variable is selected in the **Assign pulse output** parameter (→ 35).	Define output behavior in alarm condition.	▪ Actual value ▪ No pulses	Actual value
Invert output signal	–	Invert the output signal.	▪ No ▪ Yes	▪ Pulse/freq./switch output 1: yes ▪ Pulse/freq./switch output 2: no

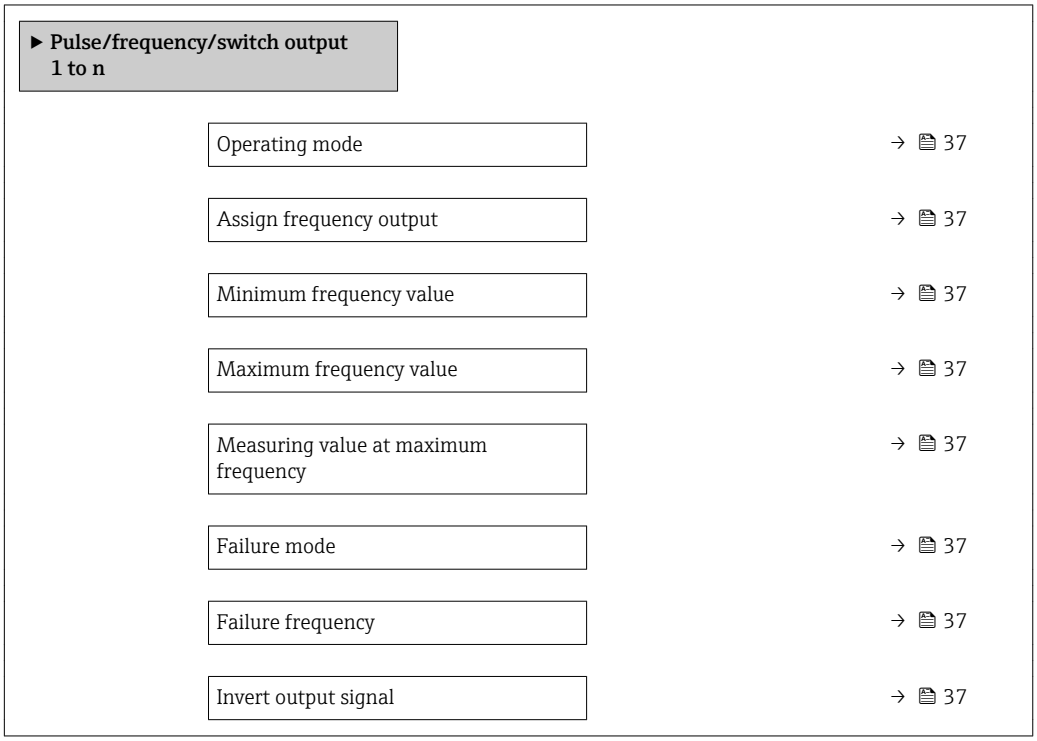
Configuring the frequency output

Flow-proportional frequency output with on/off ratio of 1:1

Navigation

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

Structure of the submenu for the frequency output



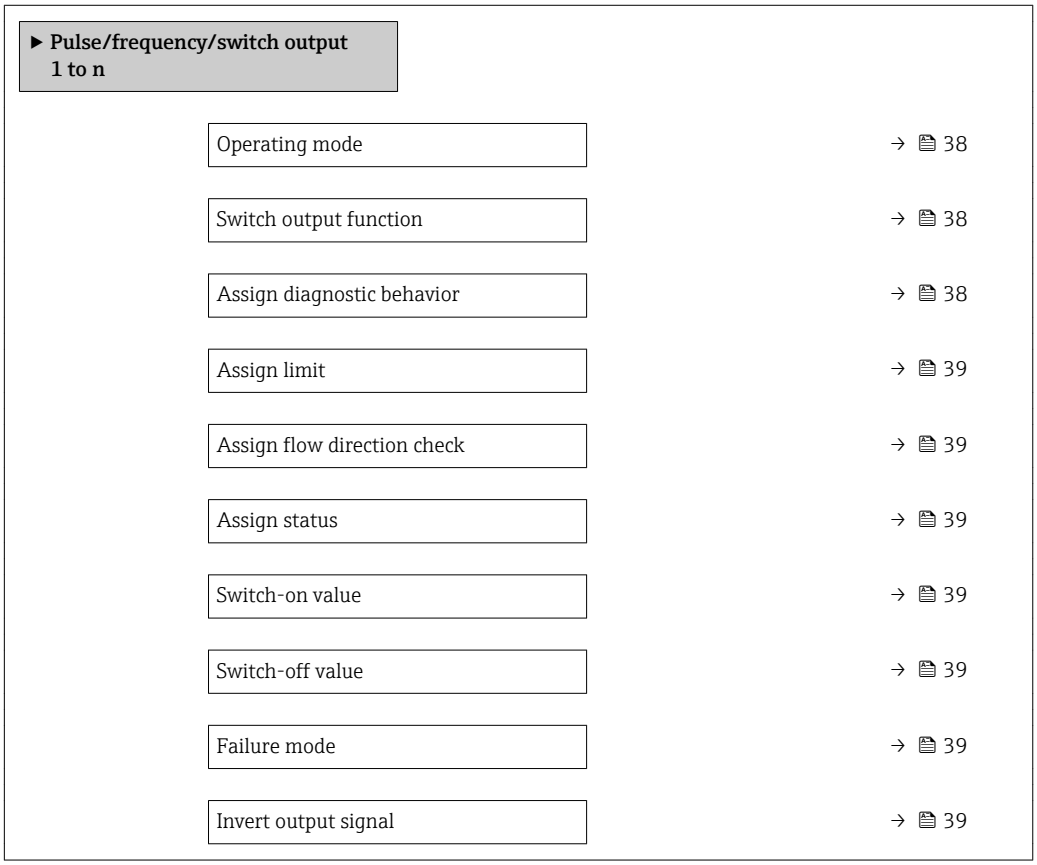
Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Operating mode	–	Define the output as a pulse, frequency or switch output.	▪ Off ▪ Pulse ▪ Automatic pulse ▪ Frequency ▪ Switch	▪ Pulse/freq./switch output 1: **Pulse** option ▪ Pulse/freq./switch output 2: **Switch** option
Assign frequency output	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 35) parameter.	Select process variable for frequency output.	▪ Off ▪ Mass flow ▪ Volume flow ▪ Density ▪ Temperature	Off
Minimum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 35) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 37). ℹ The measured value for the minimum frequency is always 0 Kelvin.	Enter minimum frequency.	0.0 to 10 000.0 Hz	0.0 Hz
Maximum frequency value	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 35) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 37).	Enter maximum frequency.	0.0 to 10 000.0 Hz	10 000.0 Hz
Measuring value at maximum frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 35) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 37).	Enter measured value for maximum frequency.	Signed floating-point number	Depends on country and nominal diameter
Failure mode	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 35) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 37).	Define output behavior in alarm condition.	▪ Actual value ▪ Defined value ▪ 0 Hz	0 Hz
Failure frequency	The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 35) and a process variable is selected in the **Assign frequency output** parameter (→ 🖹 37).	Enter frequency output value in alarm condition.	0.0 to 10 000.0 Hz	0.0 Hz
Invert output signal	–	Invert the output signal.	▪ No ▪ Yes	▪ Pulse/freq./switch output 1: yes ▪ Pulse/freq./switch output 2: no

Configuring the switch output

Navigation
"Setup" menu → Pulse/frequency/switch output 1 to n

Structure of the submenu for the switch output



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.	▪ Off ▪ Pulse ▪ Automatic pulse ▪ Frequency ▪ Switch	▪ Pulse/freq./switch output 1: **Pulse** option ▪ Pulse/freq./switch output 2: **Switch** option
Switch output function	The **Switch** option is selected in the **Operating mode** parameter.	Select function for switch output.	▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit ▪ Flow direction check ▪ Status	Off
Assign diagnostic behavior	▪ 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.	▪ Alarm ▪ Alarm or warning ▪ Warning	Alarm

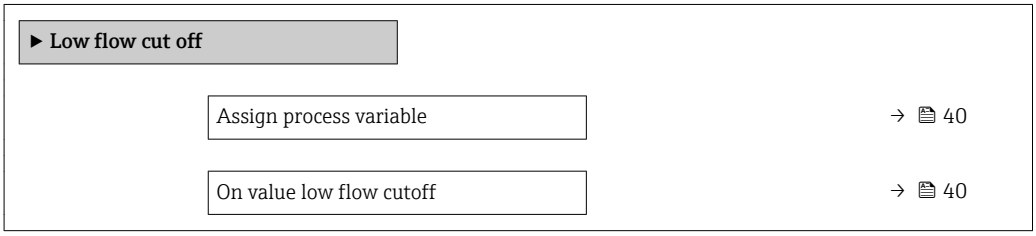
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign limit	▪ The **Switch** option is selected in the **Operating mode** parameter parameter. ▪ The **Limit** option is selected in the **Switch output function** parameter parameter.	Select process variable for limit function.	▪ Mass flow ▪ Volume flow ▪ Density ▪ Temperature	Mass flow
Assign flow direction check	▪ 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.	▪ Off ▪ Volume flow ▪ Mass flow	Mass flow
Assign status	▪ 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.	▪ Partially filled pipe detection ▪ Low flow cut off	Partially filled pipe detection
Switch-on value	▪ 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: ▪ 0 g/s ▪ 0 oz/s
Switch-off value	▪ 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: ▪ 0 g/s ▪ 0 oz/s
Failure mode	–	Define output behavior in alarm condition.	▪ Actual status ▪ Open ▪ Closed	Open
Invert output signal	–	Invert the output signal.	▪ No ▪ Yes	▪ Pulse/freq./switch output 1: yes ▪ Pulse/freq./switch output 2: no

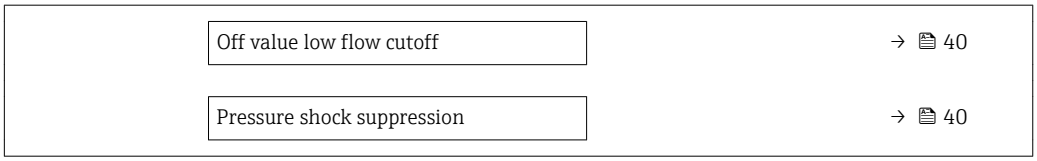
10.4.4 Low flow cut off

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





Parameter overview with brief description

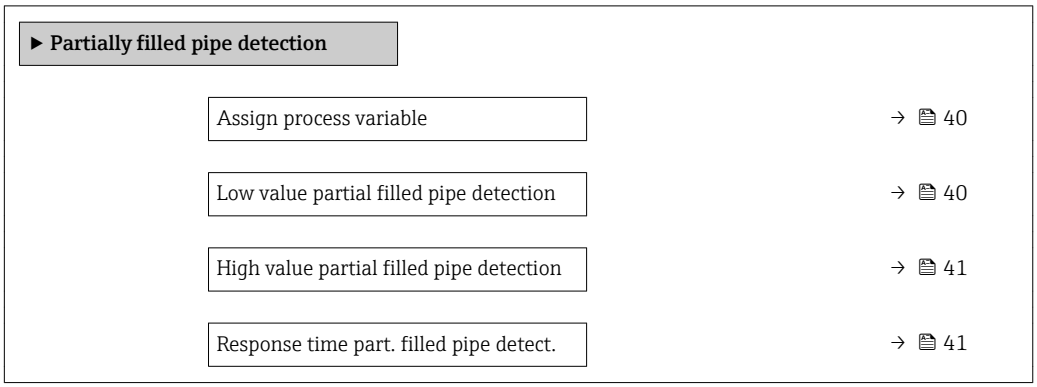
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	▪ Off ▪ Mass flow ▪ Volume flow	Mass flow
On value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 40).	Enter on value for low flow cut off.	Positive floating-point number	For liquids: depends on country and nominal diameter
Off value low flow cutoff	A process variable is selected in the **Assign process variable** parameter (→ 40).	Enter off value for low flow cut off.	0 to 100.0 %	50 %
Pressure shock suppression	A process variable is selected in the **Assign process variable** parameter (→ 40).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.4.5 Detection of partially filled pipes

The **Partially filled pipe detection** submenu contains parameters required for configuring partially filled pipe detection.

Navigation

"Setup" menu → Partially filled pipe detection



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for partially filled pipe detection.	▪ Off ▪ Density	Off
Low value partial filled pipe detection	A process variable is selected in the **Assign process variable** parameter (→ 40).	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Country-specific: ▪ 200 kg/m³ ▪ 12.5 lb/ft³

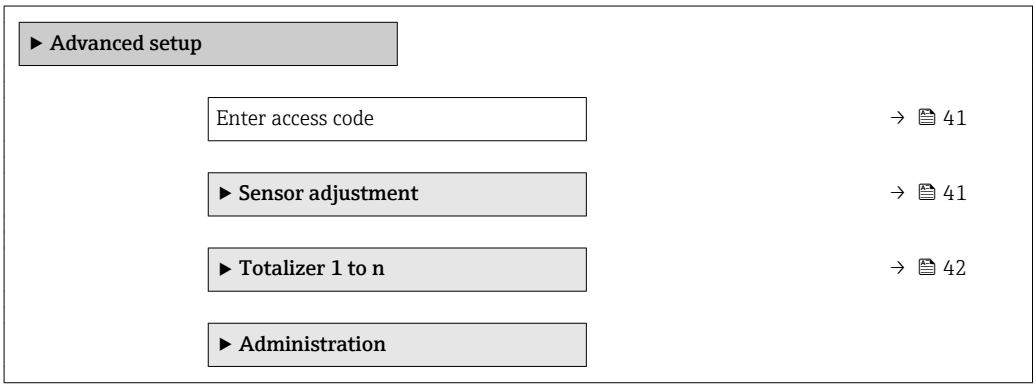
Parameter	Prerequisite	Description	Selection / User entry	Factory setting
High value partial filled pipe detection	A process variable is selected in the **Assign process variable** parameter (→ 40).	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	Country-specific: ▪ 6 000 kg/m³ ▪ 374.6 lb/ft³
Response time part. filled pipe detect.	A process variable is selected in the **Assign process variable** parameter (→ 40).	Enter time before diagnostic message is displayed for partially filled pipe detection.	0 to 100 s	1 s

10.5 Advanced settings

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

Navigation

"Setup" menu → Advanced setup



Parameter overview with brief description

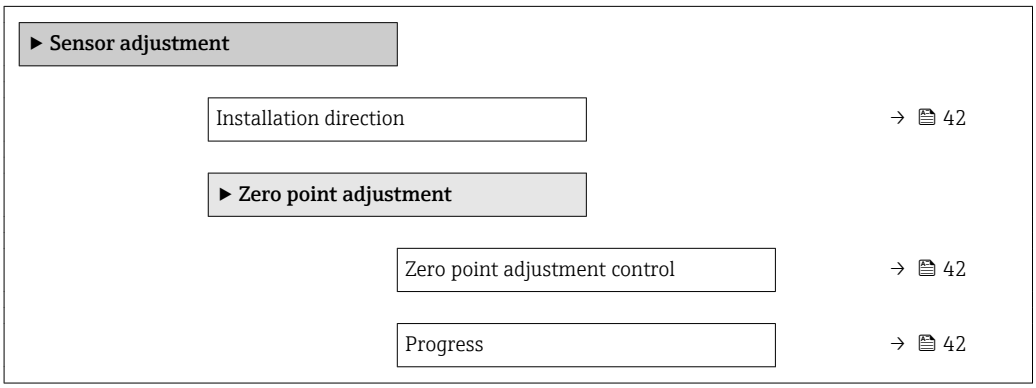
Parameter	Description	User entry
Enter access code	Enter access code to disable write protection of parameters.	Max. 16-digit character string comprising numbers, letters and special characters

10.5.1 Sensor adjustment

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

Navigation

"Setup" menu → Advanced setup → Sensor adjustment



Parameter overview with brief description

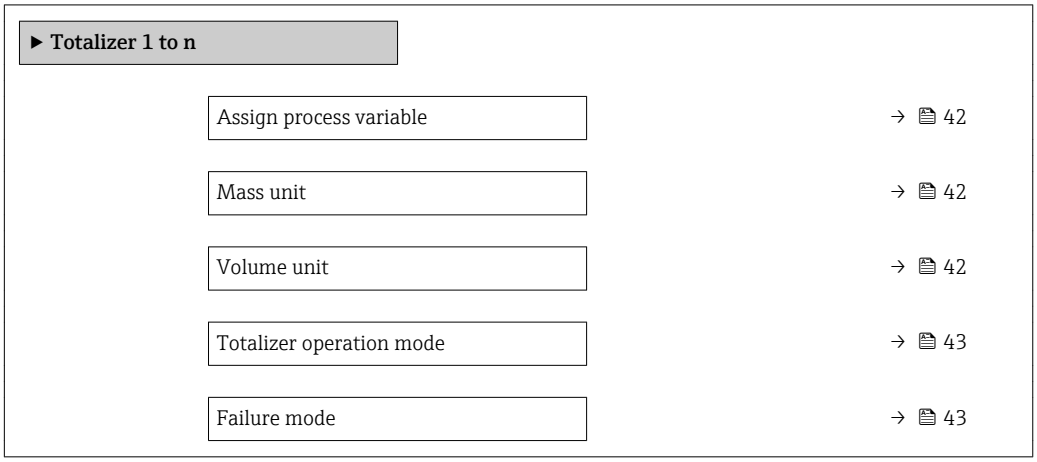
Parameter	Description	Selection / User interface	Factory setting
Installation direction	Set sign of flow direction to match the direction of the arrow on the sensor.	▪ Flow in arrow direction ▪ Flow against arrow direction	Flow in arrow direction
Zero point adjustment control	Start zero point adjustment.	▪ Cancel ▪ Busy ▪ Zero point adjust failure ▪ Start	Cancel
Progress	Shows the progress of the process.	0 to 100 %	–

10.5.2 Configuring the totalizer

The totalizer in question can be configured in the **Totalizer 1 to n** submenu.

Navigation

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



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	▪ Off ▪ Volume flow ▪ Mass flow	Mass flow
Mass unit	The **Mass flow** option is selected in the **Assign process variable** parameter (→ 42) of the **Totalizer 1 to n** submenu.	Select mass unit.	Unit choose list	Country-specific: ▪ kg ▪ lb Country-specific: ▪ g ▪ oz
Volume unit	The **Volume flow** option is selected in the **Assign process variable** parameter (→ 42) of the **Totalizer 1 to n** submenu.	Select volume unit.	Unit choose list	Country-specific: ▪ l ▪ gal (us) Country-specific: ▪ ml ▪ fl oz (us)

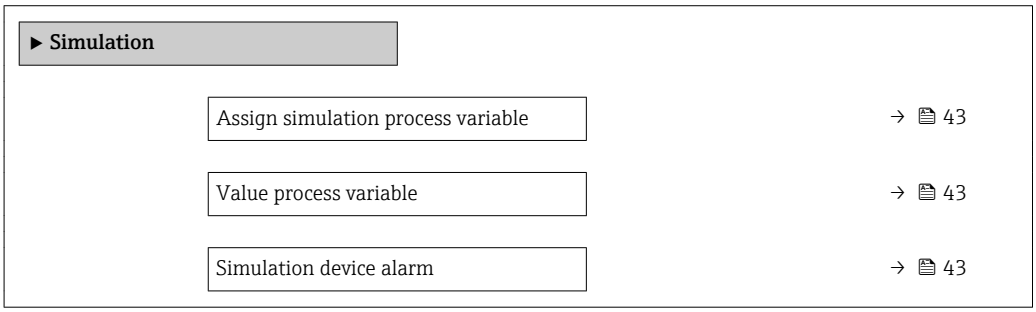
Parameter	Prerequisite	Description	Selection	Factory setting
Totalizer operation mode	A process variable is selected in the **Assign process variable** parameter (→ 🖹 42) of the **Totalizer 1 to n** submenu.	Select totalizer calculation mode.	▪ Net flow total ▪ Forward flow total ▪ Reverse flow total	Net flow total
Failure mode	A process variable is selected in the **Assign process variable** parameter (→ 🖹 42) of the **Totalizer 1 to n** submenu.	Define totalizer behavior in alarm condition.	▪ Stop ▪ Actual value ▪ Last valid value	Stop

10.6 Simulation

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

Navigation

"Diagnostics" menu → Simulation



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	▪ Off ▪ Mass flow ▪ Volume flow ▪ Density ▪ Temperature	Off
Value process variable	A process variable is selected in the **Assign simulation process variable** parameter (→ 🖹 43).	Enter the simulation value for the selected process variable.	Depends on the process variable selected	0
Simulation device alarm	–	Switch the device alarm on and off.	▪ Off ▪ On	Off

11 Operation

11.1 Reading device locking status

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

Navigation
"Operation" menu → Locking status

Function scope of the "Locking status" parameter

Options	Description
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.

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Locking status	Indicates the write protection with the highest priority that is currently active.	Temporarily locked	Temporarily locked

11.2 Reading access authorization status on operating software

Displaying active access authorization: **Access status tooling** parameter

Navigation
"Operation" menu → Access status tooling

Parameter overview with brief description

Parameter	Description	User interface	Factory setting
Access status tooling	Shows the access authorization to the parameters via the operating tool.	▪ Operator ▪ Maintenance	Maintenance

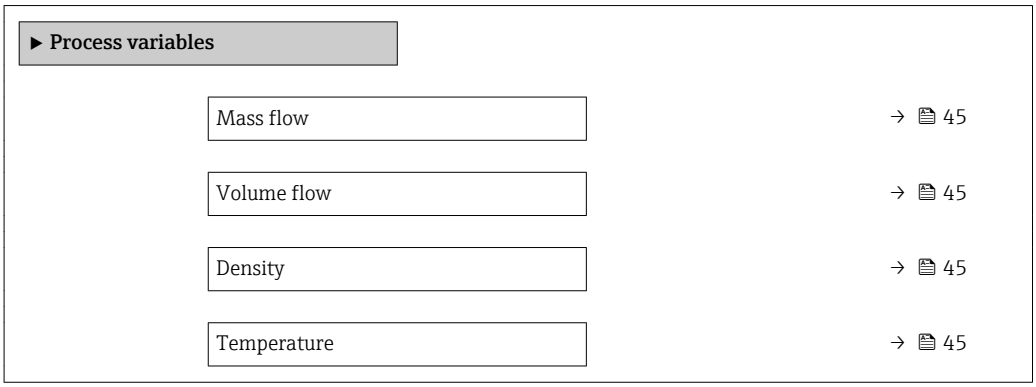
11.3 Reading measured values

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

11.3.1 Process variables

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

Navigation
"Diagnostics" menu → Measured values → Process variables



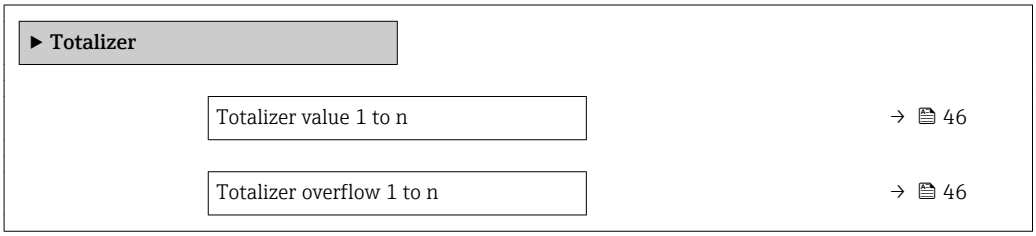
Parameter overview with brief description

Parameter	Description	User interface
Mass flow	Displays the mass flow currently measured. *Dependency* The unit is taken from the **Mass flow unit** parameter (→ 33).	Signed floating-point number
Volume flow	Displays the volume flow currently calculated. *Dependency* The unit is taken from the **Volume flow unit** parameter (→ 34).	Signed floating-point number
Density	Shows the density currently measured. *Dependency* The unit is taken from the **Density unit** parameter (→ 34).	Signed floating-point number
Temperature	Shows the medium temperature currently measured. *Dependency* The unit is taken from the **Temperature unit** parameter (→ 34).	Signed floating-point number

11.3.2 "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



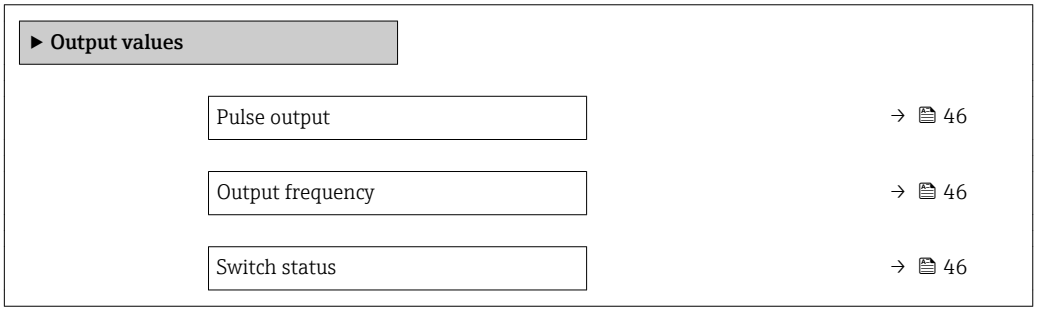
Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Totalizer value	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 42) of the **Totalizer 1 to n** submenu: ▪ Volume flow ▪ Mass flow	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow	One of the following options is selected in the **Assign process variable** parameter (→ 🖹 42) of the **Totalizer 1 to n** submenu: ▪ Volume flow ▪ Mass flow	Displays the current totalizer overflow.	Integer with sign

11.3.3 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

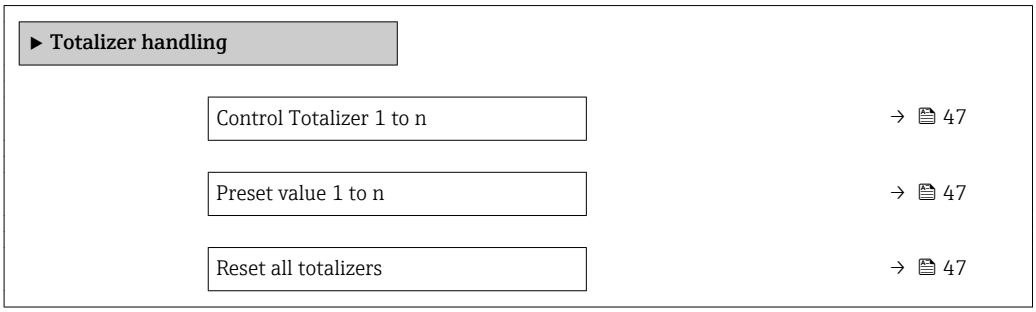


Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Pulse output	In the **Operating mode** parameter, one of the following options is selected: ▪ Pulse ▪ Automatic pulse	Displays the pulse frequency currently output.	Positive floating-point number
Output frequency	In the **Operating mode** parameter, the **Frequency** option is selected.	Displays the value currently measured for the frequency output.	0.0 to 10 000.0 Hz
Switch status	The **Switch** option is selected in the **Operating mode** parameter.	Displays the current switch output status.	▪ Open ▪ Closed

11.4 Performing a totalizer reset

Navigation
"Operation" menu → Totalizer handling



Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer	A process variable is selected in the **Assign process variable** parameter (→ 42) of the **Totalizer 1 to n** submenu.	Control totalizer value.	▪ Totalize ▪ Reset + hold ▪ Preset + hold ▪ Reset + totalize ▪ Preset + totalize ▪ Hold	Totalize
Preset value	A process variable is selected in the **Assign process variable** parameter (→ 42) of the **Totalizer 1 to n** submenu.	Specify start value for totalizer. *Dependency* The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign process variable** parameter: ▪ **Volume flow** option: **Volume flow unit** parameter ▪ **Mass flow** option: **Mass flow unit** parameter	Signed floating-point number	Country-specific: ▪ 0 kg ▪ 0 lb
Reset all totalizers	–	Reset all totalizers to 0 and start.	▪ Cancel ▪ Reset + totalize	Cancel

11.4.1 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.

11.4.2 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

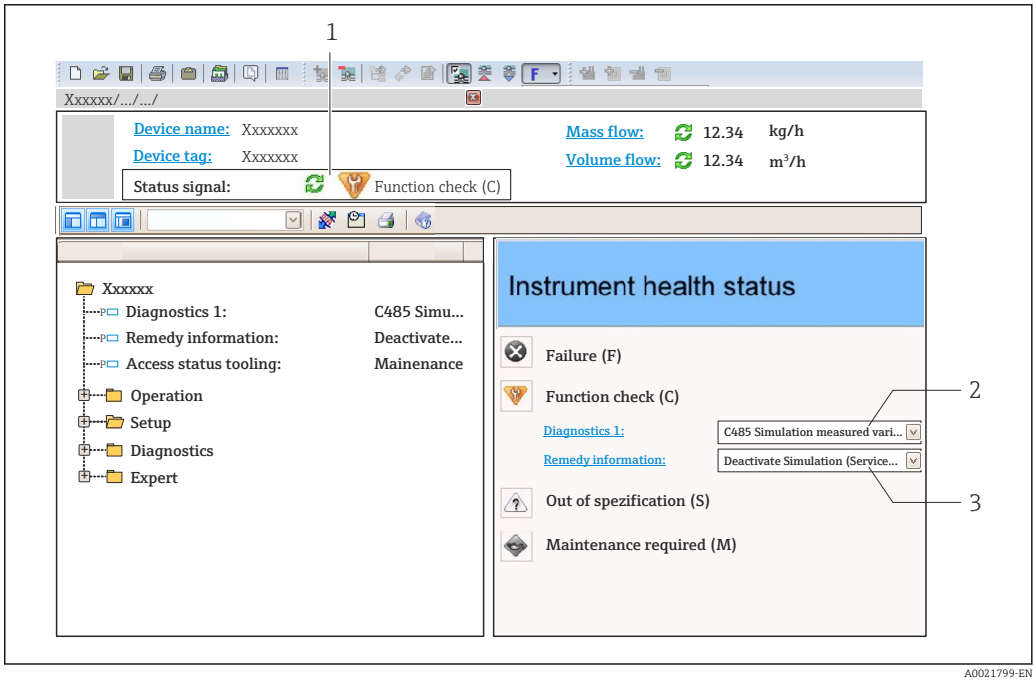
For access

Error	Possible causes	Solution
No write access to parameters	Current user role has limited access authorization	Check the access authorization status .
No connection via service adapter	Incorrect configuration of USB interface on PC or driver not installed correctly.	Observe the documentation for the Commubox. FXA291: Document "Technical Information" TI00405C

12.2 Diagnostic information in FieldCare or DeviceCare

12.2.1 Diagnostic options

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



1 Status area with status signal
2 Diagnostic information→ 50
3 Remedy information with Service ID

In addition, diagnostic events which have occurred can be shown in the **Diagnostics** menu:
- Via parameter
- Via submenu → 53

Status signals

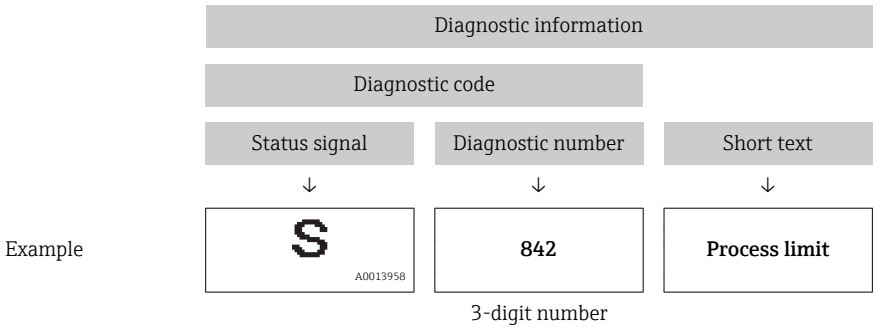
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

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

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.



12.2.2 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.

12.3 Adapting the diagnostic information

12.3.1 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.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

12.4 Overview of diagnostic information

In the case of some items of diagnostic information, the diagnostic behavior can be changed. Change the diagnostic information → 50

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 [1]
062	Sensor connection	1. Change main electronic module 2. Change sensor	F	Alarm
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 [1]
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				
242	Software incompatible	1. Check software 2. Flash or change main electronics module	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 [1]

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
311	Electronic failure	1. Reset device 2. Contact service	F	Alarm
390	Special event 2	Contact service	F	Alarm
391	Special event 6	Contact service	F	Alarm
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
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
442	Frequency output 1 to n	1. Check process 2. Check frequency output settings	S	Warning [1]
443	Pulse output 1 to n	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
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				
834	Process temperature too high	Reduce process temperature	S	Warning [1]
835	Process temperature too low	Increase process temperature	S	Warning [1]
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning
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 [1]
912	Inhomogeneous		S	Warning [1]
913	Medium unsuitable	1. Check process conditions 2. Check electronic modules or sensor	S	Alarm [1]
948	Tube damping too high	Check process conditions	S	Warning
990	Special event 4	Contact service	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
991	Batch time exceeded	Check process conditions	F	Warning [1]
991	Special event 8	Contact service	F	Alarm
991	Maximum flow rate exceeded	Check process conditions	F	Warning [1]
992	Special event 12	Contact service	F	Alarm [1]

1) Diagnostic behavior can be changed.

12.5 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 "FieldCare" operating tool → 50
- Via "DeviceCare" operating tool → 50

12.6 Event logbook

12.6.1 Event history

To call up the measures to rectify a diagnostic event:
- Via "FieldCare" operating tool → 50
- Via "DeviceCare" operating tool → 50

For filtering the displayed event messages → 53

12.6.2 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)

12.6.3 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
I1110	Write protection switch changed
I1111	Density adjust failure
I1151	History reset
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok

12.7 Resetting the measuring device

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

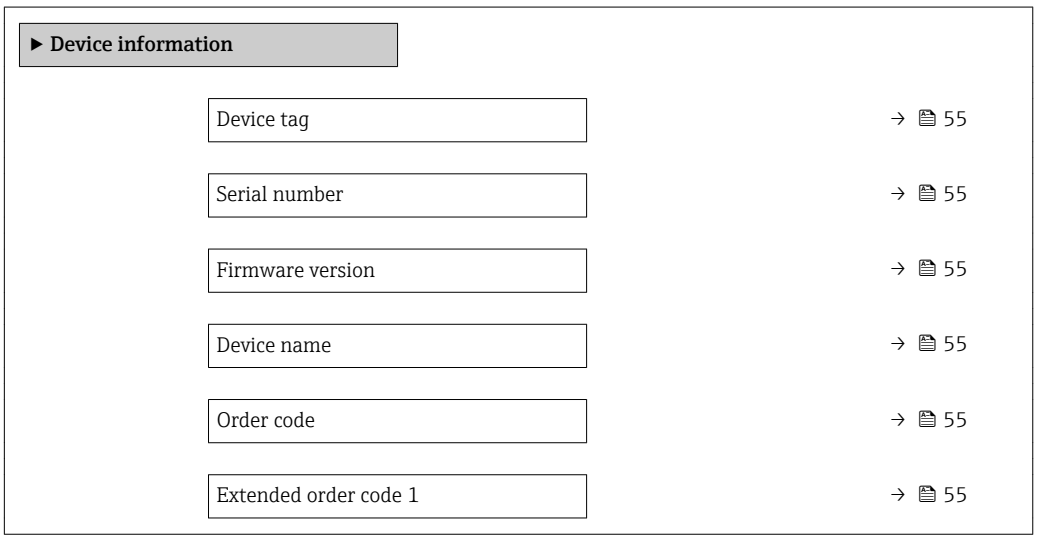
12.7.1 Function scope of the "Device reset" parameter

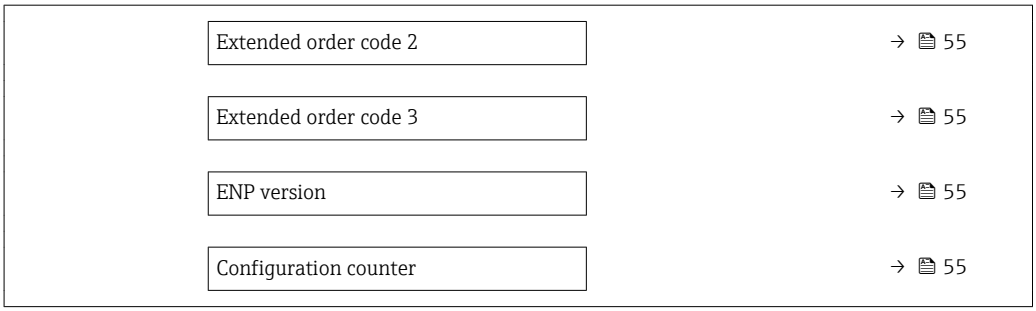
Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	All the parameters are reset to their factory settings.
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

12.8 Device information

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

Navigation
"Diagnostics" menu → Device information





Parameter overview with brief description

Parameter	Description	User entry / User interface	Factory setting
Device tag	Enter the name for the measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /)	Dosimass
Serial number	Shows the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	–
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	–
Device name	Shows the name of the transmitter. The name can be found on the nameplate of the transmitter.	Max. 32 characters such as letters or numbers.	Dosimass
Order code	Shows the device order code. It can be found in the "Order code" field on the nameplate.	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. It can be found in the "Ext. ord. cd." field on the nameplate.	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
Configuration counter		0 to 65 535	–

12.9 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
09.2015	03.00.zz	Option **A**	No change in firmware	Operating Instructions	BA00097D/06/EN/16.15
08.2014	03.00.zz	Option **A**	▪ New original firmware ▪ Can be operated via FieldCare and DeviceCare	Operating Instructions	BA00097D/06/EN/15.14
08.2012	01.01.zz	–	No change in firmware	Operating Instructions	BA00097D/06/EN/14.12
01.2011	01.01.zz	–	No change in firmware	Operating Instructions	BA00097D/06/EN/13.11
04.2007	01.01.zz	–	New functionalities: ▪ Selection of measuring mode for pulse output. ▪ New limit switch for status output with the possibility of determining the switch-on and switch-off values individually. ▪ Choice of mode for pressure shock suppression. ▪ New option to delete error memory.	Operating Instructions	BA097D/06/EN/04.07
12.2003	01.00.zz	–	▪ Original firmware ▪ Can be operated via FieldCare	Operating Instructions	BA097D/06/EN/01.14

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. 8RE
    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 .

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:

13.3 Endress+Hauser services

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

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

14 Repair

14.1 General notes

Repair and conversion concept
The Endress+Hauser repair and conversion concept provides for the following:
- The measuring device cannot be converted.
- If the measuring device is defective, the entire device is replaced.
- It is possible to replace seals.

Information on replacing wear parts (seals)
Please note the following when replacing wear parts:
- Use only original Endress+Hauser spare parts.
- Replace the part 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 (→ 55) 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 requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the website for more information:
   http://www.endress.com/support/return-material
2. Return the device if repairs or a factory calibration are required, or if the wrong device was ordered or delivered.

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 Communication-specific accessories

Accessories	Description
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
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see the "Technical Information" document TI405C/07
Adapter connection	Adapter connections for installation on other electrical connections: ▪ Adapter FXA291 (order number: 71035809) ▪ Adapter RSE8 (order number: 50107169) RSE8 connection jack, 8-pin adapter (RSE8), 24 V DC, pulse, status ▪ Adapter RSE5 (order number: 50107168) RSE8 connection jack, 5-pin adapter (RSE5), 24 V DC, pulse, status ▪ Adapter RSE4 (order number: 50107167) RSE8 connection jack, 4-pin adapter (RSE4), 24 V DC, pulse
Connecting cable RSE8	Cable RKWTN8-56/5 P92, length: 5 m (Order number: 50107895)

15.2 Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Choice of measuring devices for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. ▪ Graphic illustration of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ As a downloadable DVD for local PC installation.
W@M	W@M Life Cycle Management Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle. W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement

Accessories	Description
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices. Innovation brochure IN01047S
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.

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

The device consists of a transmitter and a sensor.

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

For information on the structure of the device → 🖹 11→ 🖹 11

16.3 Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

Volume flow

Measuring range

Flow values in SI units

DN [mm]	Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$ [kg/h]
8	0 to 2 000
15	0 to 6 500
25	0 to 18 000

Flow values in US units

DN [in]	Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$ [lb/min]
3/8	0 to 73.50
½	0 to 238.9
1	0 to 661.5

To calculate the measuring range, use the *Applicator* sizing tool → 60

Recommended measuring range

Flow limit → 69

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

Pulse/frequency/switch output

Function	Can be set to: ▪ Pulse Quantity-proportional pulse with pulse width to be configured. ▪ Automatic pulse Quantity-proportional pulse with on/off ratio of 1:1 ▪ Frequency Flow-proportional frequency output with on/off ratio of 1:1 ▪ Switch Contact for displaying a status
Channel 2	Redundant output of pulse output: 0°, 90° or 180°
Version	Passive, open emitter
Maximum input values	▪ DC 30 V ▪ 25 mA
Voltage drop	At 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Adjustable: 0.05 to 3.75 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	▪ Mass flow ▪ Volume flow
Frequency output	
Output frequency	Adjustable: 0 to 10 000 Hz
Damping	Adjustable: 0 to 999.9 s
Pulse/pause ratio	1:1
Assignable measured variables	▪ Mass flow ▪ Volume flow ▪ Density ▪ Temperature

Switch output	
Switching behavior	Binary, conductive or non-conductive
Number of switching cycles	Unlimited
Assignable functions	▪ Off ▪ On ▪ Diagnostic behavior – Alarm – Alarm and warning – Warning ▪ Limit value – Mass flow – Volume flow – Density – Temperature ▪ Flow direction monitoring ▪ Status – Partially filled pipe detection – Low flow cut off

Signal on alarm

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

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: ▪ Actual value ▪ No pulses
Frequency output	
Failure mode	Choose from: ▪ Actual value ▪ 0 Hz ▪ Defined value: 0 to 10 000 Hz
Switch output	
Failure mode	Choose from: ▪ Current status ▪ Open ▪ Closed

Modbus RS485

Failure mode	Choose from: ▪ NaN value instead of current value ▪ Last valid value

Low flow cut off

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

Galvanic isolation

– Pulse/frequency/switch outputs galvanically isolated from supply potential.
– Pulse/frequency/switch outputs not galvanically isolated from each other.

16.5 Power supply

Terminal assignment

→ 24

Pin assignment, device plug → 25

Supply voltage

DC 24 V (nominal voltage: DC 20 to 30 V)

- The power unit must be tested to ensure that it meets safety requirements (e.g. PELV, SELV).
- The supply voltage must not exceed a maximum short-circuit current of 50 A.

Power consumption

3.5 W

Current consumption

Order code for "Output, input":	Maximum Current consumption
Option **3**: 2 pulse/frequency/switch outputs	175 mA

Switch-on current: max. 1 A (< 6 ms)

Power supply failure

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

Electrical connection → 26

Potential equalization

Requirements

No special measures for potential equalization are required.

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

Cable specification → 24

16.6 Performance characteristics

Reference operating conditions

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.

To obtain measured errors, use the *Applicator* sizing tool → 60

Maximum measured error

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

Base accuracy

Mass flow and volume flow (liquids)

- ±0.15 % o.r.
- ±0.30 % ± [(zero point stability : measured value) · 100] % o.r.
- ±5 % ± [(zero point stability : measured value) · 100] % o.r.

Density (liquids)
- Reference conditions:±0.0005 g/cm³
- Field density calibration: ±0.0005 g/cm³
  (after field density calibration under process conditions)
- Standard density calibration:±0.02 g/cm³
  (valid over the entire temperature range and density range)

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

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	⅜	0.20	0.007
15	½	0.65	0.024
25	1	1.80	0.066

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

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]
⅜	73.50	7.350	3.675	1.470	0.735	0.147
½	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

Accuracy of outputs

The outputs have the following base accuracy specifications.

Pulse/frequency output

o.r. = of reading

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

Repeatability

Base repeatability

Dosing time [s]	Standard deviation [%]
≥ 0.75	0.2
≥ 1.5	0.1
≥ 3.0	0.05

Density (liquids)
±0.00025 g/cm³

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

Response time

The response time depends on the configuration (damping).

Influence of ambient temperature

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

Influence of medium temperature

Mass flow
If there is a differential between the temperature during zero point adjustment and the process temperature, the typical measured error of the sensor is ±0.0003 % of the full scale value/°C (±0.00015 % of the full scale value/°F).

Temperature
±0.005 · T °C (± 0.005 · (T − 32) °F)

Influence of medium pressure

A difference between the calibration pressure and process pressure does not affect accuracy.

16.7 Installation

"Mounting requirements"

16.8 Environment

Ambient temperature range

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

Degree of protection

As standard: IP67, type 4X enclosure

Vibration resistance	▪ Oscillation, sinusoidal, following IEC 60068-2-6 – 2 to 8.4 Hz, 3.5 mm peak – 8.4 to 2 000 Hz, 1 g peak ▪ Oscillation, broadband noise following IEC 60068-2-64 – 10 to 200 Hz, 0.003 g^2/Hz – 200 to 2 000 Hz, 0.001 g^2/Hz – Total: 1.54 g rms ▪ Vibration, sinusoidal according to IEC 60068-2-6 – 2 to 8.4 Hz, 7.5 mm peak – 8.4 to 2 000 Hz, 2 g peak ▪ Vibration broad-band random, according to IEC 60068-2-64 – 10 to 200 Hz, 0.01 g^2/Hz – 200 to 2 000 Hz, 0.003 g^2/Hz – Total: 2.70 g rms
Shock resistance	Shock, half-sine according to IEC 60068-2-27 6 ms 30 g
Shock resistance	Shock due to rough handling following IEC 60068-2-31
Interior cleaning	▪ Cleaning in place (CIP) ▪ Sterilization in place (SIP) **Options** Oil- and grease-free version for wetted parts, without declaration Order code for "Service", option HA Observe the maximum fluid temperatures → 68
Electromagnetic compatibility (EMC)	As per IEC/EN 61326 Details are provided in the Declaration of Conformity.

16.9 Process

Medium temperature range	**Sensor** −40 to +125 °C (−40 to +257 °F) **Cleaning** +150 °C (+302 °F) / 60 min for CIP and SIP processes **Seals** No internal seals
Medium pressure range (nominal pressure)	max. 40 bar (580 psi), depending on process connection
Density	0 to 5 000 kg/m^3 (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

Sensor housing

The sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside.

The housing does not have a pressure rating classification.

Reference value for the pressure loading capacity of the sensor housing: 16 bar (232 psi)

For the dimensions and installation lengths of the device, see the "Technical Information" document, "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 → 62

- 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).

To calculate the flow limit, use the *Applicator* sizing tool → 60

Pressure loss

To calculate the pressure loss, use the *Applicator* sizing tool → 60

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 sufficient convection takes place at the transmitter neck.
- ▶ Ensure that a sufficiently large area of the transmitted neck 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 sensor 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 μr ≥ 300
- Plate thickness d ≥ 0.35 mm (d ≥ 0.014 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.

16.10 Mechanical construction

Design, dimensions

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

Weight

Compact version

Weight in SI units

DN [mm]	Weight [kg]
8	3.5
15	4.0
25	4.5

Weight in US units

DN [in]	Weight [lbs]
3/8	7.7
½	8.8
1	9.9

Materials

Transmitter housing

- Acid and alkali-resistant outer surface
- Stainless steel 1.4308 (304)

Device plugs

Electrical connection	Material
Plug M12x1	▪ Socket: Stainless steel, 1.4404 (316L) ▪ Contact housing: Polyamide ▪ Contacts: Gold-plated brass

Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel, 1.4539 (904L)

Process connections

- Flanges according to EN (DIN):
  Stainless steel, 1.4404 (316/316L)
- Flanges according to DIN 32676:
  Stainless steel, 1.4435 (316L)
- All other process connections:
  Stainless steel, 1.4404 (316L)

List of all available process connections

Surface quality (parts in contact with medium)

- Ra_{max} = 0.4 µm (16 µin)
- Ra_{max} = 0.8 µm (32 µin)

Seals

Welded process connections without internal seals

Process connections

- Fixed flange connections:
  EN 1092-1 (DIN 2512N) flange
- Clamp connections:
  - Tri-Clamp (OD tubes), DIN 11866 series C
  - DIN 32676 clamp, DIN 11866 series A
- Thread:
  - DIN 11851 thread, DIN 11866 series A
  - SMS 1145 thread
  - ISO 2853 thread, ISO 2037
  - DIN 11864-1 Form A thread, DIN 11866 series A

Process connection materials → 71

Surface roughness

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

16.11 Operability

Local operation

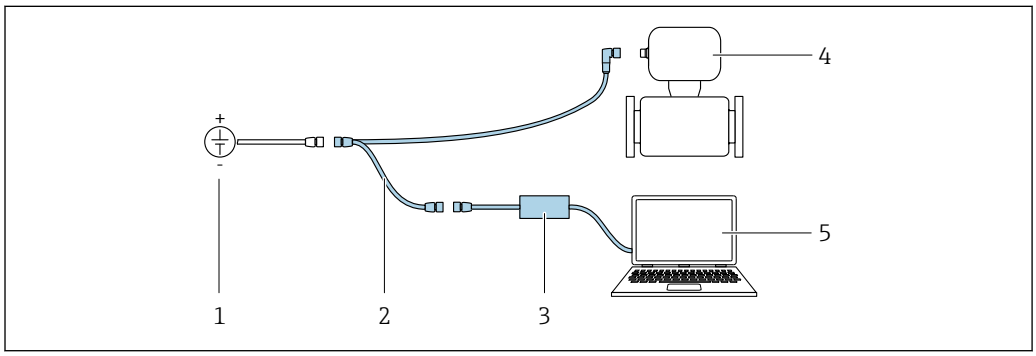
This device cannot be operated locally using a display or operating elements.

Remote operation

Using service adapter and Commubox FXA291

Operation and configuration can be performed using the Endress+Hauser FieldCare or DeviceCare service and configuration software.

The device is connected to the USB port of the computer via the service adapter and Commubox FXA291.



1 *Supply voltage 24 V DC*
2 *Service adapter*
3 *Commubox FXA291*
4 *Measuring device*
5 *Computer with "FieldCare" or "DeviceCare" operating tool*

The service adapter, cable and Commubox FXA291 are not included in the delivery. These components can be ordered as accessories → 60.

16.12 Certificates and approvals

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

CE mark	The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
RCM-Tick mark	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".
Ex approval	The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.
Sanitary compatibility	▪ 3-A approval Only devices with the order code for "Additional approval", option LP "3A" have 3-A approval. ▪ EHEDG-tested Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG. To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (www.ehedg.org).
Pressure Equipment Directive	▪ With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EU. ▪ Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Article 4 paragraph 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU.
Other standards and guidelines	▪ EN 60529 Degrees of protection provided by enclosures (IP code) ▪ EN 61010-1 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use ▪ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ▪ EN 61000-4-3 (IEC 1000-4-3) Operating behavior A with shielded connecting cable possible (shielding connected as short as possible on both sides), otherwise operating behavior B ▪ NAMUR NE 21 Electromagnetic compatibility of industrial process and laboratory control equipment ▪ CAN/CSA C22.2 No. 61010-1-12 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements

16.13 Accessories

Overview of accessories available for order → 60

16.14 Supplementary documentation

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

Standard documentation

Brief Operating Instructions

Measuring device	Documentation code
Dosimass	KA00043D

Description of device parameters

Measuring device	Documentation code
	Pulse, frequency, status output option 3
Dosimass	GP01050D

Technical Information

Measuring device	Documentation code
Dosimass	TI00065D

Supplementary device-dependent documentation

Safety Instructions

Contents	Documentation code
ATEX Ex nA	XA00079D
cCSAus	FES0232

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