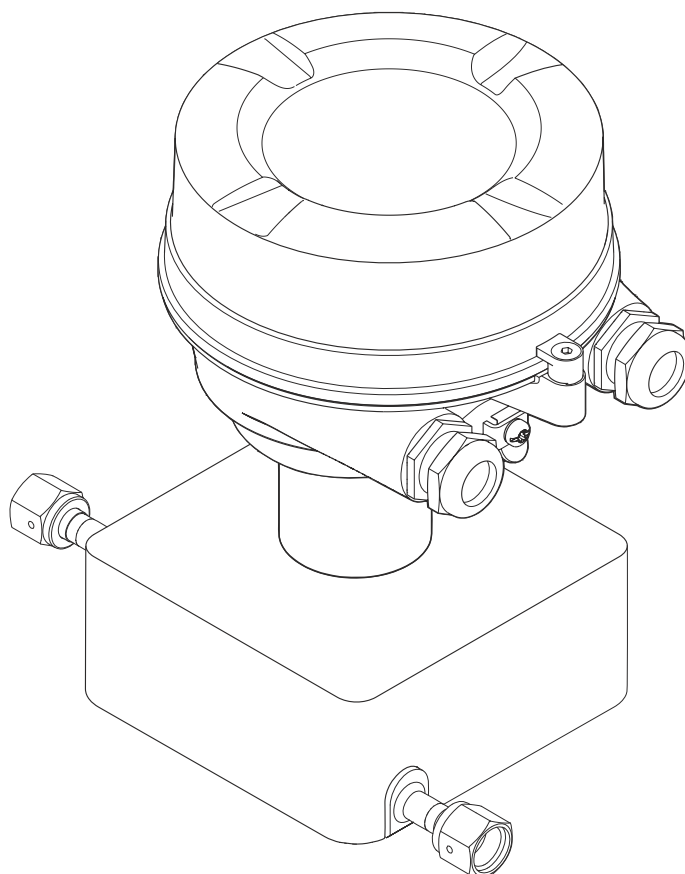


Operating Instructions

Proline Cubemass C 100

Ethernet/IP

Coriolis flowmeter



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

Table of contents

1	About this document	6	6.2	Mounting the measuring device	24
1.1	Document function	6	6.2.1	Required tools	24
1.2	Symbols	6	6.2.2	Preparing the measuring device	24
1.2.1	Safety symbols	6	6.2.3	Mounting the measuring device	24
1.2.2	Electrical symbols	6	6.2.4	Turning the display module	25
1.2.3	Tool symbols	6	6.3	Post-installation check	26
1.2.4	Symbols for certain types of information	7			
1.2.5	Symbols in graphics	7	7	Electrical connection	27
1.3	Documentation	7	7.1	Electrical safety	27
1.3.1	Standard documentation	8	7.2	Connection conditions	27
1.3.2	Supplementary device-dependent documentation	8	7.2.1	Required tools	27
1.4	Registered trademarks	8	7.2.2	Requirements for connecting cable	27
			7.2.3	Terminal assignment	28
			7.2.4	Pin assignment, device plug	29
			7.2.5	Preparing the measuring device	29
2	Safety instructions	9	7.3	Connecting the measuring device	29
2.1	Requirements for the personnel	9	7.3.1	Connecting the transmitter	30
2.2	Designated use	9	7.3.2	Ensuring potential equalization	31
2.3	Workplace safety	10	7.4	Special connection instructions	31
2.4	Operational safety	10	7.4.1	Connection examples	31
2.5	Product safety	11	7.5	Hardware settings	32
2.6	IT security	11	7.5.1	Setting the device address	32
			7.6	Ensuring the degree of protection	33
			7.7	Post-connection check	33
3	Product description	12	8	Operation options	34
3.1	Product design	12	8.1	Overview of operating options	34
3.1.1	Device version with EtherNet/IP communication protocol	12	8.2	Structure and function of the operating menu	35
			8.2.1	Structure of the operating menu	35
4	Incoming acceptance and product identification	13	8.2.2	Operating philosophy	36
4.1	Incoming acceptance	13	8.3	Displaying the measured values via the local display (optionally available)	37
4.2	Product identification	13	8.3.1	Operational display	37
4.2.1	Transmitter nameplate	14	8.3.2	User roles and related access authorization	38
4.2.2	Sensor nameplate	15	8.4	Access to the operating menu via the Web browser	39
4.2.3	Symbols on measuring device	16	8.4.1	Function range	39
			8.4.2	Prerequisites	39
5	Storage and transport	17	8.4.3	Establishing a connection	40
5.1	Storage conditions	17	8.4.4	Logging on	42
5.2	Transporting the product	17	8.4.5	User interface	43
5.2.1	Measuring devices without lifting lugs	17	8.4.6	Disabling the Web server	44
5.2.2	Measuring devices with lifting lugs	18	8.4.7	Logging out	44
5.2.3	Transporting with a fork lift	18	8.5	Access to the operating menu via the operating tool	45
5.3	Packaging disposal	18	8.5.1	Connecting the operating tool	45
			8.5.2	FieldCare	46
			8.5.3	DeviceCare	48
6	Installation	19	9	System integration	49
6.1	Installation conditions	19	9.1	Overview of device description files	49
6.1.1	Mounting position	19	9.1.1	Current version data for the device	49
6.1.2	Environmental and process requirements	21			
6.1.3	Special mounting instructions	22			

9.1.2	Operating tools	49	12.2	Diagnostic information via light emitting diodes	79
9.2	Overview of system files	49	12.2.1	Transmitter	79
9.3	Integrating the measuring device in the system	50	12.3	Diagnostic information on local display	80
9.4	Cyclic data transmission	50	12.3.1	Diagnostic message	80
9.4.1	Block model	50	12.3.2	Calling up remedial measures	82
9.4.2	Input and output groups	50	12.4	Diagnostic information in the Web browser ..	83
10	Commissioning	54	12.4.1	Diagnostic options	83
10.1	Function check	54	12.4.2	Calling up remedy information	84
10.2	Configuring the device address via software ..	54	12.5	Diagnostic information in FieldCare	84
10.2.1	Ethernet network and Web server ...	54	12.5.1	Diagnostic options	84
10.3	Setting the operating language	54	12.5.2	Calling up remedy information	85
10.4	Configuring the measuring device	54	12.6	Diagnostic information via communication interface	86
10.4.1	Defining the tag name	55	12.6.1	Reading out diagnostic information ..	86
10.4.2	Setting the system units	55	12.7	Adapting the diagnostic information	86
10.4.3	Selecting and setting the medium ...	58	12.7.1	Adapting the diagnostic behavior ...	86
10.4.4	Configuring the communication interface	59	12.8	Overview of diagnostic information	86
10.4.5	Configuring the low flow cut off	62	12.9	Pending diagnostic events	89
10.4.6	Configuring the partial filled pipe detection	63	12.10	Diagnostic list	90
10.5	Advanced settings	64	12.11	Event logbook	90
10.5.1	Using the parameter to enter the access code	64	12.11.1	Event history	90
10.5.2	Calculated values	64	12.11.2	Filtering the event logbook	91
10.5.3	Carrying out a sensor adjustment ...	66	12.11.3	Overview of information events	91
10.5.4	Configuring the totalizer	67	12.12	Resetting the measuring device	92
10.5.5	Using parameters for device administration	67	12.12.1	Function scope of "Device reset" parameter	92
10.6	Simulation	68	12.13	Device information	93
10.7	Protecting settings from unauthorized access	69	12.14	Firmware history	95
10.7.1	Write protection via access code	69	13	Maintenance	96
10.7.2	Write protection via write protection switch	70	13.1	Maintenance tasks	96
11	Operation	71	13.1.1	Exterior cleaning	96
11.1	Read out and modify current Ethernet settings	71	13.1.2	Interior cleaning	96
11.2	Reading the device locking status	71	13.2	Measuring and test equipment	96
11.3	Adjusting the operating language	72	13.3	Endress+Hauser services	96
11.4	Reading measured values	72	14	Repair	97
11.4.1	"Measured variables" submenu	72	14.1	General notes	97
11.4.2	"Totalizer" submenu	74	14.1.1	Repair and conversion concept	97
11.5	Adapting the measuring device to the process conditions	75	14.1.2	Notes for repair and conversion	97
11.6	Performing a totalizer reset	75	14.2	Spare parts	97
11.6.1	Function scope of the "Control Totalizer" parameter	76	14.3	Endress+Hauser services	97
11.6.2	Function scope of the "Reset all totalizers" parameter	76	14.4	Return	97
12	Diagnostics and troubleshooting ...	77	14.5	Disposal	98
12.1	General troubleshooting	77	14.5.1	Removing the measuring device	98
			14.5.2	Disposing of the measuring device ...	98
			15	Accessories	99
			15.1	Device-specific accessories	99
			15.2	Communication-specific accessories	99
			15.3	Service-specific accessories	100
			15.4	System components	100
			16	Technical data	101
			16.1	Application	101

16.2	Function and system design	101
16.3	Input	102
16.4	Output	103
16.5	Power supply	106
16.6	Performance characteristics	107
16.7	Installation	111
16.8	Environment	111
16.9	Process	112
16.10	Mechanical construction	114
16.11	Human interface	116
16.12	Certificates and approvals	118
16.13	Application packages	119
16.14	Accessories	120
16.15	Supplementary documentation	120
Index		122

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

1.2.1 Safety symbols

DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

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






CAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.



NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.









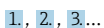



1.2.2 Electrical symbols

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





1.2.3 Tool symbols

Symbol	Meaning
	Allen key
	Open-ended wrench


1.2.4 Symbols for certain types of information

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



1.2.5 Symbols in graphics

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

1.3 Documentation

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

- *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
→  120

1.3.1 Standard documentation

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

1.3.2 Supplementary device-dependent documentation

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

1.4 Registered trademarks

EtherNet/IP™

Trademark of ODVA, Inc.

TRI-CLAMP®

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

2 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 this manual is intended only for the 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 →  7.
- ▶ Protect the measuring device permanently against corrosion from environmental influences.

Incorrect use

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

WARNING

Danger of breakage 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.

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

If a measuring tube ruptures, the pressure inside the sensor housing will rise according to the operating process pressure.

- ▶ Use a rupture disk.

⚠ WARNING**Danger from medium escaping!**

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

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

2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

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

2.4 Operational safety

Risk of injury.

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

Conversions to the device

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

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

Repair

To ensure continued operational safety and reliability,

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

2.5 Product safety

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

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

2.6 IT security

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

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

3 Product description

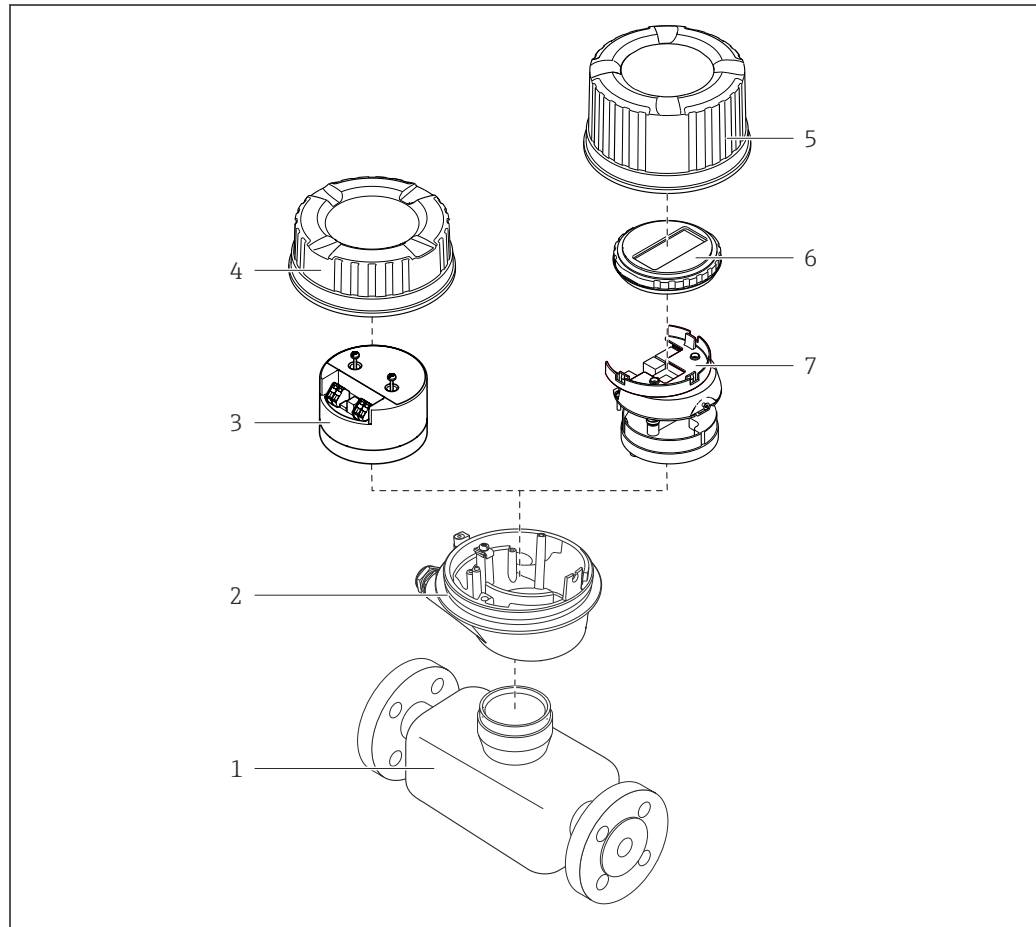
The device consists of a transmitter and a sensor.

The device is available as a compact version:


The transmitter and sensor form a mechanical unit.

3.1 Product design

3.1.1 Device version with EtherNet/IP communication protocol



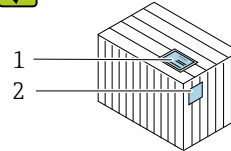
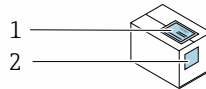
A0023153

 1 Important components of a measuring device

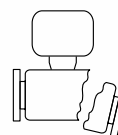
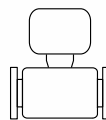
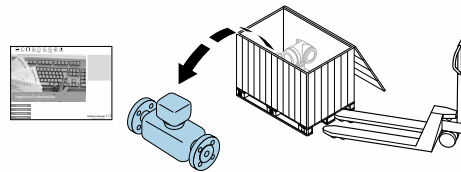
- 1 Sensor
- 2 Transmitter housing
- 3 Main electronics module
- 4 Transmitter housing cover
- 5 Transmitter housing cover (version for optional local display)
- 6 Local display (optional)
- 7 Main electronics module (with bracket for optional local display)

4 Incoming acceptance and product identification

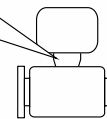
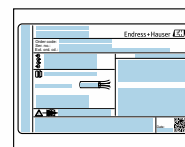
4.1 Incoming acceptance



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



Are the goods undamaged?



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



Is the envelope present with accompanying documents?



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

4.2 Product identification

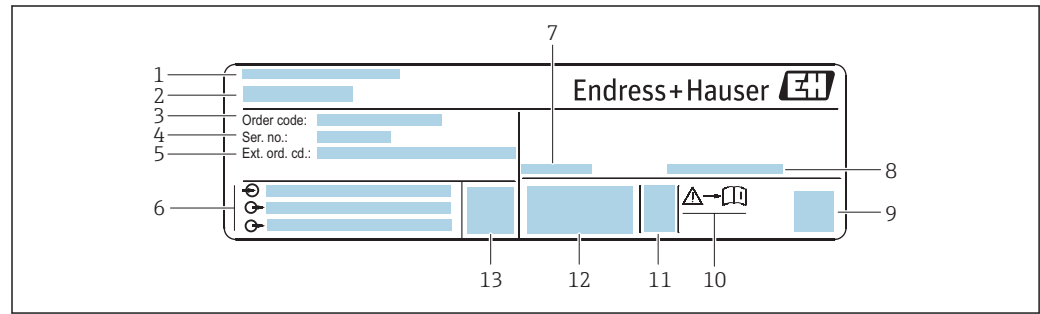
The following options are available for identification of the device:

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

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

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

4.2.1 Transmitter nameplate

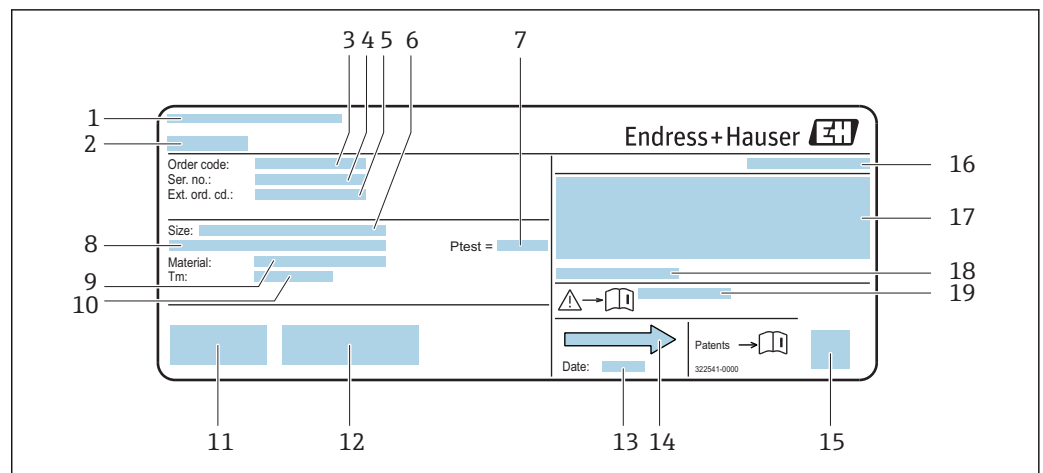


A0030222

2 Example of a transmitter nameplate

- 1 Manufacturing location
- 2 Name of the transmitter
- 3 Order code
- 4 Serial number (Ser. no.)
- 5 Extended order code (Ext. ord. cd.)
- 6 Electrical connection data, e.g. available inputs and outputs, supply voltage
- 7 Permitted ambient temperature (T_a)
- 8 Degree of protection
- 9 2-D matrix code
- 10 Document number of safety-related supplementary documentation → 121
- 11 Manufacturing date: year-month
- 12 CE mark, C-Tick
- 13 Firmware version (FW)

4.2.2 Sensor nameplate



A0013907

3 Example of a sensor nameplate

- 1 Manufacturing location
- 2 Name of the sensor
- 3 Order code
- 4 Serial number (ser. no.)
- 5 Extended order code (ext. ord. cd.)
- 6 Nominal diameter of sensor
- 7 Test pressure of the sensor
- 8 Flange nominal diameter/nominal pressure
- 9 Material of measuring tube and manifold
- 10 Medium temperature range
- 11 CE mark, C-Tick
- 12 Additional information on version: certificates, approvals
- 13 Manufacturing date: year-month
- 14 Flow direction
- 15 2-D matrix code
- 16 Degree of protection
- 17 Approval information for explosion protection and Pressure Equipment Directive
- 18 Permitted ambient temperature (T_a)
- 19 Document number of safety-related supplementary documentation




Order code

The measuring device is reordered using the order code.

Extended order code

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

4.2.3 Symbols on measuring device

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

5 Storage and transport

5.1 Storage conditions

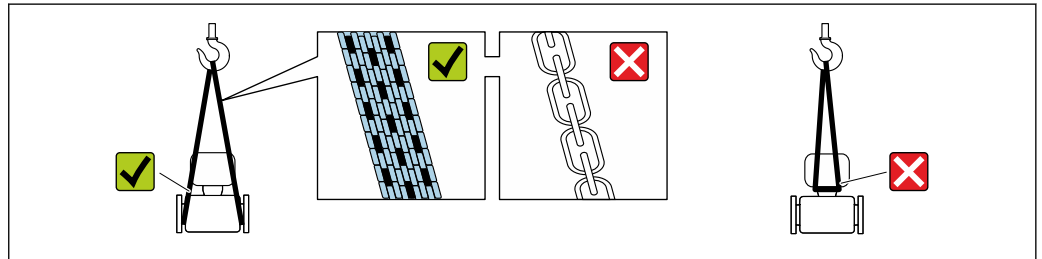
Observe the following notes for storage:

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


Storage temperature →  111

5.2 Transporting the product

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



A0029252

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

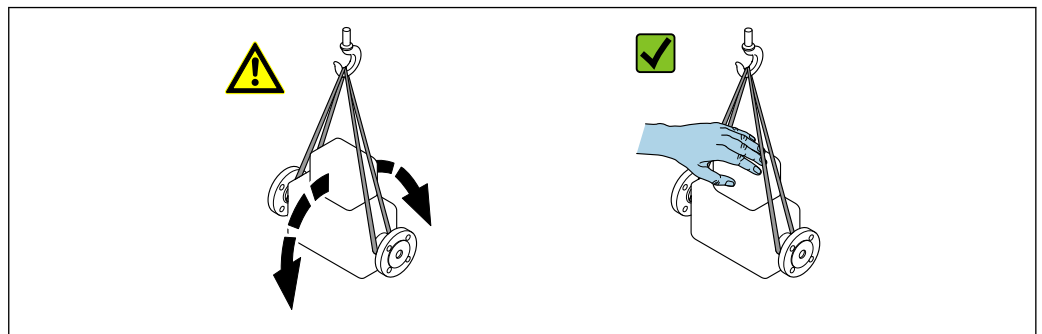
5.2.1 Measuring devices without lifting lugs

WARNING

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

Risk of injury if the measuring device slips.

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



A0029214

5.2.2 Measuring devices with lifting lugs

CAUTION

Special transportation instructions for devices with lifting lugs

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

5.2.3 Transporting with a fork lift

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

5.3 Packaging disposal

All packaging materials are environmentally friendly and 100 % recyclable:

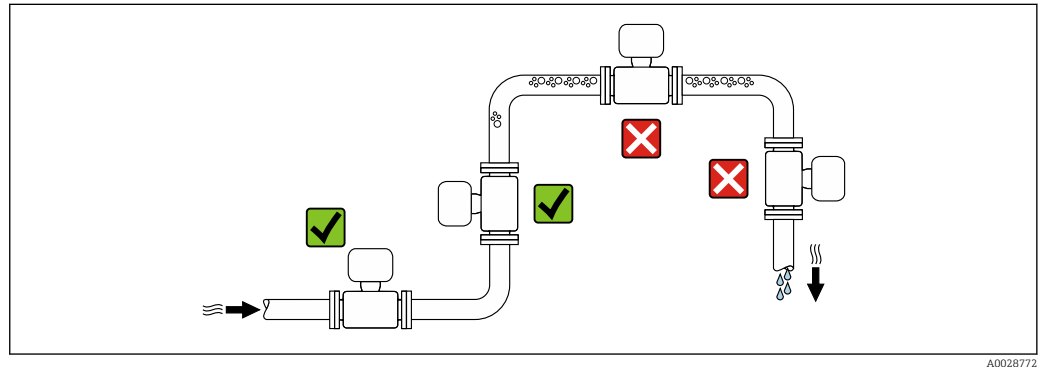
- Outer packaging of device
 - Polymer stretch wrap that complies with EU Directive 2002/95/EC (RoHS)
- Packaging
 - Wooden crate treated in accordance with ISPM 15 standard, confirmed by IPPC logo
 - Cardboard box in accordance with European packaging guideline 94/62EC, recyclability confirmed by Resy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

6 Installation

6.1 Installation conditions

6.1.1 Mounting position

Mounting location



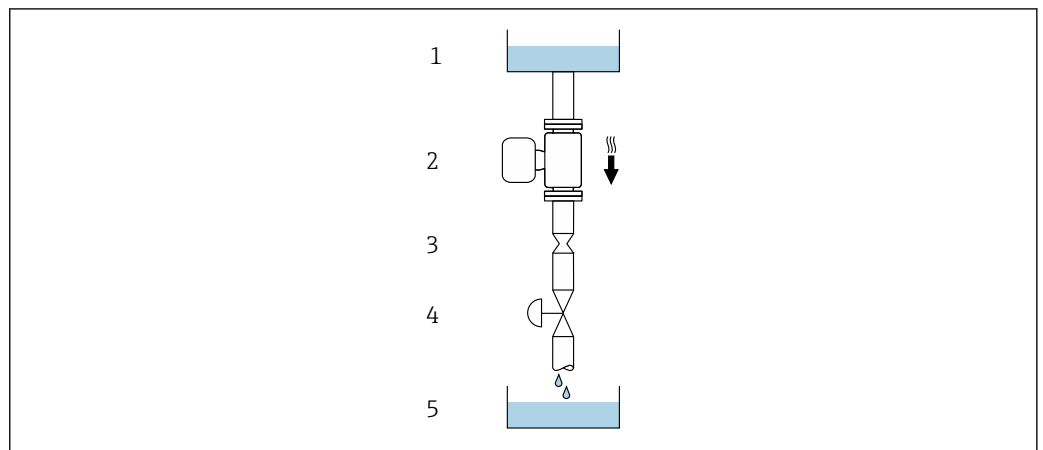
A0028772

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

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

Installation in down pipes

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



A0028773

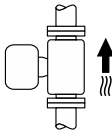
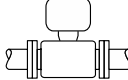
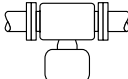

4 Installation in a down pipe (e.g. for batching applications)

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

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
1	1/24	0.8	0.03
2	1/12	1.5	0.06
4	1/8	3.0	0.12
6	1/4	5.0	0.20

Orientation

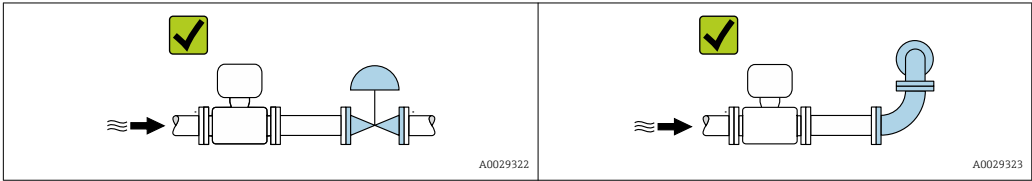
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

Orientation			Recommendation
A	Vertical orientation	 A0015591	✓✓
B	Horizontal orientation, transmitter at top	 A0015589	✓✓ ¹⁾
C	Horizontal orientation, transmitter at bottom	 A0015590	✓✓ ²⁾
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.

Inlet and outlet runs

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



Installation dimensions

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

6.1.2 Environmental and process requirements

Ambient temperature range

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

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

System pressure

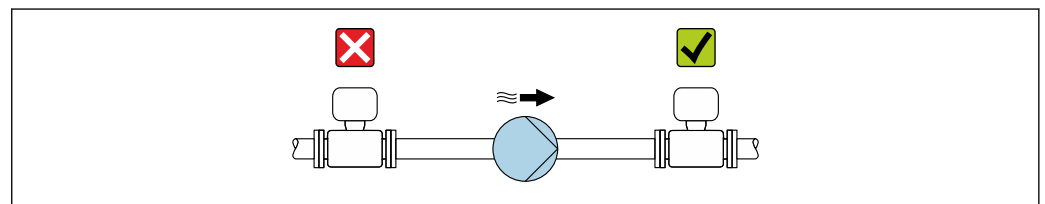
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas.

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

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

For this reason, the following mounting locations are recommended:

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



A0028777

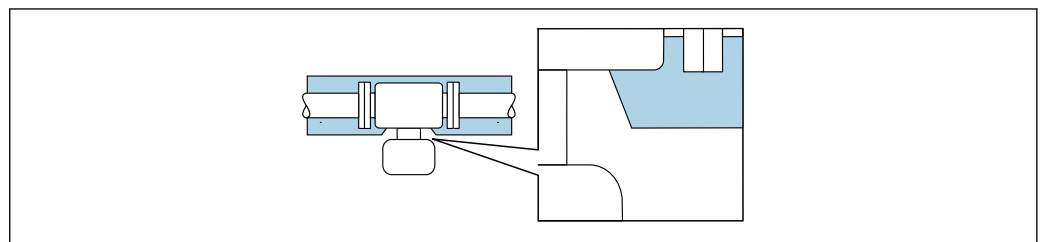
Thermal insulation

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



A0034391

5 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 transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.
- ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.

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

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

Sanitary compatibility



When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section

Rupture disk

Information that is relevant to the process: → 113.

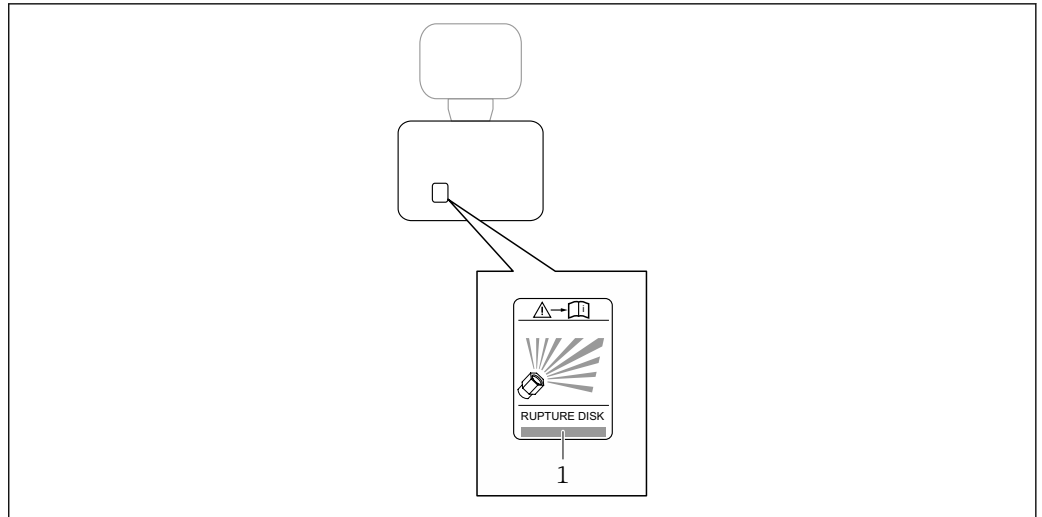
⚠ WARNING

Danger from medium escaping!

Medium escaping under pressure can cause injury or material damage.

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

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



A0029940

1 Rupture disk label

Wall mounting

⚠ WARNING

Incorrect sensor mounting

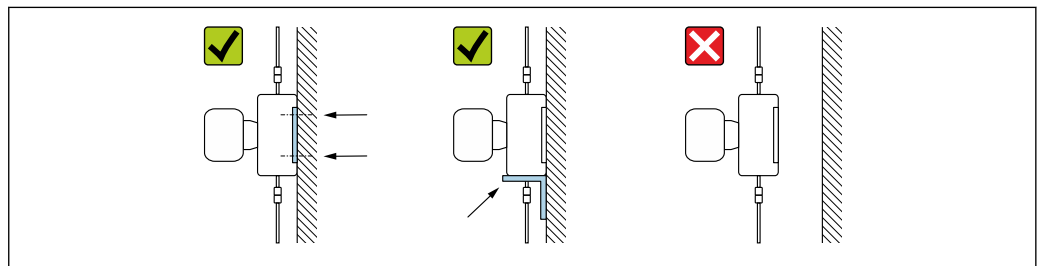
Risk of injury if measuring tube breaks

- ▶ The sensor should never be installed in a pipe in a way that it is freely suspended
- ▶ Using the base plate, mount the sensor directly on the floor, wall or ceiling.
- ▶ Support the sensor on a securely mounted support base (e.g. angle bracket).

The following mounting versions are recommended for the installation.

Vertical

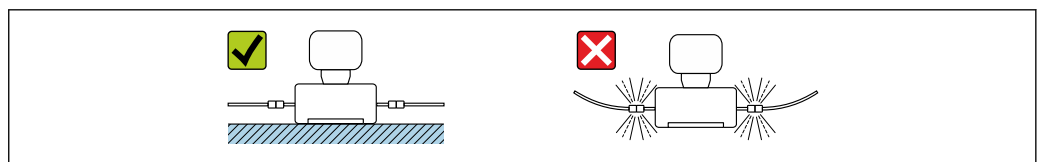
- Mounted directly on a wall using the base plate, or
- Device supported on an angle bracket mounted on the wall



A0030286

Horizontal

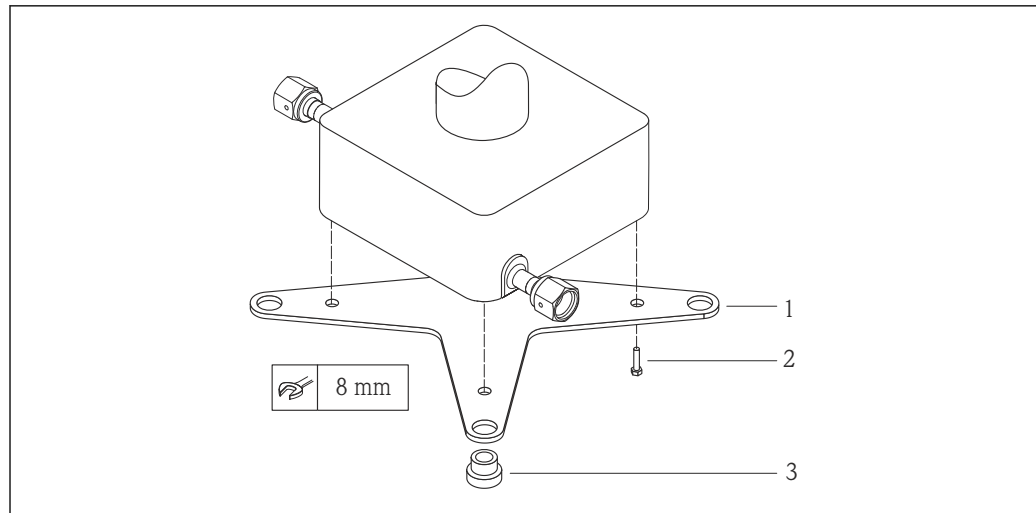
Device standing on a solid support base



A0030287

Mounting plate

The universal mounting plate can be used to affix or place the unit on a flat surface (order code for "Accessories", option PA).




A0019768

 6 Mounting kit for Cubemass mounting plate

- 1 1 x Cubemass mounting plate
- 2 4 x screw M5 x 8
- 3 4 x grommet

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions →  107. Therefore, a zero point adjustment in the field is generally not required.

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

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

6.2 Mounting the measuring device

6.2.1 Required tools

For sensor

For flanges and other process connections: Corresponding mounting tools

6.2.2 Preparing the measuring device

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

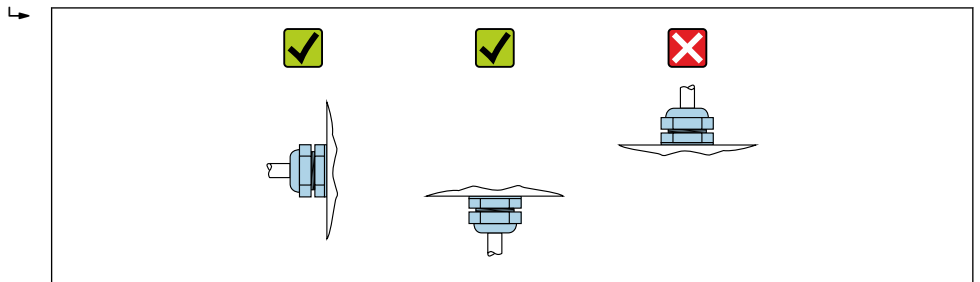
6.2.3 Mounting the measuring device

WARNING

Danger due to improper process sealing!

- ▶ Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
- ▶ Ensure that the seals are clean and undamaged.
- ▶ Secure the seals correctly.

1. Ensure that the direction of the arrow on the nameplate of the sensor matches the flow direction of the fluid.
2. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



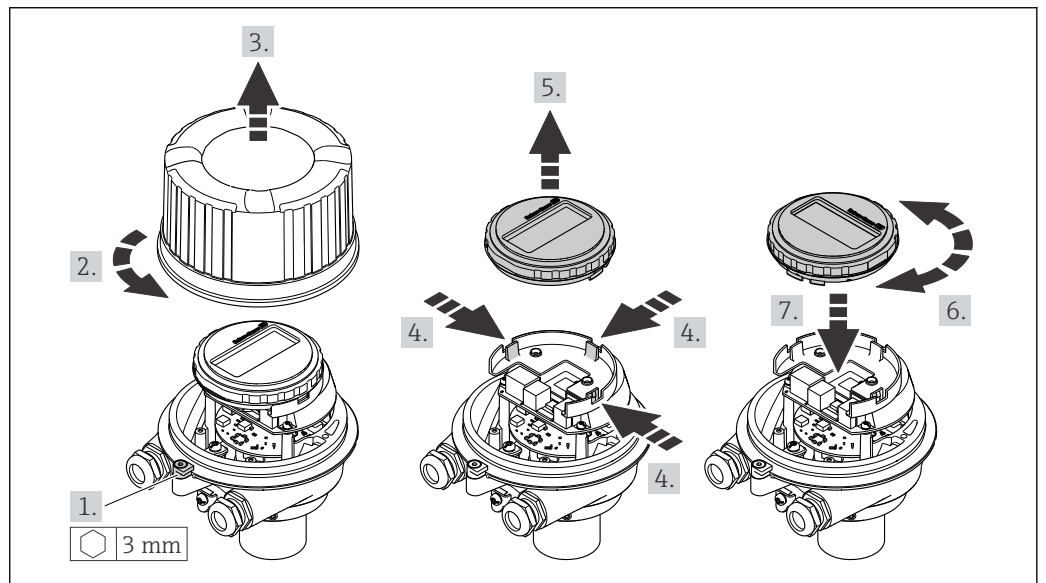
A0029263

6.2.4 Turning the display module

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

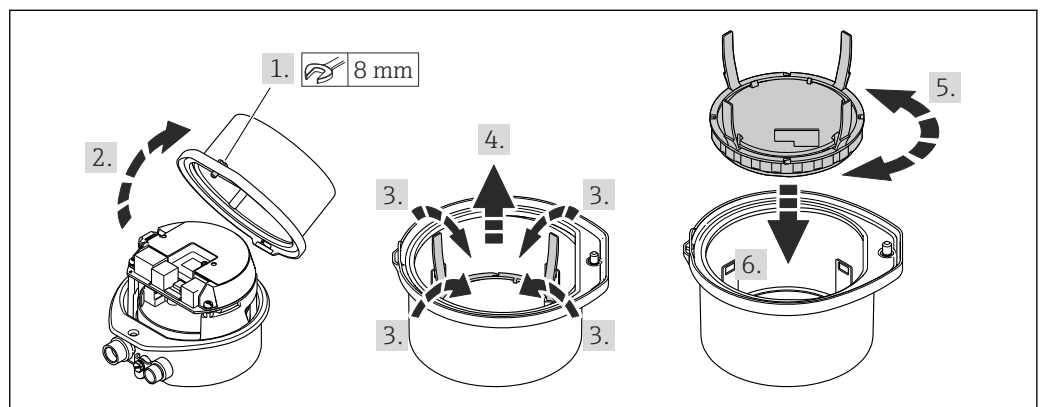
The display module can be turned to optimize display readability.

Aluminum housing version, AlSi10Mg, coated



A0023192

Compact and ultra-compact housing version, hygienic, stainless



A0023195

6.3 Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the measuring device conform to the measuring point specifications? For example: <ul style="list-style-type: none"> ■ Process temperature → 112 ■ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document) ■ Ambient temperature ■ Measuring range 	<input type="checkbox"/>
Has the correct orientation for the sensor been selected ? <ul style="list-style-type: none"> ■ According to sensor type ■ According to medium temperature ■ According to medium properties (outgassing, with entrained solids) 	<input type="checkbox"/>
Does the arrow on the sensor nameplate match the direction of flow of the fluid through the piping → 20?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Is the device adequately protected from precipitation and direct sunlight?	<input type="checkbox"/>
Are the securing screw and securing clamp tightened securely?	<input type="checkbox"/>

7 Electrical connection

NOTICE

The measuring device does not have an internal circuit breaker.

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

7.1 Electrical safety

In accordance with applicable federal/national regulations.

7.2 Connection conditions

7.2.1 Required tools

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

7.2.2 Requirements for connecting cable

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

Permitted temperature range

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

Power supply cable (incl. conductor for the inner ground terminal)

Standard installation cable is sufficient.

Signal cable

EtherNet/IP

The standard ANSI/TIA/EIA-568-B.2 Annex specifies CAT 5 as the minimum category for a cable used for EtherNet/IP. CAT 5e and CAT 6 are recommended.



For more information on planning and installing EtherNet/IP networks, please refer to the "Media Planning and Installation Manual. EtherNet/IP" of ODVA Organization

Cable diameter

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

7.2.3 Terminal assignment

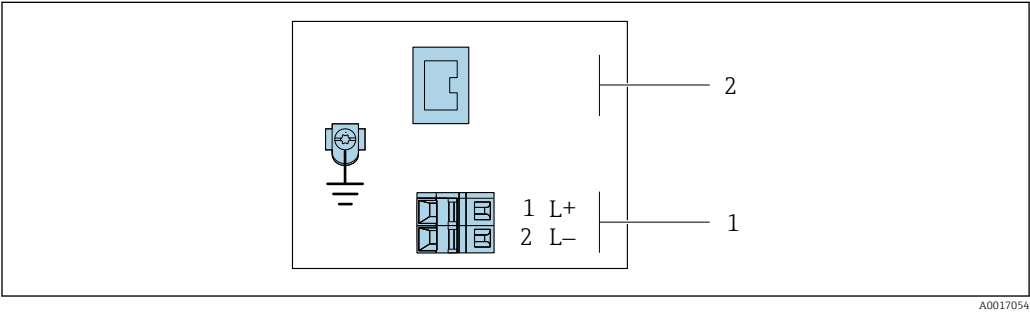
Transmitter

EtherNet/IP connection version

Order code for "Output", option N

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Device plug connectors → 29	Terminals	<ul style="list-style-type: none">Option L: plug M12x1 + thread NPT ½"Option N: plug M12x1 + coupling M20Option P: plug M12x1 + thread G ½"Option U: plug M12x1 + thread M20
Options A, B, C	Device plug connectors → 29	Device plug connectors → 29	Option Q: 2 x plug M12x1
Order code for "Housing": <ul style="list-style-type: none">Option A: compact, coated aluminumOption B: compact, hygienic, stainlessOption C ultra-compact, hygienic, stainless			



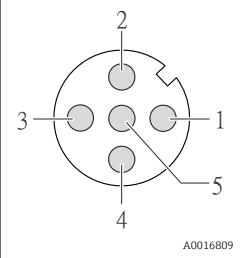
7 EtherNet/IP terminal assignment

- 1 Power supply: DC 24 V
- 2 EtherNet/IP

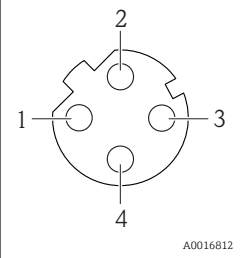
Order code "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option N	DC 24 V		EtherNet/IP
Order code for "Output": Option N: EtherNet/IP			

7.2.4 Pin assignment, device plug

Supply voltage

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

Device plug for signal transmission (device side)

	Pin	Assignment	
	1	+	Tx
	2	+	Rx
	3	-	Tx
	4	-	Rx
	Coding		Plug/socket
	D		Socket


7.2.5 Preparing the measuring device

NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.


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

1. Remove dummy plug if present.
2. If the measuring device is supplied without cable glands:
Provide suitable cable gland for corresponding connecting cable.
3. If the measuring device is supplied with cable glands:
Observe requirements for connecting cables →  27.

7.3 Connecting the measuring device

NOTICE

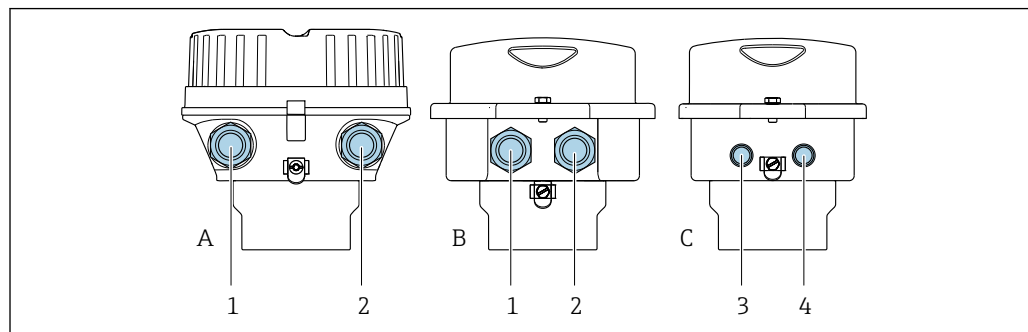
Limitation of electrical safety due to incorrect connection!

- 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).

7.3.1 Connecting the transmitter

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

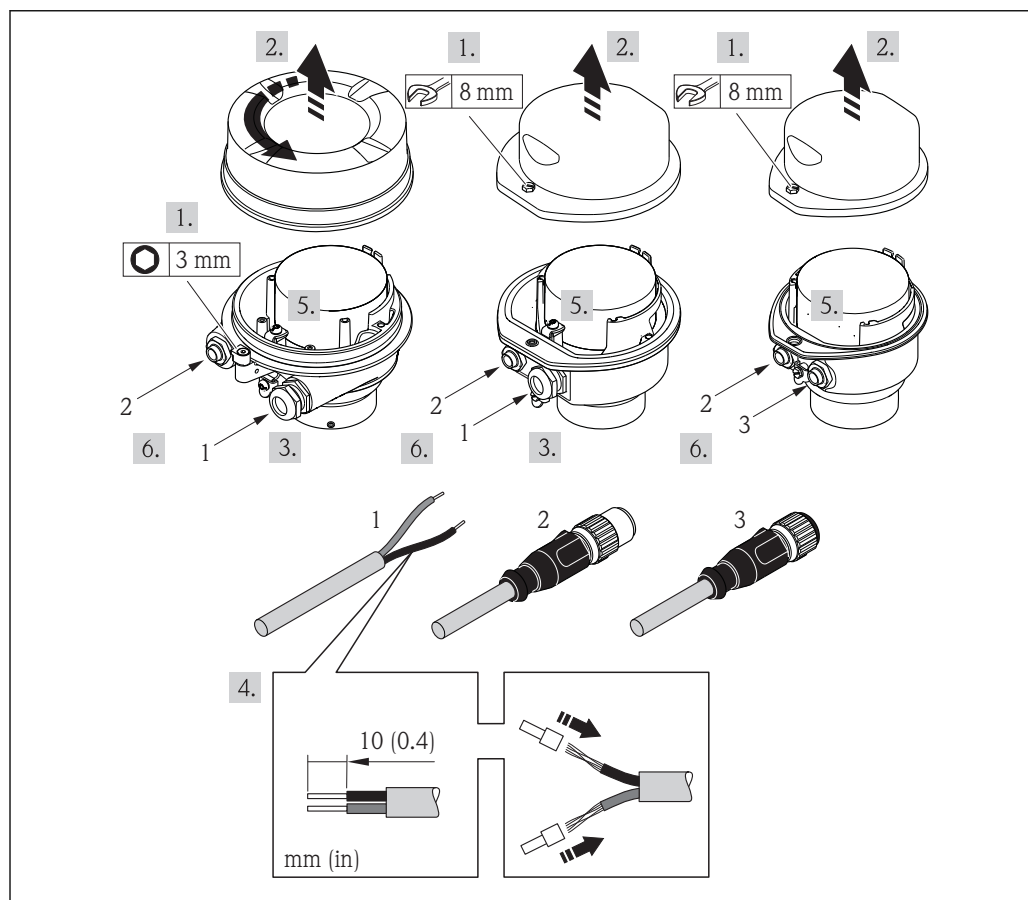
- Housing version: compact or ultra-compact
- Connection version: device plug or terminals



A0016924

8 Housing versions and connection versions

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



A0017844

9 Device versions with connection examples

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

For device version with device plug: follow step 6 only.


1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary
→ 116.
3. Push the cable through the cable entry . To ensure tight sealing, do not remove the sealing ring from the cable entry.
4. Strip the cable and cable ends. In the case of stranded cables, also fit ferrules.
5. Connect the cable in accordance with the terminal assignment or the device plug pin assignment .
6. Depending on the device version, tighten the cable glands or plug in the device plug and tighten .
7. **⚠ WARNING**
Housing degree of protection may be voided due to insufficient sealing of the housing.
 - ▶ Screw in the screw without using any lubricant. The threads on the cover are coated with a dry lubricant.

Reverse the removal procedure to reassemble the transmitter.

7.3.2 Ensuring potential equalization

Requirements

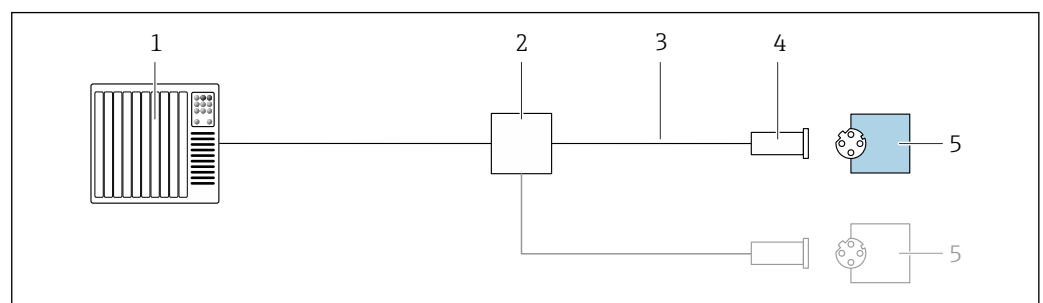
No special measures for potential equalization are required.


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

7.4 Special connection instructions

7.4.1 Connection examples

EtherNet/IP



 10 Connection example for EtherNet/IP

- 1 Control system (e.g. PLC)
- 2 Ethernet switch
- 3 Observe cable specifications
- 4 Device plug
- 5 Transmitter

7.5 Hardware settings

7.5.1 Setting the device address


EtherNet/IP

The IP address of the measuring device can be configured for the network via DIP switches.

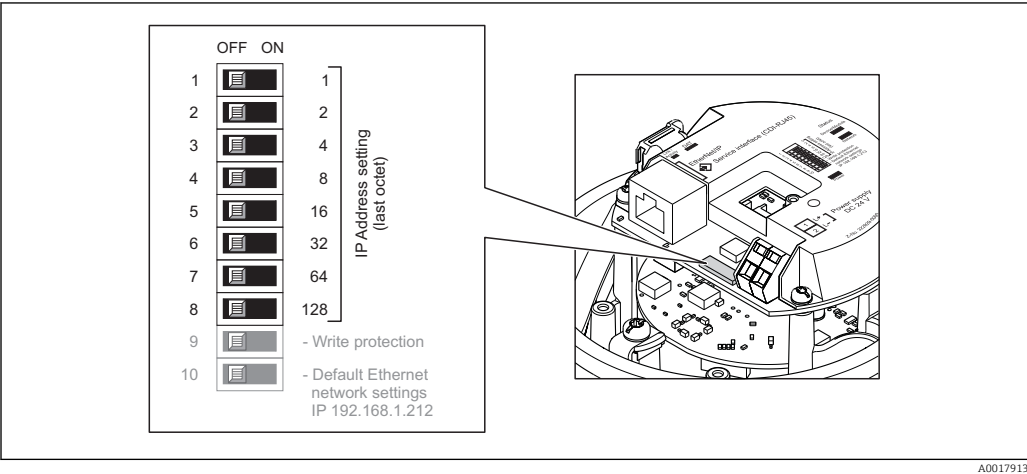
Addressing data


IP address and configuration options			
1st octet	2nd octet	3rd octet	4th octet
192.	168.	1.	XXX
↓			↓
Can only be configured via software addressing			Can be configured via software addressing and hardware addressing

IP address range	1 to 254 (4th octet)
IP address broadcast	255
Addressing mode ex works	Software addressing; all DIP switches for hardware addressing are set to OFF.
IP address ex works	DHCP server active

 For device addressing via software

Setting the address



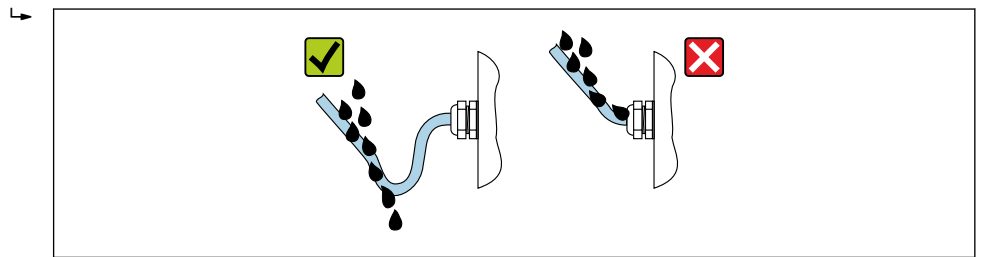
1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary →  116.
3. Set the desired IP address using the corresponding DIP switches on the I/O electronics module.
↳ Hardware addressing with the configured IP address is enabled after 10 s.
4. Reverse the removal procedure to reassemble the transmitter.

7.6 Ensuring the degree of protection

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

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

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



A0029278

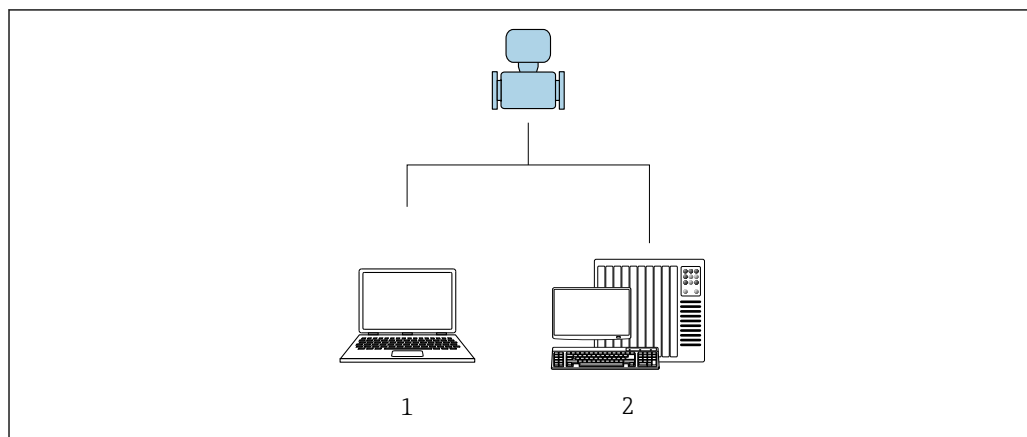
6. Insert dummy plugs into unused cable entries.

7.7 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables used meet the requirements → 27?	<input type="checkbox"/>
Do the cables have adequate strain relief?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight? Cable run with "water trap" → 33?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened → 30?	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate → 106?	<input type="checkbox"/>
Is the terminal assignment → 28 or pin assignment of the connector → 29 correct?	<input type="checkbox"/>
If supply voltage is present, is the power LED on the electronics module of the transmitter lit green → 12?	<input type="checkbox"/>
Depending on the device version, is the securing clamp or fixing screw firmly tightened?	<input type="checkbox"/>

8 Operation options

8.1 Overview of operating options





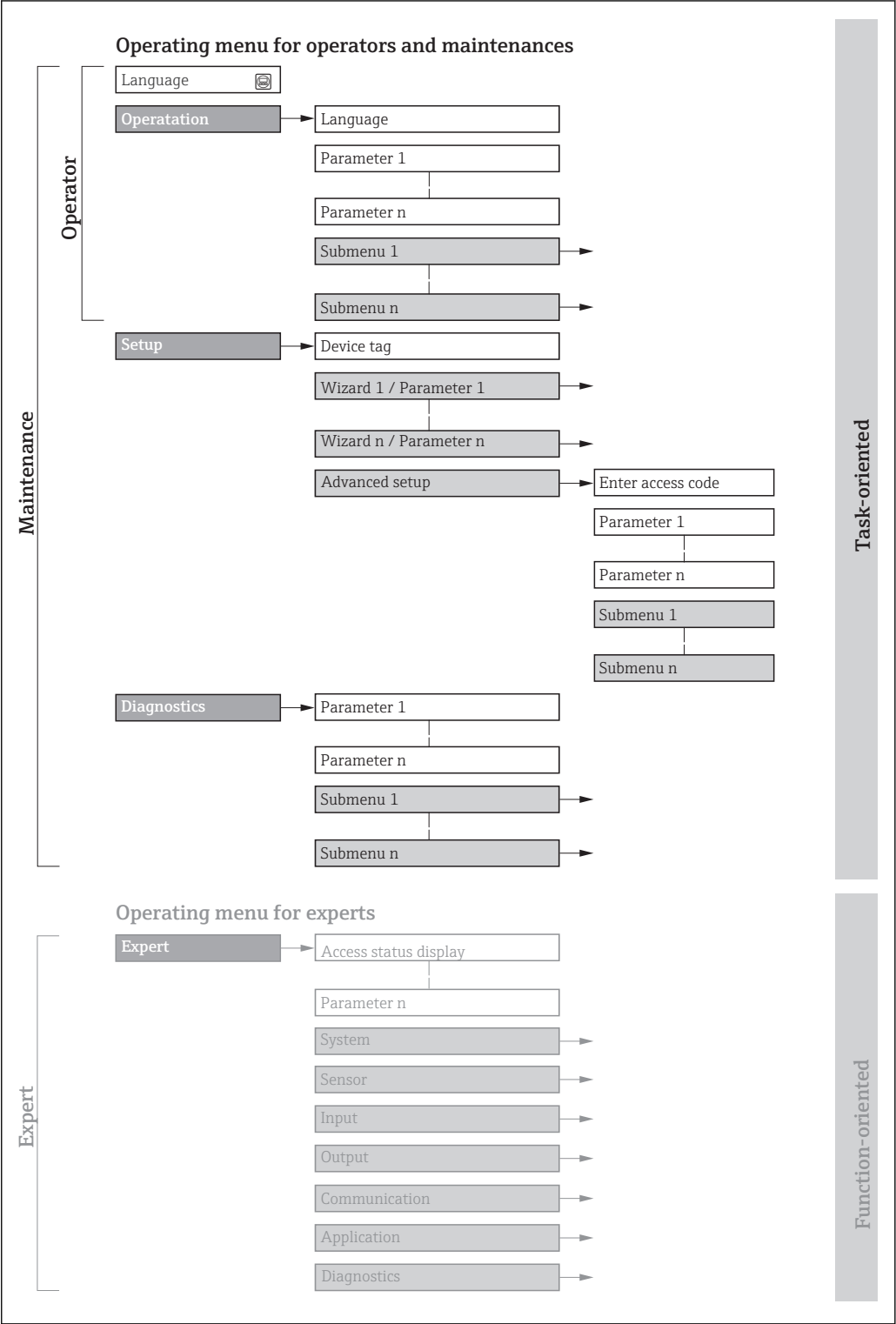
A0017760


- 1 Computer with Web browser (e.g. Internet Explorer) or with "FieldCare" operating tool
- 2 Automation system, e.g. "RSLogix" (Rockwell Automation) and work station for measuring device operation with Add-on Profile Level 3 for "RSLogix 5000" software (Rockwell Automation)

8.2 Structure and function of the operating menu

8.2.1 Structure of the operating menu

 For an overview of the operating menu for experts: "Description of Device Parameters" document supplied with the device →  121



 11 Schematic structure of the operating menu

A0018237-EN


8.2.2 Operating philosophy

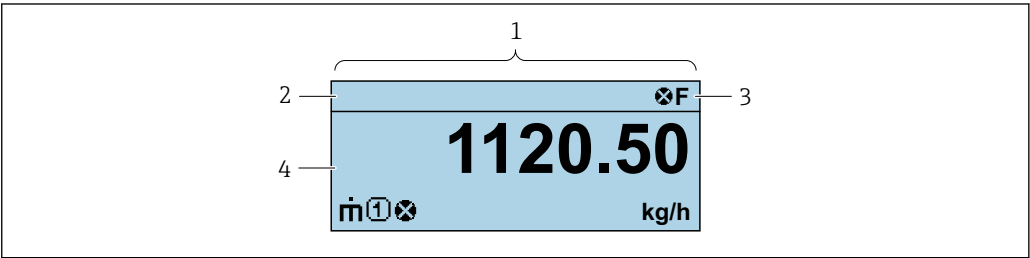
The individual parts of the operating menu are assigned to certain user roles (operator, maintenance etc.). Each user role contains typical tasks within the device lifecycle.

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

8.3 Displaying the measured values via the local display (optionally available)

8.3.1 Operational display







 The local display is optionally available:
Order code for "Display; operation", option B "4-line, illuminated; via communication".



- 1 Operational display
- 2 Device tag
- 3 Status area
- 4 Display area for measured values (4-line)

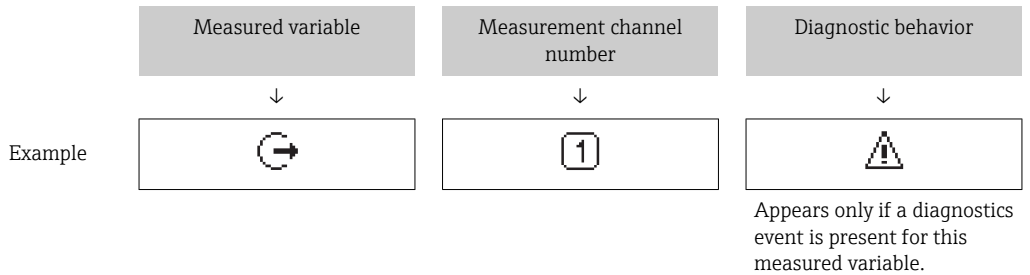
Status area

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



- Status signals →  80
 - **F**: Failure
 - **C**: Function check
 - **S**: Out of specification
 - **M**: Maintenance required
- Diagnostic behavior →  81
 - : Alarm
 - : Warning
 - : Locking (the device is locked via the hardware)
 - : Communication (communication via remote operation is active)







Display area

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




Measured variables


Symbol	Meaning
	Mass flow
	<ul style="list-style-type: none">■ Volume flow■ Corrected volume flow


	<ul style="list-style-type: none">▪ Density▪ Reference density
	Temperature
	Totalizer  The measurement channel number indicates which of the three totalizers is displayed.
	Output 

Measurement channel numbers

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

Diagnostic behavior

The diagnostic behavior pertains to a diagnostic event that is relevant to the displayed measured variable. For information on the symbols →  81
--

 The number and display format of the measured values can only be configured via the control system or Web server.

8.3.2 User roles and related access authorization

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

Defining access authorization for user roles

An access code is not yet defined when the device is delivered from the factory. Access authorization (read and write access) to the device is not restricted and corresponds to the "Maintenance" user role.

- Define the access code.
 - ↳ The "Operator" user role is redefined in addition to the "Maintenance" user role. Access authorization differs for the two user roles.

Access authorization to parameters: "Maintenance" user role


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

1) The user only has write access after entering the access code.

Access authorization to parameters: "Operator" user role

Access code status	Read access	Write access
After an access code has been defined.	✓	-- ¹⁾


- 1) Despite the defined access code, certain parameters can always be modified and thus are excepted from the write protection, as they do not affect the measurement. Refer to the "Write protection via access code" section

 The user role with which the user is currently logged on is indicated by the .
Navigation path:

8.4 Access to the operating menu via the Web browser

8.4.1 Function range

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


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

8.4.2 Prerequisites


Computer hardware

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


Computer software

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



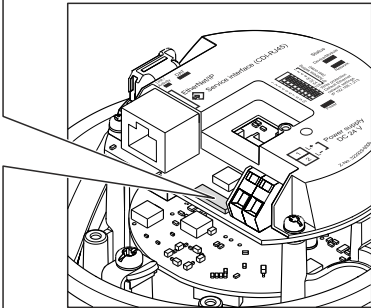
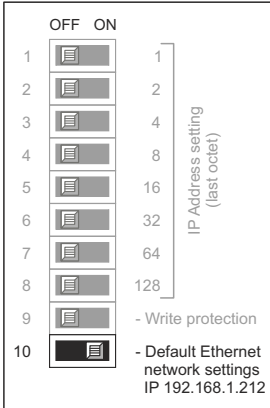

Computer settings

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

Network connections	Only the active network connections to the measuring device should be used.
	Switch off all other network connections.

 In the event of connection problems:

Measuring device: Via CDI-RJ45 service interface

Device	CDI-RJ45 service interface
Measuring device	The measuring device has an RJ45 interface.
Web server	Web server must be enabled; factory setting: ON  For information on enabling the Web server →  44
IP address	<p>If the IP address of the device is not known, communication with the Web server can be established via the default IP address 192.168.1.212. The DHCP function is enabled in the device at the factory, i.e. the device expects an IP address to be assigned by the network. This function can be disabled and the device can be set to the default IP address 192.168.1.212: set DIP switch No. 10 from OFF → ON.</p> <div></div> <p> <ul style="list-style-type: none">Once the DIP switch has been activated, the device must be restarted before the device uses the default IP address.If the default IP address is used (DIP switch No. 10 = ON), there is no connection to the EtherNet/IP network.</p>


8.4.3 Establishing a connection

Via service interface (CDI-RJ45)

Preparing the measuring device


Configuring the Internet protocol of the computer

The IP address can be assigned to the measuring device in a variety of ways:

- Dynamic Host Configuration Protocol (DHCP), factory setting:
The IP address is automatically assigned to the measuring device by the automation system (DHCP server).
- Hardware addressing:
The IP address is set via DIP switches .
- Software addressing:
The IP address is entered via the **IP address** parameter (→  60) .
- DIP switch for "Default IP address":
To establish the network connection via the service interface (CDI-RJ45): the fixed IP address 192.168.1.212 is used .

The measuring device works with the Dynamic Host Configuration Protocol (DHCP), on leaving the factory, i.e. the IP address of the measuring device is automatically assigned by the automation system (DHCP server).

To establish a network connection via the service interface (CDI-RJ45): set the "Default IP address" DIP switch to **ON**. The measuring device then has the fixed IP address: 192.168.1.212. This address can now be used to establish the network connection.

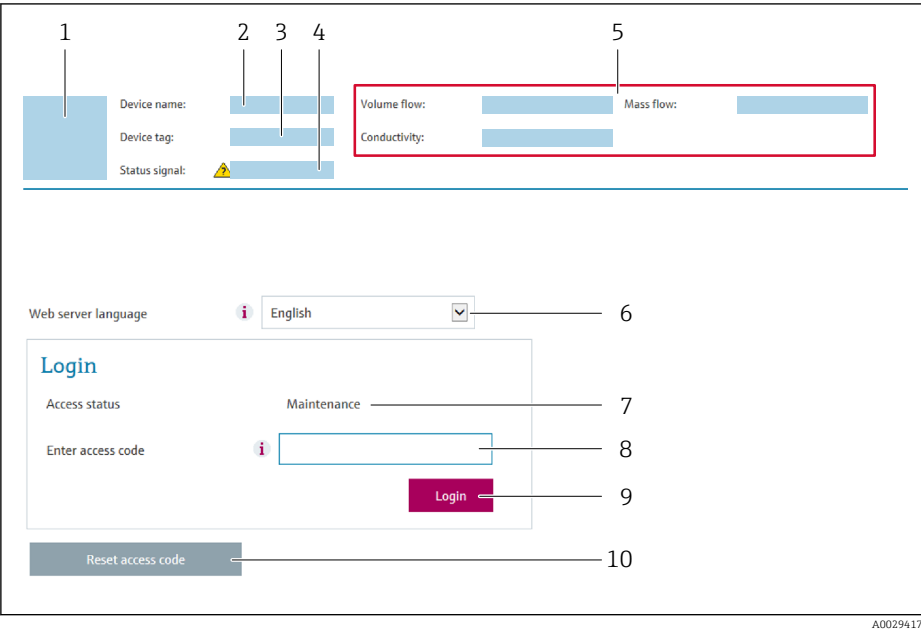
1. Via DIP switch 2, activate the default IP address 192.168.1.212: .
2. Switch on the measuring device.
3. Connect to the computer using a cable →  117.
4. If a 2nd network card is not used, close all the applications on the notebook.
 - ↳ Applications requiring Internet or a network, such as e-mail, SAP applications, Internet or Windows Explorer.
5. Close any open Internet browsers.
6. Configure the properties of the Internet protocol (TCP/IP) as defined in the table:

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

Starting the Web browser

1. Start the Web browser on the computer.

2.
- Enter the IP address of the Web server in the address line of the Web browser:
192.168.1.212
- The login page appears.



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




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

8.4.4 **Logging on**

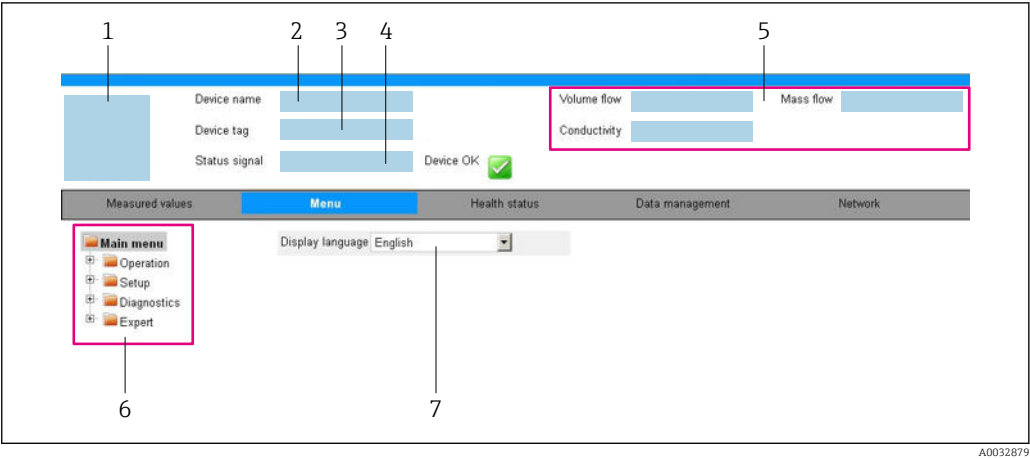
1.
- Select the preferred operating language for the Web browser.
2.
- Enter the user-specific access code.
3.
- Press **OK** to confirm your entry.

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



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

8.4.5 User interface




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

Header

The following information appears in the header:

- Device name
- Device tag
- Device status with status signal → 83
- Current measured values

Function row

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

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

Navigation area

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

Working area

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

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

8.4.6 Disabling the Web server

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

Navigation

"Expert" menu → Communication → Web server

Parameter overview with brief description

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

Function scope of the "Web server functionality" parameter

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

Enabling the Web server

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

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

8.4.7 Logging out



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

1. Select the **Logout** entry in the function row.
↳ The home page with the Login box appears.
 2. Close the Web browser.
 3. If no longer needed:
Reset modified properties of the Internet protocol (TCP/IP) → 40.
- i** If communication with the Web server was established via the default IP address 192.168.1.212, DIP switch No. 10 must be reset (from **ON** → **OFF**). Afterwards, the IP address of the device is active again for network communication.

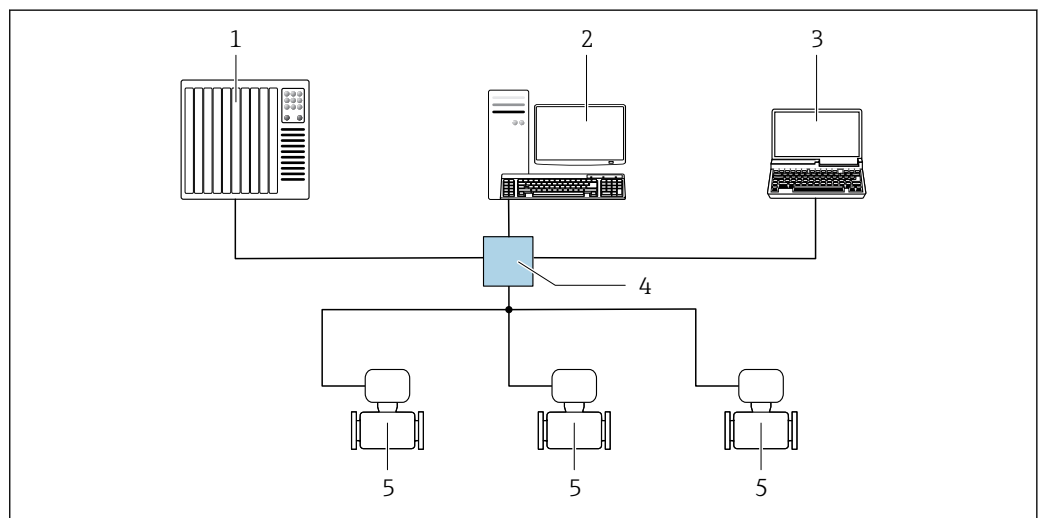
8.5 Access to the operating menu via the operating tool

8.5.1 Connecting the operating tool

Via EtherNet/IP network

This communication interface is available in device versions with EtherNet/IP.

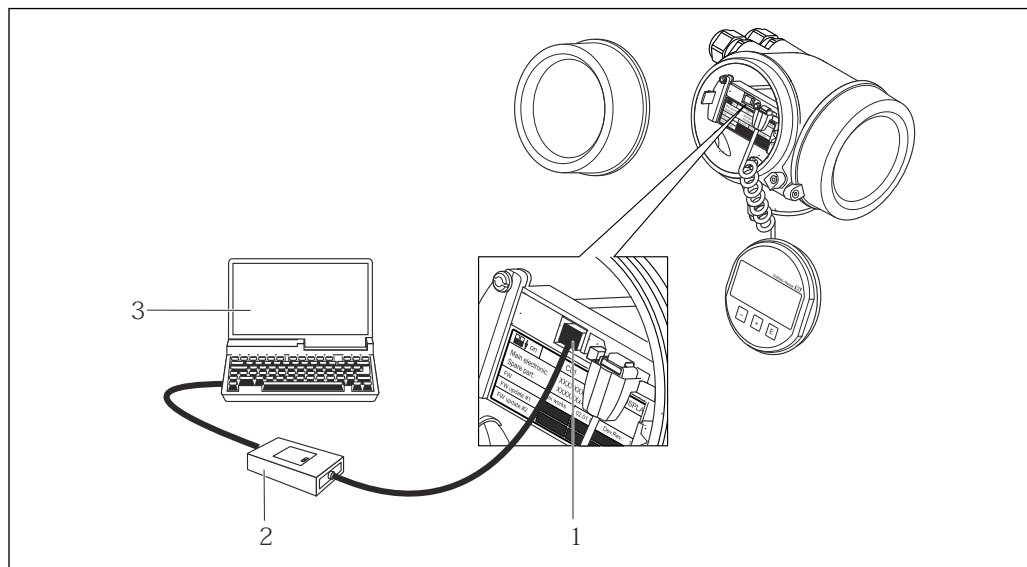
Star topology



A0032078

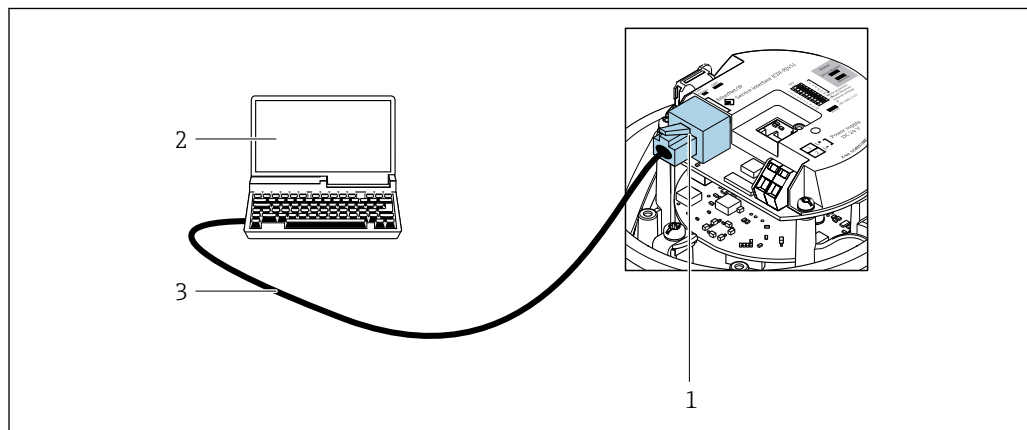
12 Options for remote operation via EtherNet/IP network: star topology

- 1 Automation system, e.g. "RSLogix" (Rockwell Automation)
- 2 Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
- 3 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
- 4 Ethernet switch
- 5 Measuring device

Via service interface (CDI)

A0014019

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

Via service interface (CDI-RJ45)*EtherNet/IP*

A0016940

13 Connection for order code for "Output", option N: EtherNet/IP

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

8.5.2 FieldCare**Function scope**

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

Access is via:

CDI-RJ45 service interface

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 →  49

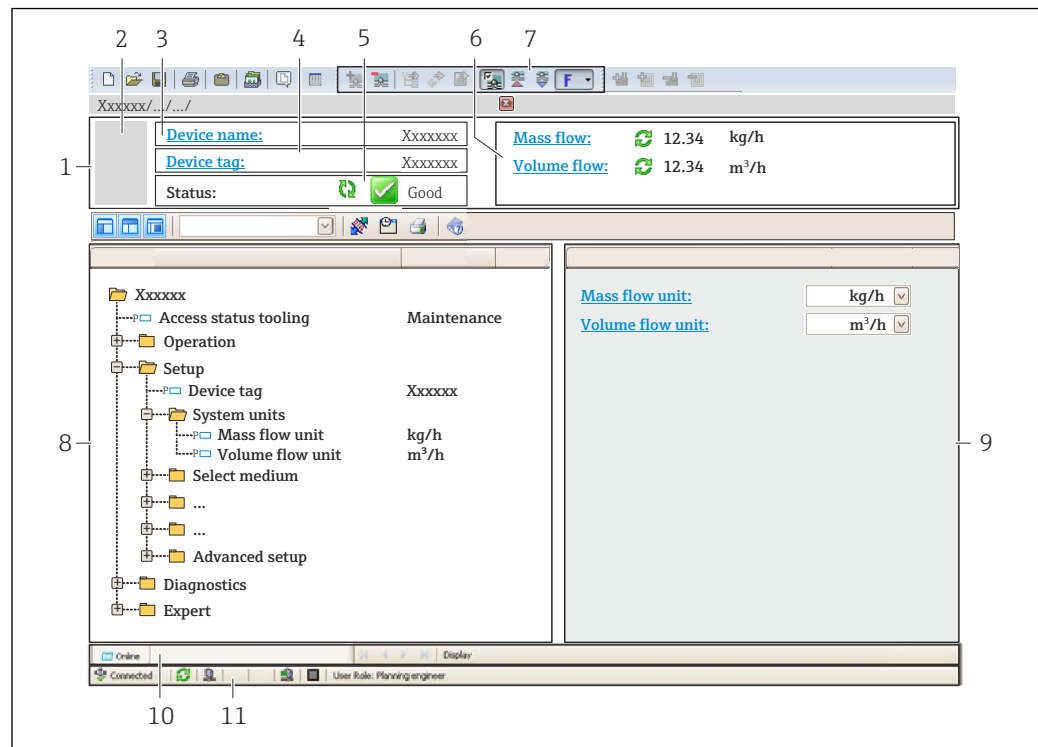
Establishing a connection

1. Start FieldCare and launch the project.
2. In the network: Add a device.
 - ↳ The **Add device** window opens.
3. Select the **CDI Communication TCP/IP** option from the list and press **OK** to confirm.
4. Right-click **CDI Communication TCP/IP** and select the **Add device** option in the context menu that opens.
5. Select the desired device from the list and press **OK** to confirm.
 - ↳ The **CDI Communication TCP/IP (Configuration)** window opens.
6. Enter the device address in the **IP address** field and press **Enter** to confirm: 192.168.1.212 (factory setting); if the IP address is not known →  71.
7. Establish the online connection to the device.



For additional information, see Operating Instructions BA00027S and BA00059S

User interface



A0021051-EN

- 1 Header
- 2 Picture of device
- 3 Device name
- 4 Device tag
- 5 Status area with status signal → 83
- 6 Display area for current measured values
- 7 Edit toolbar with additional functions such as save/restore, event list and create documentation
- 8 Navigation area with operating menu structure
- 9 Working area
- 10 Range of action
- 11 Status area

8.5.3 DeviceCare

Function scope

Tool to connect and configure Endress+Hauser field devices.

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



For details, see Innovation Brochure IN01047S

Source for device description files

See information → 49

9 System integration

9.1 Overview of device description files

9.1.1 Current version data for the device

Firmware version	01.02.zz	<ul style="list-style-type: none"> On the title page of the Operating Instructions On the transmitter nameplate Firmware version Diagnostics → Device information → Firmware version
Release date of firmware version	10.2014	---
Manufacturer ID	0x49E	Manufacturer ID Diagnostics → Device information → Manufacturer ID
Device type ID	0x104A	Device type Diagnostics → Device information → Device type
Device revision	<ul style="list-style-type: none"> Major revision 2 Minor revision 1 	<ul style="list-style-type: none"> On the transmitter nameplate Device revision Diagnostics → Device information → Device revision
Device profile	Generic device (product type: 0x2B)	



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 via Service interface (CDI)	Sources for obtaining device descriptions
FieldCare	<ul style="list-style-type: none"> www.endress.com → Download Area CD-ROM (contact Endress+Hauser) DVD (contact Endress+Hauser)
DeviceCare	<ul style="list-style-type: none"> www.endress.com → Download Area CD-ROM (contact Endress+Hauser) DVD (contact Endress+Hauser)

9.2 Overview of system files

System files	Version	Description	How to acquire
Electronic Data Sheet (EDS system file)	2.1	Certified in accordance with the following ODVA guidelines: <ul style="list-style-type: none"> Conformance test Performance test PlugFest Embedded EDS Support (File Object 0x37)	<ul style="list-style-type: none"> www.endress.com → Download-Area EDS system file integrated in the device: can be downloaded via the Web browser
Add-on Profile Level 3	<ul style="list-style-type: none"> Major revision 2 Minor revision 1 	System file for "Studio 5000" software (Rockwell Automation)	www.endress.com → Download-Area

9.3 Integrating the measuring device in the system



A detailed description of how to integrate the device into an automation system (e.g. from Rockwell Automation) is available as a separate document: www.endress.com → Select country → Automation → Digital communication → Fieldbus device integration → EtherNet/IP



Protocol-specific data → 104.

9.4 Cyclic data transmission

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

9.4.1 Block model

The block model shows which input and output data the measuring device makes available for implicit messaging. Cyclical data exchange is performed using an EtherNet/IP scanner, e.g. a distributed control system etc.

Measuring device				Control system
Transducer Block	Input Assembly Fix (Assem100) 44 Byte	→ 51	Permanently assigned input group	EtherNet/IP
	Output Assembly Fix (Assem102) 64 Byte	→ 52	Permanently assigned output group	
	Input Assembly Configurable (Assem101) 88 Byte	→ 52	Configurable input group	

9.4.2 Input and output groups

Possible configurations

Configuration 1: Exclusive Owner Multicast

Input Assembly Fix		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 64	398	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 64	44	5

Configuration 2: Input Only Multicast

Input Assembly Fix		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 68	398	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 64	44	5

Configuration 3: Exclusive Owner Multicast

Input Assembly Configurable		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 68	398	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 65	88	5

Configuration 4: Input Only Multicast

Input Assembly Configurable		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 68	398	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 64	88	5

Configuration 5: Exclusive Owner Multicast

Input Assembly Fix		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 64	44	5

Configuration 6: Input Only Multicast

Input Assembly Fix		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 65	44	5

Configuration 7: Exclusive Owner Multicast

Input Assembly Configurable		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x 66	64	5
Input Assembly Fix	T → O Configuration	0 x 64	88	5

Configuration 8: Input Only Multicast

Input Assembly Configurable		Instance	Size [byte]	Min. RPI (ms)
Input Assembly Configurable	Configuration	0 x 69	–	–
Output Assembly Fix	O → T Configuration	0 x C7	–	–
Input Assembly Fix	T → O Configuration	0 x 65	88	5

Permanently assigned input group

Input Assembly Fix (Assem100) 44 Byte

Designation	Description	Byte
Input Assembly Fix	1. File header (not visible)	1-4
	2. Current diagnosis ¹⁾	5-8
	3. Mass flow	9-12
	4. Volume flow	13-16
	5. Corrected volume flow	17-20
	6. Temperature	21-24
	7. Density	25-28
	8. Reference density	29-32
	9. Totalizer 1	33-36

Designation	Description	Byte
	10. Totalizer 2	37-40
	11. Totalizer 3	41-44

1) Structure: Code, number, description (e.g.: 16777265 F882 input signal)



Detailed description:

- Diagnostic information (Verweisziel existiert nicht, aber @y.link.required='true')
- Information events → 91

Configurable input group

Input Assembly Configurable (Assem101) 88 byte

Designation	Description	Format
Input Assembly Configurable	1. - 10. Input values 1 to 10	Real
	11. - 20. Input values 11 to 20	Double integer

Possible input values

Possible input values 1 to 10:		
<ul style="list-style-type: none"> Off Mass flow Volume flow Corrected volume flow Target mass flow ¹⁾ Carrier mass flow ¹⁾ Density Reference density Concentration ¹⁾ 	<ul style="list-style-type: none"> Temperature Carrier tube temperature ²⁾ Electronic temperature Oscillation frequency 0 Oscillation amplitude 0 Oscillation frequency 0 Oscillation damping 0 Signal shift 	<ul style="list-style-type: none"> Tube damping fluctuation 0 Exciter current 0 Monitoring of exciter current 0 Totalizer 1 Totalizer 2 Totalizer 3

- 1) Only available with the Concentration application package
 2) Only available with the Heartbeat Verification application package

Possible input values 11 to 20:		
<ul style="list-style-type: none"> Off Current diagnosis Previous diagnosis Mass flow unit Volume flow unit Corrected volume flow unit 	<ul style="list-style-type: none"> Temperature unit Density unit Reference density unit Concentration unit Current unit Verification status 	<ul style="list-style-type: none"> Totalizer 1 unit Totalizer 2 unit Totalizer 3 unit Verification result

Permanently assigned output group

Output Assembly Fix (Assem102) 64 byte

Designation	Description (format)	Byte	Bit	Value
Output Assembly Fix	1. Totalizer 1	1	1	<ul style="list-style-type: none"> 0: Disable 1: Enable
	2. Totalizer 2		2	
	3. Totalizer 3		3	
	4. Pressure compensation		4	
	5. Reference density compensation		5	
	6. Temperature compensation		6	
	7. Verification		7	

Designation	Description (format)	Byte	Bit	Value
	8. Not used		8	–
	9. Not used	2-4	0-8	–
	10. Control totalizer 1 (integer)	5-6	0-8	<ul style="list-style-type: none"> ■ -32226: Add ■ -32490: Reset and stop ■ -32228: Default value and stop ■ 198: Reset and add ■ 199: Default value and add
	11. Not used	7-8	0-8	–
	12. Control totalizer 2 (integer)	9-10	0-8	See totalizer 1
	13. Not used	11-12	0-8	–
	14. Control totalizer 3 (integer)	13-14	0-8	See totalizer 1
	15. Not used	15-16	0-8	–
	16. External pressure (real)	17-20	0-8	Data format: Byte 1 to 4: External pressure Floating-point number (IEEE754)
	17. External pressure unit (integer)	21-22	0-8	<ul style="list-style-type: none"> ■ 2165: Pa a ■ 2116: kPa a ■ 2137: MPa a ■ 4871: bar a ■ 2166: Pa g ■ 2117: kPa a ■ 2138: MPa a ■ 2053: bar g ■ 2182: Psi a ■ 2183: Psi g ■ 2244: Customer-specific
	18. Not used	23-24	0-8	–
	19. External reference density (real)	25-28	0-8	Data format: Byte 1 to 4: External ref. density Floating-point number (IEEE754)
	20. External reference density unit (integer)	29-30	0-8	<ul style="list-style-type: none"> ■ 2112: kg/Nm³ ■ 2113: kg/Nl ■ 2092: g/Scm³ ■ 2114: kg/Scm³ ■ 2181: lb/Sft³
	21. Not used	31-32	0-8	–
	22. External temperature (real)	33-36	0-8	Data format: Byte 1 to 4: External temperature Floating-point number (IEEE754)
	23. External temperature unit (integer)	37-38	0-8	<ul style="list-style-type: none"> ■ 4608: °C ■ 4609: °F ■ 4610: K ■ 4611: °R
	24. Not used	39-40	0-8	–
	25. Start verification (integer)	41-42	0-8	<ul style="list-style-type: none"> ■ 32378: Start ■ 32713: Cancel
	26. Not used	43-64	0-8	–

10 Commissioning

10.1 Function check

Before commissioning the measuring device:

- ▶ Make sure that the post-installation and post-connection checks have been performed.
- "Post-installation check" checklist→ 26
- "Post-connection check" checklist→ 33

10.2 Configuring the device address via software

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


Navigation

"Setup" menu → Communication → Device address

10.2.1 Ethernet network and Web server

When delivered, the measuring device has the following factory settings:

IP address	192.168.1.212
Subnet mask	255.255.255.0
Default gateway	192.168.1.212

-  ■ If hardware addressing is active, software addressing is disabled.
- If a switch is made to hardware addressing, the address configured via software addressing is retained for the first 9 places (the first three octets).
- If the IP address of the device is not known, the device address currently configured can be read out → 71.

10.3 Setting the operating language

Factory setting: English or ordered local language

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

Operation → Display language

10.4 Configuring the measuring device

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

⚙ Setup

Device tag

→ 55

▶ System units

→ 55

▶ Medium selection

→ 58

► Communication	→ 59
► Low flow cut off	→ 62
► Partially filled pipe detection	→ 63
► Advanced setup	→ 64

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 → 48

Navigation


"Setup" menu → Device tag

Parameter overview with brief description

Parameter	Description	User entry	Factory setting
Device tag	Enter the name for the measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	Promass 100

10.4.2 Setting the system units





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

 The number of submenus and parameters can vary depending on the device version. Certain submenus and parameters in these submenus are not described in the Operation Instructions. Instead a description is provided in the Special Documentation for the device (→ "Supplementary documentation" section).


Navigation



"Setup" menu → Advanced setup → System units

► System units	
Mass flow unit	→ 56
Mass unit	→ 56
Volume flow unit	→ 56
Volume unit	→ 56
Corrected volume flow unit	→ 56
Corrected volume unit	→ 56

Density unit	→  56
Reference density unit	→  56
Temperature unit	→  57
Pressure unit	→  57

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Mass flow unit	Select mass flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Low flow cut off Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg/h lb/min
Mass unit	Select mass unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg lb
Volume flow unit	Select volume flow unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Low flow cut off Simulation process variable 	Unit choose list	Country-specific: <ul style="list-style-type: none"> l/h gal/min (us)
Volume unit	Select volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> l gal (us)
Corrected volume flow unit	Select corrected volume flow unit. <i>Result</i> The selected unit applies for: Corrected volume flow parameter (→  73)	Unit choose list	Country-specific: <ul style="list-style-type: none"> NI/h Sft³/min
Corrected volume unit	Select corrected volume unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> NI Sft³
Density unit	Select density unit. <i>Result</i> The selected unit applies for: <ul style="list-style-type: none"> Output Simulation process variable Density adjustment (Expert menu) 	Unit choose list	Country-specific: <ul style="list-style-type: none"> kg/l lb/ft³
Reference density unit	Select reference density unit.	Unit choose list	Country-dependent <ul style="list-style-type: none"> kg/NI lb/Sft³

Parameter	Description	Selection	Factory setting
Temperature unit	<p>Select temperature unit.</p> <p><i>Result</i></p> <p>The selected unit applies for:</p> <ul style="list-style-type: none"> ■ Electronic temperature parameter (6053) ■ Maximum value parameter (6051) ■ Minimum value parameter (6052) ■ External temperature parameter (6080) ■ Maximum value parameter (6108) ■ Minimum value parameter (6109) ■ Carrier pipe temperature parameter (6027) ■ Maximum value parameter (6029) ■ Minimum value parameter (6030) ■ Reference temperature parameter (1816) ■ Temperature parameter 	Unit choose list	<p>Country-specific:</p> <ul style="list-style-type: none"> ■ °C ■ °F
Pressure unit	<p>Select process pressure unit.</p> <p><i>Result</i></p> <p>The unit is taken from:</p> <ul style="list-style-type: none"> ■ Pressure value parameter (→  59) ■ External pressure parameter (→  59) ■ Pressure value 	Unit choose list	<p>Country-specific:</p> <ul style="list-style-type: none"> ■ bar a ■ psi a

10.4.3 Selecting and setting the medium

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

Navigation

"Setup" menu → Medium selection

► Medium selection

Select medium

→ 59

Select gas type

→ 59

Reference sound velocity

→ 59

Temperature coefficient sound velocity

→ 59

Pressure compensation

→ 59

Pressure value

→ 59

External pressure

→ 59

Parameter overview with brief description

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

10.4.4 Configuring the communication interface

The **Communication** submenu guides you systematically through all the parameters that have to be configured for selecting and setting the communication interface.

Navigation
"Setup" menu → Communication

► Communication

MAC address

→ 60

Default network settings

→ 60

DHCP client

→ 60

IP address

→ 60



Subnet mask

→ 61

Default gateway

→ 61

Parameter overview with brief description

Parameter	Description	User interface / Selection / User entry	Factory setting
MAC address	Displays the MAC address of the measuring device.  MAC = Media Access Control	Unique 12-digit character string comprising letters and numbers, e.g.: 00:07:05:10:01:5F	Each measuring device is given an individual address.
Default network settings	Select whether to restore network settings.	<div><div>■ Off</div><div>■ On</div></div>	Off
DHCP client	Select to activate/deactivate DHCP client functionality. Result If the DHCP client functionality of the Web server is activated, the IP address, Subnet mask and Default gateway are set automatically.  <div><div>■ Identification is via the MAC address of the measuring device.</div><div>■ The IP address in the IP address parameter is ignored as long as the DHCP client parameter is active. This is also the case, in particular, if the DHCP server cannot be reached. The IP address in the parameter of the same name is only used if the DHCP client parameter is inactive.</div></div>	<div><div>■ Off</div><div>■ On</div></div>	Off
IP address	IP address of the Web server integrated in the measuring device. If the DHCP client is switched off and write access is enabled, the IP address can also be entered.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212

Parameter	Description	User interface / Selection / User entry	Factory setting
Subnet mask	Displays the subnet mask. If the DHCP client is switched off and write access is enabled, the Subnet mask can also be entered.	4 octet: 0 to 255 (in the particular octet)	255.255.255.0
Default gateway	Displays the default gateway. If the DHCP client is switched off and write access is enabled, the Default gateway can also be entered.	4 octet: 0 to 255 (in the particular octet)	0.0.0.0

10.4.5 Configuring the low flow cut off


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

Navigation


"Setup" menu → Low flow cut off

▶ Low flow cut off


Assign process variable

→  62


On value low flow cutoff

→  62




Off value low flow cutoff

→  62

Pressure shock suppression

→  62

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for low flow cut off.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow 	Mass flow
On value low flow cutoff	A process variable is selected in the Assign process variable parameter (→  62).	Enter on value for low flow cut off.	Positive floating-point number	Depends on country and nominal diameter
Off value low flow cutoff	A process variable is selected in the Assign process variable parameter (→  62).	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 (→  62).	Enter time frame for signal suppression (= active pressure shock suppression).	0 to 100 s	0 s

10.4.6 Configuring the partial filled pipe detection


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

Navigation


"Setup" menu → Partially filled pipe detection

▶ Partially filled pipe detection


Assign process variable

→  63


Low value partial filled pipe detection

→  63




High value partial filled pipe detection

→  63

Response time part. filled pipe detect.


→  63

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign process variable	–	Select process variable for partially filled pipe detection.	<ul style="list-style-type: none"> ■ Off ■ Density ■ Reference density 	Off
Low value partial filled pipe detection	A process variable is selected in the Assign process variable parameter (→  63).	Enter lower limit value for deactivating partialy filled pipe detection.	Signed floating-point number	200
High value partial filled pipe detection	A process variable is selected in the Assign process variable parameter (→  63).	Enter upper limit value for deactivating partialy filled pipe detection.	Signed floating-point number	6 000
Response time part. filled pipe detect.	A process variable is selected in the Assign process variable parameter (→  63).	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.

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

Navigation

"Setup" menu → Advanced setup

▶ Advanced setup

Enter access code

→ 64

▶ Calculated values

→ 64

▶ Sensor adjustment

→ 66

▶ Totalizer 1 to n

→ 67

▶ Display

▶ Viscosity

▶ Concentration

▶ Heartbeat setup

▶ Administration

→ 67

10.5.1 Using the parameter to enter the access code

Navigation

"Setup" menu → Advanced setup

Parameter overview with brief description

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

10.5.2 Calculated values

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

Navigation

"Setup" menu → Advanced setup → Calculated values

► Calculated values	
► Corrected volume flow calculation	
Corrected volume flow calculation	→ 65
External reference density	→ 65
Fixed reference density	→ 65
Reference temperature	→ 65
Linear expansion coefficient	→ 66
Square expansion coefficient	→ 66

Parameter overview with brief description

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

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

10.5.3 Carrying out a sensor adjustment

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

Navigation

"Setup" menu → Advanced setup → Sensor adjustment

► Sensor adjustment	
Installation direction	→ 66
► Zero point adjustment	→ 66

Parameter overview with brief description

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

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 107. Therefore, a zero point adjustment in the field is generally not required.

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

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

Navigation

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

► Zero point adjustment	
Zero point adjustment control	→ 67
Progress	→ 67

Parameter overview with brief description

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

10.5.4 Configuring the totalizer

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

Navigation

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

► Totalizer 1 to n	
Assign process variable	→ 67
Unit totalizer	→ 67
Totalizer operation mode	→ 67
Failure mode	→ 67

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection	Factory setting
Assign process variable	–	Select process variable for totalizer.	<ul style="list-style-type: none"> ■ Off ■ Volume flow ■ Mass flow ■ Corrected volume flow ■ Target mass flow * ■ Carrier mass flow * 	Mass flow
Unit totalizer	A process variable is selected in the Assign process variable parameter (→ 67) of the Totalizer 1 to n submenu.	Select process variable totalizer unit.	Unit choose list	Country-specific: <ul style="list-style-type: none"> ■ kg ■ lb
Totalizer operation mode	A process variable is selected in the Assign process variable parameter (→ 67) of the Totalizer 1 to n submenu.	Select totalizer calculation mode.	<ul style="list-style-type: none"> ■ 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 (→ 67) of the Totalizer 1 to n submenu.	Define totalizer behavior in alarm condition.	<ul style="list-style-type: none"> ■ Stop ■ Actual value ■ Last valid value 	Stop

* Visibility depends on order options or device settings

10.5.5 Using parameters for device administration

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

Navigation

"Setup" menu → Advanced setup → Administration

► Administration

Define access code

→ 68

Device reset

→ 68

Parameter overview with brief description

Parameter	Description	User entry / Selection	Factory setting
Define access code	Define release code for write access to parameters.	0 to 9 999	0
Device reset	Reset the device configuration - either entirely or in part - to a defined state.	<div>■ Cancel</div> <div>■ To delivery settings</div> <div>■ Restart device</div>	Cancel

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

► Simulation

Assign simulation process variable

→ 69

Value process variable

→ 69

Simulation device alarm

→ 69

Simulation diagnostic event

→ 69

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Assign simulation process variable	–	Select a process variable for the simulation process that is activated.	<ul style="list-style-type: none"> ■ Off ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Concentration * ■ Target mass flow * ■ Carrier mass flow * 	Off
Value process variable	A process variable is selected in the Assign simulation process variable parameter (→ 69).	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.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Diagnostic event category	–	Select a diagnostic event category.	<ul style="list-style-type: none"> ■ Sensor ■ Electronics ■ Configuration ■ Process 	Process
Simulation diagnostic event	–	Select a diagnostic event for the simulation process that is activated.	<ul style="list-style-type: none"> ■ Off ■ Diagnostic event picklist (depends on the category selected) 	Off

* Visibility depends on order options or device settings

10.7 Protecting settings from unauthorized access

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

- Write protection via access code for Web browser → 69
- Write protection via write protection switch → 70

10.7.1 Write protection via access code

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

Navigation

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

► Administration	
Define access code	→ 68
Device reset	→ 92

Defining the access code via the Web browser

1. Navigate to the **Define access code** parameter.

2. Define a max. 16-digit numeric code as an access code.
3. Enter the access code again in the to confirm the code.
 - ↳ The Web browser switches to the login page.

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

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


10.7.2 Write protection via write protection switch

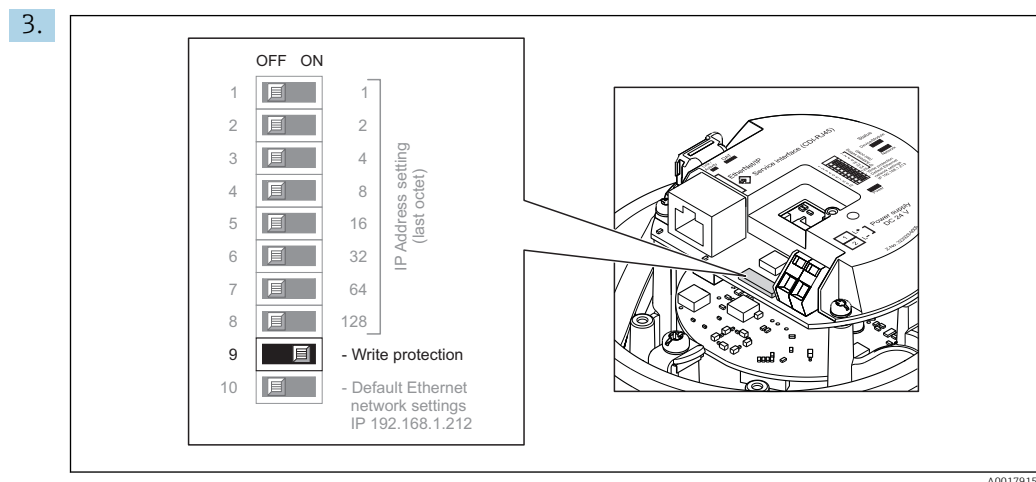
The write protection switch makes it possible to block write access to the entire operating menu with the exception of the following parameters:

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

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

- Via service interface (CDI-RJ45)
- Via Ethernet network

1. Depending on the housing version, loosen the securing clamp or fixing screw of the housing cover.
2. Depending on the housing version, unscrew or open the housing cover and disconnect the local display from the main electronics module where necessary
→  116.



Setting the write protection switch on the I/O electronics module to the **ON** position enables the hardware write protection. Setting the write protection switch on the I/O electronics module to the **OFF** position (factory setting) disables the hardware write protection.

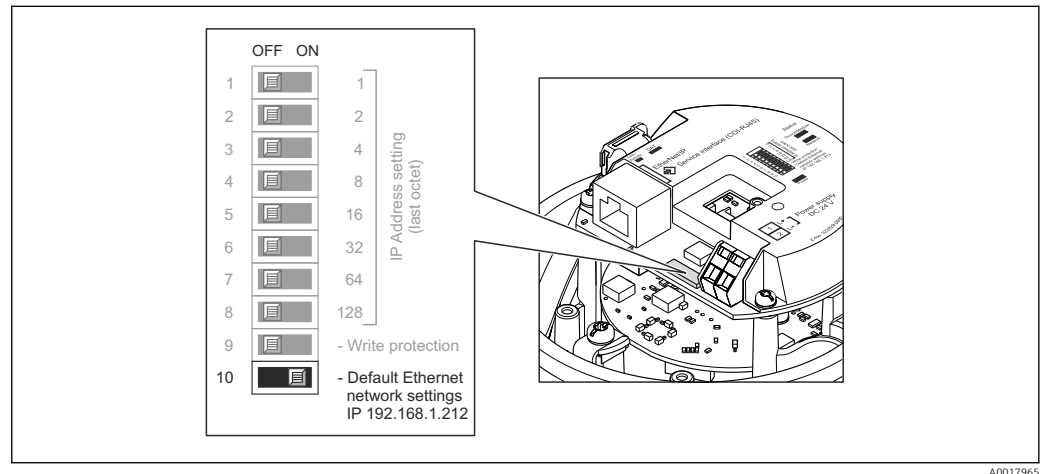
- ↳ If hardware write protection is enabled: the **Locking status** parameter displays the **Hardware locked** option ; if disabled, the **Locking status** parameter does not display any option .

4. Reverse the removal procedure to reassemble the transmitter.

11 Operation

11.1 Read out and modify current Ethernet settings

If the Ethernet settings such as the IP address of the measuring device are unknown, they can be read out and modified as explained in the following example for an IP address.



A0017965

Prerequisite

- Software addressing is enabled: All the DIP switches for hardware addressing are set to **OFF**.
- Measuring device is switched on.

1. Set the DIP switch for "Default Ethernet network settings, IP 192.168.1.212" from **OFF** → **ON**.
2. Restart the device.
 - ↳ The device's Ethernet settings are reset to their factory settings:
IP address: 192.168.1.212; Subnet mask: 255.255.255.0; Default gateway: 192.168.1.212
3. Enter the default setting for the IP address in the address line of the Web browser.
4. Navigate to **IP address** parameter in the operating menu: Setup → Communication → IP address
 - ↳ The parameter displays the configured IP address.
5. Change the IP address of the device if necessary.
6. Set the DIP switch for "Default Ethernet network settings, IP 192.168.1.212" from **ON** → **OFF**.
7. Restart the device.
 - ↳ The modified IP address of the device is now enabled.

11.2 Reading the device locking status

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

Navigation

"Operation" menu → Locking status

Function scope of "Locking status" parameter

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

11.3 Adjusting the operating language



Detailed information:

- To configure the operating language → 54
- For information on the operating languages supported by the measuring device → 118

11.4 Reading measured values

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

Navigation

"Diagnostics" menu → Measured values

► Measured values

► Process variables

→ 72

► Totalizer

→ 74

11.4.1 "Measured variables" submenu

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

Navigation

"Diagnostics" menu → Measured values → Measured variables

► Measured variables

Mass flow

→ 73

Volume flow

→ 73

Corrected volume flow

→ 73






Density

→ 73

Reference density	→ ⓘ 73
Temperature	→ ⓘ 73
Pressure value	→ ⓘ 73
Concentration	→ ⓘ 74
Target mass flow	→ ⓘ 74
Carrier mass flow	→ ⓘ 74

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Mass flow	–	Displays the mass flow that is currently measured. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→ ⓘ 56).	Signed floating-point number
Volume flow	–	Displays the volume flow that is currently calculated. <i>Dependency</i> The unit is taken from the Volume flow unit parameter (→ ⓘ 56).	Signed floating-point number
FAD volume flow	–	Displays the corrected volume flow that is currently calculated. <i>Dependency</i> The unit is taken from the Corrected volume flow unit parameter (→ ⓘ 56).	Signed floating-point number
Density	–	Shows the density currently measured. <i>Dependency</i> The unit is taken from the Density unit parameter (→ ⓘ 56).	Signed floating-point number
Reference density	–	Displays the reference density that is currently calculated. <i>Dependency</i> The unit is taken from the Reference density unit parameter (→ ⓘ 56).	Signed floating-point number
Temperature	–	Shows the medium temperature currently measured. <i>Dependency</i> The unit is taken from the Temperature unit parameter (→ ⓘ 57).	Signed floating-point number
Pressure value	–	Displays either a fixed or external pressure value. <i>Dependency</i> The unit is taken from the Pressure unit parameter (→ ⓘ 57).	Signed floating-point number

Parameter	Prerequisite	Description	User interface
Concentration	For the following order code: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the concentration that is currently calculated. <i>Dependency</i> The unit is taken from the Concentration unit parameter.	Signed floating-point number
Target mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the mass flow that is currently measured for the target medium. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→  56).	Signed floating-point number
Carrier mass flow	With the following conditions: Order code for "Application package", option ED "Concentration"  The software options currently enabled are displayed in the Software option overview parameter.	Displays the mass flow that is currently measured for the carrier medium. <i>Dependency</i> The unit is taken from the Mass flow unit parameter (→  56).	Signed floating-point number

11.4.2 "Totalizer" submenu


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

Navigation


"Diagnostics" menu → Measured values → Totalizer

► Totalizer

Totalizer value 1 to n

→  75

Totalizer overflow 1 to n

→  75

Parameter overview with brief description

Parameter	Prerequisite	Description	User interface
Totalizer value 1 to n	One of the following options is selected in the Assign process variable parameter (→ 67) of the Totalizer 1 to n submenu: <ul style="list-style-type: none">■ Volume flow■ Mass flow■ Corrected volume flow■ Target mass flow *■ Carrier mass flow *	Displays the current totalizer counter value.	Signed floating-point number
Totalizer overflow 1 to n	One of the following options is selected in the Assign process variable parameter (→ 67) of the Totalizer 1 to n submenu: <ul style="list-style-type: none">■ Volume flow■ Mass flow■ Corrected volume flow■ Target mass flow *■ Carrier mass flow *	Displays the current totalizer overflow.	Integer with sign

* Visibility depends on order options or device settings

11.5 Adapting the measuring device to the process conditions

The following are available for this purpose:

- Basic settings using the **Setup** menu (→ 54)
- Advanced settings using the **Advanced setup** submenu (→ 64)


11.6 Performing a totalizer reset

Navigation

"Operation" menu → Totalizer handling

► Totalizer handling		
Control Totalizer 1 to n		→ 76
Preset value 1 to n		→ 76
Reset all totalizers		→ 76

Parameter overview with brief description

Parameter	Prerequisite	Description	Selection / User entry	Factory setting
Control Totalizer 1 to n	A process variable is selected in the Assign process variable parameter (→ 67) of the Totalizer 1 to n submenu.	Control totalizer value.	<ul style="list-style-type: none"> ■ Totalize ■ Reset + hold ■ Preset + hold ■ Reset + totalize ■ Preset + totalize 	Totalize
Preset value 1 to n	A process variable is selected in the Assign process variable parameter (→ 67) of the Totalizer 1 to n submenu.	Specify start value for totalizer. <i>Dependency</i>  The unit of the selected process variable is specified for the totalizer in the Unit totalizer parameter (→ 67).	Signed floating-point number	Country-specific: <ul style="list-style-type: none"> ■ 0 kg ■ 0 lb
Reset all totalizers	–	Reset all totalizers to 0 and start.	<ul style="list-style-type: none"> ■ Cancel ■ Reset + totalize 	Cancel

11.6.1 Function scope of the "Control Totalizer" parameter

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

11.6.2 Function scope of the "Reset all totalizers" parameter

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

12 Diagnostics and troubleshooting

12.1 General troubleshooting

For local display



Problem	Possible causes	Remedial action
Local display dark and no output signals	Supply voltage does not match that specified on the nameplate.	Apply the correct supply voltage → 30.
Local display dark and no output signals	Supply voltage has incorrect polarity.	Reverse polarity of supply voltage.
Local display dark and no output signals	No contact between connecting cables and terminals.	Check the connection of the cables and correct if necessary.
Local display dark and no output signals	Terminals are not plugged into the I/O electronics module correctly.	Check terminals.
Local display dark and no output signals	I/O electronics module is defective.	Order spare part → 97.
Local display is dark, but signal output is within the valid range	Display is set too bright or too dark.	<ul style="list-style-type: none"> Set the display brighter by simultaneously pressing + . Set the display darker by simultaneously pressing + .
Local display is dark, but signal output is within the valid range	The cable of the display module is not plugged in correctly.	Insert the plug correctly into the main electronics module and display module.
Local display is dark, but signal output is within the valid range	Display module is defective.	Order spare part → 97.
Backlighting of local display is red	Diagnostic event with "Alarm" diagnostic behavior has occurred.	Take remedial measures → 86
Message on local display: "Communication Error" "Check Electronics"	Communication between the display module and the electronics is interrupted.	<ul style="list-style-type: none"> Check the cable and the connector between the main electronics module and display module. Order spare part → 97.

For output signals

Problem	Possible causes	Remedial action
Green power LED on the main electronics module of the transmitter is dark	Supply voltage does not match that specified on the nameplate.	Apply the correct supply voltage → 30.
Device measures incorrectly.	Configuration error or device is operated outside the application.	<ol style="list-style-type: none"> Check and correct parameter configuration. Observe limit values specified in the "Technical Data".

For access

Problem	Possible causes	Remedial action
No write access to parameters	Hardware write protection enabled	Set the write protection switch on the main electronics module to the OFF position .
No connection via EtherNet/IP	Device plug connected incorrectly	Check the pin assignment of the device plug .

Problem	Possible causes	Remedial action
Not connecting to Web server	<ul style="list-style-type: none"> Incorrect IP address IP address is not known 	<ol style="list-style-type: none"> If addressing via hardware: open the transmitter and check the IP address configured (last octet). Check the IP address of the measuring device with the network manager. If the IP address is not known, set DIP switch No. 10 on the I/O electronics module to ON, restart the device and enter the default setting for the IP address 192.168.1.212. <p> EtherNet/IP communication is interrupted by enabling the DIP switch.</p>
Not connecting to Web server	Incorrect setting for the Ethernet interface of the computer	<ol style="list-style-type: none"> Check the properties of the Internet protocol (TCP/IP). Check the network settings with the IT manager.
Not connecting to Web server	Web server disabled	Via the "FieldCare" operating tool check whether the Web server of the measuring device is enabled and enable it if necessary →  44.
Not connecting to Web server	The use of the proxy server is not disabled in the Web browser settings of the computer.	<p>Disable the use of the proxy server in the Web browser settings of the computer.</p> <p>Using the example of MS Internet Explorer:</p> <ol style="list-style-type: none"> Under <i>Control Panel</i> open <i>Internet options</i>. Select the <i>Connections</i> tab and then double-click <i>LAN settings</i>. In the <i>LAN settings</i> disable the use of the proxy server and select <i>OK</i> to confirm.
Not connecting to Web server	Other network connections or programs are still active on the computer.	<ul style="list-style-type: none"> Make sure that no other network connections are established by the computer (also no WLAN) and close other programs with network access to the computer. If using a docking station for notebooks make sure that a network connection to another network is not active.
No or incomplete display of contents in the Web browser	<ul style="list-style-type: none"> JavaScript not enabled JavaScript cannot be enabled 	<ol style="list-style-type: none"> Enable JavaScript. Enter <code>http://XXX.XXX.X.XXX/basic.html</code> as the IP address.
Web browser frozen and operation no longer possible	Data transfer active	Wait until data transfer or current action is finished.
Web browser frozen and operation no longer possible	Connection lost	<ol style="list-style-type: none"> Check cable connection and power supply. Refresh the Web browser and restart if necessary.
Content of Web browser incomplete or difficult to read	Not using optimum version of Web server.	<ol style="list-style-type: none"> Use the correct Web browser version. Clear the Web browser cache and restart the Web browser.
Content of Web browser incomplete or difficult to read	Unsuitable view settings.	Change the font size/display ratio of the Web browser.

12.2 Diagnostic information via light emitting diodes

12.2.1 Transmitter

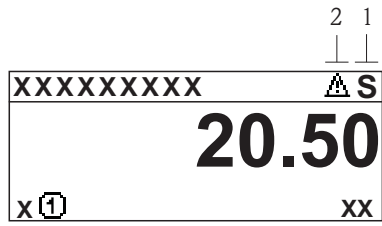
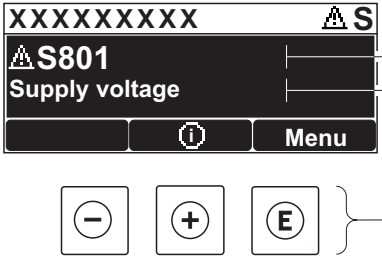
Various light emitting diodes (LEDs) on the main electronics module of the transmitter provide information on device status.

LED	Color	Meaning
Power	Off	Supply voltage is off or too low
	Green	Supply voltage is ok
Device status	Green	Device status is ok
	Flashing red	A device error of diagnostic behavior "Warning" has occurred
	Red	A device error of diagnostic behavior "Alarm" has occurred
	Alternately flashing red/ green	Boot loader is active
Network status	Off	Device has no EtherNet/IP address
	Green	Device's EtherNet/IP connection is active
	Flashing green	Device has EtherNet/IP address but no EtherNet/IP connection
	Red	EtherNet/IP address of the device has been assigned twice
	Flashing red	Device's EtherNet/IP connection is in timeout mode
Link/Activity	Orange	Link available but no activity
	Flashing orange	Activity present
Communication	Flashing white	


12.3 Diagnostic information on local display

12.3.1 Diagnostic message

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


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

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

-  Other diagnostic events that have occurred can be called up in the **Diagnostics** menu:
 - Via parameters → 89
 - Via submenus → 90



Status signals

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

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

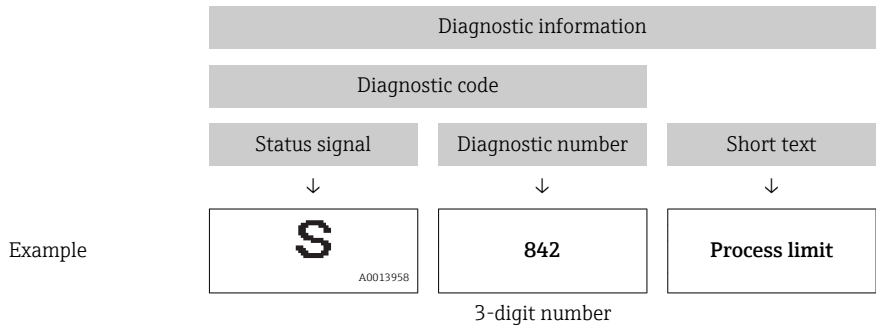
Symbol	Meaning
<div>F</div> <div>A0013956</div>	Failure A device error has occurred. The measured value is no longer valid.
<div>C</div> <div>A0013959</div>	Function check The device is in service mode (e.g. during a simulation).
<div>S</div> <div>A0013958</div>	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)
<div>M</div> <div>A0013957</div>	Maintenance required Maintenance is required. The measured value remains valid.

Diagnostic behavior



Symbol	Meaning
 <small>A0013961</small>	Alarm <ul style="list-style-type: none">■ Measurement is interrupted.■ Signal outputs and totalizers assume the defined alarm condition.■ A diagnostic message is generated.
 <small>A0013962</small>	Warning <p>Measurement is resumed. The signal outputs and totalizers are not affected. A diagnostic message is generated.</p>

Diagnostic information

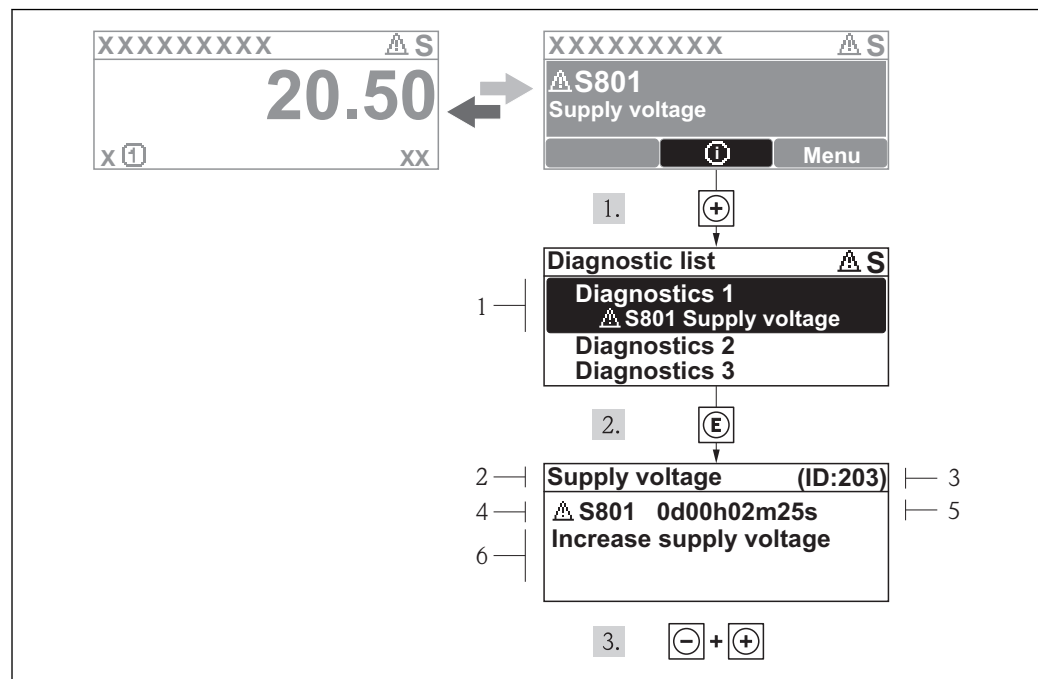
The fault can be identified using the diagnostic information. The short text helps you by providing information about the fault.



Operating elements

Key	Meaning
 <small>A0013970</small>	Plus key <p><i>In a menu, submenu</i> Opens the message about the remedial measures.</p>
 <small>A0013952</small>	Enter key <p><i>In a menu, submenu</i> Opens the operating menu.</p>

12.3.2 Calling up remedial measures



A0013940-EN

14 Message for remedial measures

- 1 Diagnostic information
- 2 Short text
- 3 Service ID
- 4 Diagnostic behavior with diagnostic code
- 5 Operation time of occurrence
- 6 Remedial measures

The user is in the diagnostic message.

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

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

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

12.4 Diagnostic information in the Web browser

12.4.1 Diagnostic options

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

1 Status area with status signal

2 Diagnostic information

3 Remedial measures with Service ID

i Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostics** menu:

- Via parameters → 89
- Via submenus → 90

Status signals

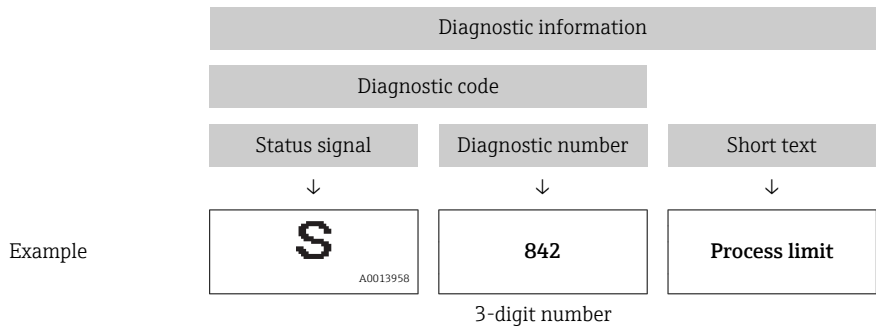
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

Symbol	Meaning
 A0017271	Failure A device error has occurred. The measured value is no longer valid.
 A0017278	Function check The device is in service mode (e.g. during a simulation).
 A0017277	Out of specification The device is operated: Outside its technical specification limits (e.g. outside the process temperature range)
 A0017276	Maintenance required Maintenance is required. The measured value is still valid.

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

Diagnostic information

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



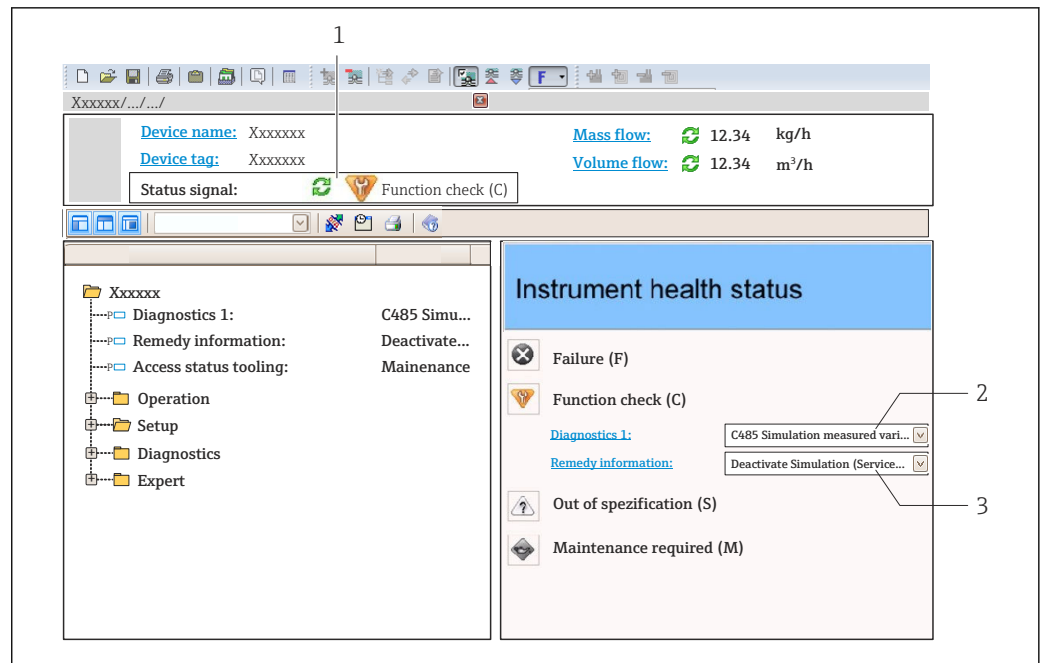
12.4.2 Calling up remedy information

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

12.5 Diagnostic information in FieldCare

12.5.1 Diagnostic options

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



A0021799-EN

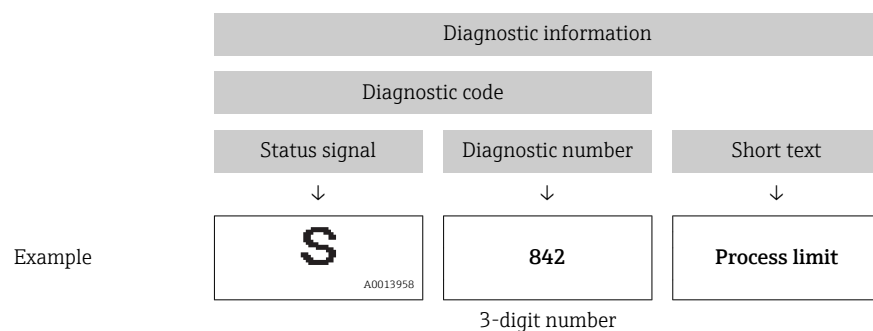
- 1 Status area with status signal → 80
- 2 Diagnostic information → 81
- 3 Remedial measures with Service ID

i Furthermore, diagnostic events that have occurred can be viewed in the **Diagnostics** menu:

- Via parameters → 89
- Via submenu → 90

Diagnostic information

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



12.5.2 Calling up remedy information

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

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

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

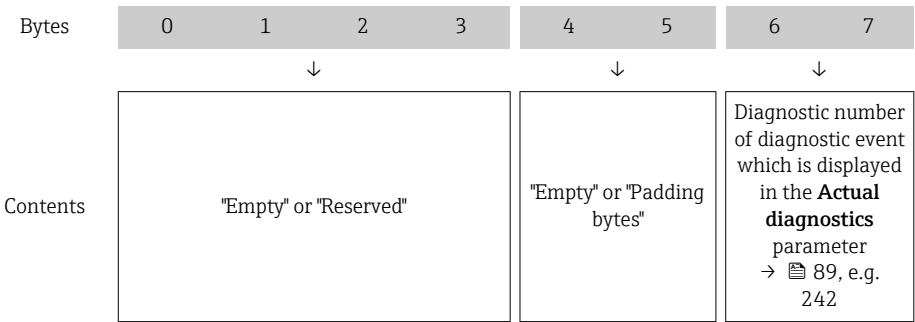
1. Call up the desired parameter.


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

12.6 Diagnostic information via communication interface

12.6.1 Reading out diagnostic information

The current diagnostic event and associated diagnostic information can be read out via the input assembly (fix assembly):



 For content of bytes 8 to 16

12.7 Adapting the diagnostic information

12.7.1 Adapting the diagnostic behavior

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

Expert → System → Diagnostic handling → Diagnostic behavior

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

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

12.8 Overview of diagnostic information

 In the case of some items of diagnostic information, the status signal and the diagnostic behavior can be changed. Adapt the diagnostic information → 86

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

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
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
437	Configuration incompatible	1. Restart device 2. Contact service	F	Alarm
438	Dataset	1. Check data set file 2. Check device configuration 3. Up- and download new configuration	M	Warning
453	Flow override	Deactivate flow override	C	Warning
484	Simulation failure mode	Deactivate simulation	C	Alarm
485	Simulation measured variable	Deactivate simulation	C	Warning
495	Simulation diagnostic event	Deactivate simulation	C	Warning
537	Configuration	1. Check IP addresses in network 2. Change IP address	F	Warning
590	Special event 3	Contact service	F	Alarm
591	Special event 7	Contact service	F	Alarm
592	Special event 11	Contact service	F	Alarm ¹⁾
Diagnostic of process				
825	Operating temperature	1. Check ambient temperature 2. Check process temperature	S	Warning
825	Operating temperature		F	Alarm
830	Sensor temperature too high	Reduce ambient temp. around the sensor housing	S	Warning
831	Sensor temperature too low	Increase ambient temp. around the sensor housing	S	Warning
832	Electronic temperature too high	Reduce ambient temperature	S	Warning ¹⁾
833	Electronic temperature too low	Increase ambient temperature	S	Warning ¹⁾
834	Process temperature too high	Reduce process temperature	S	Warning ¹⁾
835	Process temperature too low	Increase process temperature	S	Warning ¹⁾
842	Process limit	Low flow cut off active! 1. Check low flow cut off configuration	S	Warning
843	Process limit	Check process conditions	S	Warning
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning
882	Input signal	1. Check input configuration 2. Check external device or process conditions	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
910	Tubes not oscillating	1. Check electronic 2. Inspect sensor	F	Alarm
912	Medium inhomogeneous	1. Check process cond. 2. Increase system pressure	S	Warning
912	Inhomogeneous		S	Warning
913	Medium unsuitable	1. Check process conditions 2. Check electronic modules or sensor	S	Alarm
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning
948	Tube damping too high	Check process conditions	S	Warning
990	Special event 4	Contact service	F	Alarm
991	Special event 8	Contact service	F	Alarm
992	Special event 12	Contact service	F	Alarm ¹⁾

1) Diagnostic behavior can be changed.

12.9 Pending diagnostic events

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



To call up the measures to rectify a diagnostic event:

- Via Web browser → 84
- Via "FieldCare" operating tool → 85

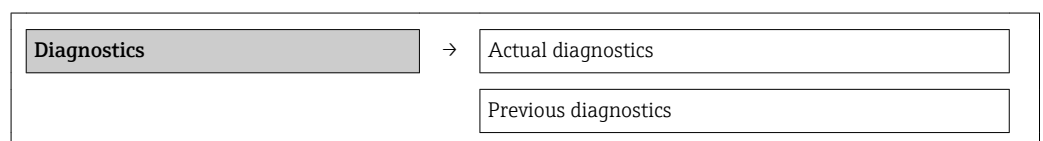


Other pending diagnostic events can be displayed in the **Diagnostic list** submenu → 90


Navigation

"Diagnostics" menu

Structure of the submenu



Parameter overview with brief description


Parameter	Prerequisite	Description	User interface	Factory setting
Actual diagnostics	1 diagnostic event has occurred.	Displays the current diagnostic event along with the diagnostic information.  If two or more messages occur simultaneously, the message with the highest priority is shown on the display.	Symbol for diagnostic behavior, diagnostic code and short message.	–
Previous diagnostics	2 diagnostic events have already occurred.	Displays the diagnostic event that occurred prior to the current diagnostic event along with the diagnostic information.	Symbol for diagnostic behavior, diagnostic code and short message.	–



12.10 Diagnostic list

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

Navigation path

Diagnostics menu → **Diagnostic list** submenu

 To call up the measures to rectify a diagnostic event:

- Via Web browser →  84
- Via "FieldCare" operating tool →  85

12.11 Event logbook

12.11.1 Event history



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

Navigation path




"Diagnostics" menu → Event logbook → Events list


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



The event history includes entries for:

- Diagnostic events →  86
- Information events →  91

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

- Diagnostic event
 - : Event has occurred
 - : Event has ended
- Information event
 - : Event has occurred

 To call up the measures to rectify a diagnostic event:

- Via Web browser →  84
- Via "FieldCare" operating tool →  85

 For filtering the displayed event messages →  91

12.11.2 Filtering the event logbook

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

Navigation path

"Diagnostics" menu → Event logbook → Filter options

Filter categories

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

12.11.3 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
I1137	Electronic changed
I1151	History reset
I1155	Reset electronic temperature
I1157	Memory error event list
I1185	Display backup done
I1186	Restore via display done
I1187	Settings downloaded with display
I1188	Display data cleared
I1189	Backup compared
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1256	Display: access status changed
I1264	Safety sequence aborted
I1335	Firmware changed
I1361	Wrong web server login
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1444	Device verification passed
I1445	Device verification failed
I1446	Device verification active
I1447	Record application reference data

Info number	Info name
I1448	Application reference data recorded
I1449	Recording application ref. data failed
I1450	Monitoring off
I1451	Monitoring on
I1457	Failed:Measured error verification
I1459	Failed: I/O module verification
I1460	Failed: Sensor integrity verification
I1461	Failed: Sensor verification
I1462	Failed:Sensor electronic module verific.

12.12 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.

Navigation

"Setup" menu → Advanced setup → Administration → Device reset

Parameter overview with brief description

Parameter	Description	Selection	Factory setting
Device reset	Restart or reset device manually.	<ul style="list-style-type: none"> ■ Cancel ■ To delivery settings ■ Restart device 	Cancel

12.12.1 Function scope of "Device reset" parameter

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
History reset	Every parameter is reset to its factory setting.

12.13 Device information

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

Navigation

"Diagnostics" menu → Device information

▶ Device information

Parameter overview with brief description

Parameter	Description	User interface / User entry	Factory setting
Device tag	Enter the name for the measuring point.	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /)	Promass 100
Serial number	Displays the serial number of the measuring device.	Max. 11-digit character string comprising letters and numbers.	79AFF16000
Firmware version	Displays the device firmware version installed.	Character string with the following format: xx.yy.zz	01.02
Device name	Displays the name of the transmitter.	Character string composed of letters, numbers and certain punctuation marks.	Promass 100
Order code	Displays the device order code.	Character string composed of letters, numbers and certain punctuation marks	–

Parameter	Description	User interface / User entry	Factory setting
Extended order code 1	Displays the 1st part of the extended order code.	Character string	–
Extended order code 2	Displays the 2nd part of the extended order code.	Character string	–
Extended order code 3	Displays the 3rd part of the extended order code.	Character string	–
ENP version	Displays the version of the electronic nameplate.	Character string in the format xx.yy.zz	2.02.00
IP address	Displays the IP address of the Web server of the measuring device.	4 octet: 0 to 255 (in the particular octet)	192.168.1.212
Subnet mask	Displays the subnet mask.	4 octet: 0 to 255 (in the particular octet)	255.255.255.0
Default gateway	Displays the default gateway.	4 octet: 0 to 255 (in the particular octet)	0.0.0.0

12.14 Firmware history

Release date	Firmware version	Order code for "Firmware version"	Firmware changes	Documentation type	Documentation
06.2012	01.00.00	–	Original firmware	Operating Instructions	–
04.2013	01.01.zz	Option 73	<ul style="list-style-type: none"> ■ Fieldbus access level was changed from service to maintenance ■ Improved calculation: <ul style="list-style-type: none"> ■ Target mass flow ■ Carrier mass flow ■ Option to access application packages: <ul style="list-style-type: none"> ■ Heartbeat Technology ■ Concentration 	Operating Instructions	BA01183D/06/EN/01.13
10.2014	01.02.zz	Option 71	<ul style="list-style-type: none"> ■ Integration of optional local display ■ Heartbeat functionality for Rockwell AOP ■ New unit "Beer Barrel (BBL)" ■ Monitoring of measuring tube damping ■ Simulation of diagnostic events 	Operating Instructions	BA01183D/06/EN/02.14



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



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



The manufacturer's information is available:

- In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download
- Specify the following details:
 - Product root, e.g. 8E1B
 - Text search: Manufacturer's information
 - Search range: documentation

13 Maintenance

13.1 Maintenance tasks


No special maintenance work is required.

13.1.1 Exterior cleaning

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


13.1.2 Interior cleaning



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
→  112.

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: →  99 →  100

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

14.1.1 Repair and conversion concept

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

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

14.1.2 Notes for repair and conversion

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

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


14.2 Spare parts

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

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



Measuring device serial number:

- Is located on the nameplate of the device.
- Can be read out via the **Serial number** parameter (→  93) 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



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to Endress+Hauser for disposal under the applicable conditions.

14.5.1 Removing the measuring device

1. Switch off the device.

WARNING

Danger to persons from process conditions.

- ▶ Beware of hazardous process conditions such as pressure in the measuring device, high temperatures or aggressive fluids.
2. Carry out the mounting and connection steps from the "Mounting the measuring device" and "Connecting the measuring device" sections in reverse order. Observe the safety instructions.

14.5.2 Disposing of the measuring device

WARNING

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

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

Observe the following notes during disposal:





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

15 Accessories



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

15.1 Device-specific accessories



15.2 Communication-specific accessories

Accessories	Description
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> Technical Information TI405C/07</p>
Fieldgate FXA42	<p>Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices</p> <p> <ul style="list-style-type: none"> ■ Technical Information TI01297S ■ Operating Instructions BA01778S ■ Product page: www.endress.com/fxa42 </p>
Field Xpert SMT70	<p>The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.</p> <p>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.</p> <p> <ul style="list-style-type: none"> ■ Technical Information TI01342S ■ Operating Instructions BA01709S ■ Product page: www.endress.com/smt70 </p>
Field Xpert SMT77	<p>The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.</p> <p> <ul style="list-style-type: none"> ■ Technical Information TI01418S ■ Operating Instructions BA01923S ■ Product page: www.endress.com/smt77 </p>

15.3 Service-specific accessories

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

15.4 System components

Accessories	Description
Memograph M graphic data manager	<p>The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.</p> <p> <ul style="list-style-type: none"> Technical Information TI00133R Operating Instructions BA00247R </p>
iTEMP	<p>The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.</p> <p> "Fields of Activity" document FA00006T</p>

16 Technical data


16.1 Application

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

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

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

16.2 Function and system design

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

16.3 Input

Measured variable	<div><div>Direct measured variables</div><div><div>■ Mass flow</div><div>■ Density</div><div>■ Temperature</div></div></div> <div><div>Calculated measured variables</div><div><div>■ Volume flow</div><div>■ Corrected volume flow</div><div>■ Reference density</div></div></div>
-------------------	---

Measuring range

Measuring ranges for liquids

DN		Measuring range full scale values $\dot{m}_{\min(\text{F})}$ to $\dot{m}_{\max(\text{F})}$	
[mm]	[in]	[kg/h]	[lb/min]
1	$\frac{1}{24}$	0 to 20	0 to 0.735
2	$\frac{1}{12}$	0 to 100	0 to 3.675
4	$\frac{1}{8}$	0 to 450	0 to 16.54
6	$\frac{1}{4}$	0 to 1 000	0 to 36.75

Measuring ranges for gases

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

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

$\dot{m}_{\max(G)}$	Maximum full scale value for gas [kg/h]
$\dot{m}_{\max(F)}$	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$
ρ_G	Gas density in [kg/m³] at operating conditions
x	Constant dependent on nominal diameter

DN		x
[mm]	[in]	[kg/m³]
1	$\frac{1}{24}$	20
2	$\frac{1}{12}$	20
4	$\frac{1}{8}$	20
6	$\frac{1}{4}$	20

Recommended measuring range

"Flow limit" section →  113

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

Input signal

External measured values

To increase the accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring device:

- Operating pressure to increase accuracy (Endress+Hauser recommends the use of a pressure measuring device for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow for gases

 Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section →  100

It is recommended to read in external measured values to calculate the following measured variables:

- Mass flow
- Corrected volume flow

Digital communication

The measured values are written from the automation system to the measuring device via EtherNet/IP.

16.4 Output

Output signal

EtherNet/IP

Standards	In accordance with IEEE 802.3
------------------	-------------------------------

Signal on alarm

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

EtherNet/IP

Device diagnostics	Device condition can be read out in Input Assembly
---------------------------	--

Local display

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

 Status signal as per NAMUR recommendation NE 107

Interface/protocol



- Via digital communication:
EtherNet/IP
- Via service interface
CDI-RJ45 service interface

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

Web browser

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

Light emitting diodes (LED)

Status information	<p>Status indicated by various light emitting diodes</p> <p>The following information is displayed depending on the device version:</p> <ul style="list-style-type: none"> ■ Supply voltage active ■ Data transmission active ■ Device alarm/error has occurred ■ EtherNet/IP network available ■ EtherNet/IP connection established <p> Diagnostic information via light emitting diodes →  79</p>
--------------------	--

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


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

- Outputs
- Power supply

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

Protocol	<ul style="list-style-type: none"> ■ The CIP Networks Library Volume 1: Common Industrial Protocol ■ The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP
Communication type	<ul style="list-style-type: none"> ■ 10Base-T ■ 100Base-TX
Device profile	Generic device (product type: 0x2B)
Manufacturer ID	0x49E
Device type ID	0x104A
Baud rates	Automatic ¹⁰ / ₁₀₀ Mbit with half-duplex and full-duplex detection
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported CIP connections	Max. 3 connections
Explicit connections	Max. 6 connections
I/O connections	Max. 6 connections (scanner)
Configuration options for measuring device	<ul style="list-style-type: none"> ■ DIP switches on the electronics module for IP addressing ■ Manufacturer-specific software (FieldCare) ■ Add-on Profile Level 3 for Rockwell Automation control systems ■ Web browser ■ Electronic Data Sheet (EDS) integrated in the measuring device
Configuration of the EtherNet interface	<ul style="list-style-type: none"> ■ Speed: 10 MBit, 100 MBit, auto (factory setting) ■ Duplex: half-duplex, full-duplex, auto (factory setting)
Configuration of the device address	<ul style="list-style-type: none"> ■ DIP switches on the electronics module for IP addressing (last octet) ■ DHCP ■ Manufacturer-specific software (FieldCare) ■ Add-on Profile Level 3 for Rockwell Automation control systems ■ Web browser ■ EtherNet/IP tools, e.g. RSLinx (Rockwell Automation)
Device Level Ring (DLR)	No

Fix Input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	64
	T → O configuration:	0x64	44
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	64
	T → O configuration:	0x64	44
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	44
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	44
Input Assembly	<div><div></div><div><div>■</div>Current device diagnostics</div><div><div>■</div>Mass flow</div><div><div>■</div>Volume flow</div><div><div>■</div>Corrected volume flow</div><div><div>■</div>Density</div><div><div>■</div>Reference density</div><div><div>■</div>Temperature</div><div><div>■</div>Totalizer 1</div><div><div>■</div>Totalizer 2</div><div><div>■</div>Totalizer 3</div></div>		
Configurable Input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	64
	T → O configuration:	0x65	88
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	64
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88

Configurable Input Assembly	<ul style="list-style-type: none">▪ Current device diagnostics▪ Mass flow▪ Volume flow▪ Corrected volume flow▪ Density▪ Reference density▪ Temperature▪ Totalizer 1▪ Totalizer 2▪ Totalizer 3 <div> The range of options increases if the measuring device has one or more application packages.</div>
Fix Output	
Output Assembly	<ul style="list-style-type: none">▪ Activation of reset totalizers 1-3▪ Activation of pressure compensation▪ Activation of reference density compensation▪ Activation of temperature compensation▪ Reset totalizers 1-3▪ External pressure value▪ Pressure unit▪ External reference density▪ Reference density unit▪ External temperature▪ Temperature unit
Configuration	
Configuration Assembly	<p>Only the most common configurations are listed below.</p> <ul style="list-style-type: none">▪ Software write protection▪ Mass flow unit▪ Mass unit▪ Volume flow unit▪ Volume unit▪ Corrected volume flow unit▪ Corrected volume unit▪ Density unit▪ Reference density unit▪ Temperature unit▪ Pressure unit▪ Length▪ Totalizer 1-3:<ul style="list-style-type: none">▪ Assignment▪ Unit▪ Operating mode▪ Failsafe mode▪ Alarm delay

16.5 Power supply

Terminal assignment →  28

Pin assignment, device plug →  29

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

Transmitter

DC 20 to 30 V

Power consumption

Transmitter

Order code for "Output"	Maximum Power consumption
Option N: EtherNet/IP	3.5 W

Current consumption

Transmitter

Order code for "Output"	Maximum Current consumption	Maximum switch-on current
Option N: EtherNet/IP	145 mA	18 A (< 0.125 ms)


Power supply failure

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

Electrical connection

→  29

Potential equalization

→  31


Terminals

TransmitterSpring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

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



Cable specification

→  27

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 →  100

Maximum measured error

o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature**Base accuracy**
 Design fundamentals →  110
Mass flow and volume flow (liquids)

±0.10 % o.r.

Mass flow (gases)

±0.50 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration ¹⁾	Wide-range Density specification ^{2) 3)}
[g/cm ³]	[g/cm ³]	[g/cm ³]
±0.0005	±0.02	±0.002

1) Valid over the entire temperature and density range

2) Valid range for special density calibration: 0 to 2 g/cm³, +5 to +80 °C (+41 to +176 °F)

3) Order code for "Application package", option EE "Special density"

Temperature

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

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
1	1/24	0.0008	0.00003
2	1/12	0.002	0.00007
4	1/8	0.014	0.0005
6	1/4	0.02	0.0007

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]
1	20	2	1	0.4	0.2	0.04
2	100	10	5	2	1	0.2
4	450	45	22.5	9	4.5	0.9
6	1000	100	50	20	10	2

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]
1/24	0.735	0.074	0.037	0.015	0.007	0.001
1/12	3.675	0.368	0.184	0.074	0.037	0.007
1/8	16.54	1.654	0.827	0.331	0.165	0.033
1/4	36.75	3.675	1.838	0.735	0.368	0.074

Accuracy of outputs

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

The outputs have the following base accuracy specifications.

Repeatability

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

Base repeatability

Design fundamentals → 110

Mass flow and volume flow (liquids)

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

Mass flow (gases)

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

Density (liquids)

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

Temperature

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

Response time

The response time depends on the configuration (damping).

Influence of medium temperature**Mass flow and volume flow**

o.f.s. = of full scale value

When there is a difference between the temperature for zero point adjustment and the process temperature, the additional measured error of the sensor is typically $\pm 0.0002 \text{ \% o.f.s./}^\circ\text{C}$ ($\pm 0.0001 \text{ \% o. f.s./}^\circ\text{F}$).

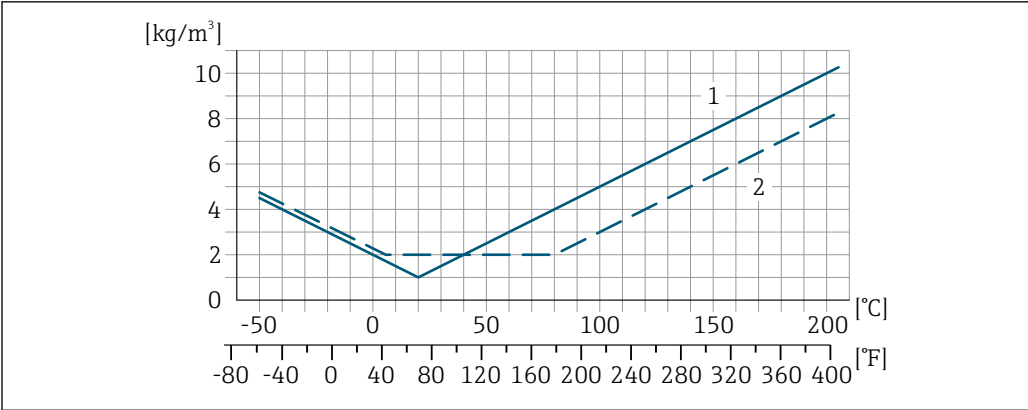
The effect is reduced if zero point adjustment is performed at process temperature.

Density

When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is $\pm 0.00005 \text{ g/cm}^3 \text{ }^\circ\text{C}$ ($\pm 0.000025 \text{ g/cm}^3 \text{ }^\circ\text{F}$). Field density calibration is possible.

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range (→ 107) the measured error is $\pm 0.00005 \text{ g/cm}^3 \text{ }^\circ\text{C}$ ($\pm 0.000025 \text{ g/cm}^3 \text{ }^\circ\text{F}$)



A0016617

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

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

Influence of medium pressure

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

o.r. = of reading



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



Operating Instructions.

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
1	1/24	-0.001	-0.00007
2	1/12	0	0
4	1/8	-0.005	-0.0004
6	1/4	-0.003	-0.0002

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

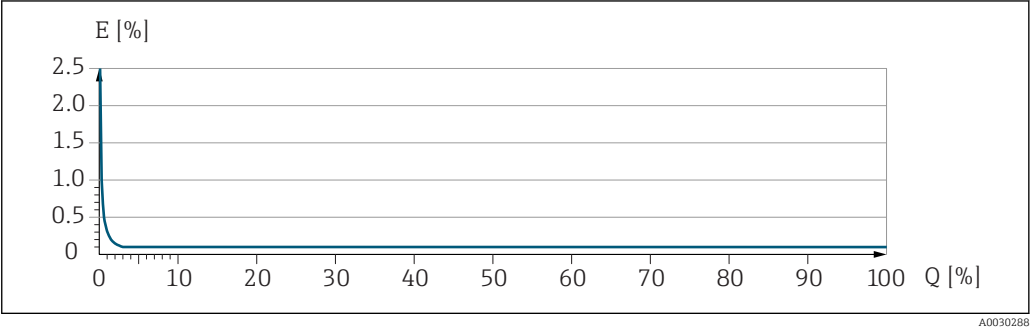
Calculation of the maximum measured error as a function of the flow rate

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

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

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

Example for maximum measured error



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

16.7 Installation

Installation conditions → 19

16.8 Environment

Ambient temperature range → 21 → 21

Temperature tables

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

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

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

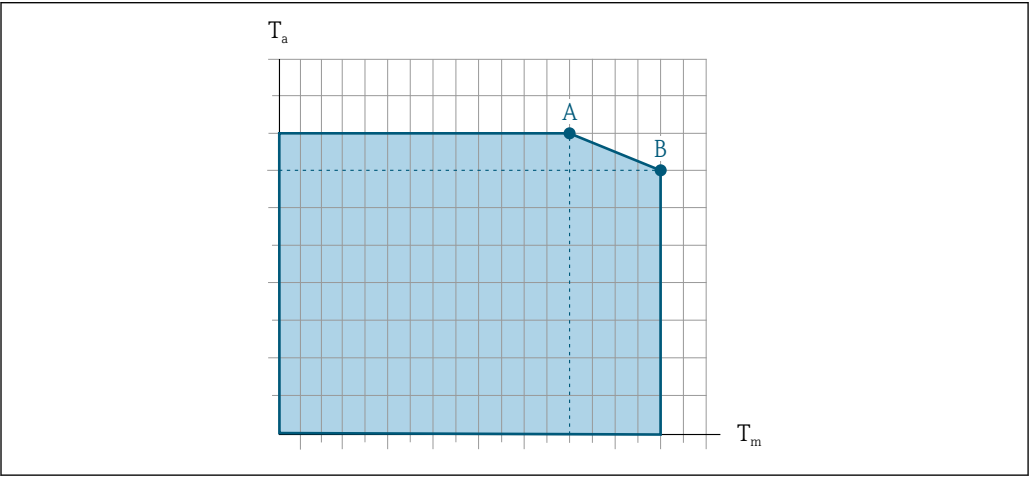
Degree of protection **Transmitter and sensor**
■ As standard: IP66/67, type 4X enclosure
■ When housing is open: IP20, type 1 enclosure
■ Display module: IP20, type 1 enclosure

Vibration resistance	<div><div></div><div><ul style="list-style-type: none">■ Oscillation, sinusoidal, following IEC 60068-2-6<ul style="list-style-type: none">■ 2 to 8.4 Hz, 3.5 mm peak■ 8.4 to 2 000 Hz, 1 g peak■ Oscillation, broadband noise following IEC 60068-2-64<ul style="list-style-type: none">■ 10 to 200 Hz, 0.003 g²/Hz■ 200 to 2 000 Hz, 0.001 g²/Hz■ Total: 1.54 g rms</div></div>
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	<div><div></div><div><ul style="list-style-type: none">■ SIP cleaning■ CIP cleaning</div></div>
Electromagnetic compatibility (EMC)	<div><div></div><div><ul style="list-style-type: none">■ As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)■ Complies with emission limits for industry as per EN 55011 (Class A)</div></div> <div><div></div><div>Details are provided in the Declaration of Conformity.</div></div>

16.9 Process

Medium temperature range	−50 to +205 °C (−58 to +401 °F)
--------------------------	---------------------------------

Dependency of ambient temperature on medium temperature



15 Exemplary representation, values in the table below.

T_a

Ambient temperature range

T_m

Medium temperature

A

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

B











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

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

Seals


For mounting sets with screwed-on connections:

- Viton: -15 to +200 °C (-5 to +392 °F)
- EPDM: -40 to +160 °C (-40 to +320 °F)
- Silicon: -60 to +200 °C (-76 to +392 °F)
- Kalrez: -20 to +275 °C (-4 to +527 °F)

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.
Rupture disk	To guarantee the safety of the measuring device, the device version with a rupture disk with a triggering pressure of 10 to 15 bar (145 to 217.5 psi) is the standard version used. Special mounting instructions →  22.
Flow limit	<p>Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.</p> <p> For an overview of the full scale values for the measuring range, see the "Measuring range" section →  102</p> <ul style="list-style-type: none"> ■ The minimum recommended full scale value is approx. 1/20 of the maximum full scale value ■ In most applications, 20 to 50 % of the maximum full scale value can be considered ideal ■ A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s). ■ For gas measurement the following rules apply: <ul style="list-style-type: none"> ■ The flow velocity in the measuring tubes should not exceed half the sound velocity (0.5 Mach). ■ The maximum mass flow depends on the density of the gas: formula →  102 <p> To calculate the flow limit, use the <i>Applicator</i> sizing tool →  100</p>
Pressure loss	 To calculate the pressure loss, use the <i>Applicator</i> sizing tool →  100
System pressure	→  21

16.10 Mechanical construction

Design, dimensions

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

Weight

All values (weight exclusive of packaging material) refer to devices with VCO couplings. Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".


Weight in SI units

DN [mm]	Weight [kg]
1 to 6	3.5

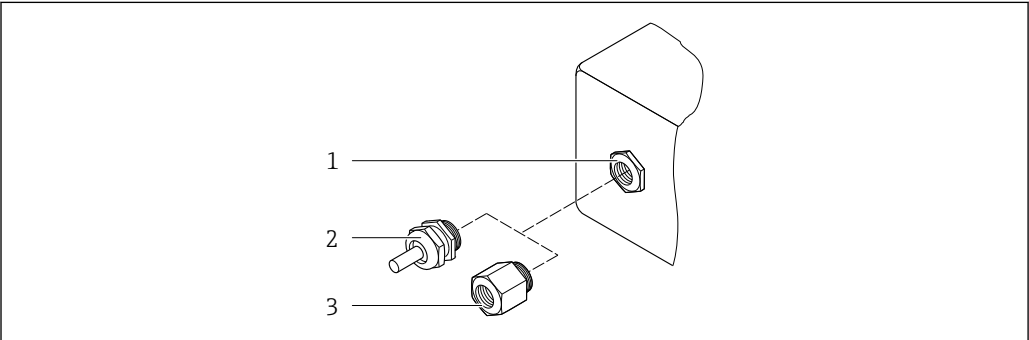
Weight in US units


DN [in]	Weight [lbs]
$\frac{1}{24}$ to $\frac{1}{4}$	8

- Materials
- Transmitter housing**

 - Order code for "Housing", option **A** "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
 - Order code for "Housing", option **B** "Compact, hygienic, stainless": Hygienic version, stainless steel 1.4301 (304)
 - Order code for "Housing", option **C** "Ultra-compact, hygienic, stainless": Hygienic version, stainless steel 1.4301 (304)
 - Window material for optional local display (→  116):
 - For order code for "Housing", option **A**: glass
 - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands



 16 Possible cable entries/cable glands

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

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

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

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

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

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

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

Device plug

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

Sensor housing

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

Measuring tubes

Stainless steel, 1.4539 (904L)

Process connections

VCO connection:



VCO connection: stainless steel, 1.4539 (904L)

Adapter for DN 15 flange according to EN 1092-1 (DIN2501) / according to ASME B 16.5 / as per JIS B2220:

Stainless steel, 1.4539 (904L)

NPTF adapter:

Stainless steel, 1.4539 (904L)

 Available process connections →  116

Seals

Welded process connections without internal seals

Seals for mounting kit

- Viton
- EPDM
- Silicone
- Kalrez

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

Safety Barrier Promass 100

Housing: Polyamide

Process connections

- Fixed flange connections:
 - EN 1092-1 (DIN 2512N) flange
 - ASME B16.5 flange
 - JIS B2220 flange
- VCO connections:
 - 4-VCO-4
 - 8-VCO-4
- Adapter for VCO connections:
 - Flange EN 1092-1 (DIN 2501)
 - Flange ASME B16.5
 - Flange JIS B2220
 - NPT



Process connection materials

Surface roughness

All data relate to parts in contact with fluid. The following surface roughness quality can be ordered.
Not polished

16.11 Human interface

Local display

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

Display element

- 4-line liquid crystal display with 16 characters per line.
- White background lighting; switches to red in event of device errors.
- Format for displaying measured variables and status variables can be individually configured.
- Permitted ambient temperature for the display: -20 to +60 °C (-4 to +140 °F). The readability of the display may be impaired at temperatures outside the temperature range.

Disconnecting the local display from the main electronics module



In the case of the "Compact, aluminum coated" housing version, the local display must only be disconnected manually from the main electronics module. In the case of the "Compact, hygienic, stainless" and "Ultra-compact, hygienic, stainless" housing versions, the local display is integrated in the housing cover and is disconnected from the main electronics module when the housing cover is opened.

"Compact, aluminum coated" housing version

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

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

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

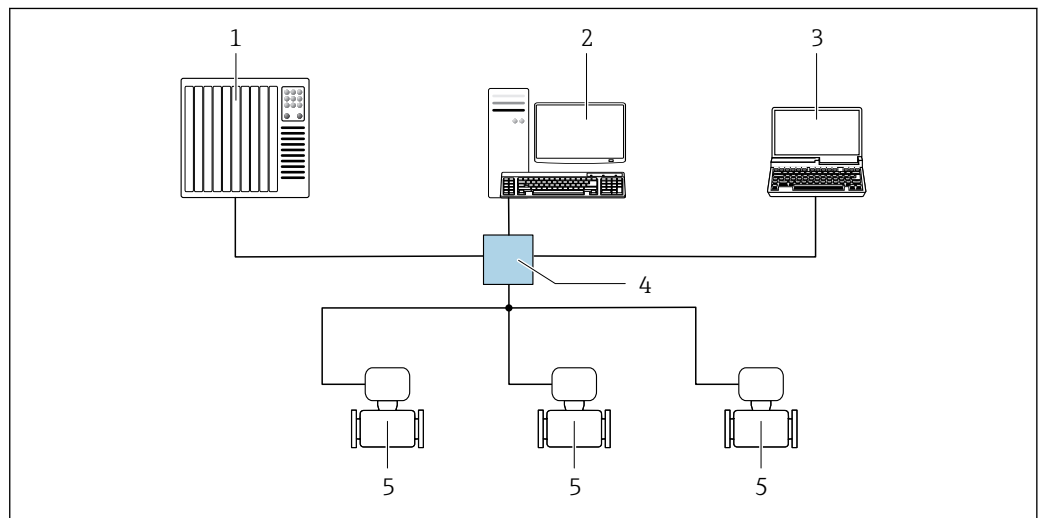
Once the work is completed, plug the local display back on.

Remote operation

Via EtherNet/IP network

This communication interface is available in device versions with EtherNet/IP.

Star topology



A0032078

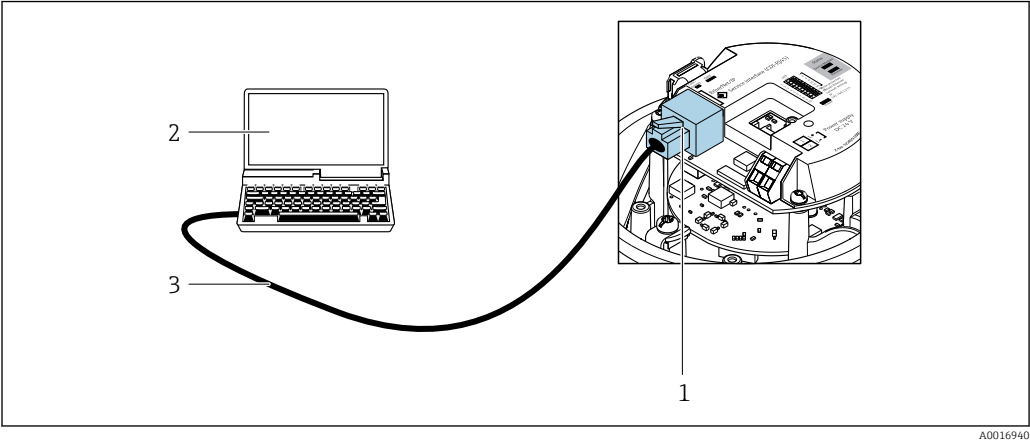
17 Options for remote operation via EtherNet/IP network: star topology

- 1 Automation system, e.g. "RSLogix" (Rockwell Automation)
- 2 Workstation for measuring device operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
- 3 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
- 4 Ethernet switch
- 5 Measuring device

Service interface

Via service interface (CDI-RJ45)

EtherNet/IP



18 Connection for order code for "Output", option N: EtherNet/IP

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

Languages

Can be operated in the following languages:

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

16.12 Certificates and approvals

i 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 symbol

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

EtherNet/IP certification

The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:

- Certified in accordance with the ODVA Conformance Test
- EtherNet/IP Performance Test
- EtherNet/IP PlugFest compliance
- The device can also be operated with certified devices of other manufacturers (interoperability)

Other standards and guidelines

- EN 60529
Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- IEC/EN 61326
Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 105
Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
Self-monitoring and diagnosis of field devices
- NAMUR NE 131
Requirements for field devices for standard applications
- NAMUR NE 132
Coriolis mass meter

16.13 Application packages

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



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




Detailed information on the application packages:
Special Documentation for the device → 121

Heartbeat Technology	Package	Description
	Heartbeat Verification +Monitoring	<p>Heartbeat Verification Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> Functional testing in the installed state without interrupting the process. Traceable verification results on request, including a report. Simple testing process via local operation or other operating interfaces. Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications. Extension of calibration intervals according to operator's risk assessment. <p>Heartbeat Monitoring Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:</p> <ul style="list-style-type: none"> Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time. Schedule servicing in time. Monitor the process or product quality, e.g. gas pockets.
Concentration	Package	Description
	Concentration	<p>Calculation and outputting of fluid concentrations The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:</p> <ul style="list-style-type: none"> Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.) Common or user-defined units (°Brix, °Plato, % mass, % volume, mol/l etc.) for standard applications. Concentration calculation from user-defined tables. <p>The measured values are output via the digital and analog outputs of the device.</p>
Special density	Package	Description
	Special density	<p>Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.</p> <p>The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.</p>

16.14 Accessories

 Overview of accessories available for order →  99

16.15 Supplementary documentation

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

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

Standard documentation **Brief Operating Instructions**

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Cubemass C	KA01217D

Transmitter Brief Operating Instructions

Measuring device	Documentation code
Proline Promass 100	KA01332D

Technical Information

Measuring device	Documentation code
Cubemass C 100	TI01105D

Description of Device Parameters

Measuring device	Documentation code
Cubemass 100	GP01066D

Supplementary device-dependent documentation

Safety Instructions

Content	Documentation code
ATEX/IECEX Ex i	XA01030D
ATEX/IECEX Ex nA	XA01143D
cCSAus IS	XA01142D
INMETRO Ex i	XA01221D
INMETRO Ex nA	XA01222D
NEPSI Ex i	XA01261D
NEPSI Ex nA	XA01263D

Special Documentation

Content	Documentation code
Information on the Pressure Equipment Directive	SD00142D
Concentration measurement	SD01152D
Heartbeat Technology	SD01153D
Web server	SD01822D

Installation Instructions

Contents	Comment
Installation instructions for spare part sets and accessories	<ul style="list-style-type: none"> Access the overview of all the available spare part sets via <i>W@M Device Viewer</i> → 97 Accessories available for order with Installation Instructions → 99

Index

A

About this document	6
Access authorization to parameters	
Read access	38
Write access	38
Access code	38
Incorrect input	38
Accuracy	107
Adapting the diagnostic behavior	86
Application	101
Application packages	119
Applicator	102
Approvals	118

C

Cable entries	
Technical data	107
Cable entry	
Degree of protection	33
CE mark	11, 118
Certificates	118
Check	
Installation	26
Checklist	
Post-connection check	33
Post-installation check	26
CIP cleaning	112
Cleaning	
Cleaning in place (CIP)	96
Exterior cleaning	96
Interior cleaning	96
Sterilization in place (SIP)	96
Climate class	111
Commissioning	54
Advanced settings	64
Configuring the measuring device	54
Connecting cable	27
Connecting the measuring device	29
Connection	
see Electrical connection	
Connection preparations	29
Connection tools	27
Current consumption	107
Cyclic data transmission	50

D

Declaration of Conformity	11
Define access code	69
Degree of protection	33, 111
Density	113
Design	
Measuring device	12
Design fundamentals	
Maximum measured error	110
Repeatability	110
Designated use	9

Device components	12
Device description files	49
Device documentation	
Supplementary documentation	8
Device locking, status	71
Device name	
Sensor	15
Transmitter	14
Device repair	97
Device revision	49
Device type ID	49
DeviceCare	48
Device description file	49
Diagnostic behavior	
Explanation	81
Symbols	81
Diagnostic information	
Communication interface	86
Design, description	81, 84, 85
FieldCare	84
Light emitting diodes	79
Local display	80
Overview	86
Remedial measures	86
Web browser	83
Diagnostic list	90
Diagnostic message	80
Diagnostics	
Symbols	80
DIP switches	
see Write protection switch	
Disabling write protection	69
Display	
Current diagnostic event	89
Previous diagnostic event	89
Display area	
For operational display	37
Display values	
For locking status	71
Disposal	98
Document	
Function	6
Symbols	6
Document function	6
Down pipe	19

E

Electrical connection	
Commubox FXA291	46
Degree of protection	33
Measuring device	27
Operating tools	
Via Ethernet network	45, 117
Via service interface (CDI-RJ45)	46, 117
Via service interface (CDI)	46
RSLogix 5000	45, 117

Web server	46, 117
Electromagnetic compatibility	112
Enabling write protection	69
Endress+Hauser services	
Maintenance	96
Repair	97
Environment	
Shock resistance	112
Storage temperature	111
Vibration resistance	112
Error messages	
see Diagnostic messages	
EtherNet/IP	
Diagnostic information	86
EtherNet/IP certification	118
Event history	90
Events list	90
Ex approval	118
Extended order code	
Sensor	15
Transmitter	14
Exterior cleaning	96
F	
Field of application	
Residual risks	10
FieldCare	46
Device description file	49
Establishing a connection	47
Function	46
User interface	48
Filtering the event logbook	91
Firmware	
Release date	49
Version	49
Firmware history	95
Fix assembly	86
Flow direction	20, 24
Flow limit	113
Function check	54
Functions	
see Parameters	
G	
Galvanic isolation	104
H	
Hardware write protection	70
I	
I/O electronics module	12, 30
Identifying the measuring device	13
Incoming acceptance	13
Influence	
Medium pressure	110
Medium temperature	109
Inlet runs	20
Input	102
Inspection	
Connection	33

Received goods	13
Installation	19
Installation conditions	
Down pipe	19
Inlet and outlet runs	20
Installation dimensions	20
Mounting location	19
Orientation	20
Rupture disk	22
Sensor heating	22
System pressure	21
Thermal insulation	21
Vibrations	22
Installation dimensions	20
Interior cleaning	96, 112
L	
Languages, operation options	118
Local display	
see Diagnostic message	
see In alarm condition	
see Operational display	
Low flow cut off	104
M	
Main electronics module	12
Maintenance tasks	96
Manufacturer ID	49
Manufacturing date	14, 15
Materials	114
Maximum measured error	107
Measured values	
see Process variables	
Measuring and test equipment	96
Measuring device	
Configuration	54
Conversion	97
Design	12
Disposal	98
Mounting the sensor	24
Preparing for electrical connection	29
Preparing for mounting	24
Removing	98
Repairs	97
Measuring principle	101
Measuring range	
For gases	102
For liquids	102
Measuring range, recommended	113
Measuring system	101
Medium pressure	
Influence	110
Medium temperature	
Influence	109
Menu	
Diagnostics	89
Operation	71
Setup	55

- Menus
 - For measuring device configuration 54
 - For specific settings 64
- Mounting dimensions
 - see Installation dimensions
- Mounting location 19
- Mounting preparations 24
- Mounting tools 24
- N**
- Nameplate
 - Sensor 15
 - Transmitter 14
- O**
- Operable flow range 102
- Operating elements 81
- Operating menu
 - Menus, submenus 35
 - Structure 35
 - Submenus and user roles 36
- Operating philosophy 36
- Operation 71
- Operation options 34
- Operational display 37
- Operational safety 10
- Order code 14, 15
- Orientation (vertical, horizontal) 20
- Outlet runs 20
- Output 103
- Output signal 103
- P**
- Packaging disposal 18
- Parameter settings
 - Administration (Submenu) 67, 92
 - Advanced setup (Submenu) 64
 - Calculated values (Submenu) 64
 - Communication (Submenu) 59
 - Device information (Submenu) 93
 - Diagnostics (Menu) 89
 - Low flow cut off (Wizard) 62
 - Measured variables (Submenu) 72
 - Medium selection (Submenu) 58
 - Partially filled pipe detection (Wizard) 63
 - Sensor adjustment (Submenu) 66
 - Setup (Menu) 55
 - Simulation (Submenu) 68
 - System units (Submenu) 55
 - Totalizer (Submenu) 74
 - Totalizer 1 to n (Submenu) 67
 - Totalizer handling (Submenu) 75
 - Web server (Submenu) 44
 - Zero point adjustment (Submenu) 66
- Performance characteristics 107
- Post-connection check (checklist) 33
- Post-installation check 54
- Post-installation check (checklist) 26
- Potential equalization 31
- Power consumption 107
- Power supply failure 107
- Pressure loss 113
- Pressure-temperature ratings 113
- Process connections 116
- Process variables
 - Calculated 102
 - Measured 102
- Product safety 11
- Protecting parameter settings 69
- R**
- RCM-tick symbol 118
- Read access 38
- Reading measured values 72
- Reading out diagnostic information, EtherNet/IP 86
- Recalibration 96
- Reference operating conditions 107
- Registered trademarks 8
- Remedial measures
 - Calling up 82
 - Closing 82
- Remote operation 117
- Repair 97
- Repair of a device 97
- Repairs
 - Notes 97
- Repeatability 109
- Replacement
 - Device components 97
- Requirements for personnel 9
- Response time 109
- Return 97
- Rupture disk
 - Safety instructions 22
 - Triggering pressure 113
- S**
- Safety 9
- Seals
 - Medium temperature range 113
- Sensor
 - Mounting 24
- Sensor heating 22
- Sensor housing 113
- Serial number 14, 15
- Setting the operating language 54
- Settings
 - Adapting the measuring device to the process
 - conditions 75
 - Administration 67
 - Communication interface 59
 - Device reset 92
 - Low flow cut off 62
 - Medium 58
 - Operating language 54
 - Partial filled pipe detection 63
 - Resetting the totalizer 75
 - Sensor adjustment 66

- Simulation 68
- System units 55
- Tag name 55
- Totalizer 67
- Totalizer reset 75
- Shock resistance 112
- Signal on alarm 103
- SIP cleaning 112
- Software release 49
- Spare part 97
- Spare parts 97
- Special connection instructions 31
- Special mounting instructions
 - Sanitary compatibility 22
- Standards and guidelines 119
- Status area
 - For operational display 37
- Status signals 80, 83
- Storage conditions 17
- Storage temperature 17
- Storage temperature range 111
- Structure
 - Operating menu 35
- Submenu
 - Administration 67, 92
 - Advanced setup 64
 - Calculated values 64
 - Communication 54, 59
 - Device information 93
 - Events list 90
 - Measured values 72
 - Measured variables 72
 - Medium selection 58
 - Overview 36
 - Process variables 64
 - Sensor adjustment 66
 - Simulation 68
 - System units 55
 - Totalizer 74
 - Totalizer 1 to n 67
 - Totalizer handling 75
 - Web server 44
 - Zero point adjustment 66
- Supply voltage 106
- Surface roughness 116
- Symbols
 - For communication 37
 - For diagnostic behavior 37
 - For locking 37
 - For measured variable 37
 - For measurement channel number 37
 - For status signal 37
 - In the status area of the local display 37
- System design
 - Measuring system 101
 - see Measuring device design
- System file
 - Release date 49
 - Source 49
- Version 49
- System integration 49
- System pressure 21
- T**
 - Technical data, overview 101
 - Temperature range
 - Medium temperature 112
 - Storage temperature 17
 - Terminal assignment 28, 30
 - Terminals 107
 - Thermal insulation 21
 - Tools
 - Electrical connection 27
 - For mounting 24
 - Transport 17
 - Totalizer
 - Configuration 67
 - Transmitter
 - Connecting the signal cables 30
 - Turning the display module 25
 - Transporting the measuring device 17
 - Troubleshooting
 - General 77
 - Turning the display module 25
- U**
 - Use of the measuring device
 - Borderline cases 9
 - Incorrect use 9
 - see Designated use
 - User roles 36
- V**
 - Version data for the device 49
 - Vibration resistance 112
 - Vibrations 22
- W**
 - W@M 96, 97
 - W@M Device Viewer 13, 97
 - Weight
 - SI units 114
 - Transport (notes) 17
 - US units 114
 - Wizard
 - Define access code 69
 - Low flow cut off 62
 - Partially filled pipe detection 63
 - Workplace safety 10
 - Write access 38
 - Write protection
 - Via access code 69
 - Via write protection switch 70
 - Write protection switch 70

www.addresses.endress.com
