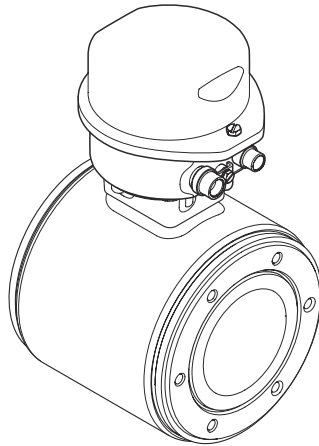


Brief Operating Instructions

Proline Promag H 100

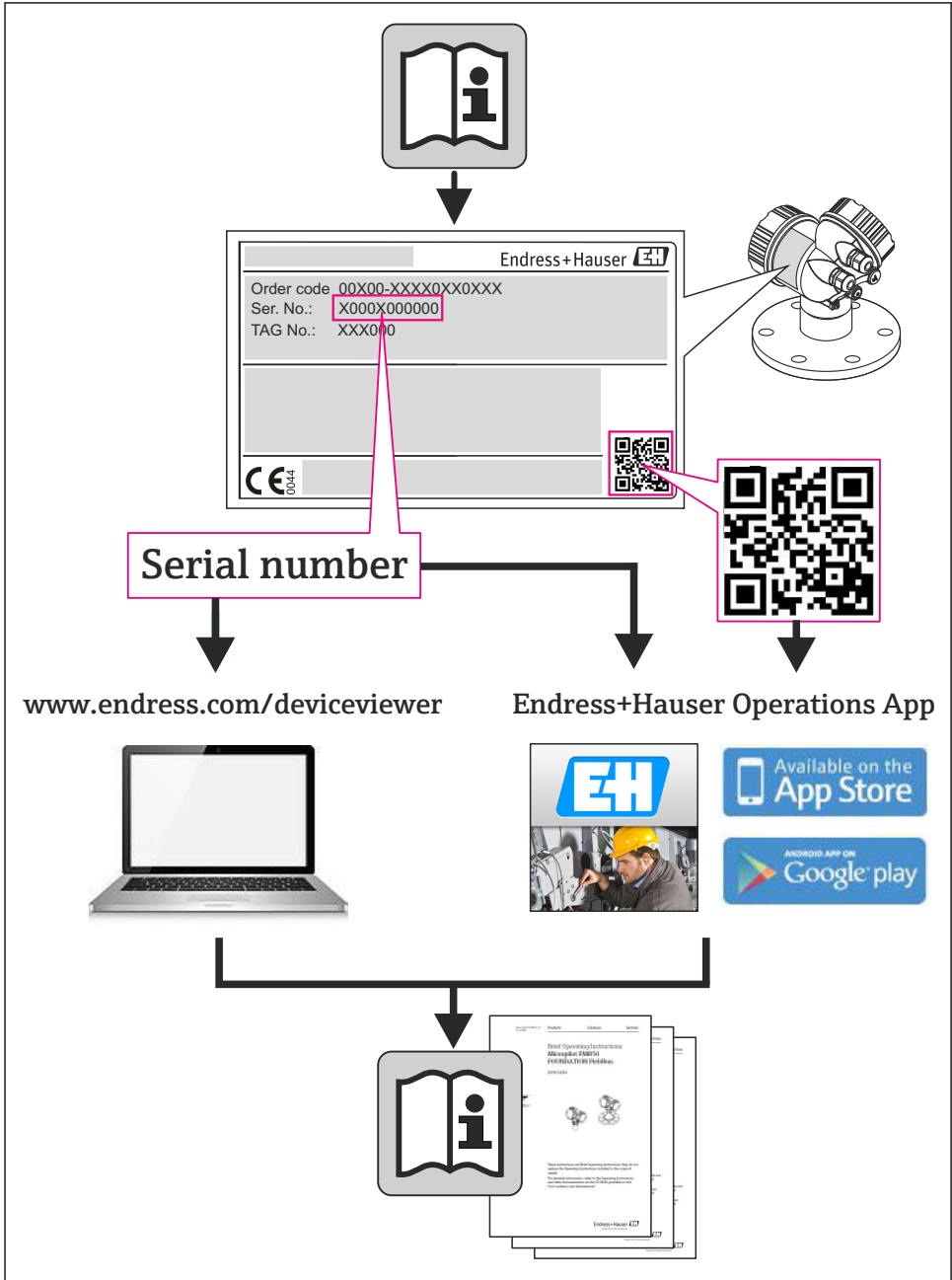
Electromagnetic flowmeter



These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:

- On the CD-ROM supplied (not included in the delivery for all device versions).
- Available for all device versions via:
 - Internet: www.endress.com/deviceviewer
 - Smart phone/tablet: *Endress+Hauser Operations App*



A0023555





Table of contents

1	Document information	4
1.1	Symbols used	4
2	Basic safety instructions	6
2.1	Requirements for the personnel	6
2.2	Designated use	6
2.3	Workplace safety	7
2.4	Operational safety	7
2.5	Product safety	7
2.6	IT security	8
3	Product description	9
3.1	Product design	9
4	Incoming acceptance and product identification	11
4.1	Incoming acceptance	11
4.2	Product identification	12
5	Storage and transport	12
5.1	Storage conditions	12
5.2	Transporting the product	13
6	Mounting	14
6.1	Installation conditions	14
6.2	Mounting the measuring device	18
6.3	Post-installation check	24
7	Electrical connection	24
7.1	Connection conditions	24
7.2	Connecting the measuring device	33
7.3	Hardware settings	37
7.4	Ensuring the degree of protection	41
7.5	Post-connection check	42
8	Operation options	43
8.1	Structure and function of the operating menu	43
8.2	Access to the operating menu via the Web browser	43
8.3	Access to the operating menu via the operating tool	47
9	System integration	47
10	Commissioning	48
10.1	Function check	48
10.2	Establishing a connection via FieldCare	48
10.3	Configuring the device address via software	48
10.4	Configuring the measuring device	49
10.5	Defining the tag name	49
10.6	Protecting settings from unauthorized access	49
11	Diagnostic information	52







1 Document information

1.1 Symbols used



1.1.1 Safety symbols

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











1.1.2 Electrical symbols

Symbol	Meaning
	Direct current A terminal to which DC voltage is applied or through which direct current flows.
	Alternating current A terminal to which alternating voltage is applied or through which alternating current flows.
	Direct current and alternating current <ul style="list-style-type: none"> ▪ A terminal to which alternating voltage or DC voltage is applied. ▪ A terminal through which alternating current or direct current flows.
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.
	Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.



1.1.3 Tool symbols



Symbol	Meaning
	Allen key
	Open-ended wrench

1.1.4 Symbols for certain types of information

Symbol	Meaning
	Permitted Indicates procedures, processes or actions that are permitted.
	Preferred Indicates procedures, processes or actions that are preferred.
	Forbidden Indicates procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation Refers to the corresponding device documentation.
	Reference to page Refers to the corresponding page number.
	Reference to graphic Refers to the corresponding graphic number and page number.
	Series of steps
	Result of a sequence of actions
	Visual inspection

1.1.5 Symbols in graphics

Symbol	Meaning
1, 2, 3,...	Item numbers
	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
	Flow direction

Symbol	Meaning
	Hazardous area Indicates a hazardous area.
	Safe area (non-hazardous area) Indicates the non-hazardous area.

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel must fulfill the following requirements for its tasks:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task
- ▶ Are authorized by the plant owner/operator
- ▶ Are familiar with federal/national regulations
- ▶ Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- ▶ Following instructions and basic conditions

2.2 Designated use

Application and media

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

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

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

- ▶ Only use the measuring device in full compliance with the data on the nameplate and the general conditions listed in the Operating Instructions and supplementary documentation.
- ▶ 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 against which the process-wetted materials are adequately resistant.
- ▶ If the measuring device is not operated at atmospheric temperature, compliance with the relevant basic conditions specified in the associated device documentation is absolutely essential: "Device documentation" section (**Verweisziel existiert nicht, aber @y.link.required=true**).

Incorrect use

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

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

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

Verification for borderline cases:

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

Residual risks

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

Possible burn hazard due to fluid temperatures!

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

2.3 Workplace safety

For work on and with the device:

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

For welding work on the piping:

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

If working on and with the device with wet hands:

- ▶ It is recommended to wear gloves on account of the higher risk of electric shock.

2.4 Operational safety

Risk of injury.

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

2.5 Product safety

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

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

2.6 IT security

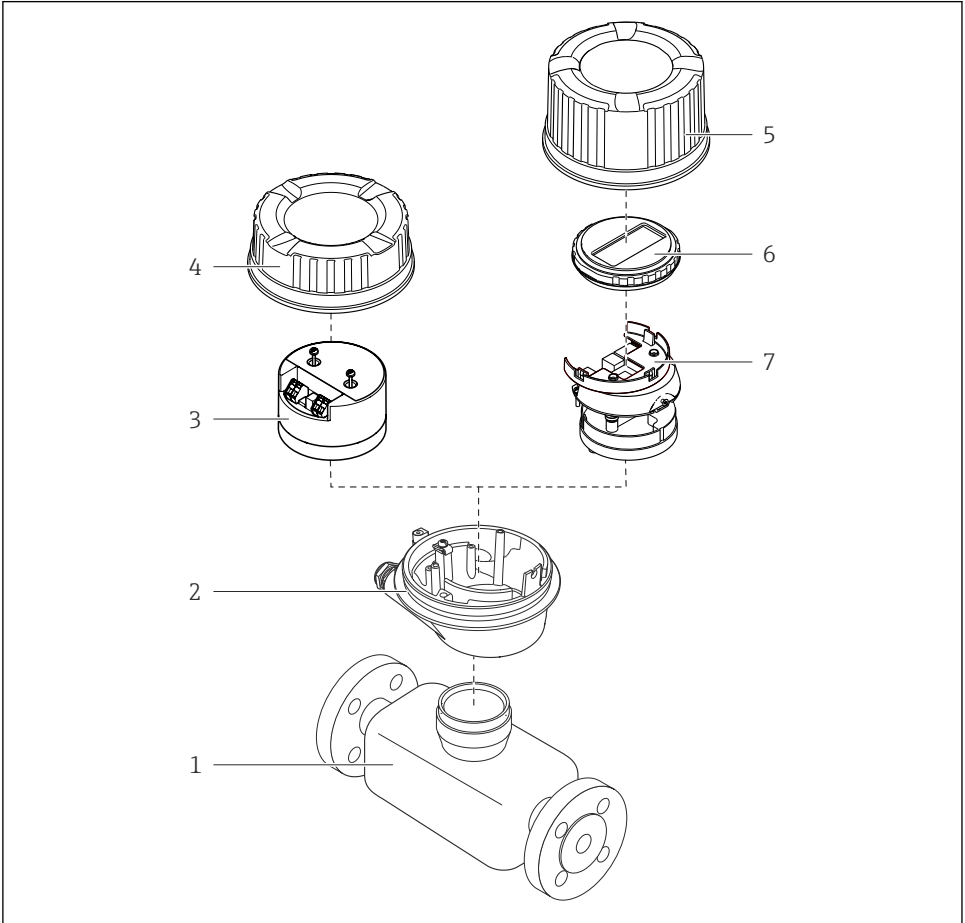
We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

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

3 Product description

3.1 Product design

3.1.1 Device version with HART, EtherNet/IP and PROFIBUS DP communication types



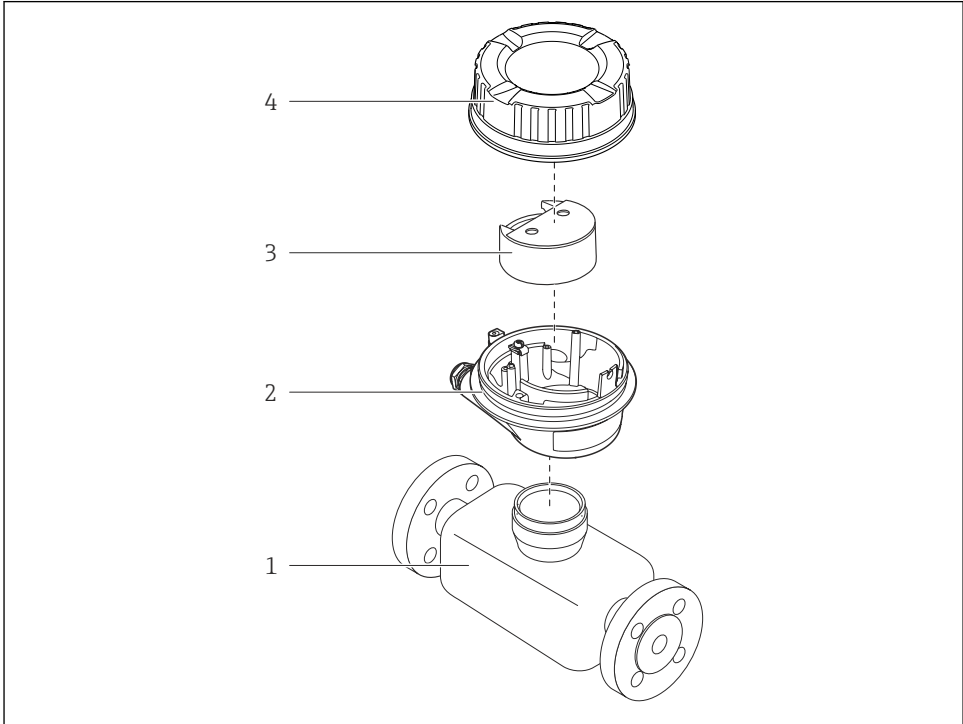
A0023153

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 onsite display)
- 6 Onsite display (optional)
- 7 Main electronics module (with bracket for optional onsite display)

3.1.2 Device version with Modbus RS485 communication types



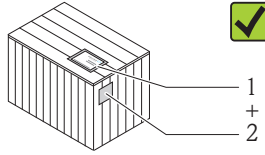
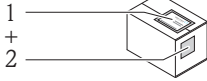
A0017609

2 Important components of a measuring device

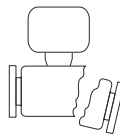
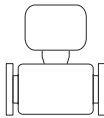
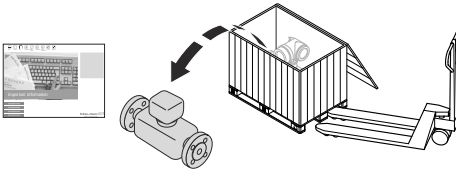
- 1 Sensor
- 2 Transmitter housing
- 3 Main electronics module
- 4 Transmitter housing cover

4 Incoming acceptance and product identification

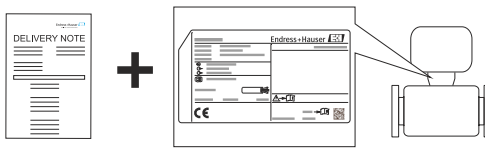
4.1 Incoming acceptance



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



Are the goods undamaged?



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



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

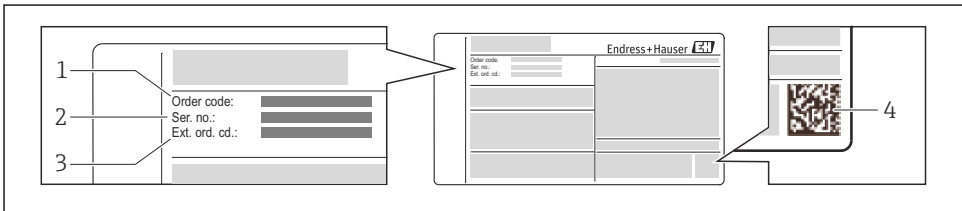


- If one of the conditions is not satisfied, contact your Endress+Hauser Sales Center.
- Depending on the device version, the CD-ROM might not be part of the delivery! The Technical Documentation is available via the Internet or via the *Endress+Hauser Operations App*.

4.2 Product identification

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


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



A0021952

3 Example of a nameplate


- 1 Order code
- 2 Serial number (Ser. no.)
- 3 Extended order code (Ext. ord. cd.)
- 4 2-D matrix code (QR code)

 For detailed information on the breakdown of the specifications on the nameplate, see the Operating Instructions for the device .

5 Storage and transport

5.1 Storage conditions

Observe the following notes for storage:

- Store in original packaging.
- Do not remove protective covers or protective caps installed on process connections.
- Protect from direct sunlight.
- Select a storage location where moisture cannot collect in the measuring device.
- Store in a dry and dust-free place.
- Do not store outdoors.
- Storage temperature →  14

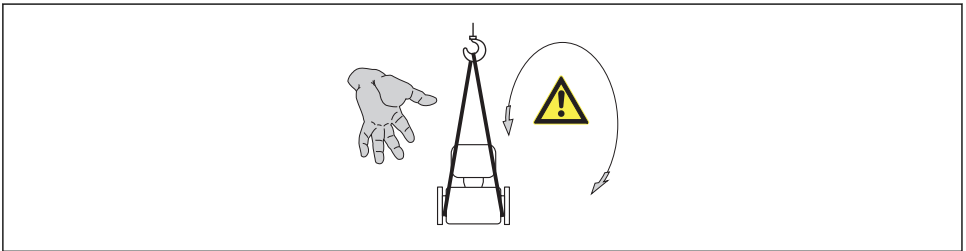
5.2 Transporting the product

⚠ WARNING

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

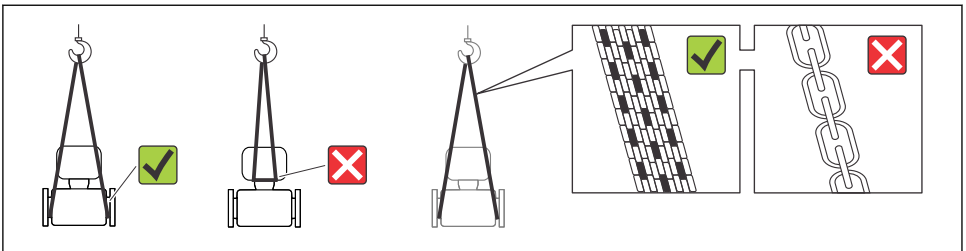
Risk of injury if the measuring device slips.

- ▶ Secure the measuring device from rotating or slipping.
- ▶ Observe the weight specified on the packaging (stick-on label).
- ▶ Observe the transport instructions on the stick-on label on the electronics compartment cover.



A0015606

- i** ■ Transport the measuring device to the measuring point in the original packaging.
- 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.



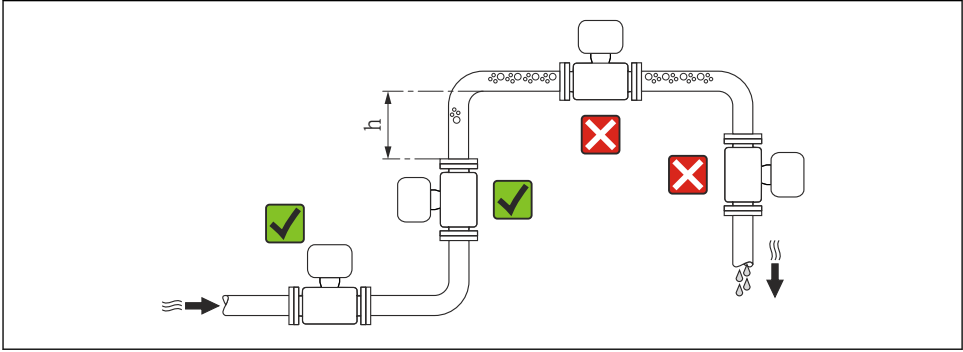
A0015604

6 Mounting

6.1 Installation conditions

6.1.1 Mounting position

Mounting location

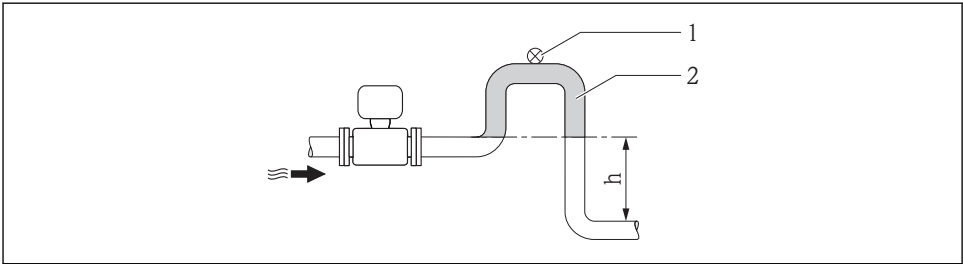


A0023343

$$h \geq 2 \times DN$$

Installation in down pipes

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



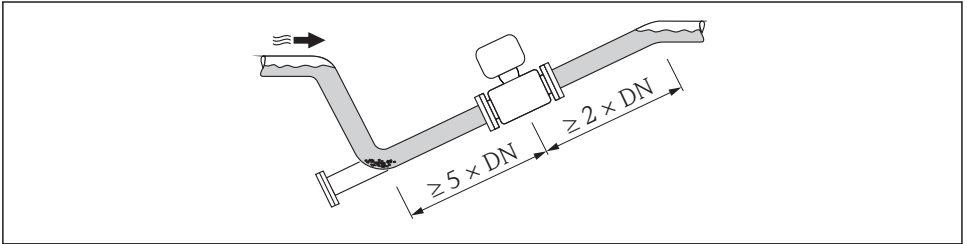
A0017064

4 Installation in a down pipe

- 1 Vent valve
- 2 Pipe siphon
- h Length of down pipe

Installation in partially filled pipes

A partially filled pipe with a gradient necessitates a drain-type configuration. The empty pipe detection (EPD) function offers additional protection by detecting empty or partially filled pipes.



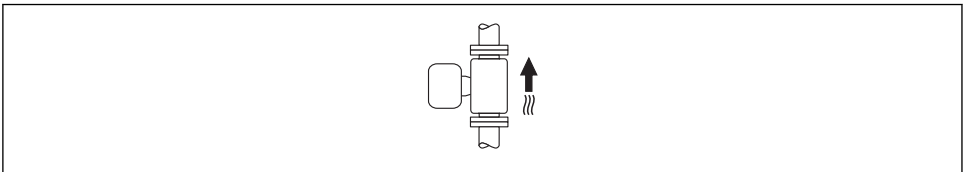
A0017063

Orientation

The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction.

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

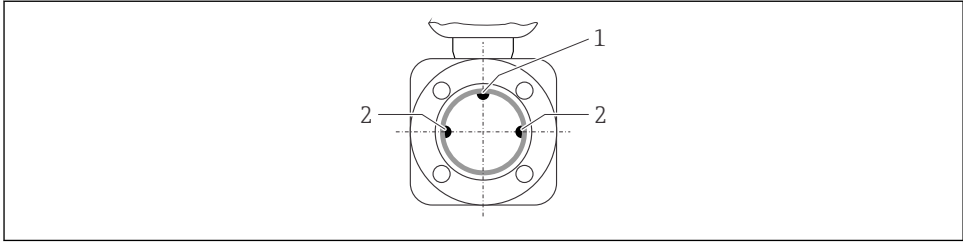
Vertical



A0015591


This is the optimum for self-emptying piping systems and for use in conjunction with empty pipe detection.

Horizontal

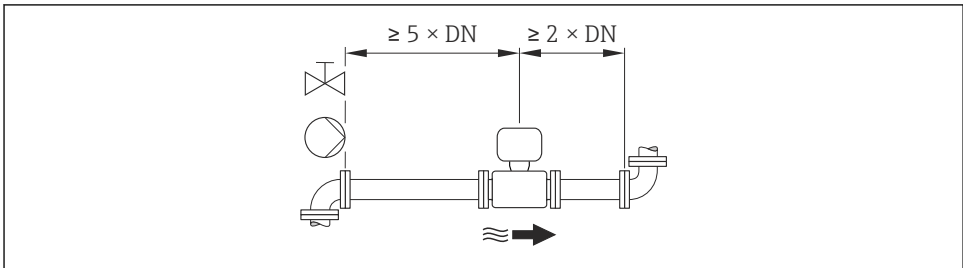


A0019602


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

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

Inlet and outlet runs




A0016275

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

6.1.2 Requirements from environment and process

Ambient temperature range

-  For detailed information on the ambient temperature range, see the Operating Instructions for the device ([Verweisziel existiert nicht, aber @y.link.required=true'](#))

If operating outdoors:

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

Temperature tables

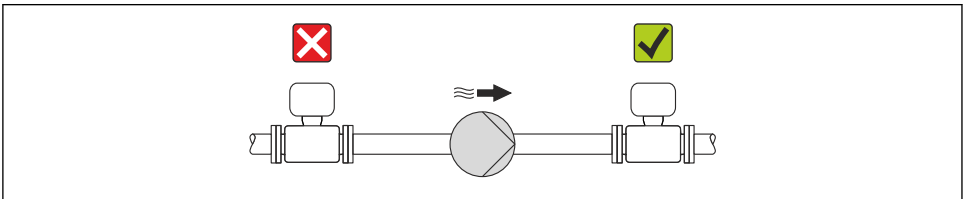
SI units

T _a [°C]	T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
30	50	95	130	150	150	150
50	-	95	130	150	150	150
60	-	95	110	110	110	110

US units

T _a [°F]	T6 [185 °F]	T5 [212 °F]	T4 [275 °F]	T3 [392 °F]	T2 [572 °F]	T1 [842 °F]
86	122	203	266	302	302	302
122	-	203	266	302	302	302
140	-	203	230	230	230	230

System pressure

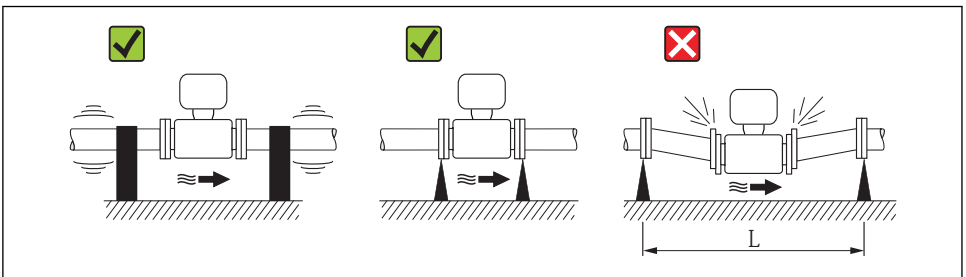


A001594



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

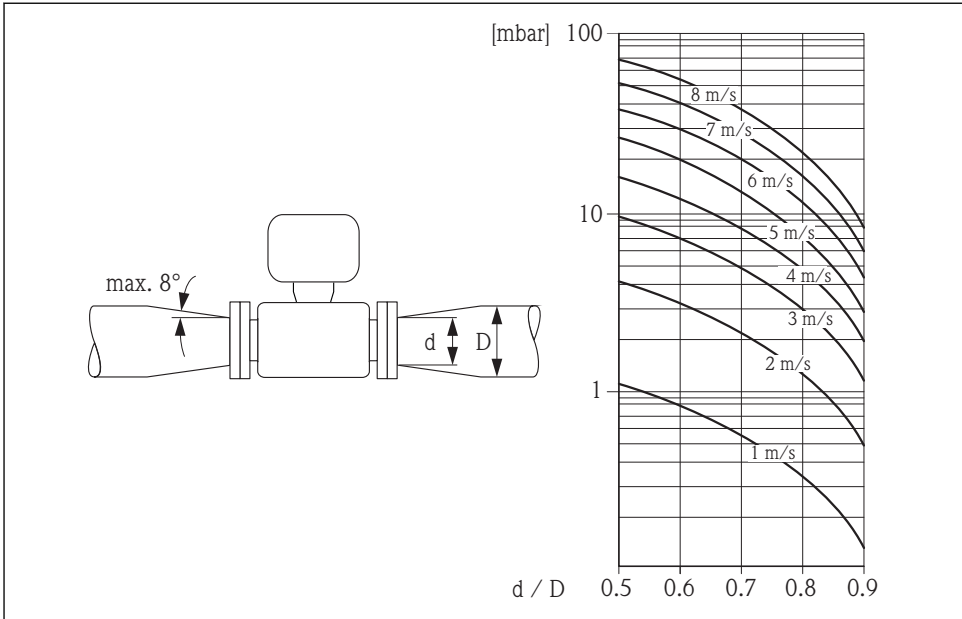
Vibrations



A0016266

5 Measures to avoid device vibrations ($L > 10\text{ m (33 ft)}$)

Adapters



A0016359

6.2 Mounting the measuring device

6.2.1 Required tools

For sensor

For flanges and other process connections:

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

6.2.2 Preparing the measuring device

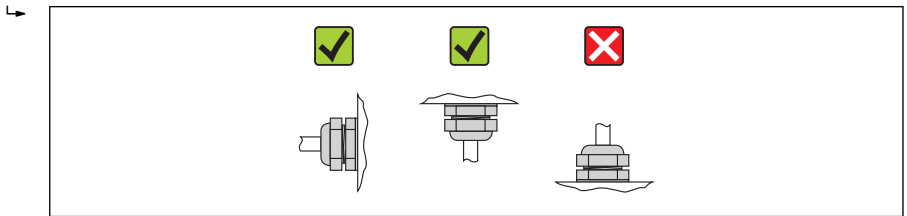
1. Remove all remaining transport packaging.
2. Remove any protective covers or protective caps present from the sensor.
3. Remove stick-on label on the electronics compartment cover.

6.2.3 Mounting the sensor

⚠ WARNING

Danger due to improper process sealing!

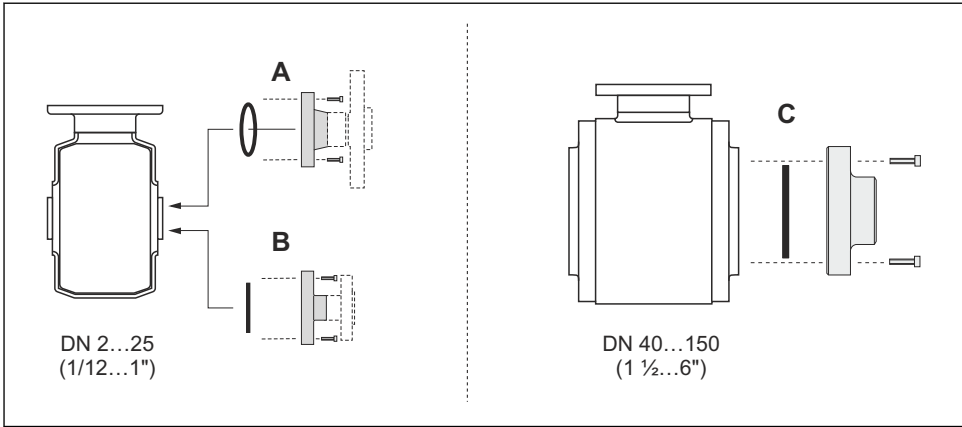
- ▶ Ensure that the inside diameters of the gaskets are greater than or equal to that of the process connections and piping.
 - ▶ Ensure that the gaskets are clean and undamaged.
 - ▶ Install the gaskets correctly.
1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
 2. To ensure compliance with device specifications, install the measuring device between the pipe flanges in a way that it is centered in the measurement section.
 3. Install the measuring device or turn the transmitter housing so that the cable entries do not point upwards.



A0013964

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

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



6 Process connection seals

A Process connections with O-ring seal

B Process connections with aseptic molded seal, DN 2 to 25 (1/12 to 1")

C Process connections with aseptic molded seal, DN 40 to 150 (1 1/2 to 6")

Welding the sensor into the pipe (welding connections)

⚠ WARNING

Risk of destroying the electronics!

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

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



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

Cleaning with pigs

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


Mounting the seals

Comply with the following instructions when installing seals:

- When mounting the process connections, make sure that the seals concerned are clean and centered correctly.
- In the case of metal process connections, the screws must be tightened securely. The process connection forms a metal connection with the sensor, which ensures a defined compression of the seal.
- In the case of plastic process connections, comply with the max. screw tightening torques for lubricated threads: 7 Nm (5.2 lbf ft). In the case of plastic flanges, always insert a seal between the connection and the counterflange.
- Depending on the application the seals should be replaced periodically, particularly if molded seals are used (aseptic version)! The interval between changes depends on the frequency of the cleaning cycles, the cleaning temperature and the medium temperature. Replacement seals can be ordered as an accessory .

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

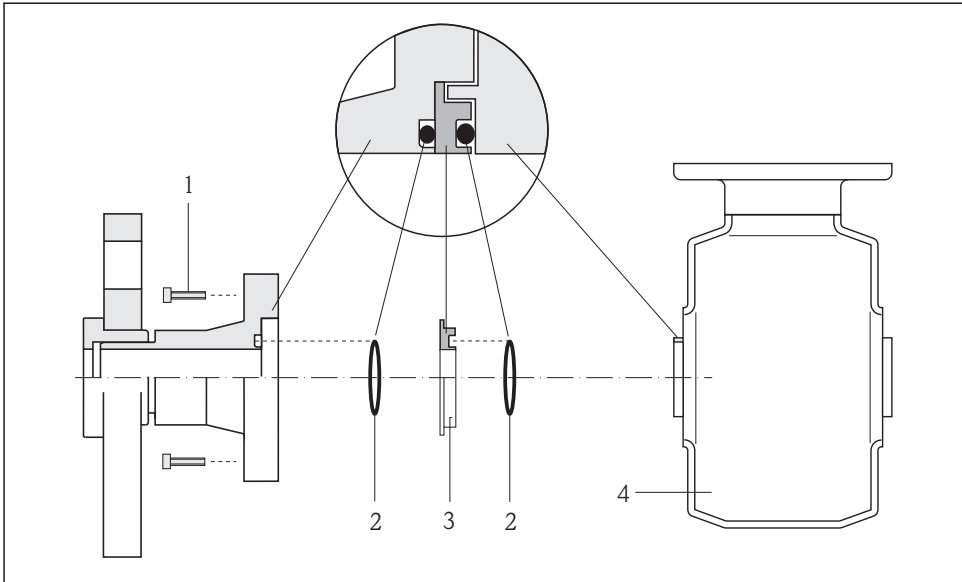


Pay attention to the information on potential equalization →  35.

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



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



A0002651

7 Installing grounding rings

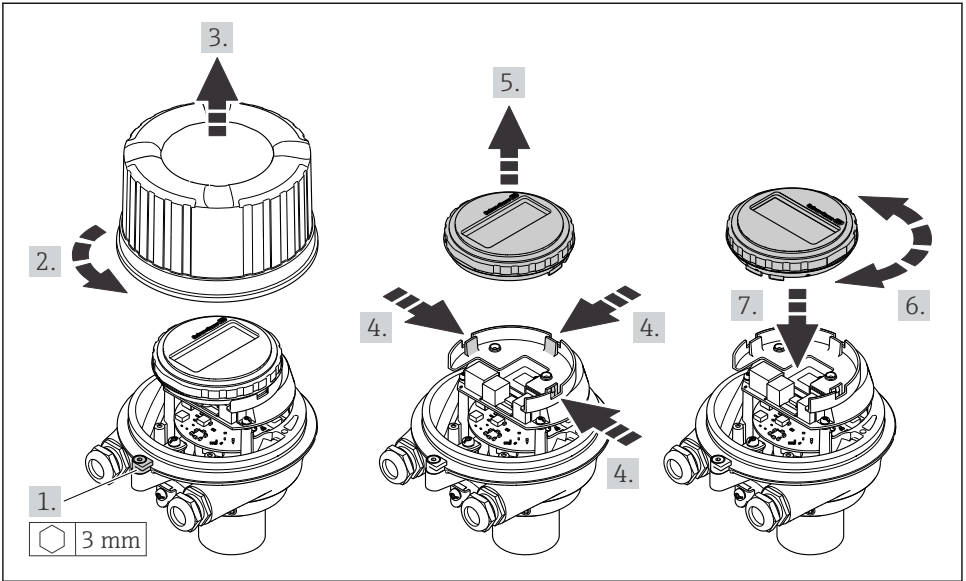
- 1 Hexagonal-headed bolts of process connection
- 2 O-ring seals
- 3 Grounding ring or plastic disk (spacer)
- 4 Sensor

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

6.2.4 Turning the display module

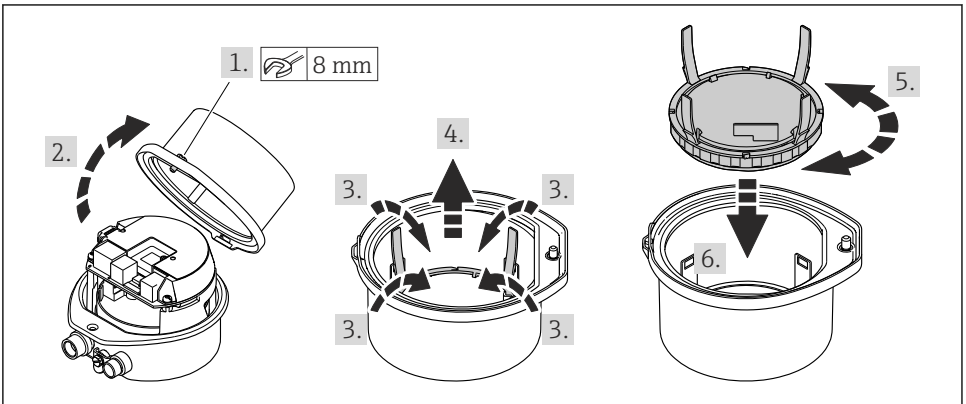
The display module can be turned to optimize display readability.

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 ■ Process pressure (refer to the section on "Pressure-temperature ratings" in the "Technical Information" document on the CD-ROM provided) ■ 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 ?	<input type="checkbox"/>
Are the measuring point identification and labeling correct (visual inspection)?	<input type="checkbox"/>
Have the fixing screws been tightened with the correct tightening torque?	<input type="checkbox"/>

7 Electrical connection



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

7.1 Connection conditions

7.1.1 Required tools

- For cable entries: Use corresponding tools
- For securing clamp (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: crimping tool for ferrule

7.1.2 Requirements for connecting cable

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

Electrical safety

In accordance with applicable federal/national regulations.

Permitted temperature range

- -40 °C (-40 °F) to $+80\text{ °C}$ ($+176\text{ °F}$)
- Minimum requirement: cable temperature range \geq ambient temperature $+20\text{ K}$

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output

For 4-20 mA HART: Shielded cable recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

PROFIBUS DP

The IEC 61158 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	<30 pF/m
Wire cross-section	>0.34 mm ² (22 AWG)
Cable type	Twisted pairs
Loop resistance	\leq 110 Ω /km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shielding	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

Modbus RS485

The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	<30 pF/m
Wire cross-section	>0.34 mm ² (22 AWG)
Cable type	Twisted pairs
Loop resistance	\leq 110 Ω /km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shielding	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

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 the ODVA Organization.

Cable diameter

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

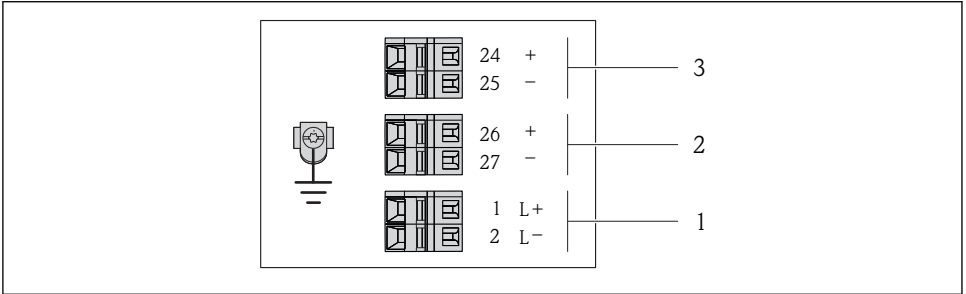
7.1.3 Terminal assignment

Transmitter

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

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

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



A0016888

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

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

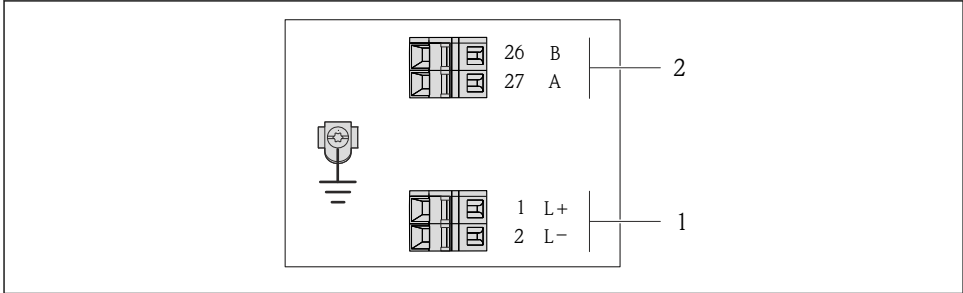
Order code for "Output"	Terminal number					
	Power supply		Output 1		Output 2	
	2 (L-)	1 (L+)	27 (-)	26 (+)	25 (-)	24 (+)
Option B	DC 24 V		4-20 mA HART (active)		Pulse/frequency/switch output (passive)	
Order code for "Output": Option B : 4-20 mA HART with pulse/frequency/switch output						

PROFIBUS DP connection version

 For use in the non-hazardous area and Zone 2/Div. 2.

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

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



A0022716

 9 *PROFIBUS DP terminal assignment*

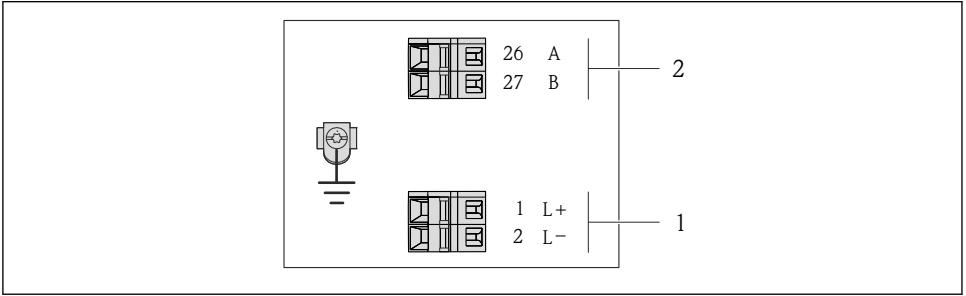
- 1 Power supply: DC 24 V
- 2 PROFIBUS DP

Order code for "Output"	Terminal number			
	Power supply		Output	
	2 (L-)	1 (L+)	26 (RxD/TxD-P)	27 (RxD/TxD-N)
Option L	DC 24 V		B	A
Order code for "Output": Option L: PROFIBUS DP, for use in non-hazardous areas and Zone 2/div. 2				

Modbus RS485 connection version

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

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



A0019528

10 *Modbus RS485 terminal assignment*

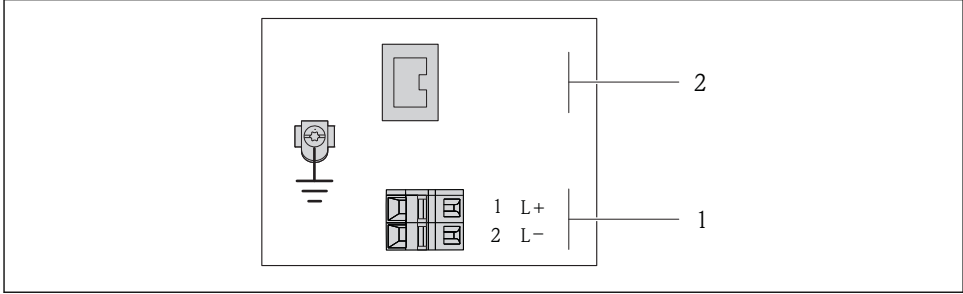
- 1 Power supply: DC 24 V
- 2 Modbus RS485

Order code for "Output"	Terminal number			
	Power supply		Output	
	2 (L-)	1 (L+)	27 (B)	26 (A)
Option M	DC 24 V		Modbus RS485	
Order code for "Output": Option M : Modbus RS485				

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.



A0017054

11 EtherNet/IP terminal assignment

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

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

7.1.4 Pin assignment, device plug

Supply voltage

For all connection versions (device side)

	Pin	Assignment	Coding A	Plug/socket Plug
	1	L+		
2				
3				
4	L-	DC 24 V		
5		Grounding/shielding		

A0016809

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

Device plug for signal transmission (device side)

<p style="text-align: right; font-size: small;">A0016810</p>	Pin	Assignment	Coding	Plug/socket	
	1	+	4-20 mA HART (active)	A	Socket
	2	-	4-20 mA HART (active)		
	3	+	Pulse/frequency/switch output (passive)		
	4	-	Pulse/frequency/switch output (passive)		
5		Grounding/shielding			

PROFIBUS DP



For use in the non-hazardous area and Zone 2/Div. 2.

Device plug for signal transmission (device side)

<p style="text-align: right; font-size: small;">A0016811</p>	Pin	Assignment	Coding	Plug/socket	
	1			B	Socket
	2	A	PROFIBUS DP		
	3				
	4	B	PROFIBUS DP		
5		Grounding/shielding			

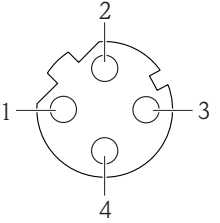
MODBUS RS485

Device plug for signal transmission (device side)

<p style="text-align: right; font-size: small;">A0016811</p>	Pin	Assignment	Coding	Plug/socket	
	1			B	Socket
	2	A	Modbus RS485		
	3				
	4	B	Modbus RS485		
5		Grounding/shielding			

EtherNet/IP

Device plug for signal transmission (device side)

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

7.1.5 Shielding and grounding

The shielding and grounding concept requires compliance with the following:

- Electromagnetic compatibility (EMC)
- Explosion protection
- Personal protection equipment
- National installation regulations and guidelines
- Observe cable specification → 24.
- Keep the stripped and twisted lengths of cable shield to the ground terminal as short as possible.
- Seamless cable shielding.

Grounding of the cable shield

To comply with EMC requirements:

- Ensure the cable shield is grounded to the potential matching line at multiple points.
- Connect every local ground terminal to the potential matching line.

NOTICE

In systems without potential matching, the multiple grounding of the cable shield causes mains frequency equalizing currents!

Damage to the bus cable shield.

- ▶ Only ground the bus cable shield to either the local ground or the protective ground at one end.

7.1.6 Preparing the measuring device

1. Remove dummy plug if present.

2. NOTICE

Insufficient sealing of the housing!

Operational reliability of the measuring device could be compromised.

- ▶ Use suitable cable glands corresponding to the degree of protection.

If measuring device is delivered without cable glands:

Provide suitable cable gland for corresponding connecting cable → 24.

3. If measuring device is delivered with cable glands:

Observe cable specification → 24.

7.2 Connecting the measuring device

NOTICE

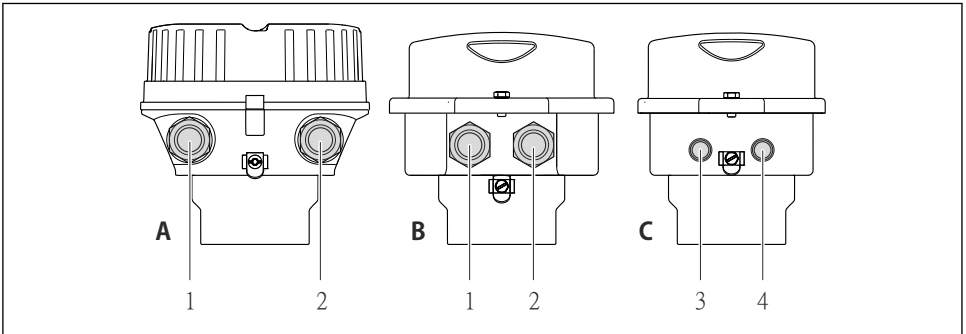
Limitation of electrical safety due to incorrect connection!

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

7.2.1 Connecting the transmitter

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

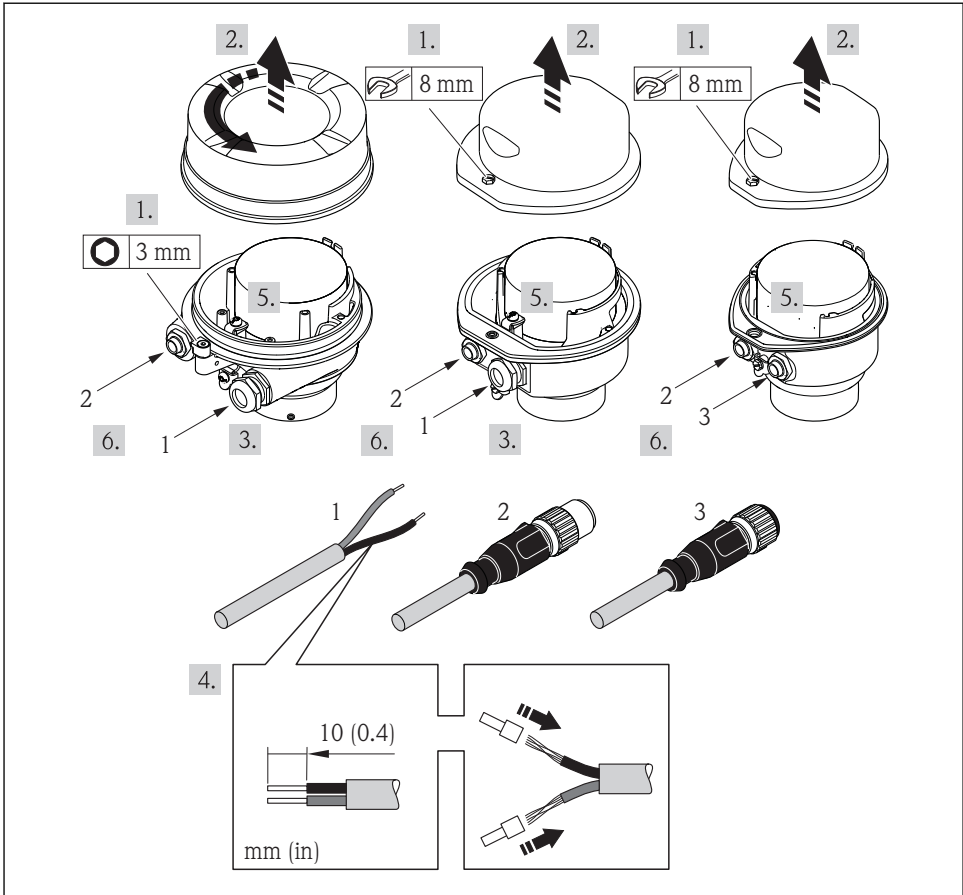
- Housing version: compact or ultra-compact
- Connection version: device plug or terminals



A0016924

12 Device versions and connection versions

- A Housing version: compact, aluminum coated
- B Housing version: compact hygienic, stainless
- 1 Cable entry or device plug for signal transmission
- 2 Cable entry or device plug for supply voltage
- C Housing version: ultra-compact hygienic, stainless, M12 device plug
- 3 Device plug for signal transmission
- 4 Device plug for supply voltage



A0017844

13 Device versions with connection examples

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

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

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

7.2.2 Ensuring potential equalization

CAUTION

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

- ▶ Make sure that the fluid and sensor have the same electrical potential.
- ▶ Pay attention to internal grounding concepts in the company.
- ▶ Pay attention to the pipe material or grounding.

Connection examples for standard situations

Metal process connections

Potential matching usually takes place via the metallic process connections in contact with medium which are directly mounted on the measuring transmitter. This usually means that additional potential matching measures are unnecessary.

Connection example in special situations

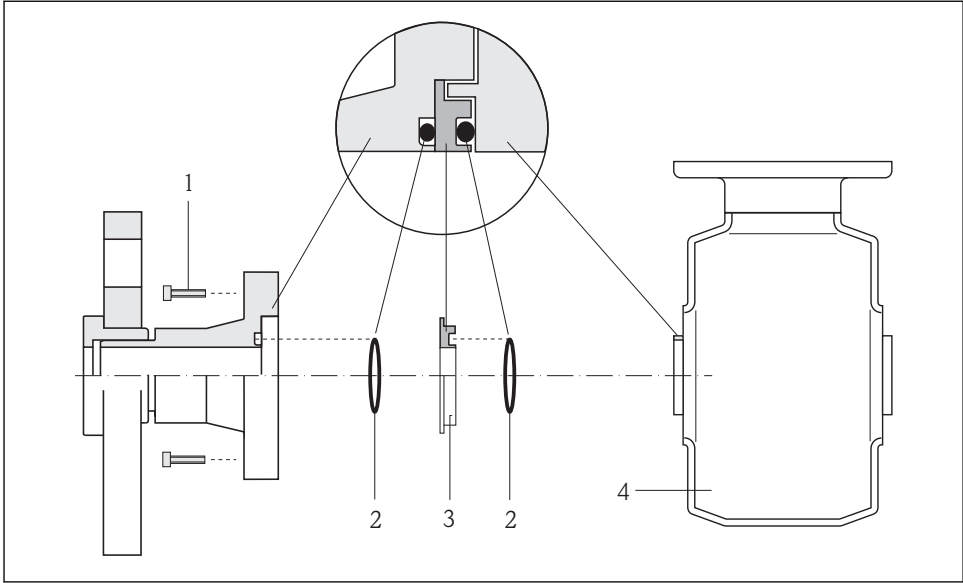
Plastic process connections

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

Note the following when using grounding rings:

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

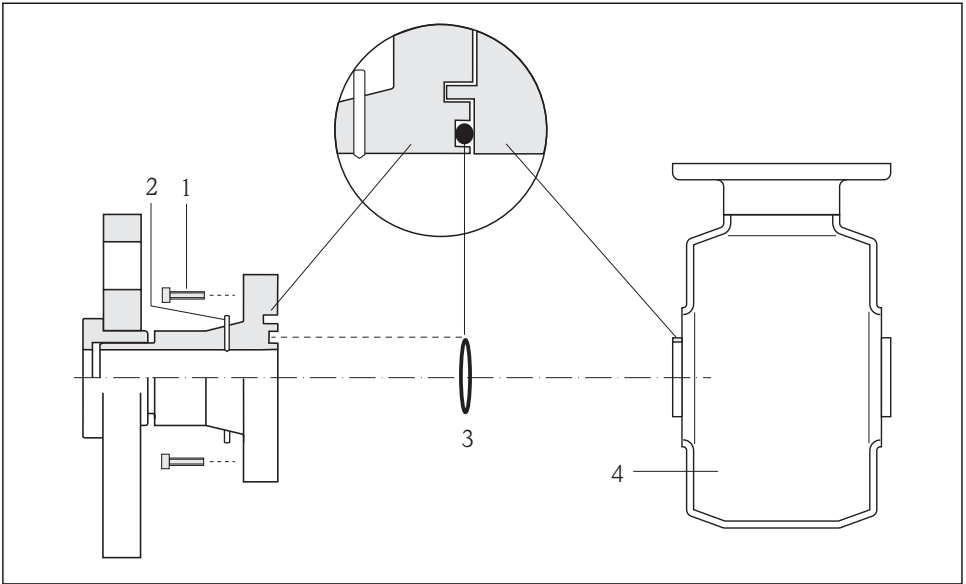
Potential equalization via additional grounding ring



A0002651

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

Potential equalization via grounding electrodes on process connection



A0017293

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

7.3 Hardware settings

7.3.1 Setting the device address



EtherNet/IP

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

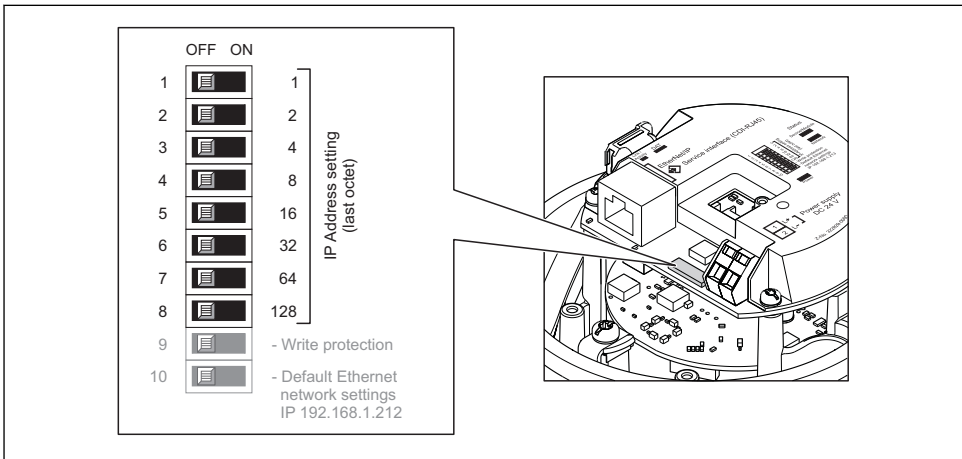
Addressing data

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 →  48

Setting the address

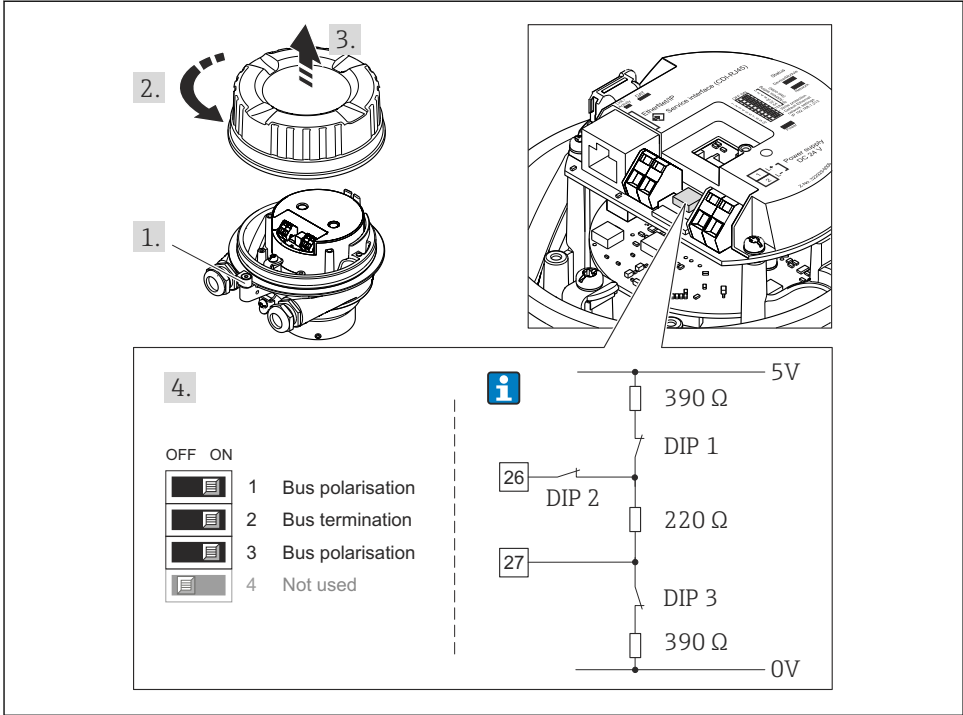


A0017913

- ▶ 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.

PROFIBUS DP

The address must always be configured for a PROFIBUS DP/PA device. The valid address range is between 1 and 126. In a PROFIBUS DP/PA network, each address can only be assigned once. If an address is not configured correctly, the device is not recognized by the master. All measuring devices are delivered from the factory with the device address 126 and with the software addressing method.



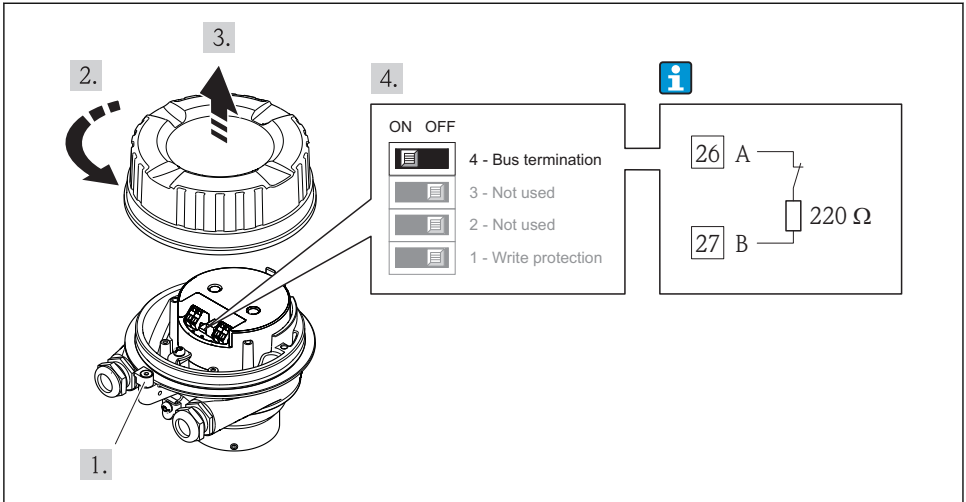
A0021274

15 Termination using DIP switches on the I/O electronics module (for baud rates < 1.5 MBaud)

Modbus RS485

To avoid incorrect communication transmission caused by impedance mismatch, terminate the Modbus RS485 cable correctly at the start and end of the bus segment.

If the transmitter is used in the non-hazardous area or Zone 2/Div. 2



A0017610

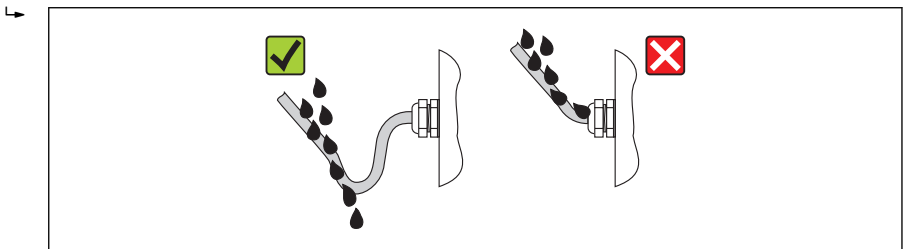
16 Terminating resistor can be enabled via DIP switch on the main electronics module

7.4 Ensuring the degree of protection

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

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







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



A0013960

5. Insert dummy plugs into unused cable entries.

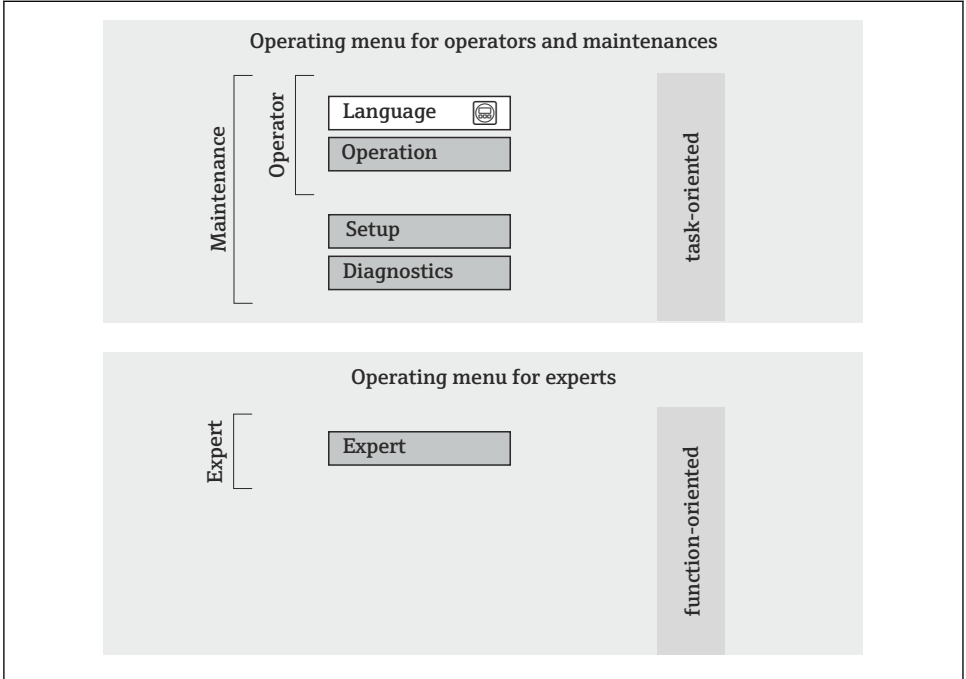
7.5 Post-connection check

Are cables or the device undamaged (visual inspection)?	<input type="checkbox"/>
Do the cables comply with the requirements →  24?	<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" →  41 ?	<input type="checkbox"/>
Depending on the device version: are all the device plugs firmly tightened →  33?	<input type="checkbox"/>
<ul style="list-style-type: none"> ■ Does the supply voltage match the specifications on the transmitter nameplate ? ■ For device version with Modbus RS485 intrinsically safe: does the supply voltage match the specifications on the nameplate of the Safety Barrier Promass 100 ? 	<input type="checkbox"/>
Is the terminal assignment or the pin assignment of the device plug correct?	<input type="checkbox"/>
<ul style="list-style-type: none"> ■ If supply voltage is present, is the power LED on the electronics module of the transmitter lit green →  9? ■ For device version with Modbus RS485 intrinsically safe, if supply voltage is present, is the power LED on the Safety Barrier Promass 100 lit →  9? 	<input type="checkbox"/>
Is the potential equalization established correctly →  35?	<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 Structure and function of the operating menu

8.1.1 Structure of the operating menu



A0014058-EN

 17 Schematic structure of the operating menu

8.1.2 Operating philosophy

The individual parts of the operating menu are assigned to certain user roles. Each user role corresponds to typical tasks within the device lifecycle.



For detailed information about the operating philosophy of the device, see the Operating Instructions for the device ([Verweisziel existiert nicht, aber @.link.required=true'](#)).

8.2 Access to the operating menu via the Web browser

This type of access is available with the following device version:
Order code for "Output", option **N**: EtherNet/IP

8.2.1 Function range

Thanks to the integrated Web server the device can be operated and configured via a Web browser.

8.2.2 Prerequisites

Hardware

Connecting cable	Standard Ethernet cable with RJ45 connector																														
Computer	RJ45 interface																														
Measuring device:	Web server must be enabled; factory setting: ON																														
IP address	<p>If the IP address of the device is not known, communication with the Web server can be established via the standard IP address 192.168.1.212.</p> <p>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 standard IP address 192.168.1.212: set switch DIP switch No. 10 from OFF → ON.</p> <div style="text-align: center;"> <p>OFF ON</p> <table border="1"> <tr><td>1</td><td>[OFF]</td><td>1</td></tr> <tr><td>2</td><td>[OFF]</td><td>2</td></tr> <tr><td>3</td><td>[OFF]</td><td>4</td></tr> <tr><td>4</td><td>[OFF]</td><td>8</td></tr> <tr><td>5</td><td>[OFF]</td><td>16</td></tr> <tr><td>6</td><td>[OFF]</td><td>32</td></tr> <tr><td>7</td><td>[OFF]</td><td>64</td></tr> <tr><td>8</td><td>[OFF]</td><td>128</td></tr> <tr><td>9</td><td>[OFF]</td><td>- Write protection</td></tr> <tr><td>10</td><td>[ON]</td><td>- Default Ethernet network settings IP 192.168.1.212</td></tr> </table> <p>IP Address setting (last octet)</p> </div> <div style="text-align: right;"> </div> <p style="text-align: right; font-size: small;">A0017965</p> <p>i</p> <ul style="list-style-type: none"> ▪ Once the DIP switch has been activated, the device must be restarted before the device uses the standard IP address. ▪ If the standard IP address (DIP switch No. 10 = ON) is used, there is no connection to the EtherNet/IP network. 	1	[OFF]	1	2	[OFF]	2	3	[OFF]	4	4	[OFF]	8	5	[OFF]	16	6	[OFF]	32	7	[OFF]	64	8	[OFF]	128	9	[OFF]	- Write protection	10	[ON]	- Default Ethernet network settings IP 192.168.1.212
1	[OFF]	1																													
2	[OFF]	2																													
3	[OFF]	4																													
4	[OFF]	8																													
5	[OFF]	16																													
6	[OFF]	32																													
7	[OFF]	64																													
8	[OFF]	128																													
9	[OFF]	- Write protection																													
10	[ON]	- Default Ethernet network settings IP 192.168.1.212																													

Software of the computer

Web browsers supported	<ul style="list-style-type: none"> ▪ Microsoft Internet Explorer (min. 8.x) ▪ Mozilla Firefox ▪ Google chrome
Recommended operating systems	<ul style="list-style-type: none"> ▪ Windows XP ▪ Windows 7

User rights for TCP/IP settings	User rights required for TCP/IP settings (e.g. for changes to IP address, subnet mask)
Computer configuration	<ul style="list-style-type: none"> ▪ JavaScript is 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.

8.2.3 Establishing a connection

Configuring the Internet protocol of the computer


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

IP address of the device: 192.168.1.212 (factory setting)

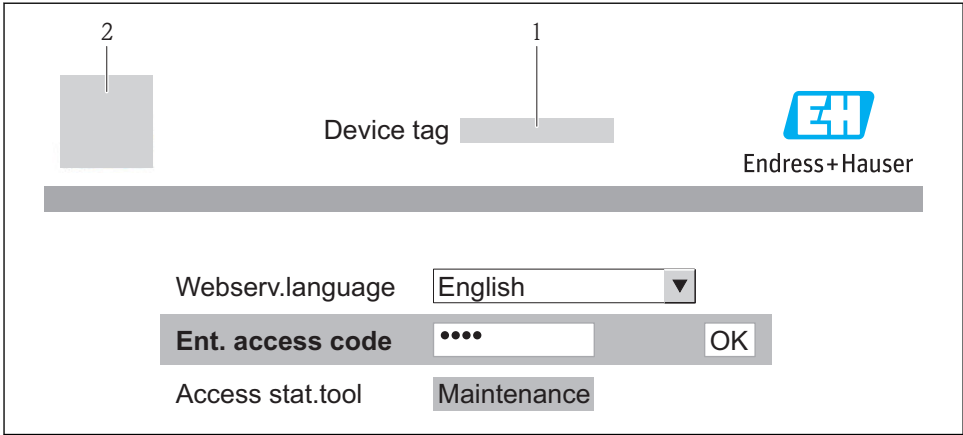
IP address	192.168.1.XXX; for XXX all numerical values except: 0, 212 and 255 → e.g. 192.168.1.213
Subnet mask	255.255.255.0
Default gateway	192.168.1.212 or leave cells empty

1. Switch on the measuring device and connect to the computer via the cable .
2. If a 2nd network card is not used: all the applications on the notebook should be closed, or all the applications that require the Internet or network, such as e-mail, SAP applications, Internet or Windows Explorer, i.e. close all open Internet browsers.
3. Configure the properties of the Internet protocol (TCP/IP) as defined in the table above.

Starting the Web browser

1. Enter the IP address of the Web server in the address line of the Web browser: 192.168.1.212
2. If the IP address of the measuring device is known, enter the defined device address in the address line of the Web browser. If it is unknown, set DIP switch No. 10 to ON, restart the device and enter the standard IP address: 192.168.1.212 →  44.

The login page appears.



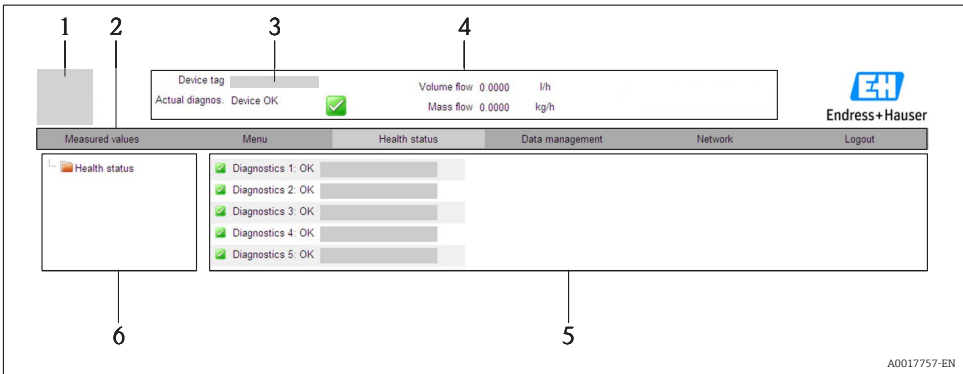
A0017362

- 1 Device tag → 49
- 2 Picture of device

8.2.4 Logging on

Access code	0000 (factory setting); can be changed by customer → 49
--------------------	--

8.2.5 User interface




A0017757-EN

- 1 Picture of device
- 2 Function row with 6 functions
- 3 Device tag
- 4 Header
- 5 Working area
- 6 Navigation area

Header

The following information appears in the header:

- Device tag →  49
- Device status with status signal
- Current measured values

Function row

Functions	Meaning
Measured values	The measured values of the device are displayed
Menu	Access to the operating menu structure of the device, same as for the operating tool
Device status	Displays the diagnostic messages currently pending, listed in order of priority
Data management	<ul style="list-style-type: none"> ■ Data exchange between PC and measuring device: <ul style="list-style-type: none"> – Upload the configuration from the device (XML format, create configuration back-up) – Save the configuration to the device (XML format, restore configuration) – Export the event list (.csv file) – Export parameter settings (.csv file, create documentation of the measuring point configuration) – Export the Heartbeat verification log (PDF file, only available with the "Heartbeat Verification" application package) ■ Upload the device driver for system integration from the device
Network configuration	Configuration and checking of all the parameters required for establishing the connection to the 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

8.3 Access to the operating menu via the operating tool



For detailed information about access to the operating menu via operating tool, refer to the Operating Instructions for the device (**Verweiszil existiert nicht, aber @y.link.required=true**).

9 System integration



For information on system integration, see the Operating Instructions for the device (**Verweiszil existiert nicht, aber @y.link.required=true**).





Applies only to device version with EtherNet/IP communication type

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 → Feldbus device integration → EtherNet/IP

10 Commissioning

10.1 Function check

Before commissioning the device, make sure that the post-installation and post-connection checks have been performed.

- "Post-installation check" checklist →  24
- "Post-connection check" checklist →  42

10.2 Establishing a connection via FieldCare

- For FieldCare connection →  47
- For establishing a connection via FieldCare

10.3 Configuring the device address via software

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


Navigation


"Setup" menu → Communication → Device address

10.3.1 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: Operating Instructions for the device

10.3.2 PROFIBUS network

At time of delivery, the measuring device has the following factory setting:

Device address	126
----------------	-----

-  If hardware addressing is active, software addressing is blocked →  37

10.4 Configuring the measuring device

The **Setup** menu with its submenus is used for fast commissioning of the measuring device. The submenus contain all the parameters required for configuration, such as parameters for measurement or communication.

Submenu	Meaning
System units	Configuring the units for all measured values
Medium selection	Defining the medium
Communication	Configuration of the digital communication interface
Low flow cut off	Configuring the low flow cut off

10.5 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.

Navigation



"Setup" menu → Device tag

Parameter overview with brief description

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

10.6 Protecting settings from unauthorized access

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

- Write protection via access code for Web browser →  49
- Write protection via write protection switch →  50

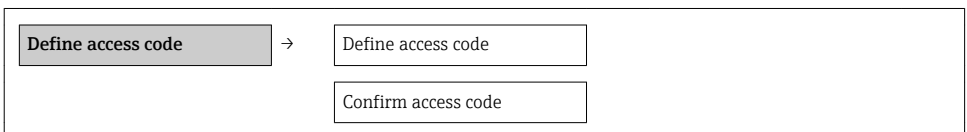
10.6.1 Write protection via access code

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

Navigation


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


Structure of the submenu



Defining the access code via the Web browser

1. Navigate to the **Enter access code** parameter.
2. Define a max. 4-digit numeric code as an access code.
3. Enter the access code again to confirm the code.
 - ↳ The Web browser switches to the login page.

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

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

10.6.2 Write protection via write protection switch

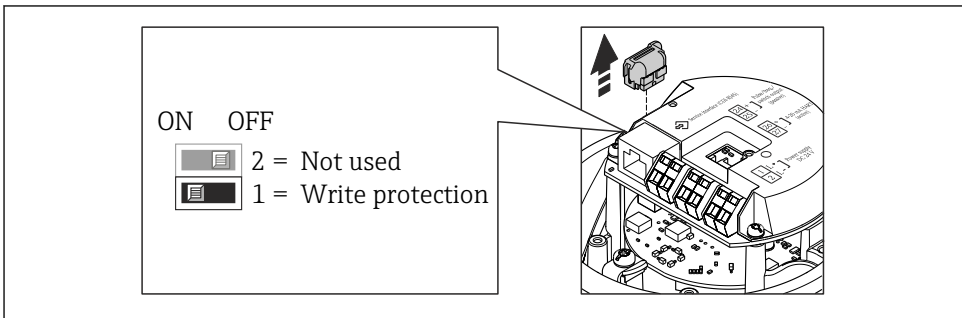
The write protection switch makes it possible to block write access to the entire operating menu with the exception of the following parameters:

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

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

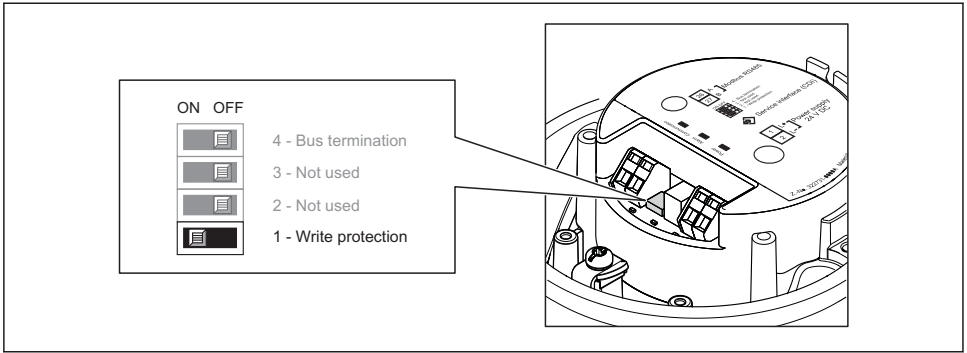
- Via service interface (CDI)
- Via HART protocol
- Via Modbus RS485
- Via service interface (CDI-RJ45)
- Via Ethernet network
- Via PROFIBUS DP

For device version with HART communication type

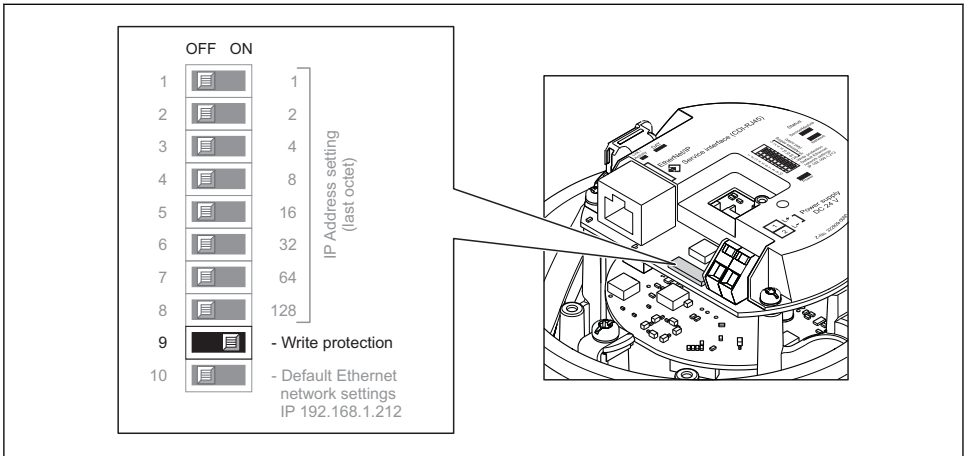


A0022571

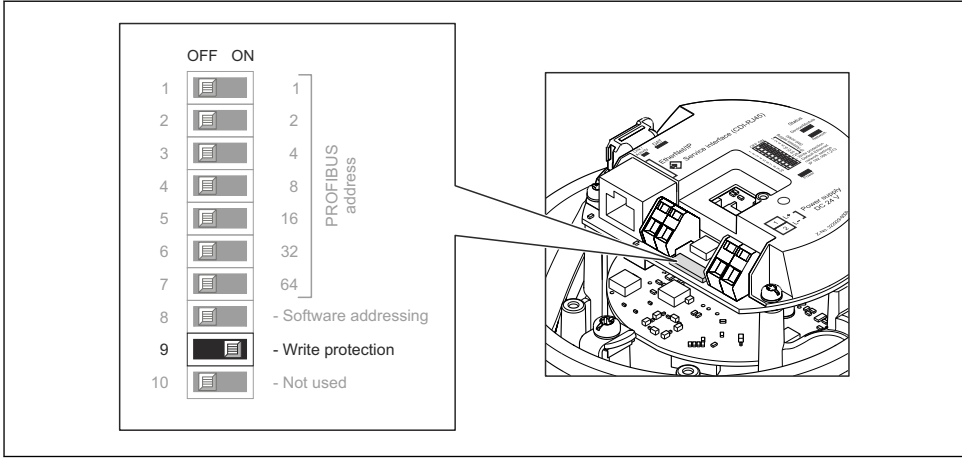
For device version with Modbus RS485 communication type



For device version with EtherNet/IP communication type



For device version with PROFIBUS DP communication type



A0021262

- ▶ Setting the write protection switch on the electronics module to the ON position enables the hardware write protection.
 - ↳ If hardware write protection is enabled, the **Hardware locked** option is displayed in the **Locking status** parameter.

11 Diagnostic information

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

Remedial measures are provided for each diagnostic event to ensure that problems can be rectified quickly.

- Web browser: Remedial measures are displayed in red on the home page next to the diagnostic event.
- FieldCare: Remedial measures are displayed on the home page in a separate field below the diagnostic event.

www.addresses.endress.com
