

Operating Instructions

Proline Promag D 10

Electromagnetic flowmeter
IO-Link

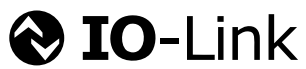


Table of contents

1	About this document	6	8	Commissioning	58
	Document function	6		Post-installation check and post-connection check	58
	Related documentation	6		IT security	58
	Symbols	7		Device-specific IT security	58
	Registered trademarks	9		Switching on the device	59
2	Safety instructions	12		Commissioning the device	60
	Requirements for specialist personnel	12		Backing up or duplicating the device data	60
	Requirements for operating personnel	12	9	Operation	62
	Incoming acceptance and transport	12		Operational display	62
	Adhesive labels, tags and engravings	12		Reading off the device locking status	62
	Environment and process	12		HistoROM data management	63
	Workplace safety	12	10	Diagnostics and troubleshooting	66
	Installation	12		General troubleshooting	66
	Electrical connection	12		Diagnostic information via LED	67
	Surface temperature	13		Diagnostic information on local display	69
	Commissioning	13		Diagnostic information in FieldCare or DeviceCare	70
	Modifications to the device	13		Changing the diagnostic information	71
3	Product information	16		Overview of diagnostic information	71
	Measuring principle	16		Pending diagnostic events	74
	Intended use	16		Diagnostic list	74
	Incoming acceptance	16		Event logbook	74
	Product identification	17		Resetting the device	76
	Transport	19	11	Maintenance	80
	Checking the storage conditions	21		Maintenance tasks	80
	Recycling of packaging materials	21		Services	80
	Product design	22	12	Disposal	82
	Firmware history	24		Removing the device	82
	Device history and compatibility	24		Disposing of the device	82
4	Installation procedure	26	13	Technical data	84
	Installation conditions	26		Input	84
	Device installation	31		Output	85
	Post-installation check	36		Power supply	88
5	Electrical connection	38		Cable specifications	89
	Connecting requirements	38		Performance characteristics	91
	Connecting cable connection	39		Environment	92
	Transmitter connection	43		Process	94
	Ensuring potential equalization	43		Mechanical construction	96
	Removing a cable	45		Local display	101
	Hardware settings	45		Certificates and approvals	102
	Post-connection check	46		Application packages	103
6	Operation	48	14	Dimensions in SI units	106
	Overview of the operating options	48		Compact version	106
	Operation via SmartBlue app	48		Remote version	108
7	System integration	52		Flange connections	111
	Device description files	52		Couplings	114
	Process data	52		Accessories	115
	Information about IO-Link communication	54			
	Switching signals	54			

15	Dimensions in US units	118
	Compact version	118
	Remote version	120
	Flange connections	123
	Couplings	124
	Accessories	125
16	Accessories	128
	Device-specific accessories	128
	Communication-specific accessories	129
	Service-specific accessory	129
	System components	130
17	Appendix	132
	Screw tightening torques	132
	Examples of electric terminals	134

Index

1 About this document

Document function	6
Related documentation	6
Symbols	7
Registered trademarks	9

Document function




These Operating Instructions provide all of the information that is required in various phases of the life cycle of the device:

- Incoming acceptance and product identification
- Storage and transport
- Installation and connection
- Commissioning and operation
- Diagnostics and troubleshooting
- Maintenance and disposal

Related documentation

Technical information	Overview of the device with the most important technical data.
Operating instructions	All the information that is required in the 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 as well as the technical data and dimensions.
Sensor Brief Operating Instructions	Incoming acceptance, transport, storage and mounting of the device.
Transmitter Brief Operating Instructions	Electrical connection and commissioning of the device.
Description of Parameters	Detailed explanation of the menus and parameters.
Safety Instructions	Documents for the use of the device in hazardous areas.
Special Documentation	Documents with more detailed information on specific topics.
Installation Instructions	Installation of spare parts and accessories.

The related documentation is available online:

Device Viewer	On the www.endress.com/deviceviewer website, enter the serial number of the device: nameplate → <i>Product identification</i> ,  17
Endress+Hauser Operations App	<ul style="list-style-type: none"> ▶ Scan the Data Matrix code: nameplate → <i>Product identification</i>,  17 ▶ Enter the serial number of the device: nameplate → <i>Product identification</i>,  17

Symbols

Warnings

DANGER

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

WARNING

This symbol alerts you to a potentially dangerous situation. Failure to avoid the situation may result in a fatal or serious injury.





CAUTION

This symbol alerts you to a potentially dangerous situation. Failure to avoid the situation may result in a minor or mild injury.






NOTICE

This symbol alerts you to a potentially harmful situation. Failure to avoid the situation may result in damage to the facility or to something in the facility's vicinity.




Electronics

-  Direct current
-  Alternating current
-  Direct current and alternating current
-  Terminal connection for potential equalization








Device communication







-  Communication via a wireless, local area network.
-  Bluetooth is enabled.
-  LED is off.
-  LED flashing.
-  LED lit.

Tools

-  Flat-blade screwdriver
-  Hexagon wrench
-  Wrench

Types of information

-  Preferred procedures, processes or actions
-  Permitted procedures, processes or actions
-  Forbidden procedures, processes or actions
-  Additional information
-  Reference to documentation
-  Reference to page
-  Reference to graphic

-  Measure or individual action to be observed
-  Series of steps
-  Result of an individual step
-  Help in the event of a problem
-  Visual inspection
-  Write-protected parameter

Registered trademarks

IO-Link®

Is a registered trademark. It may only be used in conjunction with products and services by members of the IO-Link Community or by non-members who hold an appropriate license. For more specific guidelines on use, refer to the IO-Link Community rules on: www.io-link.com.

Bluetooth®

The Bluetooth word mark and Bluetooth logos are registered trademarks of Bluetooth SIG. Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

Apple®

Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

Android®

Android, Google Play and the Google Play logo are trademarks of Google Inc.

2 Safety instructions

Requirements for specialist personnel	12
Requirements for operating personnel	12
Incoming acceptance and transport	12
Adhesive labels, tags and engravings	12
Environment and process	12
Workplace safety	12
Installation	12
Electrical connection	12
Surface temperature	13
Commissioning	13
Modifications to the device	13

Requirements for specialist personnel

- ▶ Installation, electrical connection, commissioning, diagnostics and maintenance of the device must only be carried out by trained, specialist personnel authorized by the facility's owner-operator.
- ▶ Before commencing work, the trained, specialist personnel must carefully read, understand and adhere to the Operating Instructions, additional documentation and certificates.
- ▶ Comply with national regulations.

Requirements for operating personnel

- ▶ Operating personnel are authorized by the facility's owner-operator and are instructed according to the requirements of the task.
- ▶ Before commencing work, the operating personnel must carefully read, understand and adhere to the instructions provided in the Operating Instructions and additional documentation.

Incoming acceptance and transport

- ▶ Transport the device in a correct and appropriate manner.
- ▶ Do not remove protective covers or protective caps on the process connections.

Adhesive labels, tags and engravings

- ▶ Pay attention to all the safety instructions and symbols on the device.

Environment and process

- ▶ Only use the device for the measurement of appropriate media.
- ▶ Keep within the device-specific pressure range and temperature range.
- ▶ Protect the device from corrosion and the influence of environmental factors.

Workplace safety

- ▶ Wear the required protective equipment according to national regulations.
- ▶ Do not ground the welding unit via the device.
- ▶ Wear protective gloves if working on and with the device with wet hands.

Installation

- ▶ Do not remove protective covers or protective caps on the process connections until just before you install the sensor.
- ▶ Do not damage or remove the liner on the flange.
- ▶ Observe tightening torques.

Electrical connection

- ▶ Comply with national installation regulations and guidelines.
- ▶ Observe cable specifications and device specifications.
- ▶ Check the cable for damage.

- ▶ If using the device in hazardous areas, observe the "Safety Instructions" documentation.
- ▶ Provide (establish) potential equalization.
- ▶ Provide (establish) grounding.

Surface temperature

Media with elevated temperatures can cause the surfaces of the device to become hot. For this reason, note the following:

- ▶ Mount suitable touch protection.
- ▶ Wear suitable protective gloves.

Commissioning

- ▶ Install the device only if it is in proper technical condition, free from errors and faults.
- ▶ Only put the device into operation once you have performed the post-installation check and post-connection check.

Modifications to the device

Modifications or repairs are not permitted and can pose a danger. For this reason, note the following:

- ▶ Only carry out modifications or repairs after consulting beforehand with an Endress+Hauser service organization.
- ▶ Only use original spare parts and original accessories from Endress+Hauser.
- ▶ Install original spare parts and original accessories according to the Installation Instructions.

3 Product information

Measuring principle	16
Intended use	16
Incoming acceptance	16
Product identification	17
Transport	19
Checking the storage conditions	21
Recycling of packaging materials	21
Product design	22
Firmware history	24
Device history and compatibility	24

Measuring principle

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

Intended use

The device is only suitable for flow measurement of liquids with a minimum conductivity of 5 $\mu\text{S}/\text{cm}$.

Depending on the version ordered, the device measures poisonous and oxidizing media.

Devices for use in hygienic applications, or where there is an increased risk due to pressure, are labeled accordingly on the nameplate.

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

Incoming acceptance

Is technical documentation provided with the device?	<input type="checkbox"/>
Does the scope of supply match the specifications on the delivery note?	<input type="checkbox"/>
Is the order code on the delivery note and nameplate identical?	<input type="checkbox"/>
Does the device bear any signs of damage from transportation?	<input type="checkbox"/>
Has an incorrect device been ordered or delivered or has the device been damaged in transit? Complaints or returns: https://www.endress.com/support/return-material	<input type="checkbox"/>

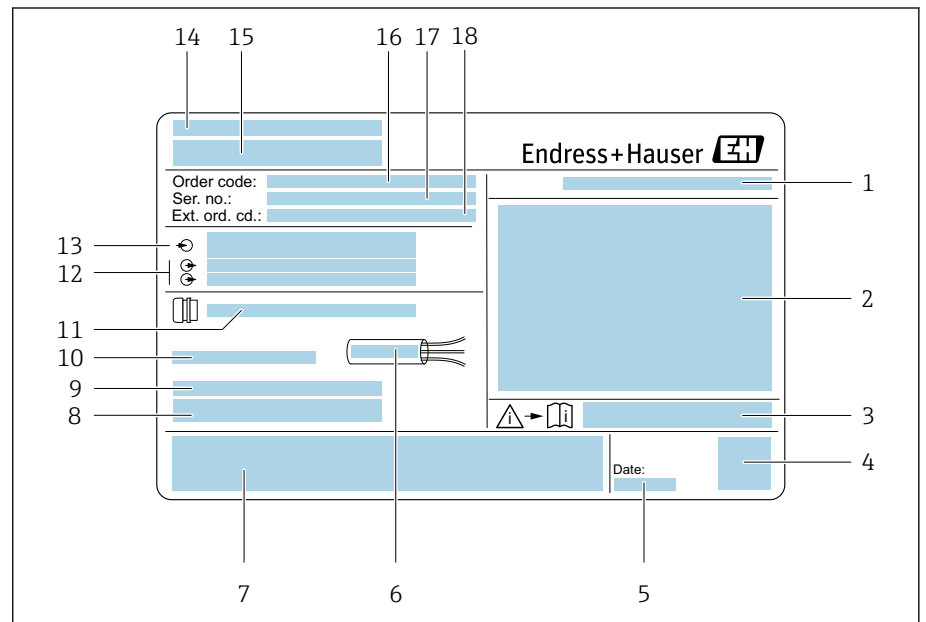
Product identification

Device tag

The device comprises the following parts:

- Proline 10 transmitter
- Promag D sensor

Transmitter nameplate

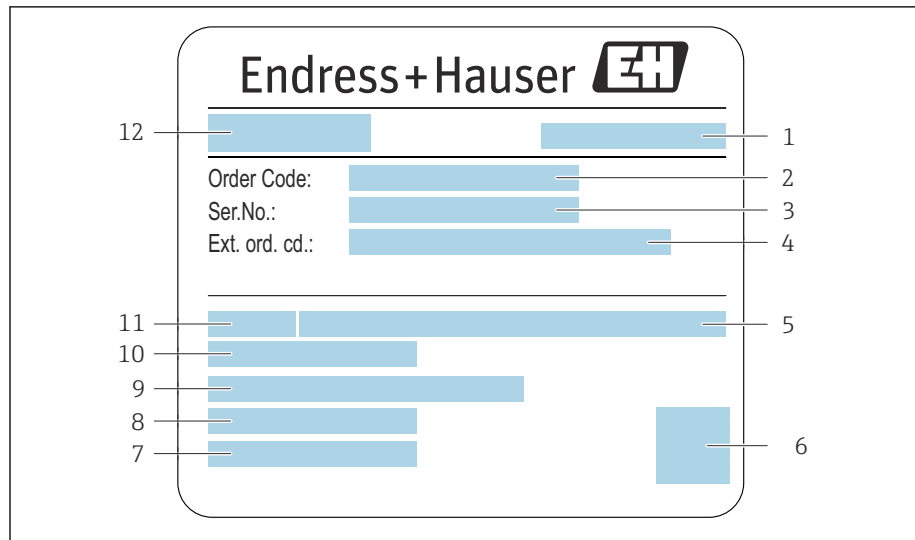


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1 Example of a transmitter nameplate

- 1 Degree of protection
- 2 Approvals for hazardous area, electrical connection data
- 3 Document number of safety-related supplementary documentation
- 4 Data Matrix code
- 5 Date of manufacture: year-month
- 6 Permitted temperature range for cable
- 7 CE mark and other approval marks
- 8 Firmware version (FW), Device ID
- 9 Additional information in the case of special products
- 10 Permitted ambient temperature (T_a)
- 11 Information on the cable entry
- 12 Available inputs and outputs: supply voltage
- 13 Electrical connection data: supply voltage and supply power
- 14 Place of manufacture
- 15 Transmitter name
- 16 Order code
- 17 Serial number
- 18 Extended order code

Sensor nameplate



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 2 Example of sensor nameplate

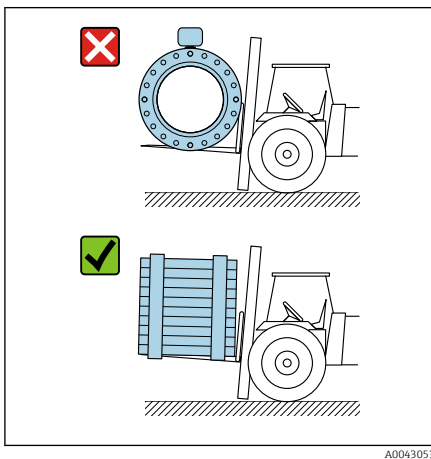
- 1 Place of manufacture
- 2 Order code
- 3 Serial number (ser. no.)
- 4 Extended order code (ext. ord. cd.)
- 5 Nominal pressure
- 6 2-D matrix code
- 7 Degree of protection
- 8 Permitted ambient temperature range
- 9 Material of lining and electrodes
- 10 Medium temperature range
- 11 Nominal diameter of sensor
- 12 Name of the sensor

Transport

Protective packaging

Protective covers or protective caps are fitted on the process connections to protect against damage and dirt.

Transporting in the original packaging



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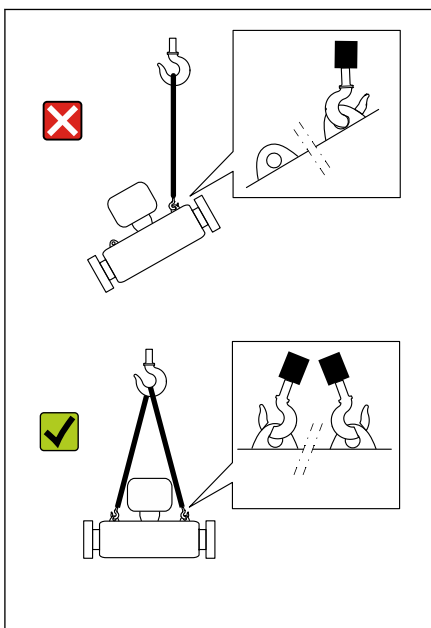
NOTICE

Original packaging is missing!

Damage to the magnetic coil.

- ▶ Only lift and transport the device in the original packaging.

Transporting with lifting lugs



A0043058

⚠ DANGER

Potentially life-threatening hazard from suspended loads!

The device could fall.

- ▶ Secure the device against slipping and turning.
- ▶ Do not move suspended loads over people.
- ▶ Do not move suspended loads over unprotected areas.

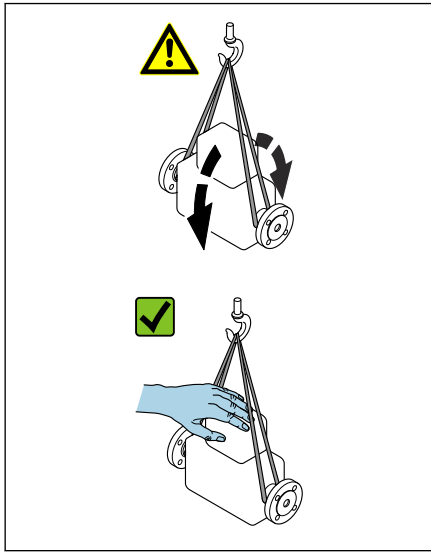
NOTICE

Lifting equipment incorrectly attached!

Lifting equipment attached on one side only can damage the device.

- ▶ Attach lifting equipment to both lifting lugs.

Transporting without lifting lugs



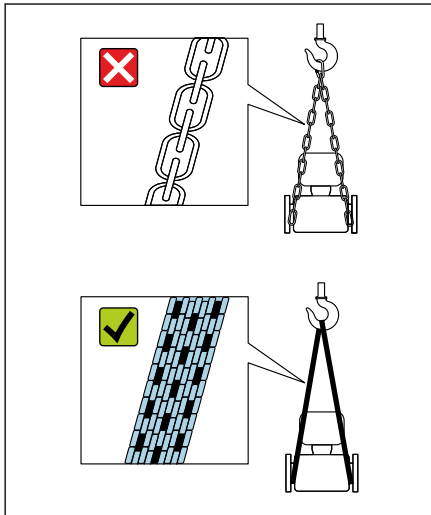
A0043054

⚠ DANGER

Potentially life-threatening hazard from suspended loads!

The device could fall.

- ▶ Secure the device against slipping and turning.
- ▶ Do not move suspended loads over people.
- ▶ Do not move suspended loads over unprotected areas.



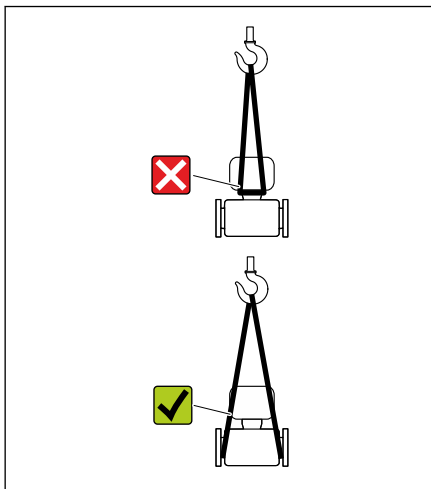
A0043055

NOTICE

Incorrect lifting equipment can damage the device!

The use of chains as hoists can damage the device.

- ▶ Use textile hoists.



A0043056

NOTICE

Lifting equipment incorrectly attached!

Lifting equipment attached to unsuitable points can damage the device.

- ▶ Attach lifting equipment to both process connections of the device.

Checking the storage conditions

Are the protective covers or protection caps on the process connections?	<input type="checkbox"/>
Is the device in the original packaging?	<input type="checkbox"/>
Is the device protected against sunlight?	<input type="checkbox"/>
Is it guaranteed that the device is not stored outdoors?	<input type="checkbox"/>
Is the device stored in a dry and dust-free place?	<input type="checkbox"/>
Does the storage temperature match the device ambient temperature specified on the nameplate?	<input type="checkbox"/>
Is the possibility of moisture/condensation collecting on the device and original packaging as a result of variations in temperature ruled out?	<input type="checkbox"/>

Recycling of packaging materials

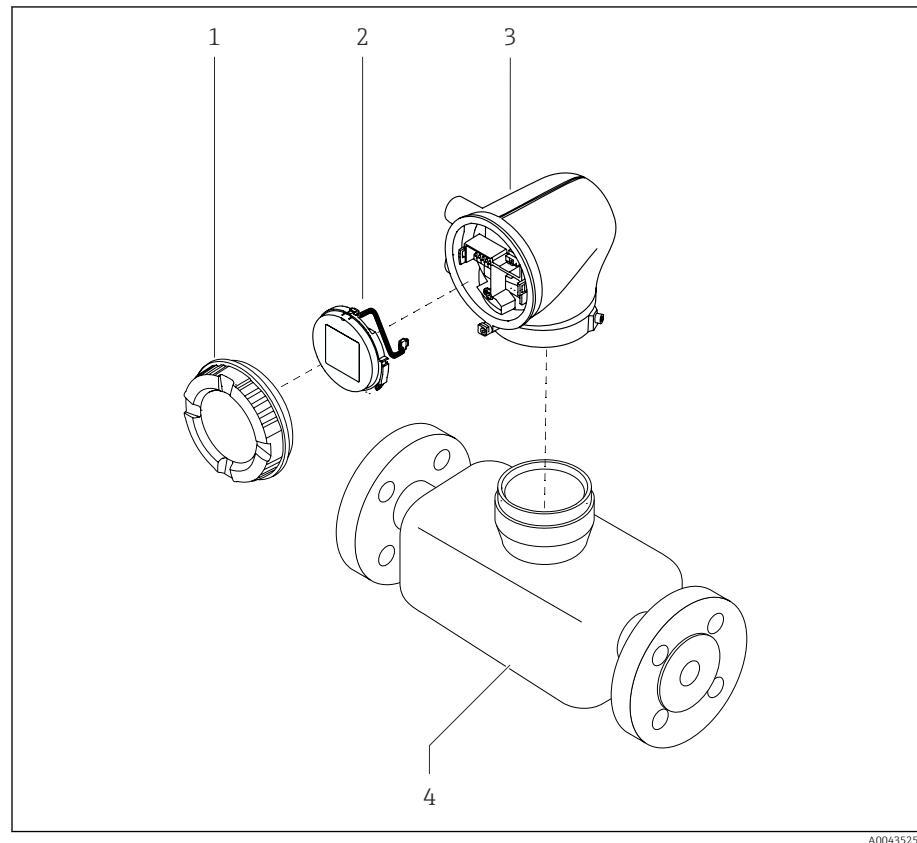
All packaging materials and packaging aids must be recycled as specified by national regulations.

- Stretch wrap: polymer in accordance with EU Directive 2002/95/EC (RoHS)
- Crate: wood in accordance with ISPM 15 standard, confirmed by IPPC logo
- Cardboard box: in accordance with European Packaging Directive 94/62/EC, confirmed by Resy symbol
- Disposable pallet: plastic or wood
- Packaging straps: plastic
- Adhesive strips: plastic
- Padding: paper

Product design

Compact version

The transmitter and sensor form a mechanical unit.



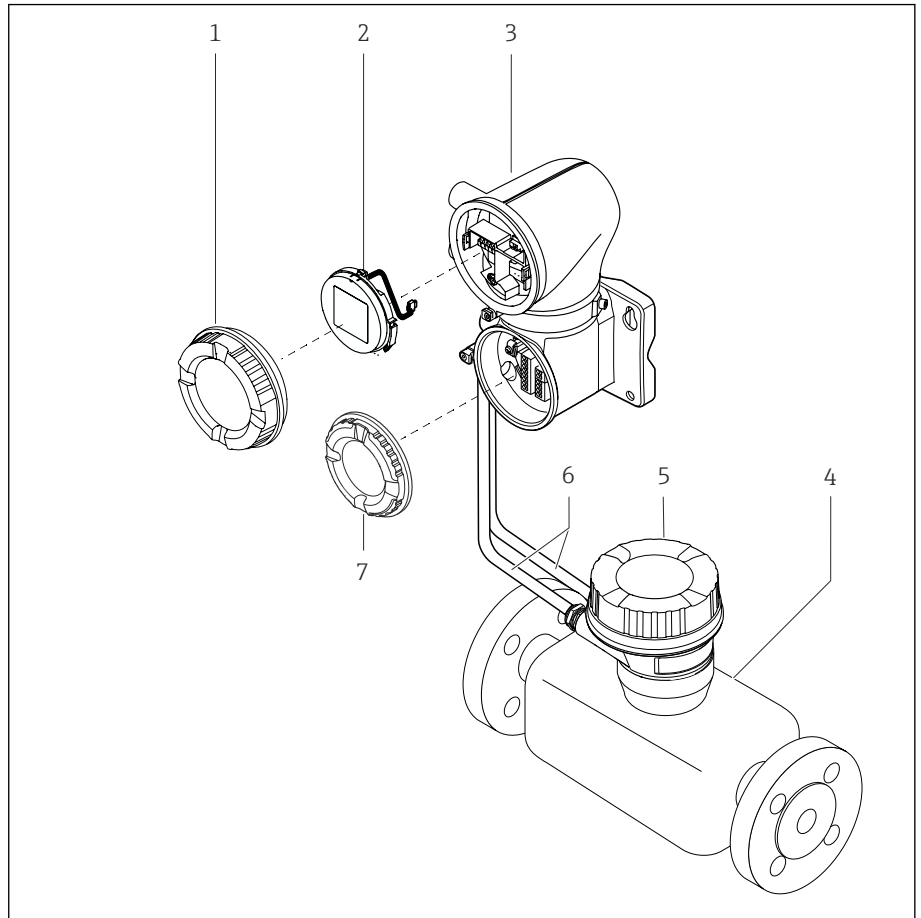
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3 Main device components

- 1 Housing cover
- 2 Display module
- 3 Transmitter housing
- 4 Sensor

Remote version

The transmitter and sensor are installed in physically separate locations.



A0043524

4 Main device components

- 1 Housing cover
- 2 Display module
- 3 Transmitter housing
- 4 Sensor
- 5 Sensor connection housing
- 6 Connecting cable consisting of coil current cable and electrode cable
- 7 Connection compartment cover

Firmware history

List of firmware versions and changes since previous version

Firmware version 01.00.zz		
Release date	06.2024	Original firmware
Version of the Operating Instructions	01.24	
Order code for "Firmware version"	Option 76	

Device history and compatibility

List of device models and changes since previous model

Device model A1		
Release	2025-12-15	-
Version of the Operating Instructions	01.25	
Compatibility with previous model	-	

4 Installation procedure

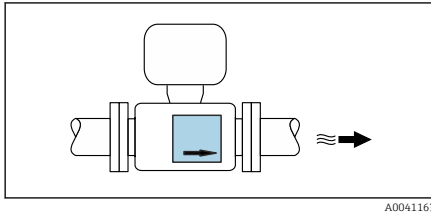
Installation conditions	26
Device installation	31
Post-installation check	36

Installation conditions

Flow direction

Install the device in the direction of flow.

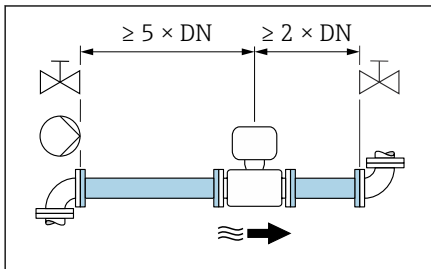
i Note the direction of arrow on the nameplate.



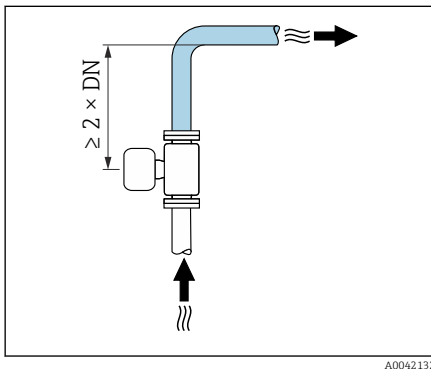
Installation with inlet runs and outlet runs

Ensure straight, undisturbed inlet and outlet runs.

i To avoid negative pressure and to comply with accuracy specifications, install the sensor upstream from assemblies that produce turbulence (e.g. valves, T-sections) and downstream from pumps → *Installation near pumps*, 29.



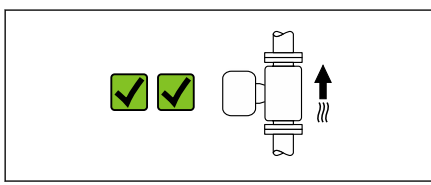
Keep a sufficient distance to the next pipe elbow.



Orientations

Vertical orientation, upward direction of flow

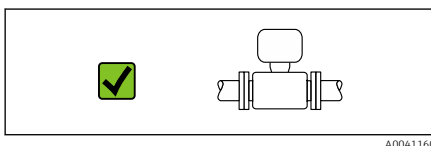
For all applications.

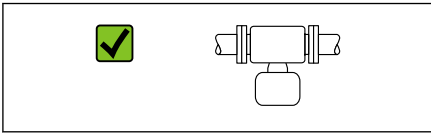


Horizontal orientation, transmitter at top

This orientation is suitable for the following applications:

For medium and low process temperatures, in order to maintain the minimum ambient temperature for the transmitter.



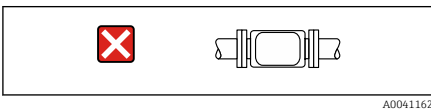


Horizontal orientation, transmitter at bottom

This orientation is suitable for the following applications:

- For medium and high process temperatures, in order to maintain the maximum ambient temperature for the transmitter.
- To prevent the electronics module from overheating in the case of a sharp rise in temperature (e.g. CIP or SIP processes), install the measuring instrument with the transmitter component pointing downwards.

This orientation is not suitable for the following applications:
If empty pipe detection is to be used.

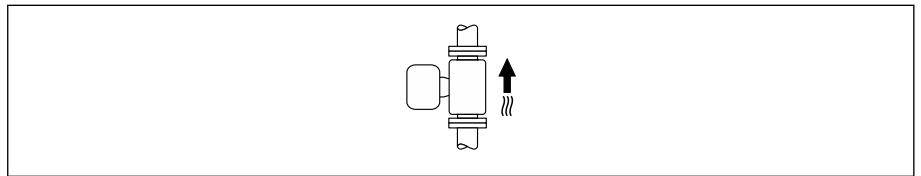


Horizontal orientation, transmitter at side

This orientation is not suitable

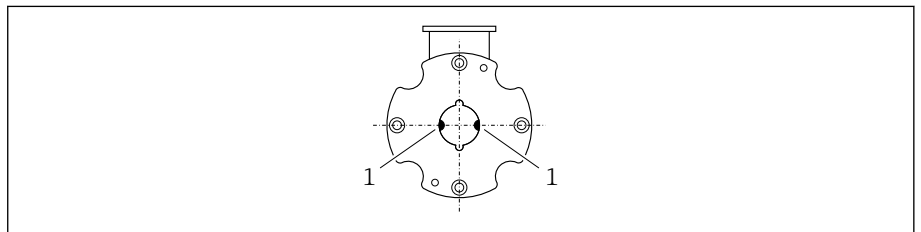
Vertical

Optimum for self-emptying pipe systems.



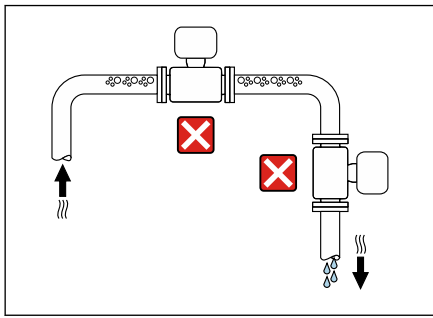
Horizontal

Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the measuring electrodes by entrained air bubbles.



1 Measuring electrodes for signal detection

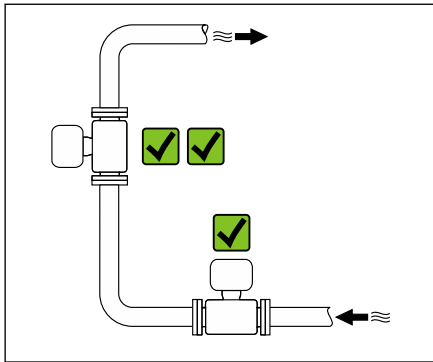
Mounting locations



A0042131

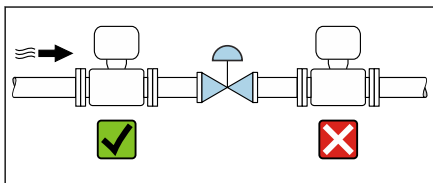
- Do not install the device at the highest point of the pipe.
- Do not install the device upstream from a free pipe outlet in a down pipe.

The device should ideally be installed in an ascending pipe.



A0042317

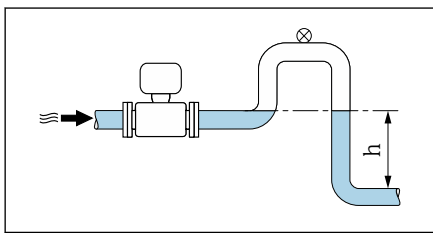
Installation near control valves



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Install the device in the direction of flow upstream from the control valve.

Installation upstream from a down pipe



A0041089

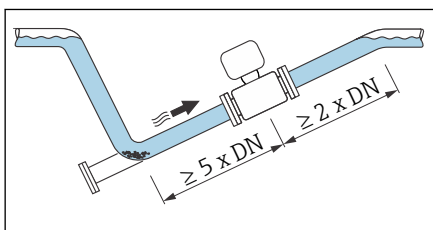
NOTICE

Negative pressure in the measuring pipe can damage the liner!

- ▶ If installing upstream from down pipes with a length $h \geq 5 \text{ m}$ (16.4 ft): install a siphon with a vent valve downstream from the device.

i This arrangement prevents the flow of liquid stopping in the pipe and air entrainment.

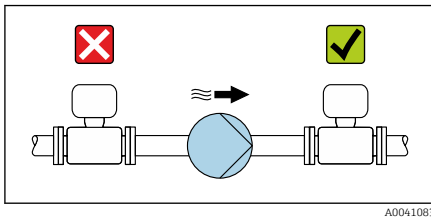
Installation with partially filled pipes



A0041088

- Partially filled pipes with a gradient require a drain-type configuration.
- The installation of a cleaning valve is recommended.

Installation near pumps



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NOTICE

A vacuum in the measuring tube can damage the liner!

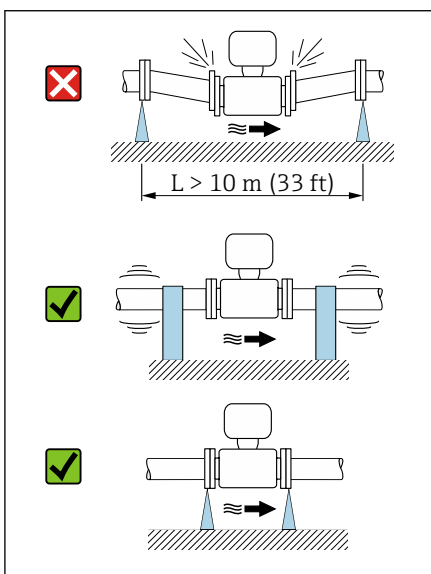
- ▶ Install the device in the direction of flow downstream from the pump.
- ▶ Install pulsation dampers if reciprocating, diaphragm or peristaltic pumps are used.



Information on the measuring system's resistance to vibration and shock
→ *Vibration resistance and shock resistance*, 92

Pipe vibrations

A remote version is recommended in the event of strong pipe vibrations.



A0041092

NOTICE

Pipe vibrations can damage the device!

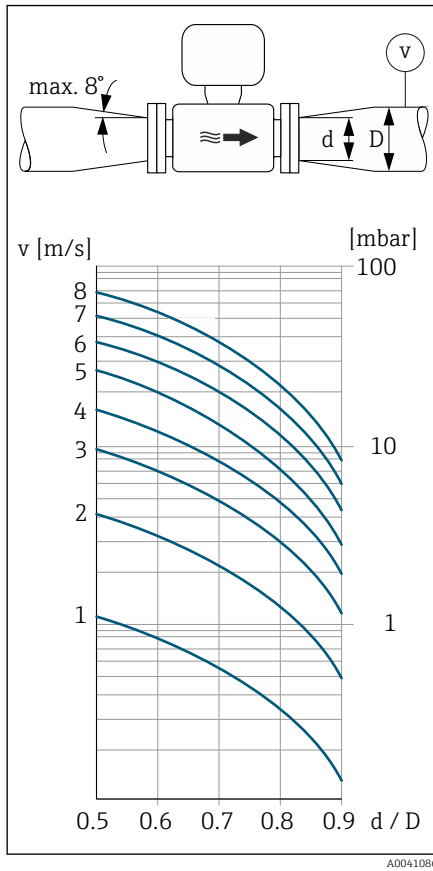
- ▶ Do not expose the device to strong vibrations.
- ▶ Support the pipe and fix it in place.
- ▶ Support the device and fix it in place.
- ▶ Mount the sensor and transmitter separately.

Adapters

Suitable adapters (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resulting higher rate of flow improves measuring accuracy with very slow-moving media.

i The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders. It only applies to liquids with a viscosity similar to that of water.

1. Calculate the ratio of the diameters d/D .
2. Determine the flow velocity after the reduction.
3. From the chart, determine the pressure loss as a function of the flow velocity v and the d/D ratio.



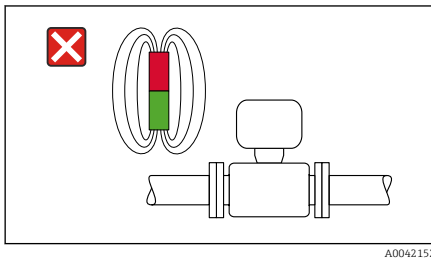
Seals

Note the following when installing seals:

- Use seals with a hardness rating of 70° Shore.
- For DIN flanges: only install seals according to DIN EN 1514-1.

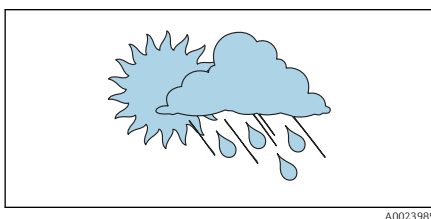
Magnetism and static electricity

Do not install the device near magnetic fields, e.g. Engines, transformers.



Outdoor use

- Avoid exposure to direct sunlight.
- Install in a location protected from sunlight.
- Avoid direct exposure to weather conditions.
- Use a weather protection cover → *Transmitter*, 128.



Device installation

Preparing the device

1. Remove the entire transportation packaging.
2. Remove protective covers or protective caps on the device.

Installing seals

⚠ WARNING

Improper process sealing can put staff at risk!

- ▶ Check whether the seals are clean and undamaged.

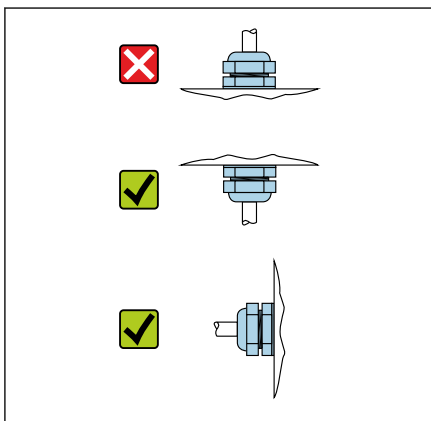
NOTICE

Incorrect installation can lead to incorrect measurement results!

- ▶ The internal diameter of the seal must be greater than or equal to that of the process connection and pipe.
- ▶ Fit the seals and measuring pipe centrally.
- ▶ Make sure that the seals do not protrude into the pipe cross-section.

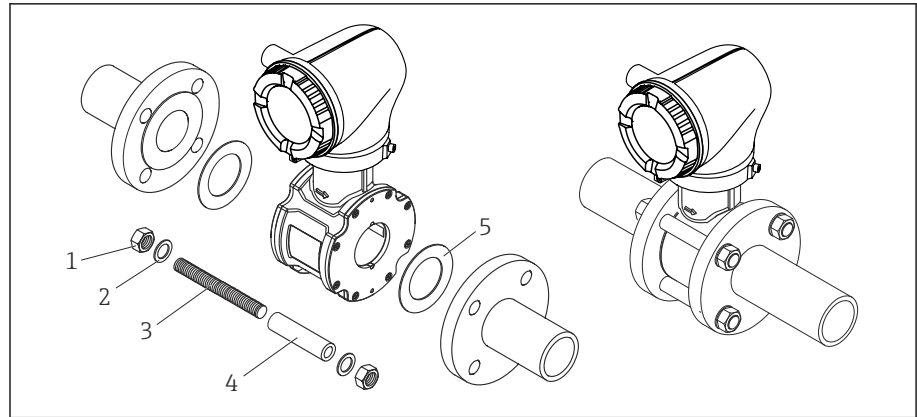
Installing the sensor

1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
2. Install and turn the device or transmitter housing in such a way that the cable entries point down or to the side.



Mounting kit

- i A mounting kit can be ordered separately → *Device-specific accessories*, 📄 128.



5 Mounting kit consisting of:

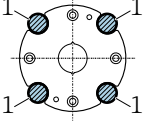
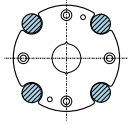
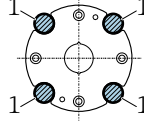
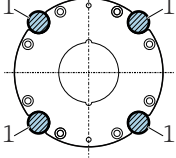
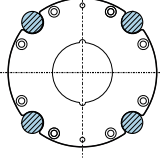
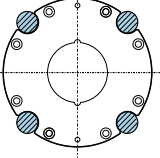
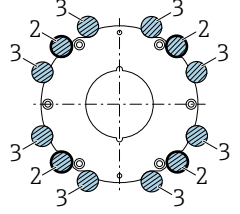
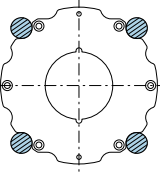
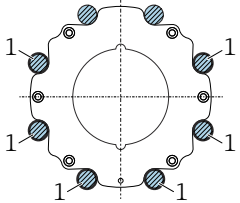
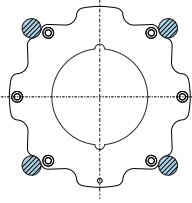
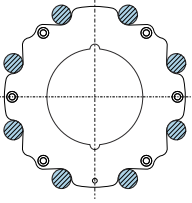
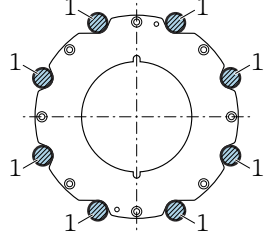
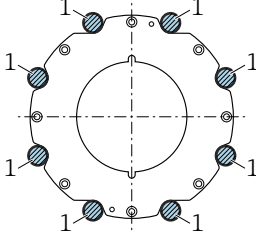
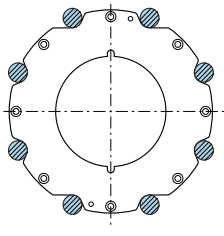
- 1 Nut
- 2 Washer
- 3 Mounting bolts
- 4 Centering sleeve
- 5 Seal

1. Mount the device between the pipe flanges with a mounting kit.
2. The device is centered using the recesses on the sensor.
3. Depending on the flange standard or diameter of the pitch circle, install the additional centering sleeves.
4. Observe tightening torques → *Screw tightening torques*, 132.

The arrangement of the mounting bolts and the use of the centering sleeves supplied are dependent on the nominal diameter, the flange standard and the diameter of the pitch circle.

Arranging the mounting bolts and centering sleeves

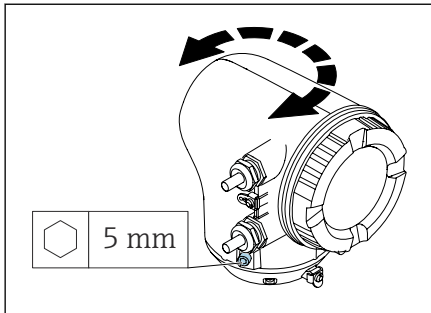
The device is centered using recesses on the sensor. The arrangement of the mounting bolts and the use of the centering sleeves supplied are dependent on the nominal diameter, the flange standard and the diameter of the pitch circle.

Nominal diameter		Process connection		
[mm]	[in]	EN 1092-1	ASME B16.5	JIS B2220
25 to 40	1 to 1 ½	 A0029490	 A0029491	 A0029490
50	2	 A0029492	 A0029493	 A0029493
65	2 ½	 A0029494	—	 A0029495
80	3	 A0029496	 A0029497	 A0029498
100	4	 A0029499	 A0029499	 A0029500

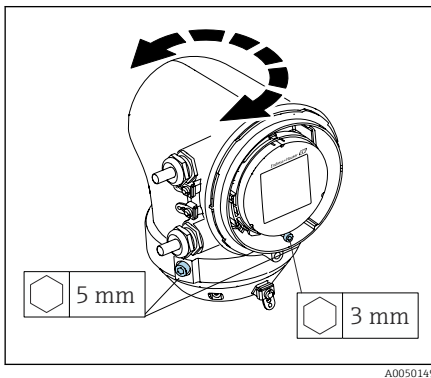
- 1 = Mounting bolts with centering sleeves
- 2 = EN (DIN) flange: 4-hole → with centering sleeves
- 3 = EN (DIN) flange: 8-hole → without centering sleeves

Turning the transmitter housing

Order code for "Housing", option
"Aluminum"



Order code for "Housing", option
"Polycarbonate"



1. Loosen the fixing screws on both sides of the transmitter housing.

2. **NOTICE**

Overrotation of the transmitter housing!

Interior cables are damaged.

- ▶ Turn the transmitter housing a maximum of 180° in each direction.

Turn the transmitter housing to the desired position.

3. Tighten the screws in the logically reverse sequence.

1. Loosen the screw on the housing cover.

2. Open the housing cover.

3. Loosen the grounding screw (below the display).

4. Loosen the fixing screws on both sides of the transmitter housing.

5. **NOTICE**

Overrotation of the transmitter housing!

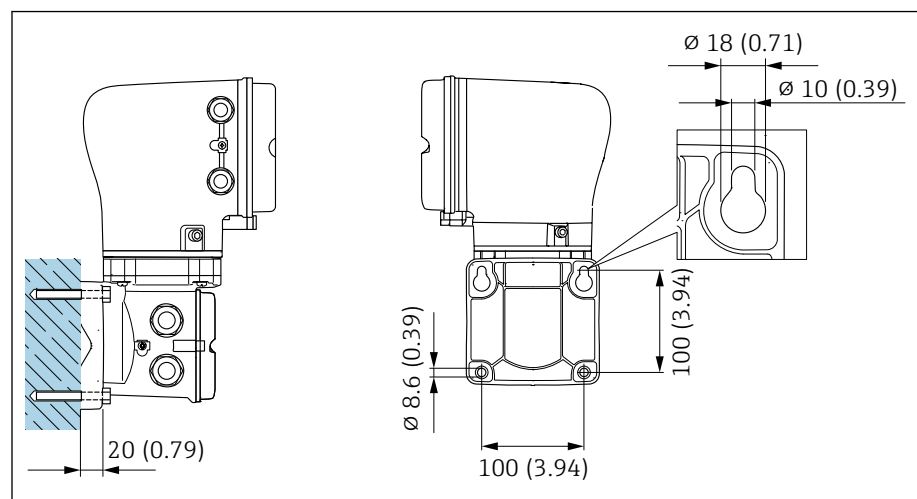
Interior cables are damaged.

- ▶ Turn the transmitter housing a maximum of 180° in each direction.

Turn the transmitter housing to the desired position.

6. Tighten the screws in the logically reverse sequence.

Mounting the transmitter on the wall



6 Unit mm (in)

NOTICE

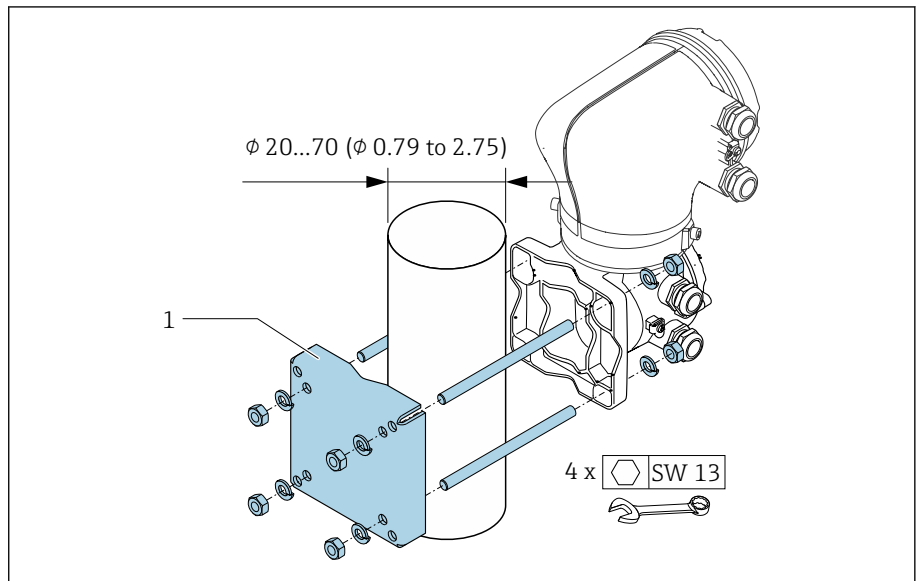
Ambient temperature too high!

If the electronics overheat this can damage the transmitter housing.

- ▶ Do not exceed the permissible temperature range for the ambient temperature.
- ▶ Use a weather protection cover → *Transmitter*, 128.

- ▶ Mount the device correctly.

Mounting the transmitter on a post



7 Unit mm (in)

NOTICE

Ambient temperature too high!

If the electronics overheat this can damage the transmitter housing.

- ▶ Do not exceed the permissible temperature range for the ambient temperature.
- ▶ Use a weather protection cover → *Transmitter*, 128.
- ▶ Mount the device correctly.

Post-installation check

Is the device undamaged (visual inspection)?	<input type="checkbox"/>
Does the device comply with the measuring point specifications? For example: <ul style="list-style-type: none">■ Process temperature■ Process pressure■ Ambient temperature■ Measuring range	<input type="checkbox"/>
Has the correct orientation been selected for the device?	<input type="checkbox"/>
Does the direction of the arrow on the device match the flow direction of the medium?	<input type="checkbox"/>
Is the device protected against precipitation and sunlight?	<input type="checkbox"/>
Are the screws tightened with the correct tightening torque?	<input type="checkbox"/>

5 Electrical connection

Connecting requirements	38
Connecting cable connection	39
Transmitter connection	43
Ensuring potential equalization	43
Removing a cable	45
Hardware settings	45
Post-connection check	46

Connecting requirements

Notes on the electrical connection

WARNING


Live parts!

Incorrect work performed on the electrical connections can result in an electric shock.

- ▶ Have electrical connection work carried out by appropriately trained specialists only.
- ▶ Comply with applicable federal/national installation codes and regulations.
- ▶ Comply with national and local workplace safety regulations.
- ▶ Ground the device carefully and provide potential equalization.
- ▶ Connect protective earthing to all outer ground terminals.

Additional protective measures

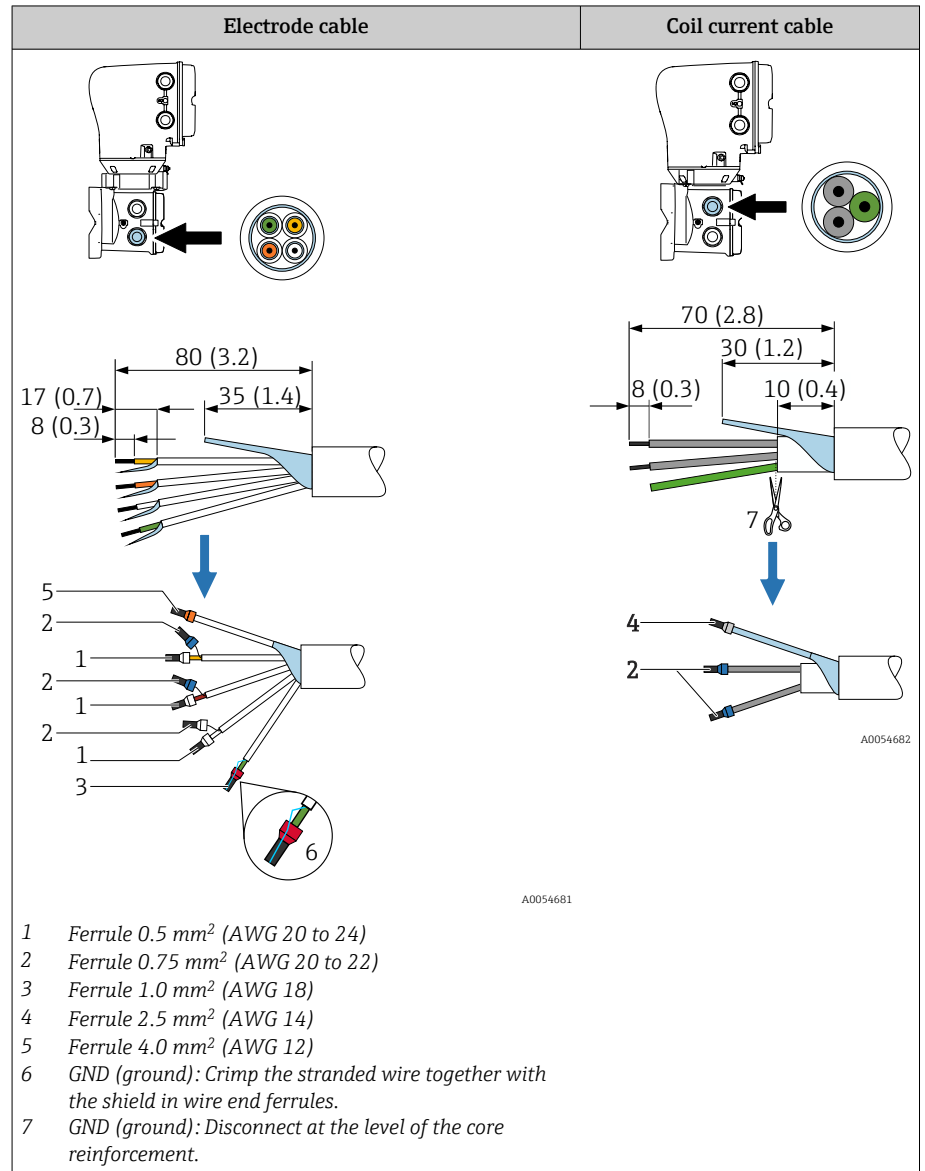
The following protective measures are required:

- Set up a disconnecting device (switch or power-circuit breaker) to easily disconnect the device from the supply voltage.
- The DC power unit must be tested to ensure it meets technical safety requirements (e.g. PELV, SELV) with limited power sources (e.g. class 2).
- Plastic sealing plugs act as safeguards during transportation and must be replaced by suitable, individually approved installation material.
- Connection examples: → *Examples of electric terminals*,  134

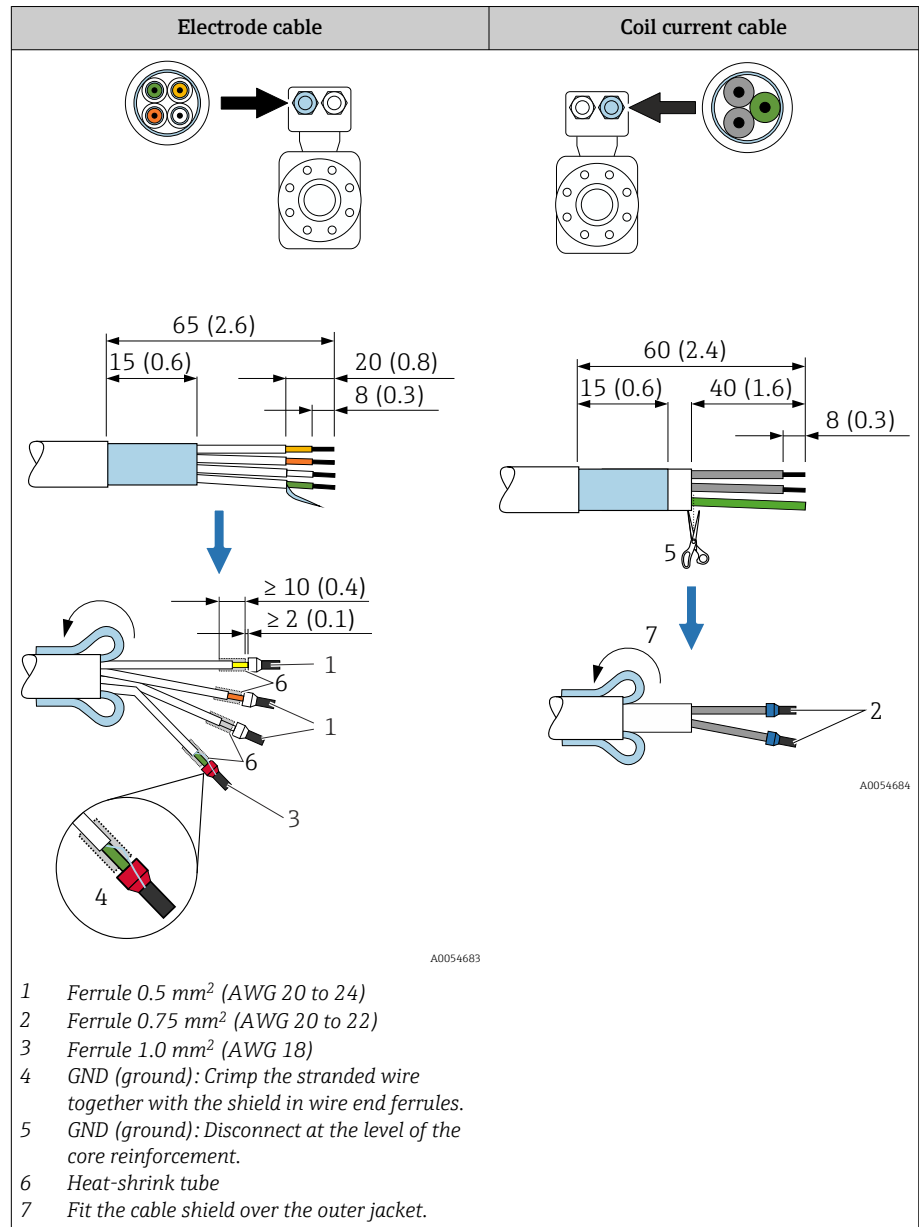
Connecting cable connection

Preparing the connecting cable

Transmitter



Sensor



1. Make sure that the ferrules do not touch the cable shields on the sensor side. Minimum distance = 1 mm (exception: green "GND" cable)
2. A: Terminate the electrode cable.
3. B: Fit ferrules over the strands and press in place.
4. Fit the cable shield on the sensor side over the outer jacket.
5. Insulate the cable shield on the transmitter side, e.g. heat shrink tube.

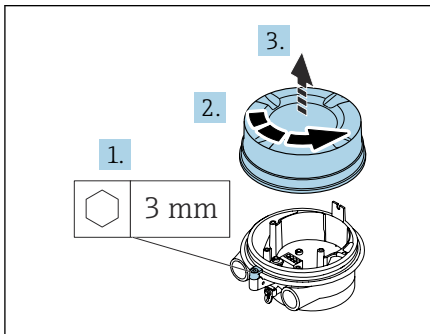
Connecting the connecting cable

Wiring the sensor connection housing

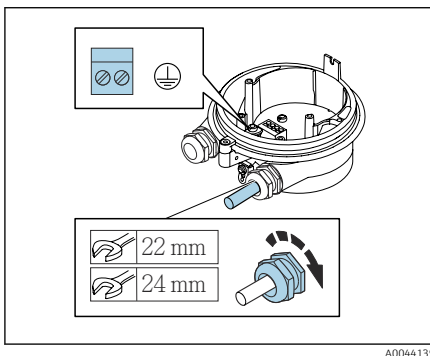
NOTICE

Incorrect wiring can damage the electronic components!

- ▶ Only connect sensors and transmitters with identical serial numbers.
- ▶ Connect the sensor connection housing and the transmitter housing to the potential equalization of the facility via the outer ground terminal.
- ▶ Connect the sensor and transmitter to the same potential.



1. Loosen the Allen key of the securing clamp.
2. Open the connection compartment cover counterclockwise.



NOTICE

If the sealing ring is missing, the housing is not sealed tight!

Damage to the device.

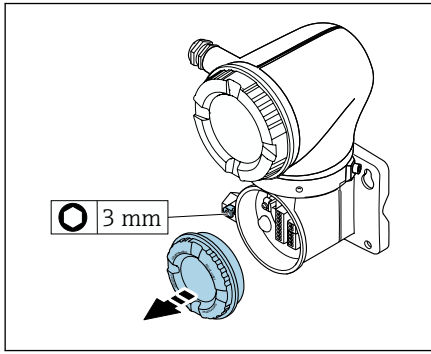
- ▶ Do not remove the sealing ring from the cable entry.
3. Feed the coil current cable and electrode cable through the corresponding cable entry.
 4. Adjust the cable lengths.
 5. Connect the cable shield to the inner ground terminal.
 6. Strip the cable and cable ends.
 7. Fit ferrules over the strands and press in place.
 8. Connect the coil current cable and the electrode cable as per the terminal assignment.
 9. Tighten the cable glands.
 10. Close the connection compartment cover.
 11. Fasten the securing clamp.

Wiring the transmitter housing

NOTICE

Incorrect wiring can damage the electronic components!

- ▶ Only connect sensors and transmitters with identical serial numbers.
- ▶ Connect the sensor connection housing and the transmitter housing to the potential equalization of the facility via the outer ground terminal.
- ▶ Connect the sensor and transmitter to the same potential.



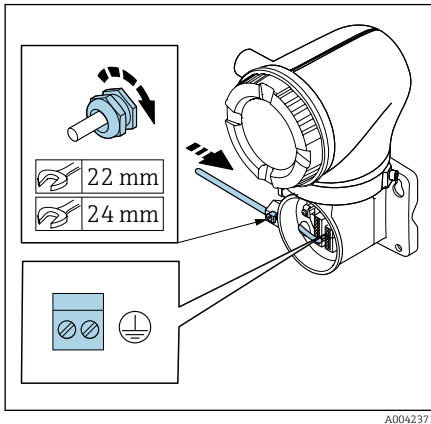
1. Loosen the Allen key of the securing clamp.
2. Open the connection compartment cover counterclockwise.

NOTICE

If the sealing ring is missing, the housing is not sealed tight!

Damage to the device.

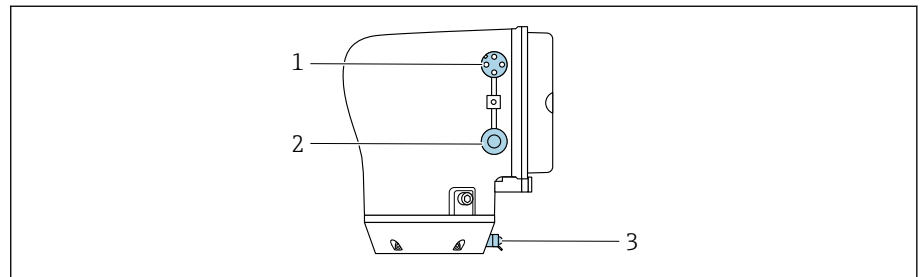
- ▶ Do not remove the sealing ring from the cable entry.



3. Feed the coil current cable and electrode cable through the corresponding cable entry.
4. Adjust the cable lengths.
5. Connect the cable shields to the inner ground terminal.
6. Strip the cable and cable ends.
7. Fit ferrules over the strands and press in place.
8. Connect the coil current cable and the electrode cable as per the terminal assignment.
9. Tighten the cable glands.
10. Close the connection compartment cover.
11. Fasten the securing clamp.

Transmitter connection

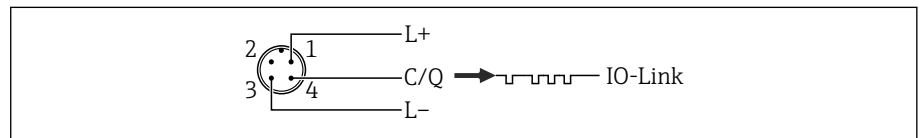
Transmitter terminal connections



A0053767

- 1 M12 plug for power supply (supply voltage) and signals (IO-Link)
- 2 Dummy plug
- 3 Outer ground terminal

Pin assignment of IO-Link device plug



A0053891

8 M12 A-coded (IEC 61076-2-101)

- 1 PIN 1: power supply
- 2 PIN 2: not used
- 3 PIN 3: reference potential for power supply/output
- 4 PIN 4: output 1 (IO-link)

Wiring the transmitter

- Pay attention to the requirements for the power supply cable and signal cable → *Requirements for connecting cable*, 89 .
- Connect protective earthing to the outer signal terminals.
 - Connect the IO-Link signal cable to M12.

Ensuring potential equalization

Introduction

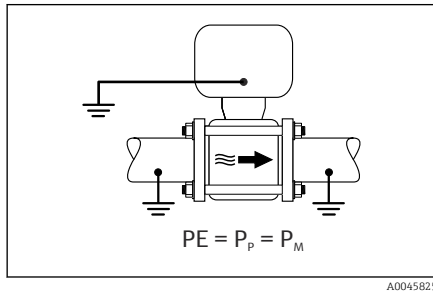
Correct potential equalization (equipotential bonding) is a prerequisite for stable and reliable flow measurement. Inadequate or incorrect potential equalization can result in device failure and present a safety hazard.

The following requirements must be observed to ensure correct, trouble-free measurement:

- The principle that the medium, the sensor and the transmitter must be at the same electric potential applies.
- Take in-company grounding guidelines, materials and the grounding conditions and potential conditions of the pipe into consideration.
- The necessary potential equalization connections must be established using a ground cable with a minimum cross-section of 6 mm² (0.0093 in²). Also use a cable lug.
- In the case of remote device versions, the ground terminal in the example always refers to the sensor and not to the transmitter.

Abbreviations used

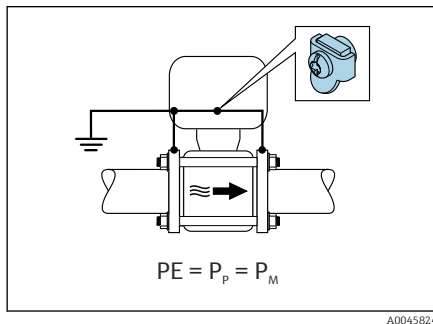
- PE (Protective Earth): potential at the potential equalization terminals of the device
- P_p (Potential Pipe): potential of the pipe, measured at the flanges
- P_M (Potential Medium): potential of the medium

Connection examples for standard situations**Unlined and grounded metal pipe**

- Potential equalization is via the measuring tube.
- The medium is set to ground potential.

Starting conditions:

- Pipes are correctly grounded on both sides.
 - Pipes are conductive and at the same electric potential as the medium
- Connect the connection housing of the transmitter or sensor to ground potential via the ground terminal provided for this purpose.

**Plastic pipe or pipe with insulating liner**

- Potential equalization is via the ground terminal and flanges
- The medium is set to ground potential.

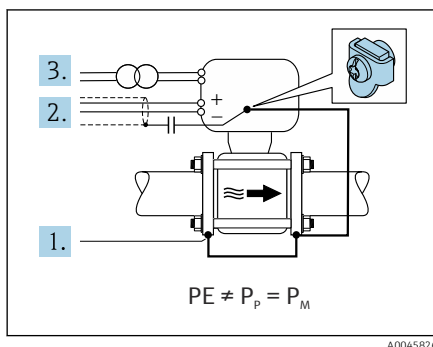
Starting conditions:

- The pipe has an insulating effect.
- Low-impedance medium grounding close to the sensor is not guaranteed.
- Equalizing currents through the medium cannot be ruled out.

1. Connect flanges to the ground terminal of the transmitter or sensor connection housing via the ground cable.
2. Connect the connection to ground potential.

Connection example with the potential of medium not equal to potential equalization connection

In these cases, the medium potential can differ from the potential of the device.

**Metal, ungrounded pipe**

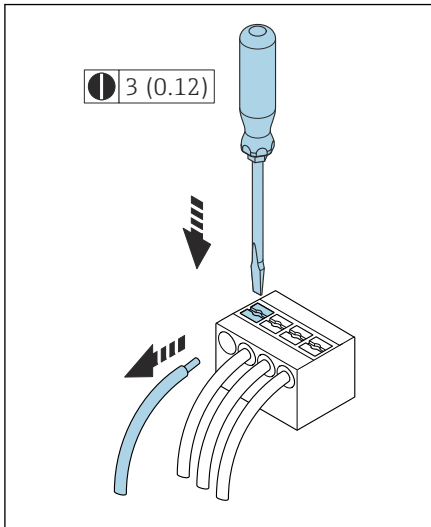
The sensor and transmitter are installed in a way that provides electrical insulation from PE, e.g. applications for electrolytic processes or systems with cathodic protection.

Starting conditions:

- Unlined metal pipe
- Pipes with an electrically conductive liner

1. Connect the pipe flanges and transmitter via the ground cable.
2. Route the shielding of the signal lines via a capacitor (recommended value 1.5 μ F/50V).
3. Device connected to power supply such that it is floating in relation to the potential equalization connection (isolation transformer). This measure is not required in the case of 24V DC supply voltage without PE (= SELV power unit).

Removing a cable

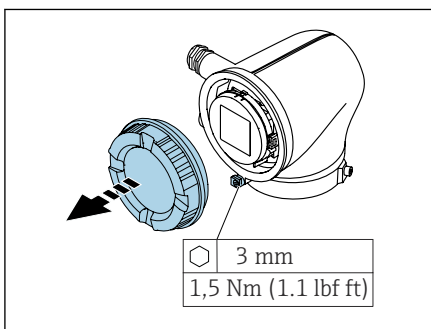


1. Use a flat-blade screwdriver to press down on the slot between the two terminal holes and hold.
2. Remove the cable end from the terminal.

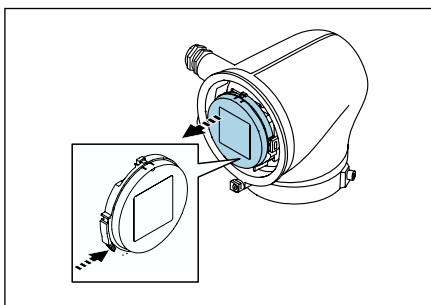
9 Engineering unit mm (in)

Hardware settings

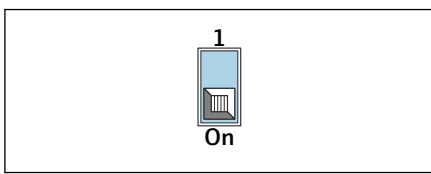
Enabling write protection



1. Loosen the Allen key of the securing clamp.
2. Open the housing cover counterclockwise.

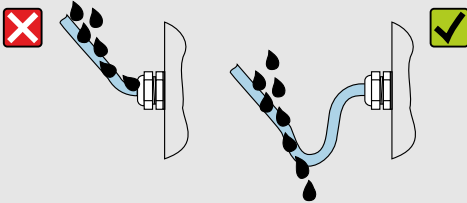


3. Press the tab of the display module holder.
4. Remove the display module from the display module holder.



5. Set the write protection switch on the back of the display module to the **On** position.
 - ↳ Write protection is enabled.
6. Follow the sequence in the reverse order to reassemble.

Post-connection check

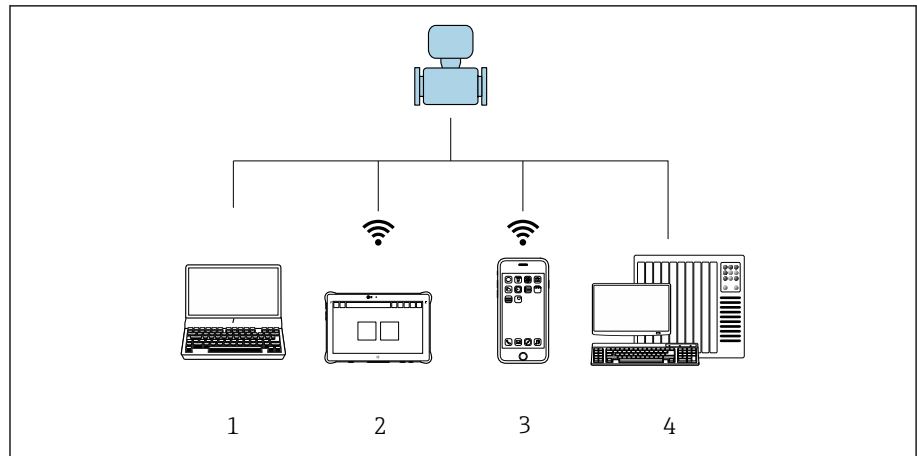
Only for remote version: Is the serial number on the nameplates of the connected sensor and transmitter identical?	<input type="checkbox"/>
Is the potential equalization established correctly?	<input type="checkbox"/>
Is the protective earthing established correctly?	<input type="checkbox"/>
Are the device and cable undamaged (visual check)?	<input type="checkbox"/>
Do the cables meet the requirements?	<input type="checkbox"/>
Is the terminal assignment correct?	<input type="checkbox"/>
Are all the cable glands installed, firmly tightened and leak-tight?	<input type="checkbox"/>
Are dummy plugs inserted in unused cable entries?	<input type="checkbox"/>
Are transportation plugs replaced by dummy plugs?	<input type="checkbox"/>
Are the housing screws and housing cover tightened?	<input type="checkbox"/>
Do the cables loop down before the cable gland ("water trap")? 	<input type="checkbox"/>
Does the supply voltage match the specifications on the transmitter nameplate?	<input type="checkbox"/>

A0042316

6 Operation

Overview of the operating options	48
Operation via SmartBlue app	48

Overview of the operating options



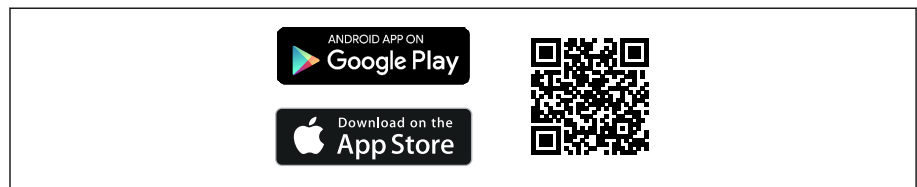
A0054834

- 1 Computer with operating tool, e.g. FieldCare, DeviceCare or IODD operating tools
- 2 Field Xpert SMT70 via Bluetooth, e.g. SmartBlue App
- 3 Tablet or smartphone via Bluetooth, e.g. SmartBlue App
- 4 Automation system, e.g. PLC

Operation via SmartBlue app

The device can be operated and configured with the SmartBlue App.

- The SmartBlue app must be downloaded onto a mobile device for this purpose
- For information on the compatibility of the SmartBlue app with mobile devices, see **Apple App Store (iOS devices)** or **Google Play Store (Android devices)**
- Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption.
- The Bluetooth® function can be deactivated after initial device setup.



A0033202

10 QR code for free Endress+Hauser SmartBlue App

Download and installation:

1. Scan the QR code or enter **SmartBlue** in the search field of the Apple App Store (iOS) or Google Play Store (Android).
2. Install and start the SmartBlue app.
3. For Android devices: enable location tracking (GPS) (not required for iOS devices).
4. Select a device that is ready to receive from the device list displayed.

Login:

1. Enter the user name: admin
2. Enter the initial password: serial number of the device

3. Change the password after logging in for the first time

i **Information on password and reset code**

For devices that meet the requirements of IEC 62443-4-1 "Secure product development lifecycle management" ("ProtectBlue"):

- If the user-defined password is lost: refer to the user management instructions and the reset button in the operating manual.
- Refer to the associated Security Manual (SD).

For all other devices (without "ProtectBlue"):



- If the user-defined password is lost, access can be restored via a reset code. The reset code is the serial number of the device in reverse. The original password is once again valid after the reset code has been entered.
- The reset code can also be changed in addition to the password.
- If the user-defined reset code is lost, the password can no longer be reset via the SmartBlue app. Contact Endress+Hauser Service in this case.

7 System integration

Device description files	52
Process data	52
Information about IO-Link communication	54
Switching signals	54

Device description files

Version data

Firmware version	01.00.zz	<ul style="list-style-type: none"> On the title page of the Operating instructions On the transmitter nameplate → <i>Transmitter nameplate</i>,  17 System → Information → Device → Firmware version
Release date of firmware version	06.2024	-
Manufacturer ID	17	-
Device type code	Promag10 IOL	Guidance → Commissioning → Device identification → Device name
Device ID		<ul style="list-style-type: none"> On the transmitter nameplate → <i>Transmitter nameplate</i>,  17 Application → IO-Link → Device ID

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 obtained.

IO-link	Sources for obtaining device descriptions
FieldCare	<ul style="list-style-type: none"> www.endress.com → Downloads USB stick (contact Endress+Hauser)
DeviceCare	<ul style="list-style-type: none"> www.endress.com → Downloads USB stick (contact Endress+Hauser)

Process data

Process data input

Transmission direction	float32	float32	float32	float32	uint8	bool	bool	bool	bool	bool	bool	bool	bool
←	Volume flow	Conductivity	Temperature	Totalizer 1 value	Extended device status	SSC 4.2	SSC 4.1	SSC 3.2	SSC 3.1	SSC 2.2	SSC 2.1	SSC 1.2	SSC 1.1

Name	Data type	Description	Value range	Unit
Volume flow	float32	Volume flow currently measured	$-1.4 \cdot 10^{+21}$ to $1.4 \cdot 10^{+21}$	m ³ /h
Conductivity ¹⁾	float32	Conductivity currently measured	$-1.4 \cdot 10^{+21}$ to $1.4 \cdot 10^{+21}$	S/m
Temperature ¹⁾	float32	Medium temperature currently measured	$-1.4 \cdot 10^{+21}$ to $1.4 \cdot 10^{+21}$	°C
Totalizer 1 value	float32	Current value of totalizer 1	$-1.4 \cdot 10^{+21}$ to $1.4 \cdot 10^{+21}$	m ³
Extended device status	uint8	Current extended device status	→  11,  54	-
Switching signal, channel 4.2	bool	Current switching signal, channel 4.2	0 = false 1 = true	-
Switching signal, channel 4.1	bool	Current switching signal, channel 4.1	0 = false 1 = true	-

Name	Data type	Description	Value range	Unit
Switching signal, channel 3.2	bool	Current switching signal, channel 3.2	0 = false 1 = true	-
Switching signal, channel 3.1	bool	Current switching signal, channel 3.1	0 = false 1 = true	-
Switching signal, channel 2.2	bool	Current switching signal, channel 2.2	0 = false 1 = true	-
Switching signal, channel 2.1	bool	Current switching signal, channel 2.1	0 = false 1 = true	-
Switching signal, channel 1.2	bool	Current switching signal, channel 1.2	0 = false 1 = true	-
Switching signal, channel 1.1	bool	Current switching signal, channel 1.1	0 = false 1 = true	-

1) The following substitute value is read if the application package or hardware version is not suitable: +3.3e38 and substituted in IODD by "No measured data".


Process data output

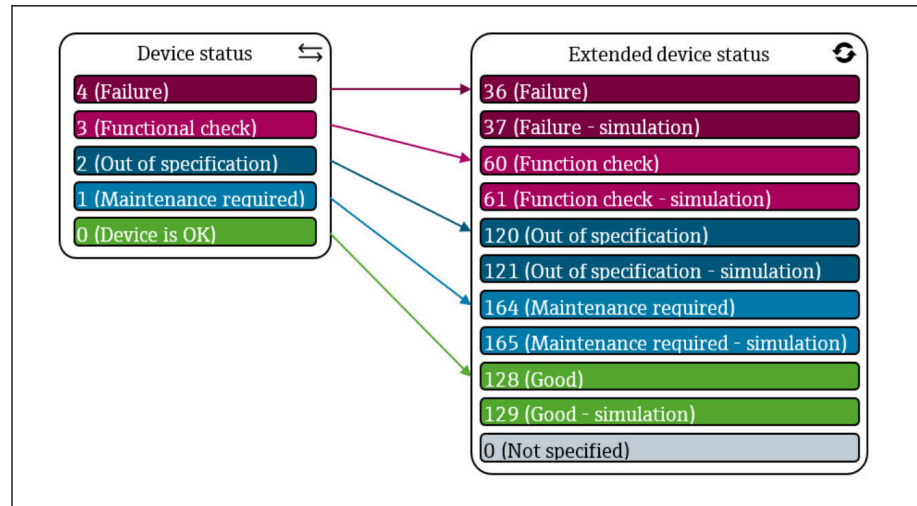
Transmission direction	bool	bool	bool	bool	bool	bool	bool	bool	bool	bool
←	Totalizer 1 – Totalize	Totalizer 1 – Reset + hold	Totalizer 1 – Reset + totalize	Totalizer 1 – Hold	Flow override	Device search	CSC 4 – Totalizer 1	CSC 3 – Temperature	CSC 2 – Conductivity parameter	CSC 1 – Volume flow parameter

Name	Data type	Description	Value range
Totalizer 1 – Totalize	bool	The totalizer is started or continues running.	Off On
Totalizer 1 – Reset + hold	bool	The totalizer is reset to "0" and stopped.	Off On
Totalizer 1 – Reset + totalize	bool	The totalizer is reset to "0" and restarted.	Off On
Totalizer 1 – Hold	bool	The totalizer is stopped.	Off On
Flow override	bool	Reports the flow rate as zero until flow override is deactivated. Can be used during cleaning processes, for example.	Off On
Device search	bool	Activate the device search to locate the device in the application. When the function is activated, the device emits visual signals (e.g. a flashing LED or local display).	Off On
Control signal channel 4 – Totalizer 1	bool	Disables the corresponding measured value. When the function is activated, the process data input is set to "No measured data".	Off On
Control signal channel 3 – Temperature	bool		Off On
Control signal channel 2 – Conductivity parameter	bool		Off On
Control signal channel 1 – Volume flow parameter	bool		Off On

Extended device status

The "Extended device status" maps the device status in the cyclical process data and also displays an activated simulation.

 During an active simulation, the "Device status" and "Extended device status" may differ from each other, depending on the scenario.



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11 Extended device status

Information about IO-Link communication

- i** The following contents are described in the accompanying Special Documentation:
- Reading out and writing device data (ISDU – Indexed Service Data Unit)
 - Endress+Hauser-specific device data
 - IO-Link-specific device data
 - System commands

- b** For detailed IO-Link information, see "IO-Link" Special Documentation for the device → *Related documentation*, 6

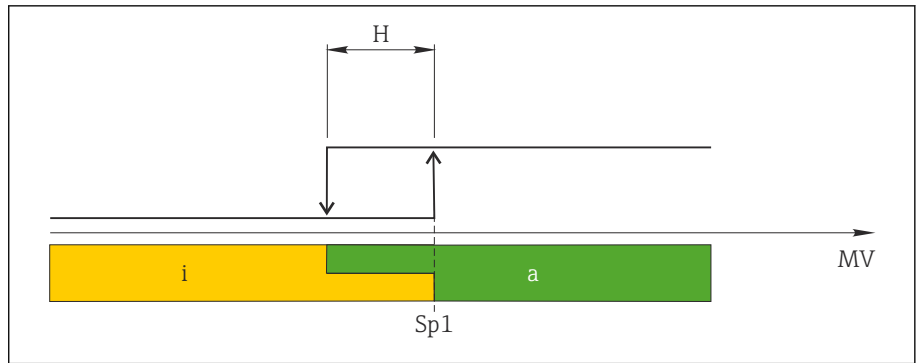
Switching signals

The switching signals offer a simple way of monitoring the measured values for limit violations.

Each switching signal is clearly assigned to a process value and provides a status (active/inactive). This status is transmitted along with the process data → *Process data*, 52. The switching behavior of this status must be configured using the configuration parameters of a "Switching Signal Channel" (SSC). In addition to manual configuration for switch points SP1 and SP2, a teach mechanism is available in the "Teach single value" menu. With this option, the current process value is written to the SP1 or SP2 parameter of the selected SSC using a system command. The following section illustrates the different behaviors of the modes available for selection. The "Logic" parameter is always "High active" in these cases. If the logic is to be inverted, the "Logic" parameter can be set to "Low active".

Single point mode

SP2 is not used in this mode.



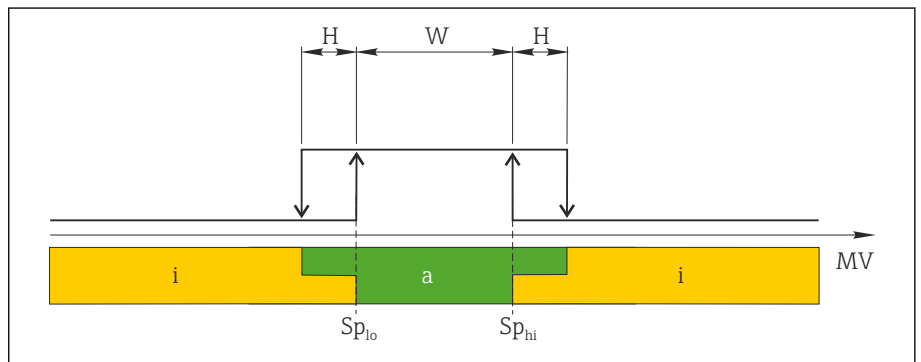
A0055074

12 SSC, single point

- H* Hysteresis
- Sp1* Switch point 1
- MV* Measured value
- i* Inactive (orange)
- a* Active (green)

Window mode

SP_{hi} always corresponds to whichever value is higher, SP1 or SP2, while SP_{lo} always corresponds to whichever value is lower, SP1 or SP2.



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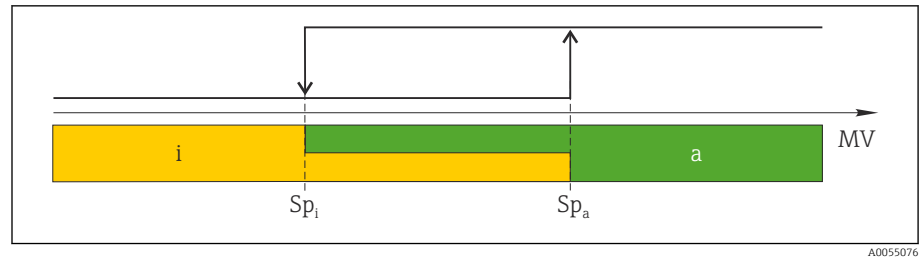
13 SSC, window

- H* Hysteresis
- W* Window
- Sp_{lo}* Switch point with lower measured value
- Sp_{hi}* Switch point with higher measured value
- MV* Measured value
- i* Inactive (orange)
- a* Active (green)

Two-point mode

SP_{hi} always corresponds to whichever value is higher, SP1 or SP2, while SP_{lo} always corresponds to whichever value is lower, SP1 or SP2.

Hysteresis is not used.



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14 SSC, two-point

Sp_i Switch point inactive

Sp_a Switch point active

MV Measured value

i Inactive (orange)



a Active (green)

8 Commissioning

Post-installation check and post-connection check	58
IT security	58
Device-specific IT security	58
Switching on the device	59
Commissioning the device	60
Backing up or duplicating the device data	60

Post-installation check and post-connection check

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

- Post-installation check → *Post-installation check*,  36
- Post-connection check → *Post-connection check*,  46

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.

Device-specific IT security

Access via Bluetooth

Secure signal transmission via Bluetooth uses an encryption method tested by the Fraunhofer Institute.

- Without the SmartBlue App, the device is not visible via Bluetooth.
- Only one point-to-point connection is established between the device and a smartphone or tablet.

Access via the SmartBlue App

Two access levels (user roles) are defined for the device: the **Operator** user role and the **Maintenance** user role. The **Maintenance** user role is configured when the device leaves the factory.

If a user-specific access code is not defined (in the Enter access code parameter), the default setting **0000** continues to apply and the **Maintenance** user role is automatically enabled. The device's configuration data are not write-protected and can be edited at all times.

If a user-specific access code has been defined (in the Enter access code parameter), all the parameters are write-protected. The device is accessed with the **Operator** user role. When the user-specific access code is entered a second time, the **Maintenance** user role is enabled. All parameters can be written to.



For detailed information, see the "Description of Device Parameters" document pertaining to the device.

Protecting access via a password

There are a variety of ways to protect against write access to the device parameters:

- User-specific access code:
Protect write access to the device parameters via all the interfaces.
- Bluetooth key:
The password protects access and the connection between an operating unit, e.g. a smartphone or tablet, and the device via the Bluetooth interface.

General notes on the use of passwords


- The access code and Bluetooth key that are valid when the device is delivered must be redefined during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code and Bluetooth key.
- The user is responsible for the management and careful handling of the access code and Bluetooth key.



Write protection switch

The entire operating menu can be locked via the write protection switch. The values of the parameters cannot be changed. Write protection is disabled when the device leaves the factory.

Access authorization with write protection:

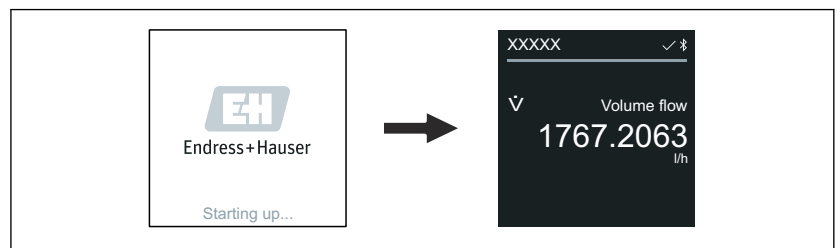
- Disabled: write access to the parameters
- Enabled: read-only access to the parameters

Write protection is enabled with the write protection switch on the back of the display module → *Hardware settings*,  45.



 The local display indicates that write protection is enabled on the top right of the display: .

Switching on the device

- ▶ Switch on the supply voltage for the device.
 - ↳ The local display switches from the start screen to the operational display.



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 If device startup is not successful, the device displays an error message to this effect → *Diagnostics and troubleshooting*,  66.


Commissioning the device

SmartBlue App



Information on the SmartBlue App .

Connecting the SmartBlue App to the device

1. Enable Bluetooth on the mobile handheld terminal, tablet or smartphone.
2. Start the SmartBlue App.
 - ↳ A Live List shows all the devices available.
3. Select the desired device.
 - ↳ The SmartBlue App shows the device login.
4. Under user name, enter **admin**.
5. Under password, enter the device's serial number. Serial number:
 - *Transmitter nameplate*,  17.
6. Confirm your entries.
 - ↳ The SmartBlue App connects to the device and displays the main menu.

Backing up or duplicating the device data

The device does not have a memory module. However, using an operating tool based on the FDT technology (e.g. FieldCare) or the SmartBlue App, the following options are available:

- Save/recover configuration data
- Duplicate device configurations
- Transfer all relevant parameters when replacing electronic inserts


For more information → *Related documentation*,  6

9 Operation

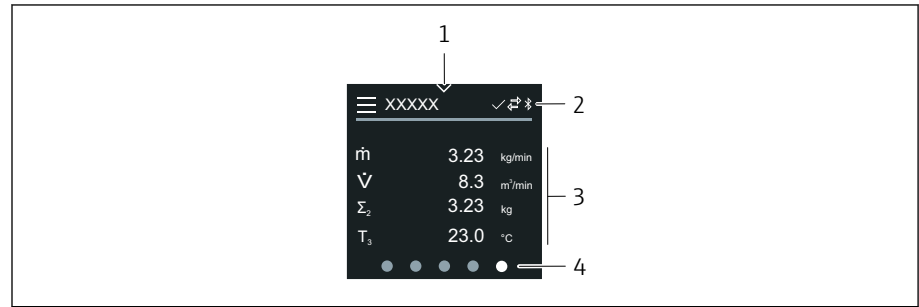
Operational display	62
Reading off the device locking status	62
HistoROM data management	63

Operational display

During routine operation, the local display shows the operational display screen.

 The operational display can be customized: see the description of parameters .









Operational display



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- 1 Quick access
- 2 Status symbols, communication symbols and diagnostic symbols
- 3 Measured values
- 4 Rotating page display

Symbols

-  Locking status
-  Bluetooth is active.
-  Device communication is enabled.
-  Status signal: function check
-  Status signal: maintenance required
-  Status signal: out of specification
-  Status signal: failure
-  Status signal: diagnostics active.

Reading off the device locking status

Indicates the write protection with the highest priority that is currently active.

Navigation

"System" menu → Device management → Locking status

Parameter overview with brief description

Parameter	Description	User interface
Locking status	Indicates the write protection with the highest priority that is currently active.	<ul style="list-style-type: none"> ▪ Hardware locked ▪ Temporarily locked option (e.g. during IO-Link block configuration or parameter upload)

HistoROM data management

The device features HistoROM data management. Device data and process data can be saved, imported and exported with the HistoROM data management function, making operation and servicing far more reliable, secure and efficient.

Data backup

Automatically

The most important device data, e.g. sensor and transmitter, are automatically saved in the S+T-DAT.

Following replacement of the sensor, the customer-specific sensor data are transferred to the device. The device goes into operation immediately without any problems.

Manual

The transmitter data (customer settings) must be manually saved.

Storage concept

	HistoROM backup	S+T-DAT
Available data	<ul style="list-style-type: none"> ▪ Event logbook, e.g. Diagnostic events ▪ Parameter data record backup 	<ul style="list-style-type: none"> ▪ Sensor data, e.g. Nominal diameter ▪ Serial number ▪ Calibration data ▪ Configuration of the device, e.g. software options
Storage location	On the sensor electronics module (ISEM)	In the sensor connector in the sensor neck

Data transmission

- A parameter configuration can be transferred to another device using the export function of the operating tool. The parameter configuration can be duplicated or saved in an archive.
- IO-Link engineering tools also provide an option for carrying out parameter configuration using an IO-Link master, allowing parameters to be saved and restored from there.

10 Diagnostics and troubleshooting

General troubleshooting	66
Diagnostic information via LED	67
Diagnostic information on local display	69
Diagnostic information in FieldCare or DeviceCare	70
Changing the diagnostic information	71
Overview of diagnostic information	71
Pending diagnostic events	74
Diagnostic list	74
Event logbook	74
Resetting the device	76

General troubleshooting

Local display

Fault	Possible causes	Remedy
Local display dark, no output signals	Supply voltage does not match the voltage specified on the nameplate. Supply voltage has incorrect polarity. Connector is not plugged in correctly. Electronics module is defective.	Apply the correct supply voltage. Reverse polarity of supply voltage. Check contact of cables. Check connector. Order the appropriate spare part.
Local display is dark, but signal output is within the valid range.	Incorrect contrast setting of local display. Cable connector for the local display is not correctly connected. Local display is defective.	Adjust the contrast of the local display to ambient conditions. Plug in the cable connector correctly. Order the appropriate spare part.
Display alternates between error message and operational display	Diagnostic event has occurred.	Carry out appropriate troubleshooting measures.
Local display shows text in a foreign, incomprehensible language.	A foreign language is set.	Set the language of the local display.

Only for remote version

Fault	Possible causes	Remedy
Local display displays a fault, no output signals	Cable connectors between the electronics module and local display are not plugged in correctly. Electrode cable and coil current cable are not plugged in correctly.	Plug in the cable connector correctly. Plug in the electrode cable and coil current cable correctly.

Output signal

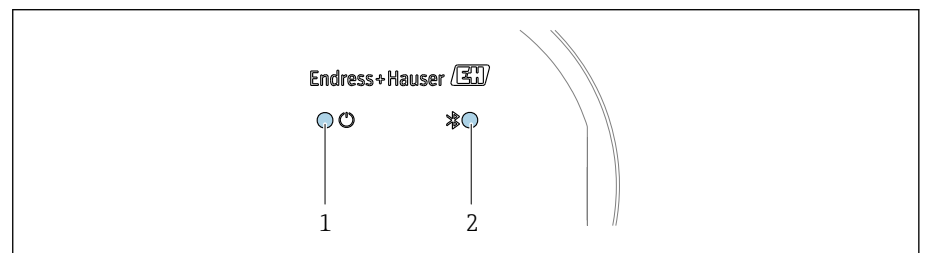
Fault	Possible causes	Remedy
Local display shows the correct value, but signal output is incorrect, though in the valid range.	Parameter configuration error	<ul style="list-style-type: none"> ■ Check parameter configuration. ■ Correct parameter configuration.
Device is measuring incorrectly.	<ul style="list-style-type: none"> ■ Parameter configuration error ■ The device is being operated outside the application range. 	<ul style="list-style-type: none"> ■ Check parameter configuration. ■ Correct parameter configuration. ■ Observe limit values indicated.

Access and communication

Fault	Possible causes	Remedy
Not possible to write-access the parameter.	Write protection is enabled.	Set the write protection switch on the local display to the Off position.
	Current user role has limited access authorization.	<ol style="list-style-type: none"> 1. Check user role. 2. Enter correct customer-specific access code.
Device communication is not possible.	Data transfer is active.	Wait until the data transfer or the current action is finished.
SmartBlue App does not show the device in the live list.	<ul style="list-style-type: none"> Bluetooth is disabled on the device. Bluetooth is disabled on the smartphone or tablet. 	<ol style="list-style-type: none"> 1. Check whether the Bluetooth symbol appears on the local display. 2. Enable Bluetooth on the device. 3. Enable Bluetooth on the smartphone or tablet.
Device cannot be operated with the SmartBlue App.	<ul style="list-style-type: none"> Bluetooth connection is not available. The device is already connected to another smartphone or tablet. Incorrect password entered. Password forgotten. 	<ol style="list-style-type: none"> 1. Check whether other devices are connected to the SmartBlue App. 2. Disconnect any other device connected to the SmartBlue App. <ol style="list-style-type: none"> 1. Enter correct password. 2. Contact Endress+Hauser service organization.
Login with user data is not possible with the SmartBlue App.	Device in operation for the first time.	<ol style="list-style-type: none"> 1. Enter the initial password (serial number of the device). 2. Change the initial password.

Diagnostic information via LED

Only for devices with the order code for "Display; operation", option H



- 1 Device status
- 2 Bluetooth

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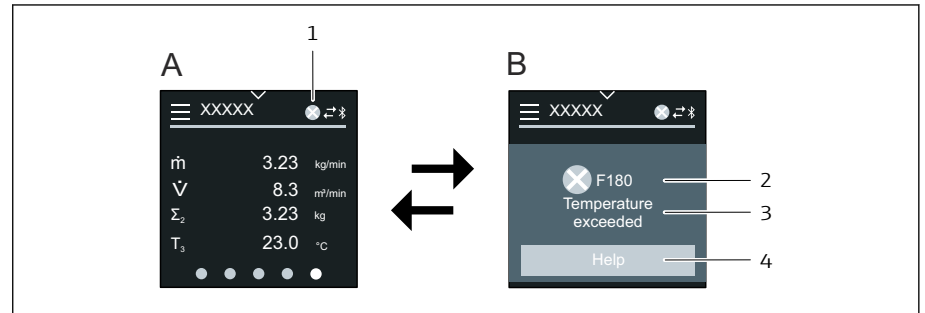
LED	Status	Meaning
1 Device status (normal operation)	Off	No power supply
	Permanently green	Device status is OK. No warning / failure / alarm
	Flashing red	Warning is active.
	Permanently red	Alarm is active.

LED	Status	Meaning
2 Bluetooth	Off Permanently blue Flashing blue	Bluetooth is disabled. Bluetooth is enabled. Data transfer in progress.

Diagnostic information on local display

Diagnostic message

The local display alternates between displaying faults as a diagnostic message and displaying the operational display screen.



- A Operational display in alarm condition
 B Diagnostic message
 1 Diagnostic behavior
 2 Diagnostic behavior with diagnostic code
 3 Short text
 4 Open information on remedial measures (HART and Modbus RS485 only)

If two or more diagnostic events are pending simultaneously, the local display only shows the diagnostic message with the highest priority.

- i** Other diagnostic events that have occurred can be opened as follows:
- Via FieldCare → *Operating tools*, 102
 - Via DeviceCare → *Operating tools*, 102
 - Via IO-Link

Status signals

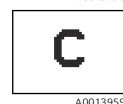
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

- i** The status signals are categorized according to NAMUR Recommendation NE 107: F = Failure, C = Function Check, S = Out of Specification, M = Maintenance Required, N = No Effect



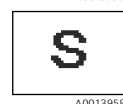
Failure

- A device error has occurred.
- Measured value is no longer valid.



Function check

Device is in the service mode, e.g. during a simulation.



Out of specification

Device is being operated outside the technical specification limits, e.g. outside the process temperature range.

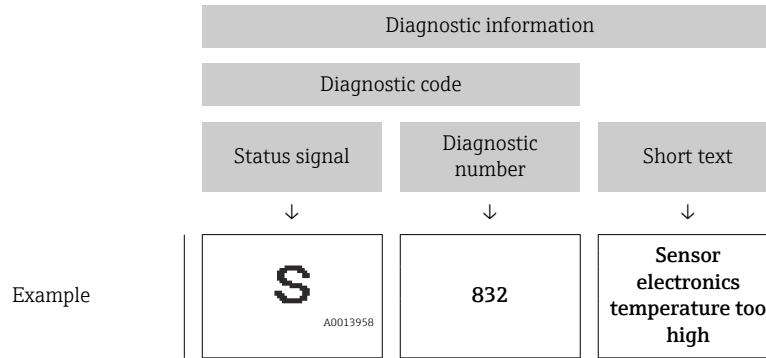


Maintenance required

- Maintenance is required.
- Measured value is still valid.

Diagnostic information

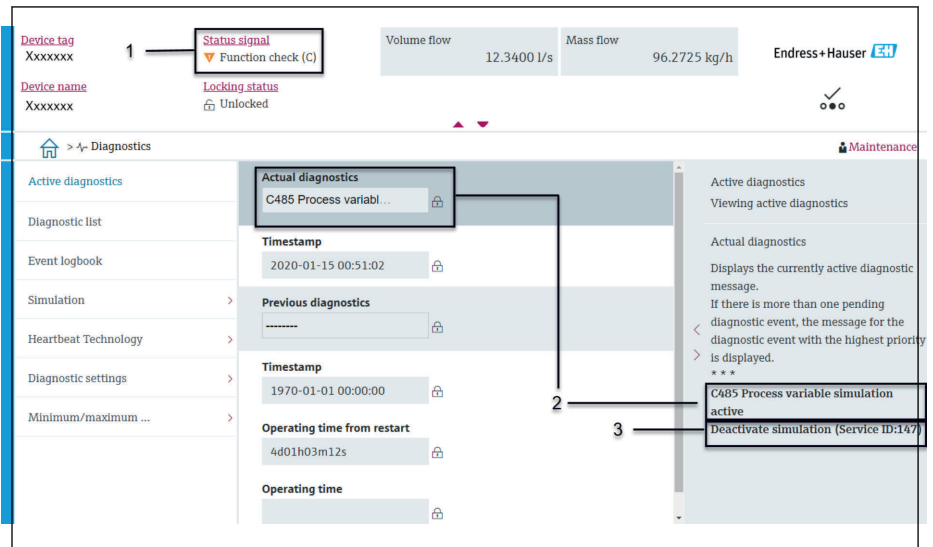
The fault can be identified using the diagnostic information. The short text displays a tip about the fault.



Diagnostic information in FieldCare or DeviceCare

Diagnostic options

After the connection has been established, the device shows faults on the home page.

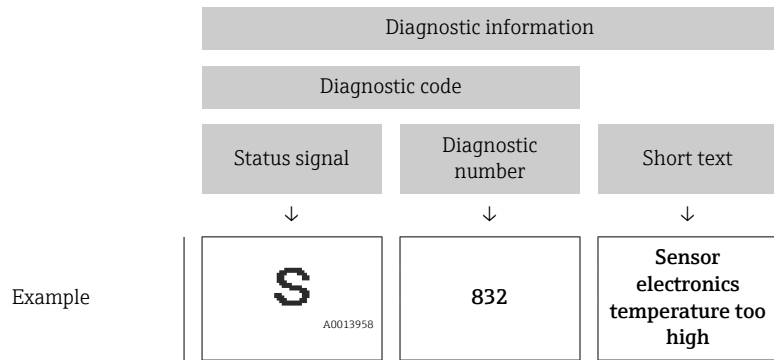


- 1 Status area with diagnostic behavior and status signal
- 2 Diagnostic code and short message
- 3 Troubleshooting measures with service ID

- i** Other diagnostic events that have occurred can be opened in the **Diagnostics** menu as follows:
 - Via parameter
 - Via submenus

Diagnostic information

The fault can be identified using the diagnostic information. The short text displays a tip about the fault. The corresponding symbol for the diagnostic behavior appears at the start.



Changing the diagnostic information

Adapting the diagnostic behavior

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

Navigation path

Diagnostics → Diagnostic settings

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

Options	Description
Alarm	<ul style="list-style-type: none"> Device stops measurement. Signal outputs and totalizers assume a defined alarm condition. Diagnostic message is generated.
Warning	<ul style="list-style-type: none"> Device continues measuring. Signal outputs and totalizers are not affected. Diagnostic message is generated.
Logbook entry only	<ul style="list-style-type: none"> Device continues measuring. The local display shows the diagnostic message in the Event logbook submenu (Event list submenu) and does not alternate with the operational display.
Off	<ul style="list-style-type: none"> Diagnostic event is ignored. Diagnostic message is not generated and not entered.

Overview of diagnostic information

i The amount of diagnostic information and the number of measured variables affected increase if the device has one or more application packages.

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
Diagnostic of sensor				
043	Sensor 1 short circuit detected	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	S	Warning ¹⁾
082	Data storage inconsistent	Check module connections	F	Alarm
083	Memory content inconsistent	1. Restart device 2. Restore S-DAT data 3. Replace S-DAT	F	Alarm
168	Buildup limit exceeded	Clean measuring tube	M	Warning
169	Conductivity measurement failed	1. Check grounding conditions 2. Deactivate conductivity measurement	M	Warning
170	Coil resistance faulty	Check ambient and process temperature	F	Alarm
180	Temperature sensor defective	1. Check sensor connections 2. Replace sensor cable or sensor 3. Turn off temperature measurement	F	Warning
181	Sensor connection faulty	1. Check sensor cable and sensor 2. Execute Heartbeat Verification 3. Replace sensor cable or sensor	F	Alarm
Diagnostic of electronic				
201	Electronics faulty	1. Restart device 2. Replace electronics	F	Alarm
230	Date/time incorrect	1. Replace RTC buffer battery 2. Set date and time	M	Warning ¹⁾
231	Date/time not available	1. Replace display module or its cable 2. Set date and time	M	Warning ¹⁾
242	Firmware incompatible	1. Check firmware version 2. Flash or replace electronic module	F	Alarm
252	Module incompatible	1. Check electronic modules 2. Check if correct modules are available (e.g. NEx, Ex) 3. Replace electronic modules	F	Alarm
278	Display module defective	Replace display module	F	Alarm
283	Memory content inconsistent	Restart device	F	Alarm
302	Device verification active	Device verification in progress, please wait.	C	Warning ¹⁾
311	Sensor electronics (ISEM) faulty	Maintenance required! Do not reset device	M	Warning

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
331	Firmware update failed in module 1 to n	1. Update firmware of device 2. Restart device	F	Warning
372	Sensor electronics (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	F	Alarm
373	Sensor electronics (ISEM) faulty	Contact service	F	Alarm
376	Sensor electronics (ISEM) faulty	1. Replace sensor electronic module (ISEM) 2. Turn off diagnostic message	S	Warning ¹⁾
377	Electrode signal faulty	1. Activate empty pipe detection 2. Check partial filled pipe and installation direction 3. Check sensor cabling 4. Deactivate diagnostics 377	S	Warning ¹⁾
378	Electronic module supply voltage faulty	1. Restart device 2. Check if failure recurs 3. Replace electronic module	F	Alarm
383	Memory content	Reset device	F	Alarm
387	HistoROM data faulty	Contact service organization	F	Alarm
Diagnostic of configuration				
410	Data transfer failed	1. Retry data transfer 2. Check connection	F	Alarm
412	Processing download	Download active, please wait	C	Warning
419	Power cycle required	Power cycle device	F	Alarm
437	Configuration incompatible	1. Update firmware 2. Execute factory reset	F	Alarm
438	Dataset different	1. Check dataset file 2. Check device parameterization 3. Download new device parameterization	M	Warning
453	Flow override active	Deactivate flow override	C	Warning
484	Failure mode simulation active	Deactivate simulation	C	Alarm
485	Process variable simulation active	Deactivate simulation	C	Warning
495	Diagnostic event simulation active	Deactivate simulation	C	Warning
511	Electronic module settings faulty	1. Check measuring period and integration time 2. Check sensor properties	C	Alarm
Diagnostic of process				
832	Sensor electronics temperature too high	Reduce ambient temperature	S	Warning ¹⁾
833	Sensor electronics temperature too low	Increase ambient temperature	S	Warning ¹⁾

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
834	Process temperature too high	Reduce process temperature	S	Warning ¹⁾
835	Process temperature too low	Increase process temperature	S	Warning ¹⁾
842	Process value below limit	Low flow cut off active! Check low flow cut off configuration	S	Warning ¹⁾
937	Sensor symmetry	1. Eliminate external magnetic field near sensor 2. Turn off diagnostic message	S	Warning ¹⁾
938	Coil current not stable	1. Check if external magnetic interference is present 2. Perform Heartbeat Verification 3. Check flow value	F	Alarm ¹⁾
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning
961	Electrode potential out of specification	1. Check process conditions 2. Check ambient conditions	S	Warning ¹⁾
962	Pipe empty	1. Perform full pipe adjustment 2. Perform empty pipe adjustment 3. Turn off empty pipe detection	S	Warning ¹⁾

1) Diagnostic behavior can be changed.

Pending diagnostic events

The **Active diagnostics** submenu displays the current diagnostic event and the last diagnostic event to occur.

Diagnostics → Active diagnostics



The **Diagnostic list** submenu shows other diagnostic events that are pending.

Diagnostic list

The **Diagnostic list** submenu shows up to 5 currently pending diagnostic events with the related diagnostic information. If more than 5 diagnostic events are pending, the local display shows the diagnostic information with the highest priority.

Navigation path

Diagnostics → Diagnostic list

Event logbook

Reading out the event logbook



The event logbook is only available via FieldCare, DeviceCare or SmartBlue App (Bluetooth).



The **Event logbook** submenu shows a chronological overview of the event messages that have occurred.

Navigation path

Diagnostics menu → **Event logbook** submenu

Chronological display with a maximum of 20 event messages.

The event history includes the following entries:

- Diagnostic event → *Overview of diagnostic information*,  71
- Information event → *Overview of information events*,  75

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

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



Filter event messages:

Filtering the event logbook

The **Event logbook** submenu displays the category of event messages that were configured with the **Filter options** parameter.

Navigation path

Diagnostics → Event logbook → Filter options

Filter categories

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

Overview of information events

The information event is only displayed in the event logbook.



See also information in the IODD finder

→ <https://ioddfinder.io-link.com/>,  101.

Info number	Info name
I1000	----- (Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I11036	Date/time set successfully
I11167	Date/time resynchronized
I1137	Display module replaced
I1151	History reset
I1155	Sensor electronics temperature reset
I1157	Memory error event list
I1256	Display: access status changed

Info number	Info name
I1335	Firmware changed
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1443	Buildup thickness not determined
I1444	Device verification passed
I1445	Device verification failed
I1459	I/O module verification failed
I1461	Sensor verification failed
I1462	Sensor electronic module verific. failed
I1512	Download started
I1513	Download finished
I1514	Upload started
I1515	Upload finished
I1622	Calibration changed
I1624	All totalizers reset
I1625	Write protection activated
I1626	Write protection deactivated
I1629	CDI: login successful
I1632	Display: login failed
I1633	CDI: login failed
I1634	Reset to factory settings
I1635	Reset to delivery settings
I1649	Hardware write protection activated
I1650	Hardware write protection deactivated
I1712	New flash file received
I1725	Sensor electronic module (ISEM) changed

Resetting the device

The entire configuration, or a part of the configuration, can be reset to a defined state here.

Navigation path

System → Device management → Device reset

Options	Description
To delivery settings	Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
Restart device	The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
Restore S-DAT backup	Restores the data that is saved on the S-DAT. Additional information: This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed. Visibility depends on order options or device settings
Create T-DAT backup	Creates T-DAT backup.

Restore T-DAT backup	Restores the data saved on the T-DAT. This function can be used to resolve the memory issue "283 Memory content inconsistent" or to restore the T-DAT data when a new T-DAT has been installed. Visibility depends on order options or device settings
(Back to box) ¹⁾	Similar to the reset To delivery settings option, the IO-Link connection is also disconnected. Consequently any existing DataStorage Backup in the master is not overwritten. Device is waiting for power cycle.

1) Available as IO-Link system command

11 Maintenance

Maintenance tasks	80
Services	80

Maintenance tasks

The device is maintenance-free. Modifications or repairs may only be carried out following consultation with an Endress+Hauser service organization. It is recommended to examine the device regularly for corrosion, mechanical wear and damage.

Cleaning

Cleaning of surfaces not in contact with the medium

1. Recommendation: Use a lint-free cloth that is either dry or slightly dampened using water.
2. Do not use sharp objects or aggressive cleaning agents that could damage surfaces (e.g. displays, housing) and seals.
3. Do not use high-pressure steam.
4. Ensure compliance with the protection class of the device.

NOTICE

Cleaning agents can damage the surfaces!

Incorrect cleaning agents can damage the surfaces!

- ▶ Do not use cleaning agents containing concentrated mineral acids, alkalis or organic solvents e.g. benzyl alcohol, methylene chloride, xylene, concentrated glycerol cleaners or acetone.

Cleaning of surfaces in contact with the medium

Note the following for cleaning and sterilization in place (CIP/SIP):

- Use only cleaning agents to which the materials in contact with the medium are sufficiently resistant.
- Observe the permitted maximum medium temperature.

Services

Endress+Hauser offers a wide range of services for device maintenance, e.g. recalibration, maintenance service or device tests.

Endress+Hauser sales organizations can provide information about the services available.

12 Disposal

Removing the device	82
Disposing of the device	82

Removing the device

1. Disconnect the device from the supply voltage.
2. Remove all connecting cables.

⚠ WARNING

Process conditions can put staff at risk!

- ▶ Wear suitable protective equipment.
- ▶ Allow the device and pipe to cool.
- ▶ Empty the device and pipe so that they are unpressurized.
- ▶ Rinse the device and pipe if necessary.

3. Remove the device correctly.

Disposing of the device

⚠ WARNING

Dangerous media can endanger staff and the environment!

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



A0042336

If required by the Directive 2012/19/EU of the European Parliament and the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE), the device is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste.

- Do not dispose of devices bearing this marking as unsorted municipal waste. Instead, return them to Endress+Hauser for disposal under the applicable conditions.
- Observe applicable federal/national regulations.
- Ensure proper separation and reuse of the device components.
- Overview of installed materials: → *Materials*, 99

13 Technical data

Input	84
Output	85
Power supply	88
Cable specifications	89
Performance characteristics	91
Environment	92
Process	94
Mechanical construction	96
Local display	101
Certificates and approvals	102
Application packages	103

Input

Measured variable

Direct measured variables	Volume flow (proportional to induced voltage)
Calculated measured variables	Mass flow

Operable flow range

Over 1000 : 1

Measuring range

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

Electrical conductivity:

- ≥ 5 $\mu\text{S/cm}$ for liquids in general
- ≥ 20 $\mu\text{S/cm}$ for demineralized water

Flow characteristic values in SI units

Nominal diameter		Recommended flow min./max. full scale value ($v \sim 0.3/10$ m/s)	Full scale value current output ($v \sim 2.5$ m/s)	Factory settings	
[mm]	[in]			Pulse value (~ 2 pulse/s)	Low flow cut off ($v \sim 0.04$ m/s)
		[dm ³ /min]	[dm ³ /min]	[dm ³]	[dm ³ /min]
25	1	9 to 300	75	0.5	1
40	1 ½	25 to 700	200	1.5	3
50	2	35 to 1 100	300	2.5	5
65	–	60 to 2 000	500	5	8
80	3	90 to 3 000	750	5	12
100	4	145 to 4 700	1 200	10	20

Flow characteristic values in US units

Nominal diameter		Recommended flow min./max. full scale value ($v \sim 0.3/10$ m/s)	Full scale value current output ($v \sim 2.5$ m/s)	Factory settings	
[in]	[m1m]			Pulse value (~ 2 pulse/s)	Low flow cut off ($v \sim 0.04$ m/s)
		[gal/min]	[gal/min]	[gal]	[gal/min]
1	25	2.5 to 80	18	0.2	0.25
1 ½	40	7 to 190	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
–	65	16 to 500	130	1	2
3	80	24 to 800	200	2	2.5
4	100	40 to 1 250	300	2	4

Output

Output signal

Output versions

Order code 020: output; input	Output version
Option F	IO-Link

IO-Link

Physical interface	Similar to the standard IEC 61131-9
Signal	Digital communication signal IO-Link, 3-wire
IO-Link version	1.1
IO-Link SSP version	Smart Sensor Profile 2nd Edition V1.2
IO-Link device port	IO-Link port class A

Signal on alarm

Output behavior in the event of a device alarm (failure mode)

IO-Link

Operating mode	Digital transmission of all failure information
Device status	Readable via cyclic and acyclic data transmission

Low flow cut off

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

Galvanic isolation

The outputs are galvanically isolated from one another and from earth.

Protocol-specific data

IO-Link specification	Version 1.1.3
Device ID	9728257
Manufacturer ID	17
Smart Sensor Profile	Smart Sensor Profile 2nd Edition V1.2; supported <ul style="list-style-type: none"> ▪ Identification and Diagnosis ▪ Digital Measuring and Switching Sensor (as per SSP type 4.3.4) ▪ Function Class Sensor Control Wide
Smart Sensor Profile Type	Measuring profile type 4.3.4 Measuring and Switching Sensor, floating point, 4 channel
SIO mode	No
Speed	COM2 (38.4 kBaud)
Minimum cycle time	12 ms
Process data width	Input: 18 bytes (as per SSP 4.3.4) Output: 2 bytes (as per SSP 4.3.4)
OnRequestdata	8 bytes
Data storage	Yes
Block configuration	Yes
Device operational	The device is operational 6 s after the supply voltage has been applied
System integration	Cyclic input measured variables: <ul style="list-style-type: none"> ▪ Volume flow [m³/h] ▪ Conductivity [S/m], depending on order options or device settings ▪ Temperature [°C], depending on the sensor option selected ▪ Totalizer 1 [m³] Cyclic output measured variables: <ul style="list-style-type: none"> ▪ Totalizer submenu – Totalize option ▪ Totalizer submenu – Reset + hold option ▪ Totalizer submenu – Reset + totalize option ▪ Totalizer submenu – Hold option ▪ Flow override ▪ Device search

Device description

In order to integrate field devices into a digital communication system, the IO-Link system needs a description of the device parameters, such as output data, input data, data format, data volume and supported transmission rate.

These data are available in the device description (IODD) which is provided to the IO-Link Master when the communication system is commissioned.

The IODD can be downloaded as follows:

- www.endress.com
- <https://ioddfinder.io-link.com>

Power supply

Supply voltage

Order code for "Power supply"	Terminal voltage	Frequency range
Option A IO-Link port class A	DC 18 to 30 V ¹⁾	–

1) These values are absolute minimum and maximum values. No tolerance applies. The DC power unit must be tested to ensure it meets technical safety requirements (e.g. PELV, SELV) with limited power sources (e.g. Class 2).

Power consumption

- Transmitter:
IO-Link: Max. 6 W (active power)
- Switch-on current:
IO-Link: Max. 400 mA

Current consumption

Max 200 mA. (18 to 30 V, IO-Link port class A)

Power supply failure

- Totalizers stop at the last value measured.
- Device configuration remains unchanged.
- Error messages (incl. total operated hours) are stored.

Cable entries

M12 plug-in connector

Overvoltage protection

Mains voltage fluctuations	→ <i>Supply voltage</i> , 88
Overvoltage category	Overvoltage category II
Short-term, temporary overvoltage	Between cable and neutral conductor up to 1200 V for max. 5s
Long-term, temporary overvoltage	Up to 500 V between cable and ground

Cable specifications

Requirements for connecting cable

Electrical safety

As per applicable national regulations.

Permitted temperature range

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

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

- A standard installation cable is sufficient.
- Provide grounding according to applicable national codes and regulations.

Signal cable

IO-Link:

Twisted three- or four-core cable M12 A-coded according to IEC 61076-2-101 recommended with

- Conductor cross-section: 0.34 mm² (AWG22)
- Max. cable length: 20 m

Ground cable requirements

Copper wire: at least 6 mm² (0.0093 in²)

Connecting cable requirements



Connecting cable only necessary for remote version.

Electrode cable	Coil current cable
<p style="text-align: right; font-size: small;">A0054679</p> <p>1 GND (green): Ground-wire 0.38 mm² (AWG 21)</p> <p>2 E1 (brown): "Electrode E1" - core 0.38 mm² (AWG 21)</p> <p>3 E (yellow): grounding 0.38 mm² (AWG 21)</p> <p>4 E2 (white): "Electrode E2" - core 0.38 mm² (AWG 21)</p> <p>a Outer jacket</p> <p>b Cable shield</p> <p>c Core jacket</p> <p>d Core shield</p> <p>e Core insulation</p> <p>f Core</p>	<p style="text-align: right; font-size: small;">A0054680</p> <p>1 ER+ (black): coil current core 0.75 mm² (AWG 18)</p> <p>2 ER- (black): coil current core 0.75 mm² (AWG 18)</p> <p>3 NC (yellow-green): not connected 0.75 mm² (AWG 18)</p> <p>a Outer jacket</p> <p>b Cable shield</p> <p>c Core insulation</p> <p>d Core</p> <p>e Core reinforcement</p>



Armored connecting cable

Armored connecting cables with additional, metal reinforcing braid can be ordered from Endress+Hauser. Armored connecting cables are used:

- When laying the cable directly in the ground
- Where there is a risk of damage from rodents
- If using the device below IP68 degree of protection

Electrode cable

Design	3×0.38 mm ² (21 AWG) with common, braided copper shield (∅ ~ 9.5 mm (0.37 in)) and individual shielded cores
Conductor resistance	≤ 50 Ω/km (0.015 Ω/ft)
Capacitance: core/shield	≤ 420 pF/m (128 pF/ft)
Cable length	Depends on the medium conductivity: maximum 200 m (656 ft)
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 20 m (60 ft) Armored cables: variable length up to maximum 200 m (656 ft)
Operating temperature	-20 to +80 °C (-4 to +176 °F)

Coil current cable

Design	3×0.75 mm ² (18 AWG) with common, braided copper shield (∅ ~ 9.5 mm (0.37 in)) and individual shielded cores
Conductor resistance	≤ 37 Ω/km (0.011 Ω/ft)
Capacitance: core/shield	≤ 120 pF/m (37 pF/ft)
Cable length	Depends on the medium conductivity, max. 200 m (656 ft)
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 20 m (60 ft) or variable length up to max. 200 m (656 ft) Armored cables: variable length up to max. 200 m (656 ft)

Operating temperature	-20 to +80 °C (-4 to +176 °F)
Test voltage for cable insulation	≤ AC 1 433 V rms 50/60 Hz or ≥ DC 2 026 V

Performance characteristics

Reference operating conditions

- Error limits based on ISO 20456:2017
- Water, typically: +15 to +45 °C (+59 to +113 °F); 0.5 to 7 bar (73 to 101 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

i To obtain measured errors, use the *Applicator* sizing tool → *Service-specific accessory*, 129

Maximum measurement error

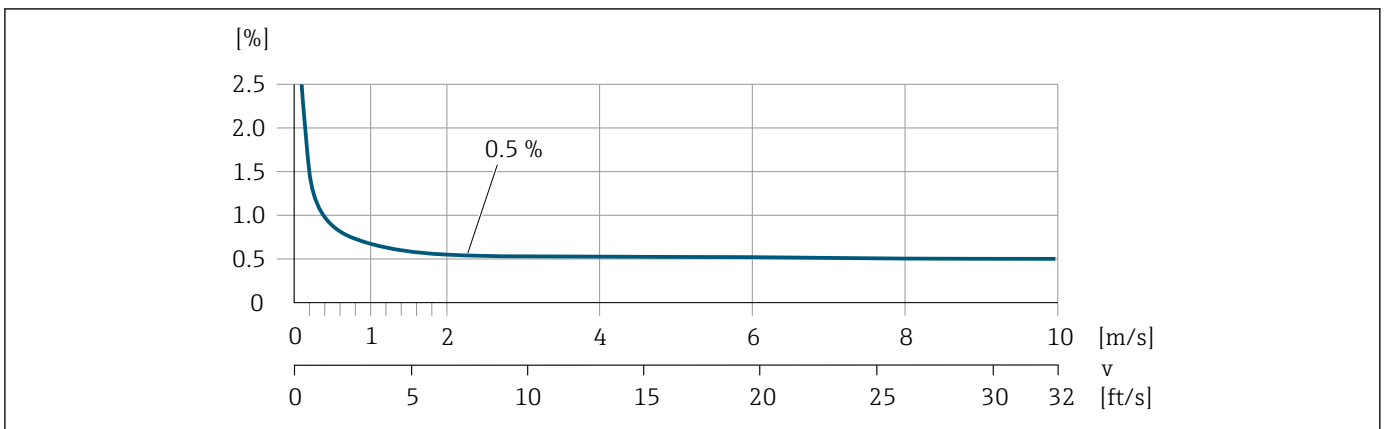
o. r. = of reading

Maximum permissible error under reference operating conditions

Volume flow

±0.5 % o. r. ±1 mm/s (±0.04 in/s)

i Fluctuations in the supply voltage have no effect within the specified range.




15 Maximum measurement error in % o.r.



Repeatability

Volume flow	Max. ±0.1 % o. r. ± 0.5 mm/s (0.02 in/s)
--------------------	------------------------------------------

Environment

Ambient temperature range

Transmitter	-40 to +60 °C (-40 to +140 °F)
Local display	-20 to +60 °C (-4 to +140 °F) The readability of the display may be impaired at temperatures outside the temperature range.
Sensor	-20 to +60 °C (-4 to +140 °F)
Liner	Do not exceed or fall below the permitted temperature range of the liner → <i>Medium temperature range</i> ,  94.

 Dependency of ambient temperature on medium temperature → *Medium temperature range*,  94

Storage temperature

The storage temperature corresponds to the ambient temperature range of the transmitter and sensor.

Relative humidity

The device is suitable for use in outdoor and indoor areas with a relative humidity of 5 to 95%.

Operating height

According to EN 61010-1

- Without overvoltage protection: ≤ 2 000 m
- With overvoltage protection: > 2 000 m (e.g. Endress+Hauser HAW series)

Degree of protection

Transmitter	<ul style="list-style-type: none"> ▪ IP66/67, Type 4X enclosure, suitable for pollution degree 4 ▪ Open housing: IP20, Type 1 enclosure, suitable for pollution degree 2
Sensor	IP66/67, Type 4X enclosure, suitable for pollution degree 4

Vibration resistance and shock resistance

Compact version

Vibration, sinusoidal Following IEC 60068-2-6	2 to 8.4 Hz	3.5 mm peak
	8.4 to 2 000 Hz	1 g peak
Vibration, broad-band random Following IEC 60068-2-64	10 to 200 Hz	0.003 g ² /Hz
	200 to 2 000 Hz	0.001 g ² /Hz (1.54 g rms)
Shocks, half-sine Following IEC 60068-2-27	6 ms 30 g	

Shock

Due to rough handling similar to IEC 60068-2-31.

Remote version (sensor)

Vibration, sinusoidal Following IEC 60068-2-6	2 to 8.4 Hz	7.5 mm peak
	8.4 to 2 000 Hz	1 g peak
Vibration, broad-band random Following IEC 60068-2-6	10 to 200 Hz	0.01 g ² /Hz
	200 to 2 000 Hz	0.003 g ² /Hz (2.7 g rms)
Shocks, half-sine Following IEC 60068-2-6	6 ms 50 g	

Shock

Due to rough handling similar to IEC 60068-2-31.

Electromagnetic compatibility (EMC)

As per IEC/EN 61326 and
IO-Link Interface and System Specification



For more information: Declaration of Conformity

Process

Medium temperature range

0 to +60 °C (+32 to +140 °F)

Conductivity

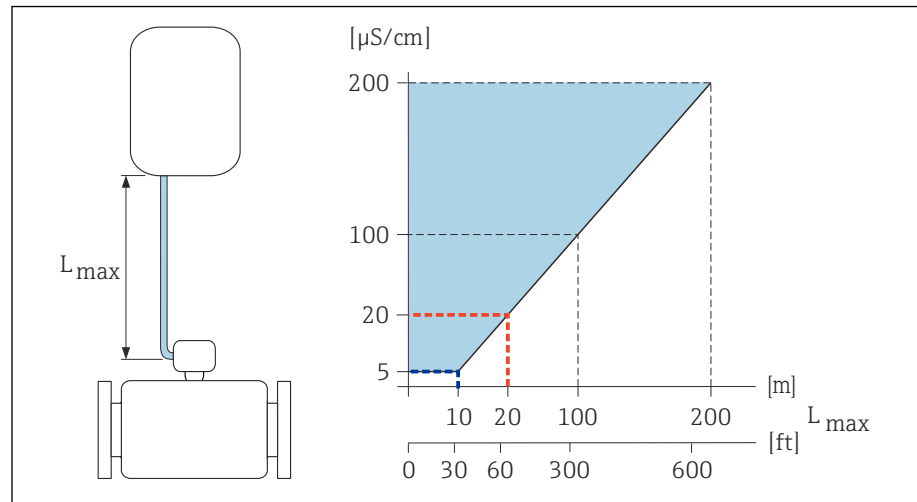
The minimum conductivity is:

- 5 $\mu\text{S/cm}$ for liquids in general
- 20 $\mu\text{S/cm}$ for demineralized water

The following basic conditions must be observed for $< 20 \mu\text{S/cm}$:

- Order code 013 for "Functionality", option D "Extended transmitter" and higher output signal damping is recommended for values under $20 \mu\text{S/cm}$.
- Observe the maximum permitted cable length L_{max} . This length is determined by the conductivity of the medium.
- With order code 013 "Functionality", option A "Standard transmitter" and empty pipe detection (EPD) switched on, the minimum conductivity is $20 \mu\text{S/cm}$.
- With order code 013 "Functionality", option A "Standard transmitter" - remote version, empty pipe detection may not be activated if $L_{\text{max}} > 20 \text{ m}$.

i Note that in the case of the remote version, the minimum conductivity depends on the cable length.



16 Permitted length of connecting cable

Colored area = permitted range

L_{max} = length of connecting cable in [m] ([ft])

[$\mu\text{S/cm}$] = medium conductivity

Red line = order code 013 "Functionality", option A "Standard transmitter"

Blue line = order code 013 "Functionality", option D "Extended transmitter"

Flow limit

Pipe diameter and flow rate determine the nominal diameter of the sensor.

i The flow velocity is increased by reducing the sensor nominal diameter.

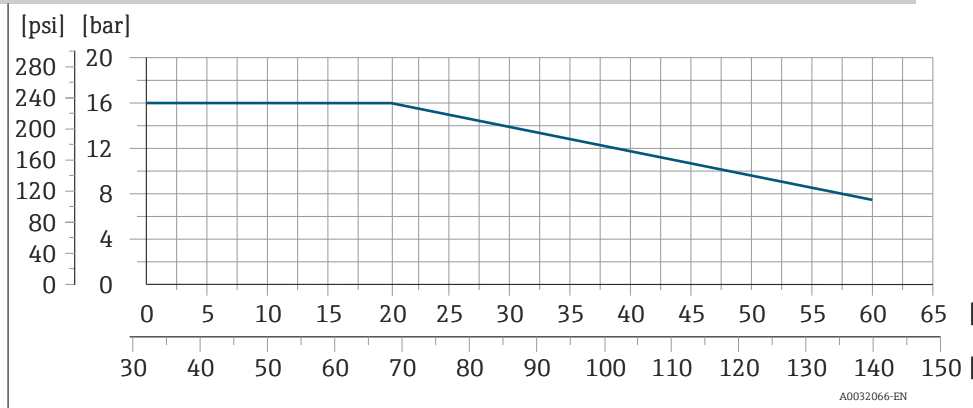
2 to 3 m/s (6.56 to 9.84 ft/s)	Optimum flow velocity
$v < 2$ m/s (6.56 ft/s)	For abrasive media, e.g. potter's clay, lime milk, ore slurry
$v > 2$ m/s (6.56 ft/s)	For media producing buildup, e.g. wastewater sludge

Pressure/temperature ratings

Permitted process pressure

Fixed flange similar to EN 1092-1
 Fixed flange similar to ASME B16.5
 Fixed flange similar to JIS B2220

Stainless steel



Pressure tightness

Measuring tube: 0 mbar abs. (0 psi abs.) at a medium temperature of $\leq +60$ °C (+140 °F)

Pressure loss

- No pressure loss: transmitter installed in a pipe with the same nominal diameter.
- Pressure loss information when adapters are used → *Adapters*, 30

Mechanical construction

Weight

All values refer to devices with flanges with a standard pressure rating. Weight data are guideline values. The weight may be lower than indicated depending on the pressure rating and design.

Transmitter remote version

- Polycarbonate: 1.4 kg (3.1 lbs)
- Aluminum: 2.4 kg (5.3 lbs)

Sensor remote version

Aluminum sensor connection housing: see the information in the following table.

Compact version

Weight in SI units

DN		Weight
[mm]	[in]	[kg]
25	1	3.20
40	1½	3.80
50	2	4.60
65	–	5.40
80	3	6.40
100	4	9.10

Weight in US units

DN		Weight
[mm]	[in]	[lbs]
25	1	7
40	1½	8
50	2	10
65	–	12
80	3	14
100	4	20

Remote version

Weight in SI units

DN		Weight
[mm]	[in]	[kg]
25	1	2.5
40	1½	3.1
50	2	3.9
65	–	4.7

DN		Weight
[mm]	[in]	[kg]
80	3	5.7
100	4	8.4

Weight in US units

DN		Weight
[mm]	[in]	[kg]
25	1	6
40	1½	7
50	2	9
65	–	10
80	3	13
100	4	19

Measuring tube specification

Wafer version

Pressure rating EN (DIN), PN16

DN		Mounting bolts			Centering sleeves		Measuring tube	
[mm]	[in]		[mm]	[in]	Length		Internal diameter	
					[mm]	[in]	[mm]	[in]
25	1	4 × M12 ×	145	5.71	54	2.13	24	0.94
40	1½	4 × M16 ×	170	6.69	68	2.68	38	1.50
50	2	4 × M16 ×	185	7.28	82	3.23	50	1.97
65 ¹⁾	–	4 × M16 ×	200	7.87	92	3.62	60	2.36
65 ²⁾	–	8 × M16 ×	200	7.87	– ³⁾	–	60	2.36
80	3	8 × M16 ×	225	8.86	116	4.57	76	2.99
100	4	8 × M16 ×	260	10.24	147	5.79	97	3.82

1) EN (DIN) flange: 4-hole → with centering sleeves

2) EN (DIN) flange: 8-hole → without centering sleeves

3) A centering sleeve is not required. The device is centered directly via the sensor housing.

Pressure rating ASME, Class 150

DN		Mounting bolts			Centering sleeves		Measuring tube	
[mm]	[in]		[mm]	[in]	Length		Internal diameter	
					[mm]	[in]	[mm]	[in]
25	1	4 × UNC ½" ×	145	5.70	– ¹⁾	–	24	0.94
40	1½	4 × UNC ½" ×	165	6.50	–	–	38	1.50
50	2	4 × UNC 5/8" ×	190.5	7.50	–	–	50	1.97

DN		Mounting bolts			Centering sleeves		Measuring tube	
[mm]	[in]		[mm]	[in]	Length		Internal diameter	
					[mm]	[in]	[mm]	[in]
80	3	8 × UNC 5/8" ×	235	9.25	–	–	76	2.99
100	4	8 × UNC 5/8" ×	264	10.4	147	5.79	97	3.82

1) A centering sleeve is not required. The device is centered directly via the sensor housing.

Pressure rating JIS, 10K

DN		Mounting bolts			Centering sleeves		Measuring tube	
[mm]	[in]		[mm]	[in]	Length		Internal diameter	
					[mm]	[in]	[mm]	[in]
25	1	4 × M16 ×	170	6.69	54	2.13	24	0.94
40	1 ½	4 × M16 ×	170	6.69	68	2.68	38	1.50
50	2	4 × M16 ×	185	7.28	– ¹⁾	–	50	1.97
65	–	4 × M16 ×	200	7.87	–	–	60	2.36
80	3	8 × M16 ×	225	8.86	–	–	76	2.99
100	4	8 × M16 ×	260	10.24	–	–	97	3.82

1) A centering sleeve is not required. The device is centered directly via the sensor housing.

Threaded connection

Pressure rating EN (DIN), PN16

DN		Threaded connection	Wrench size		Measuring tube	
[mm]	[in]		Length		Internal diameter	
			[mm]	[in]	[mm]	[in]
25	1	G 1"	28	1.1	24	0.94
40	1 ½	G 1 ½"	50	1.97	38	1.50
50	2	G 2"	60	2.36	50	1.97

Pressure rating ASME, Class 150

DN		Threaded connection	Wrench size		Measuring tube	
[mm]	[in]		Length		Internal diameter	
			[mm]	[in]	[mm]	[in]
25	1	NPT 1"	28	1.1	24	0.94
40	1 ½	NPT 1 ½"	50	1.97	38	1.50
50	2	NPT 2"	60	2.36	50	1.97

Materials

Transmitter housing

Order code for "Housing"	<ul style="list-style-type: none"> ■ Option A: Compact, coated aluminum ■ Option N: Remote, polycarbonate ■ Option P: Remote, aluminum, coated
Window material	<ul style="list-style-type: none"> ■ Order code for "Housing", option A: glass ■ Order code for "Housing", option N: polycarbonate ■ Order code for "Housing", option P: glass
Neck adapter	Order code for "Housing", option A, : Aluminum, coated

Sensor connection housing

Order code for "Sensor connection housing"	Option A: aluminum, AlSi10Mg, coated
--------------------------------------------	--------------------------------------

Cable glands and entries

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

Connecting cable for remote version

Electrode and coil current cable:
PVC cable with copper shield

Sensor housing

Aluminum, AlSi10Mg, coated

Measuring tube

Polyamide

Liner

Polyamide

Electrodes

Stainless steel: 1.4435 (316L)

Seals

EPDM

Process connections

EN 1092-1 (DIN 2501)	1.4301/304
ASME B16.5	1.4301/304
JIS B2220	1.4301/304
DIN ISO 228, G" external thread	1.4301/304
ASME B1.20, NPT" external thread	1.4301/304

Accessories

Weather protection cover	Stainless steel, 1.4404 (316L)
Pipe mounting kit (welding jig)	Stainless steel 1.4301 (304)
Wall mounting kit	Stainless steel 1.4301 (304)

Mounting bolts**Tensile strength**

- Galvanized steel mounting bolts: strength category 5.6 or 5.8
- Stainless steel mounting bolts: strength category A2-70

Fitted electrodes

Standard electrodes:
Measuring electrodes

Process connections

- EN 1092-1 (DIN 2501)
- ASME B16.5
- JIS B2220
- DIN ISO 228, G external thread
- ASME B1.20, NPT external thread

Local display

Operation concept

Operation method	Operation via: <ul style="list-style-type: none"> ▪ SmartBlue app ¹⁾ ▪ Commubox FXA291
Reliable operation	<ul style="list-style-type: none"> ▪ Operation in local language ▪ Uniform operating philosophy in device and in the SmartBlue App ▪ Write protection ▪ When electronics modules are replaced: configurations are transferred using the T-DAT Backup device memory. The device memory contains process data, device data and the event logbook. No reconfiguration is necessary.
Diagnostic behavior	Efficient diagnostic behavior increases measurement availability: <ul style="list-style-type: none"> ▪ Open remedial actions via local display and SmartBlue app ▪ Diverse simulation options ▪ Logbook of events that have occurred

1) Optional via order code "Display; operation", options H, J or K

IO-Link



The device-specific parameters are configured via IO-Link. There are specific configuration or operating programs from different manufacturers available to the user for this purpose. The device description file (IODD) is provided for the device.

IO-Link operating concept

Operator-oriented menu structure for user-specific tasks. Efficient diagnostic behavior increases measurement availability:

- Diagnostic messages
- Remedial action
- Simulation options

IODD download

Two options to download the IODD :

- www.endress.com/download
- <https://ioddfinder.io-link.com/>

www.endress.com/download



1. Select "Device Drivers".
2. Select the "IO Device Description (IODD)" entry under "Type".
3. Select "Product root".
4. Click "Search".
 - ↳ A list of search results is displayed.

Select the appropriate version and download.

<https://ioddfinder.io-link.com/>

1. Enter "Endress" as the manufacturer and select.
2. Select product name.
 - ↳ A list of search results is displayed.

Select the appropriate version and download.

 For detailed IO-Link information, see "IO-Link" Special Documentation for the device → *Related documentation*,  6

Operation options

Local display	<p>Display element:</p> <ul style="list-style-type: none"> ▪ Depends on the orientation, automatic alignment of the local display ▪ Configuration of display format for measured variables and status variables
SmartBlue app	<ul style="list-style-type: none"> ▪ The SmartBlue app allows the user to put devices into operation and operate them. ▪ Based on Bluetooth ▪ No separate driver required ▪ Available for mobile handheld terminals, tablets and smartphones ▪ Suitable for convenient and secure access to devices in hard-to-reach locations or in hazardous areas ▪ Can be used within a 20 m (65.6 ft) radius of the device ▪ Encrypted and secure data transmission ▪ No data loss during commissioning and maintenance ▪ Diagnostic information and process information in real time

Operating tools

Operating tools	Operating unit	Interface	Additional information
DeviceCare SFE100	<ul style="list-style-type: none"> ▪ Notebook ▪ PC ▪ Tablet with Microsoft Windows system 	<ul style="list-style-type: none"> ▪ CDI service interface ▪ Fieldbus protocol 	Innovation brochure IN01047S
FieldCare SFE500	<ul style="list-style-type: none"> ▪ Notebook ▪ PC ▪ Tablet with Microsoft Windows system 	<ul style="list-style-type: none"> ▪ CDI service interface ▪ Fieldbus protocol 	Operating Instructions BA00027S and BA00059S
SmartBlue app	<ul style="list-style-type: none"> ▪ Devices with iOS: iOS9.0 or higher ▪ Devices with Android: Android 4.4 KitKat or higher 	Bluetooth	Endress+HauserSmartBlue App: <ul style="list-style-type: none"> ▪ Google Playstore (Android) ▪ iTunes Apple Shop (iOS devices)

Certificates and approvals

Non-Ex approval

- cCSAus
- EAC
- UKCA

Pressure Equipment Directive

- CRN
- PED Cat. II/III
- PESR Cat. II/III

Drinking water approval

- ACS
- KTW/W270
- NSF 61
- WRAS BS 6920

Radio approval

The device has radio approvals.

Additional certification

- IO-Link
Self-certification with Manufacturer Declaration
- CRN approval
Some device versions have a CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.
- EN10204-3.1 material certificate, wetted parts and sensor housing (order code for "Test, certificate", option JA)
- Pressure test, internal process, test report (order code for "Test, certificate", option JB)
- Surface roughness test ISO4287/Ra, (wetted parts), test report (option JE)
- Compliance with requirements derived from cGMP, Declaration (option JG)

External standards and guidelines

- IEC/EN 60529
Degrees of protection provided by enclosure (IP code)
- IEC/EN 60068-2-6
Environmental influences: Test procedure - Test Fc: vibration (sinusoidal)
- IEC/EN 60068-2-31
Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- IEC/EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements.
- GB 30439.5
Safety requirements for industrial automation products - Part 5: Flowmeter safety requirements
- CAN/CSA-C22.2 No. 61010-1-12
Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements.
- IEC 61131-9
Interface for communication with small sensors and actuators via a point-to-point connection
- IEC/EN 61326
Emission in accordance with Class A requirements; Electromagnetic compatibility (EMC requirements)
- ANSI/ISA-61010-1 (82.02.01)
Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements.
- ETSI EN 300 328
Guidelines for 2.4 GHz radio components
- EN 301489
Electromagnetic compatibility and radio spectrum matters (ERM).

Application packages

Use

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 relevant order code is available from your local Endress+Hauser sales organization or on the product page of the Endress+Hauser website: www.endress.com.

Heartbeat Verification + Monitoring

Heartbeat Verification

Availability depends on the product structure.

Meets the requirement for traceable verification according to DIN ISO 9001:2015 Clause 7.6 a) "Control of monitoring and measuring equipment":

- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including report.
- Simple testing process with operating interfaces.
- Clear measuring point assessment (pass/fail) with high total test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk evaluation.

Heartbeat Monitoring

Availability depends on the product structure.

Heartbeat Monitoring continuously provides data characteristic of the measuring principle to an external condition monitoring system, facilitating preventive maintenance or process analysis. This data enables the operator to:

- Draw conclusions - using this data and other information - about the measuring performance over time.
- Schedule servicing in time.
- Monitor the process quality or product quality .

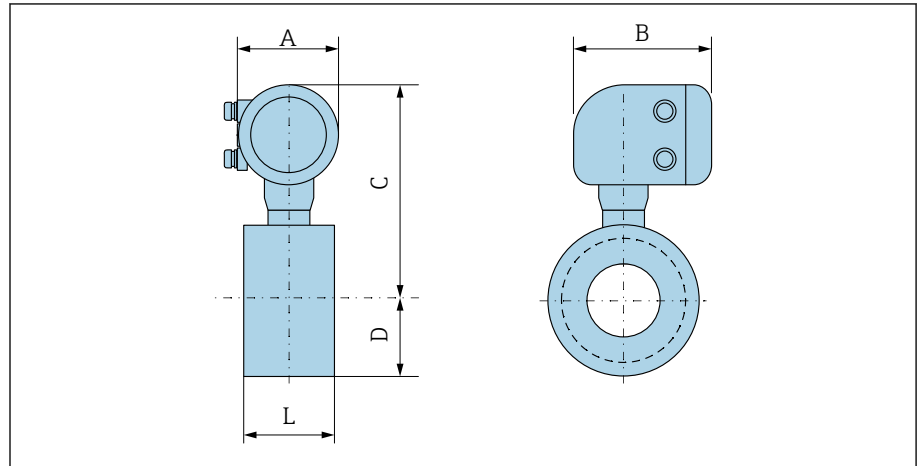
14 Dimensions in SI units

Compact version	106
Wafer version	106
Threaded version	107
Remote version	108
Transmitter remote version	108
Sensor remote version	109
Flange connections	111
Flange similar to EN 1092-1: PN 16	111
Flange similar to ASME B16.5: Class 150	112
Flange JIS B2220: 10K	113
Couplings	114
External thread: ISO 228	114
External thread: ASME B1.20.1	114
Accessories	115
Weather protection cover	115

Compact version

Wafer version

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



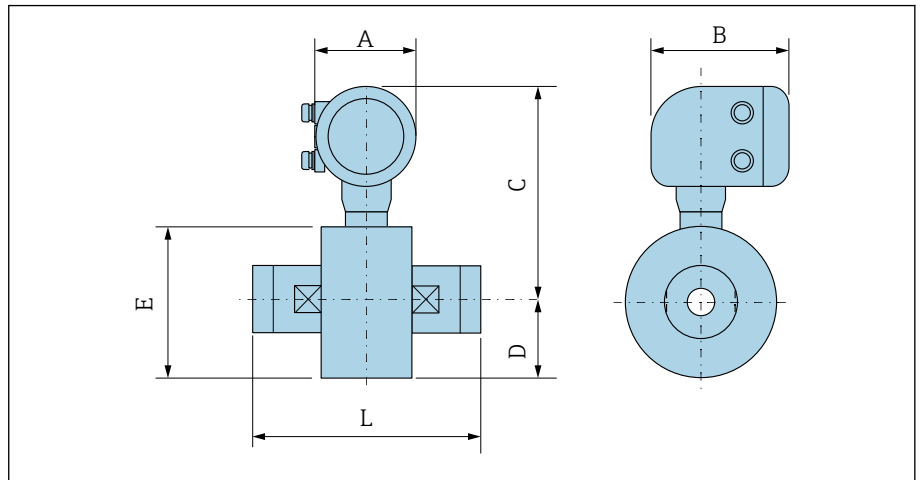
A0046005

DN		A ¹⁾	B	C	D	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	139	178	259	43	55
40	1 ½	139	178	270	52	69
50	2	139	178	281	62	83
65	-	139	178	291	70	93
80	-	139	178	295	76	117
-	3	139	178	295	76	117
100	4	139	178	309	89	148

1) Depending on the cable entry used: values up to +30 mm

Threaded version

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



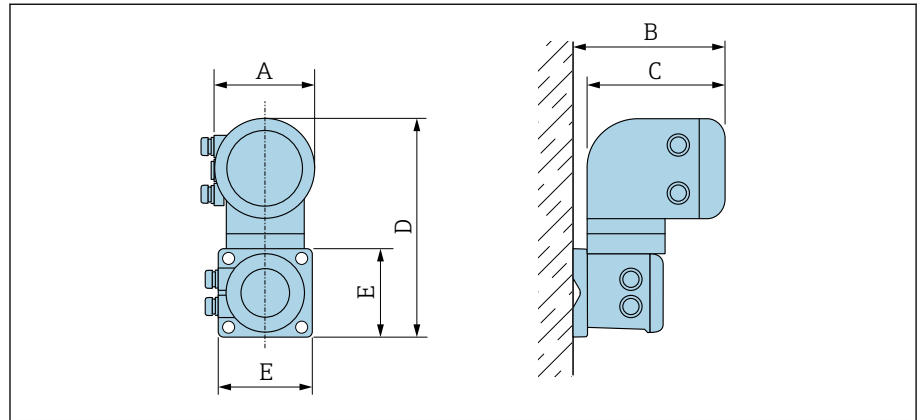
A0046007

DN		A ¹⁾	B	C	D	E	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	139	178	259	43	86	110
40	1 ½	139	178	270	52	104	140
50	2	139	178	281	62	124	200

1) Depending on the cable entry used: values up to +30 mm

Remote version

Transmitter remote version



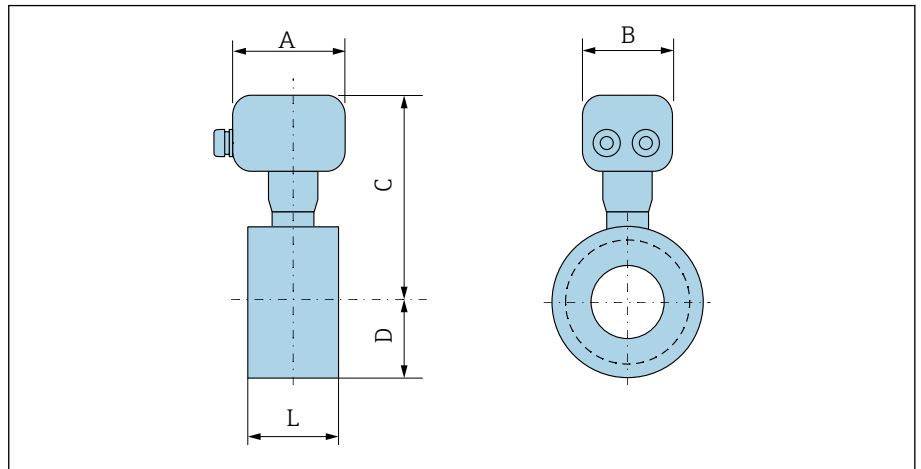
A0042715

Order code for "Housing"	A ¹⁾ [mm]	B [mm]	C [mm]	D [mm]	E [mm]
Option N "Remote, polycarbonate"	132	187	172	307	130
Option P and T "Remote, coated aluminum"	139	185	178	309	130

1) Depending on the cable entry used: values up to + 30 mm

Sensor remote version

Wafer version

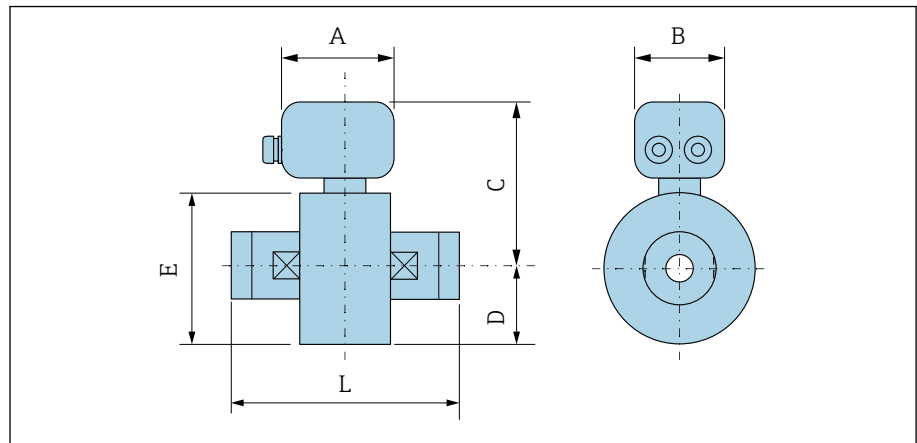


A0045564

DN		A ¹⁾	B	C	D	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	113	112	199	43	55
40	1 ½	113	112	210	52	69
50	2	113	112	221	62	83
65	-	113	112	231	70	93
80	-	113	112	235	76	117
-	3	113	112	235	76	117
100	4	113	112	249	89	148

1) Depending on the cable entry used: values up to +30 mm

Threaded connection



DN		A ¹⁾	B	C	D	E	L
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	1	113	112	199	43	86	110
40	1 ½	113	112	210	52	104	140
50	2	113	112	221	62	124	200

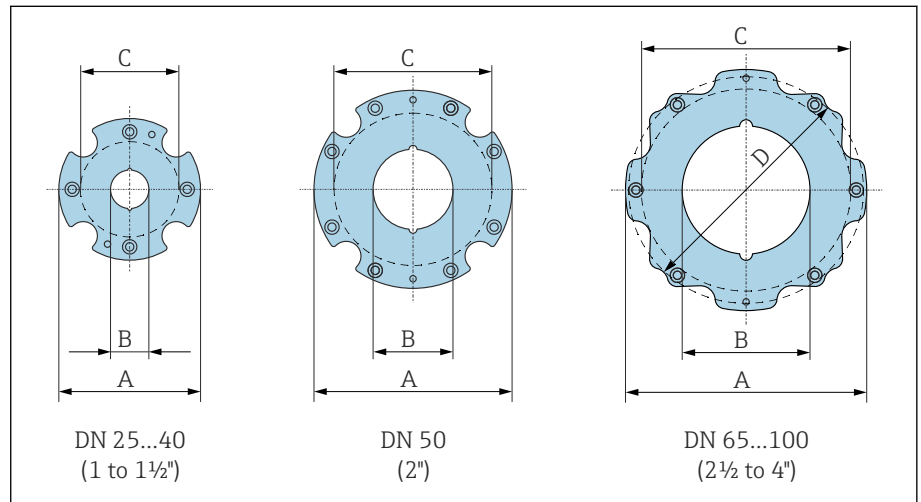
1) Depending on the cable entry used: values up to +30 mm

Flange connections

Flange similar to EN 1092-1: PN 16

Order code for "Process connection", option D3Z

Dimension B: Internal diameter depends on the liner → *Measuring tube specification*, 97



A0046000

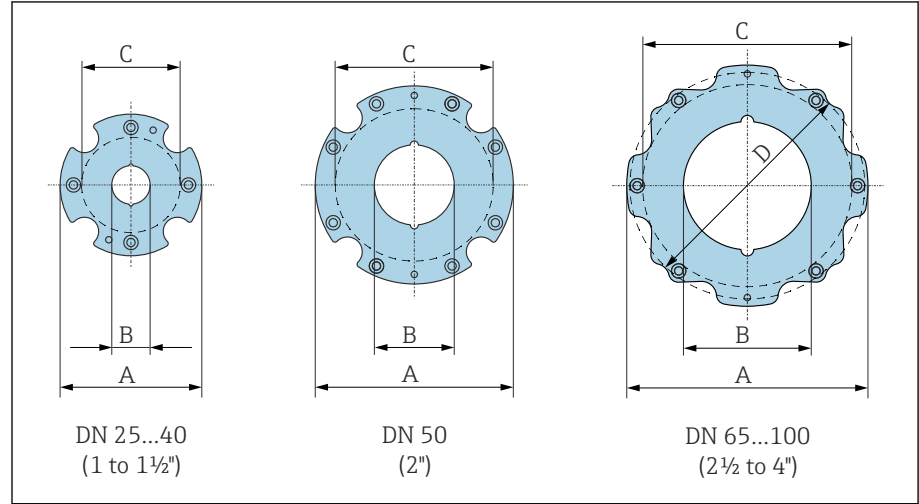
DN [mm]	A [mm]	B [mm]	C ¹⁾ [mm]
25	86	24	68
40	105	38	87
50	124	50	106
65	139	60	125
80	151	76	135
100	179	97	160

1) Max. Ø seals

Flange similar to ASME B16.5: Class 150

Order code for "Process connection", option A1Z

Dimension B: internal diameter depends on the liner → *Measuring tube specification*, 97



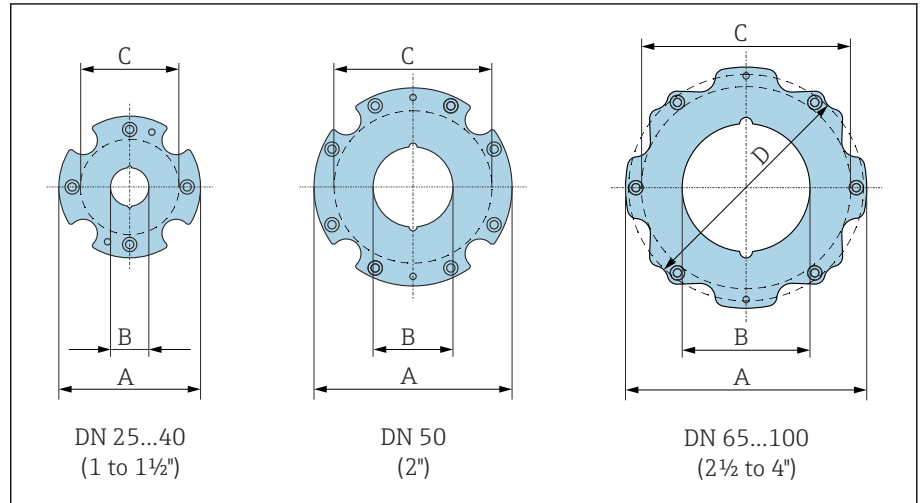
DN [in]	A [mm]	B [mm]	C ¹⁾ [mm]	D [mm]
1	86	24	68	-
1 ½	105	38	87	-
2	124	50	106	-
3	151	76	135	138
4	179	97	160	-

1) Max. Ø seals

Flange JIS B2220: 10K

Order code for "Process connection", option N3Z

Mass B: internal diameter depends on the liner → *Measuring tube specification*, 97



A0046000

DN [mm]	A [mm]	B [mm]	C ¹⁾ [mm]
25	86	24	68
40	105	38	87
50	124	50	106
65	139	60	125
80	151	76	135
100	179	97	160

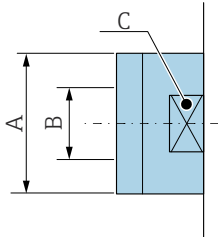
1) Max. Ø seals

Couplings

External thread: ISO 228

Order code for "Process connection", option I4S

Mass B: internal diameter depends on the liner → *Measuring tube specification*, 97



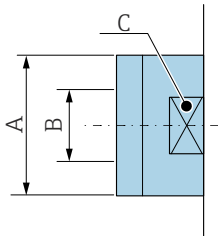
A0046008

DN [mm]	A [in]	B [mm]	C [mm]
25	G 1"	22	28
40	G 1 ½"	34.4	50
50	G 2"	43	60

External thread: ASME B1.20.1

Order code for "Process connection", option I5S

Mass B: internal diameter depends on the liner → *Measuring tube specification*, 97

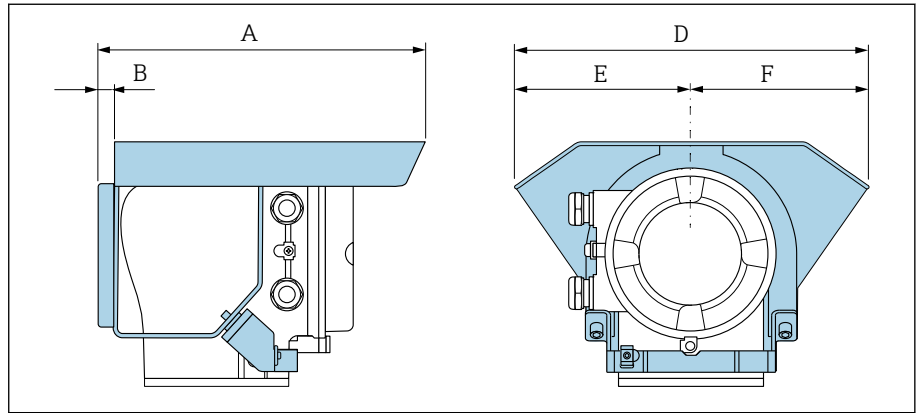


A0046008

DN [in]	A [in]	B [mm]	C [mm]
1	NPT 1"	22	28
1 ½	NPT 1 ½"	34.4	50
2	NPT 2"	43	60

Accessories

Weather protection cover



A0042332

A [mm]	B [mm]	D [mm]	E [mm]	F [mm]
257	12	280	140	140

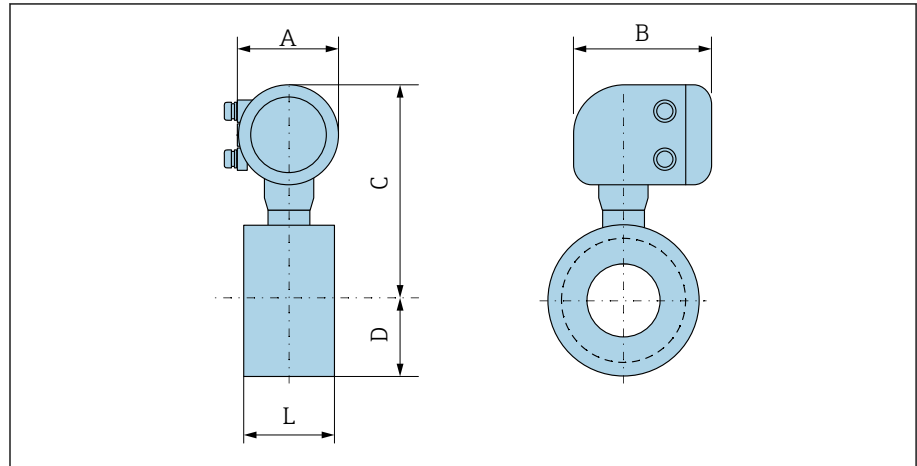
15 Dimensions in US units

Compact version	118
Wafer version	118
Threaded version	119
Remote version	120
Transmitter remote version	120
Sensor remote version	121
Flange connections	123
Flange similar to ASME B16.5: Class 150	123
Couplings	124
External thread: ASME B1.20.1	124
Accessories	125
Weather protection cover	125

Compact version

Wafer version

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



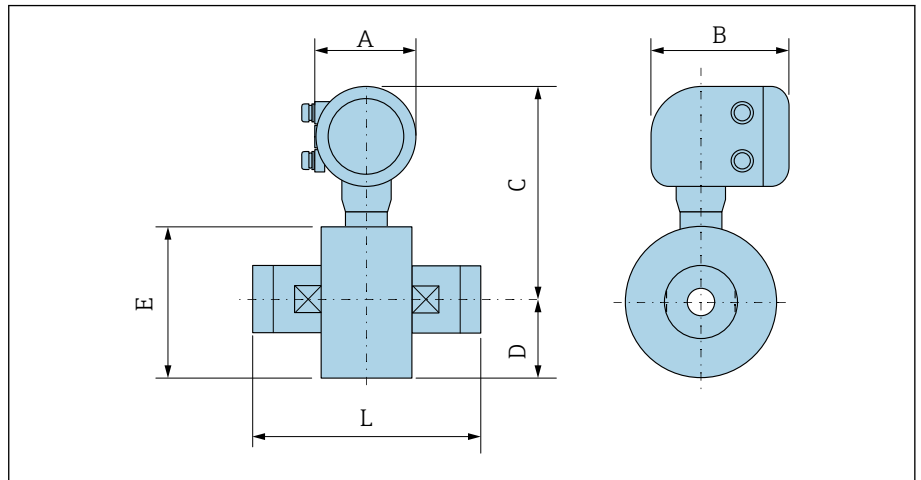
A0046005

DN [in]	A ¹⁾ [in]	B [in]	C [in]	D [in]	L [in]
1	5.47	7.01	10.2	1.69	2.17
1 ½	5.47	7.01	10.63	2.05	2.72
2	5.47	7.01	11.06	2.44	3.27
3	5.47	7.01	11.61	2.99	4.61
4	5.47	7.01	12.17	3.5	5.83

1) Depending on the cable entry used: values up to +1.18 in

Threaded version

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



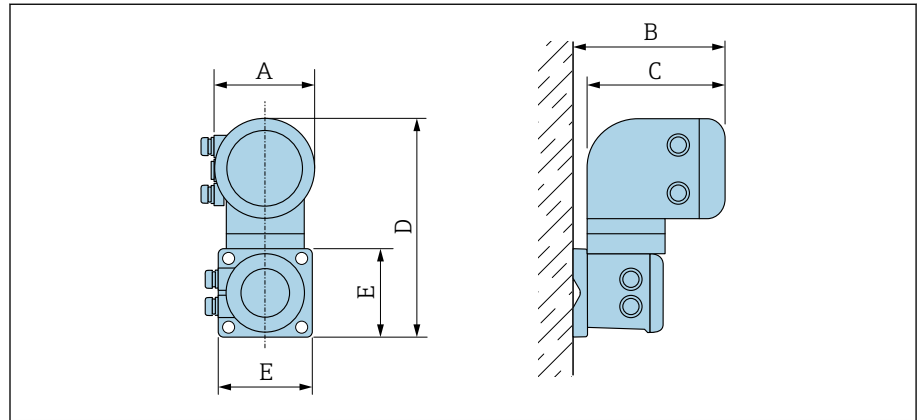
A0046007

DN [in]	A ¹⁾ [in]	B [in]	C [in]	D [in]	E [in]	L [in]
1	5.47	7.01	10.2	1.69	3.39	4.33
1 ½	5.47	7.01	10.63	2.05	4.09	5.51
2	5.47	7.01	11.06	2.44	4.88	7.87

1) Depending on the cable entry used: values up to +1.18 in

Remote version

Transmitter remote version



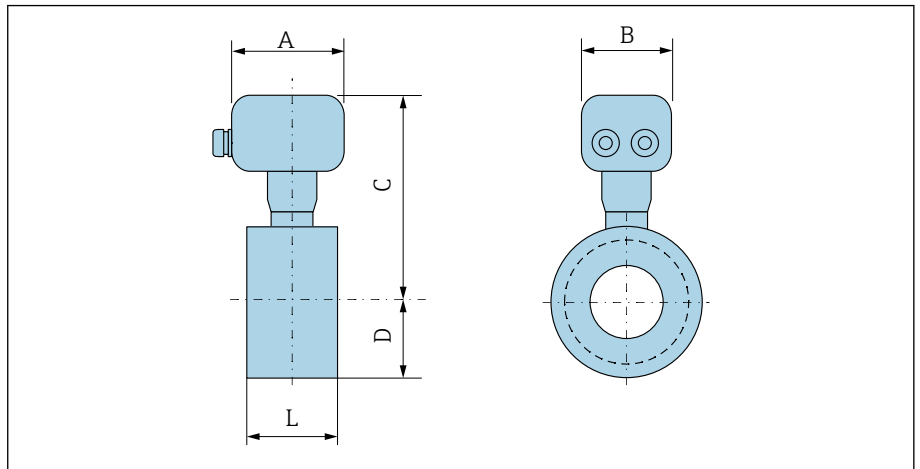
A0042715

Order code for "Housing"	A ¹⁾ [in]	B [in]	C [in]	D [in]	E [in]
Option N "Remote, polycarbonate"	5.2	7.36	6.77	12.09	5.12
Option P and T "Remote, coated aluminum"	5.47	7.28	7.01	12.17	5.12

1) Depending on the cable entry used: values up to +1.18 in

Sensor remote version

Wafer version

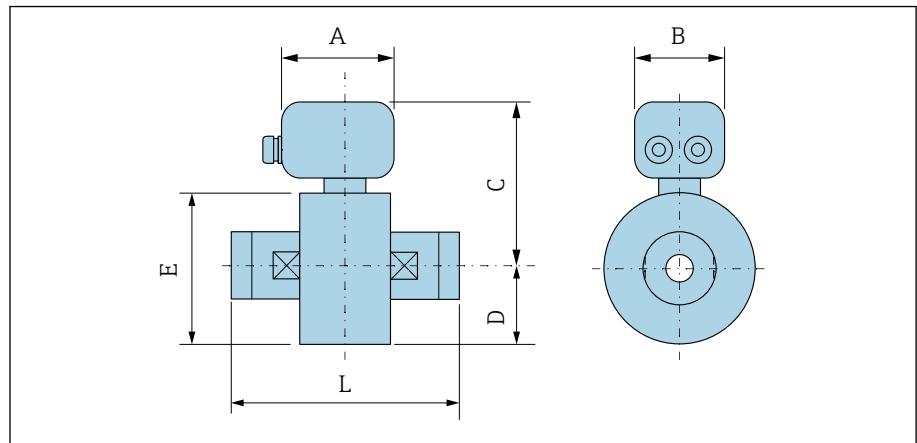


A0045564

DN [in]	A ¹⁾ [in]	B [in]	C [in]	D [in]	L [in]
1	4.45	4.41	7.83	1.69	2.17
1 ½	4.45	4.41	8.27	2.05	2.72
2	4.45	4.41	8.7	2.44	3.27
3	4.45	4.41	9.25	2.99	4.61
4	4.45	4.41	9.8	3.5	5.83

1) Depending on the cable entry used: values up to +1.18 in

Threaded connection



A0045807

DN [in]	A ¹⁾ [in]	B [in]	C [in]	D [in]	E [in]	L [in]
1	4.45	4.41	7.83	1.69	3.39	4.33
1 ½	4.45	4.41	8.27	2.05	4.09	5.51
2	4.45	4.41	8.7	2.44	4.88	7.87

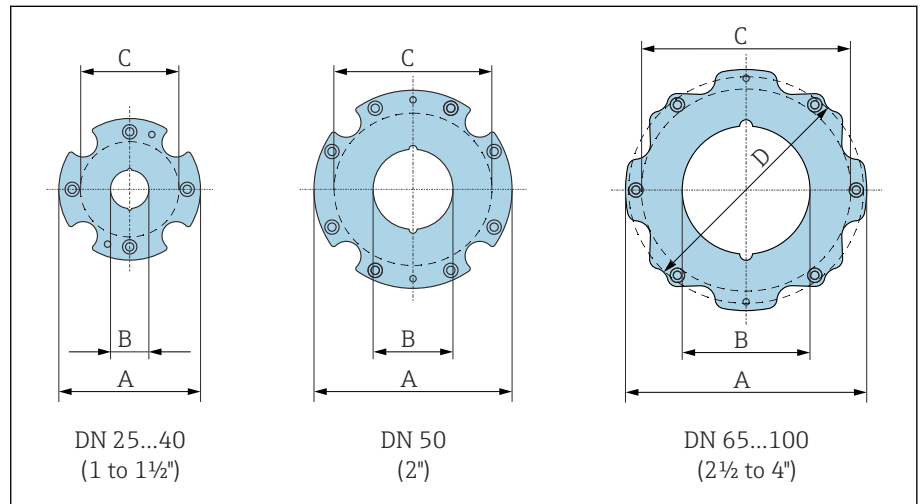
1) Depending on the cable entry used: values up to +1.18 in

Flange connections

Flange similar to ASME B16.5: Class 150

Order code for "Process connection", option A1Z

Dimension B: Internal diameter depends on liner → *Measuring tube specification*, 97



DN [in]	A [in]	B [in]	C ¹⁾ [in]	D [in]
1	3.39	0.94	2.68	-
1 ½	4.13	1.5	3.43	-
2	4.88	1.97	4.17	-
3	5.94	2.99	5.31	5.43
4	7.05	3.82	6.3	-

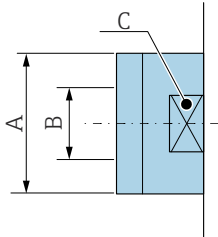
1) Max. Ø seals

Couplings

External thread: ASME B1.20.1

Order code for "Process connection", option I5S

Mass B: internal diameter depends on the liner → *Measuring tube specification*, 97

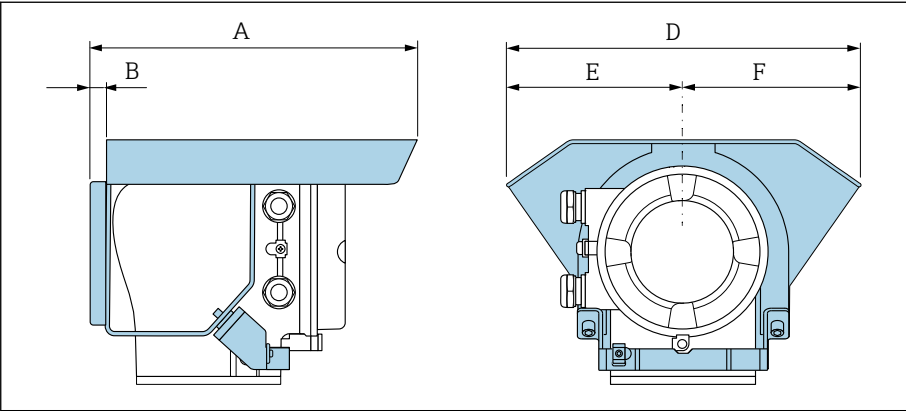


A0046008

DN [in]	A [in]	B [mm]	C [mm]
1	NPT 1"	22	28
1 ½	NPT 1 ½"	34.4	50
2	NPT 2"	43	60

Accessories

Weather protection cover






A [in]	B [in]	D [in]	E [in]	F [in]
10.12	0.47	11.02	5.51	5.51

16 Accessories

Device-specific accessories	128
Communication-specific accessories	129
Service-specific accessory	129
System components	130

Device-specific accessories





Transmitter

Accessories	Description	Order number
Proline 10 transmitter	 Installation Instructions EA01350D	5XBBXX-*...*
Weather protection cover	Protects the device from weather exposure:  Installation Instructions EA01351D	71502730
Connecting cable	Can be ordered with the device. The following cable lengths are available: order code for "Cable, sensor connection" <ul style="list-style-type: none"> ▪ 5 m (16 ft) ▪ 10 m (32 ft) ▪ 20 m (65 ft) ▪ User-configurable cable length m (ft)  Max. cable length: 200 m (660 ft)	DK5013-*...*

Sensor



Accessories	Description
Mounting kit for wafer version	Consists of: <ul style="list-style-type: none"> ▪ Mounting bolts ▪ Nuts with washers ▪ Flange seals ▪ Centering sleeves (if required for the flange)
Seal set	Consists of: 2 flange seals

Communication-specific accessories



Accessory	Description
Commubox FXA291	Connects the Endress+Hauser devices with the CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or laptop.  Technical Information TI405C/07
Field Xpert SMT50	The Field Xpert SMT50 table PC for device configuration enables mobile plant asset management. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. 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.  <ul style="list-style-type: none"> ▪ Technical Information TI01555S ▪ Operating Instructions BA02053S ▪ Product page: www.endress.com/smt50
Field Xpert SMT70	Tablet PC for the configuration of the device. Enables mobile Plant Asset Management to manage the devices with a digital communication interface. Suitable for Zone 2.  <ul style="list-style-type: none"> ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt70
Field Xpert SMT77	Tablet PC for the configuration of the device. Enables mobile Plant Asset Management to manage the devices with a digital communication interface. Suitable for Zone 1.  <ul style="list-style-type: none"> ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77
FieldPort SFP20	The FieldPort SFP20 is a USB interface for the configuration of Endress+Hauser IO-Link devices, and also of devices from other vendors. Combined with the IO-Link CommDTM (DeviceCare, FieldCare, Field Xpert) and the IODD Interpreter, the FieldPort complies with the FDT/DTM standards.
IO-Link master BL20	IO-Link master from Turck for DIN rails supports PROFINET, EtherNet/IP and Modbus TCP. With web server for easy configuration.

Service-specific accessory

Accessory	Description	Order code
Applicator	Software for selecting and sizing Endress+Hauser devices.	https://portal.endress.com/webapp/applicator
Netilion	IIoT ecosystem: Unlock knowledge With the Netilion IIoT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem that enables you to gain useful insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.	www.netilion.endress.com

Accessory	Description	Order code
FieldCare	FDT-based plant asset management software from Endress+Hauser. Management and configuration of Endress+Hauser devices.  Operating Instructions BA00027S and BA00059S	<ul style="list-style-type: none"> ▪ Device driver: www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
DeviceCare	Software for connecting and configuring Endress+Hauser devices.  <ul style="list-style-type: none"> ▪ Technical Information: TI01134S ▪ Innovation brochure: IN01047S 	<ul style="list-style-type: none"> ▪ Device driver: www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)

System components

Accessories	Description
Memograph M	Graphic data manager: <ul style="list-style-type: none"> ▪ Record measured values ▪ Monitor limit values ▪ Analyze measuring points  <ul style="list-style-type: none"> ▪ Technical Information TI00133R ▪ Operating Instructions BA00247R
iTEMP	Temperature transmitter: <ul style="list-style-type: none"> ▪ Measure the absolute pressure and gauge pressure of gases, vapors and liquids ▪ Read the medium temperature  "Fields of Activity" document FA00006T

17 Appendix

Screw tightening torques	132
Examples of electric terminals	134

Screw tightening torques

General notes

Note the following for the screw tightening torques:

- Only for lubricated threads.
- Only for pipes that are free from tensile stress.
- Only if using an EPDM soft-material flat seal (e.g. 70° Shore A).
- Tighten the screws uniformly and in diagonally opposite sequence.
- Overtightening the screws will deform the sealing surface or damage the seal.

Mounting bolts and centering sleeves for EN 1092 -1, PN 16

Nominal diameter [mm]	Mounting bolts [mm]	Length Centering sleeve [mm]	Max. screw tightening torque [Nm] for a process flange with ...	
			smooth seal face	Raised face
25	4 × M12 × 145	54	19	19
40	4 × M16 × 170	68	33	33
50	4 × M16 × 185	82	41	41
65 ¹⁾	4 × M16 × 200	92	44	44
65 ²⁾	8 × M16 × 200	– ³⁾	29	29
80	8 × M16 × 225	116	36	36
100	8 × M16 × 260	147	40	40

- 1) EN (DIN) flange: 4-hole → with centering sleeves
 2) EN (DIN) flange: 8-hole → without centering sleeves
 3) A centering sleeve is not required. The device is centered directly via the sensor housing.

Mounting bolts and centering sleeves for ASME B16.5; Class 150

Nominal diameter		Mounting bolts [in]	Length Centering sleeve [in]	Max. screw tightening torque [Nm] ([lbf · ft]) for a process flange with ...	
[mm]	[in]			smooth seal face	Raised face
25	1	4 × UNC ½" × 5.70	– ¹⁾	19 (14)	10 (7)
40	1 ½	4 × UNC ½" × 6.50	– ¹⁾	29 (21)	19 (14)
50	2	4 × UNC 5/8" × 7.50	– ¹⁾	41 (30)	37 (27)
80	3	4 × UNC 5/8" × 9.25	– ¹⁾	43 (31)	43 (31)
100	4	8 × UNC 5/8" × 10.4	5.79	38 (28)	38 (28)

- 1) A centering sleeve is not required. The device is centered directly via the sensor housing.

Mounting bolts and centering sleeves for JIS B2220, 10K

Nominal diameter [mm]	Mounting bolts [mm]	Length Centering sleeve [mm]	Max. screw tightening torque [Nm] for a process flange with ...	
			smooth seal face	Raised face
25	4 × M16 × 170	54	24	24
40	4 × M16 × 170	68	32	25
50	4 × M16 × 185	– ¹⁾	38	30
65	4 × M16 × 200	– ¹⁾	42	42
80	8 × M16 × 225	– ¹⁾	36	28
100	8 × M16 × 260	– ¹⁾	39	37

1) A centering sleeve is not required. The device is centered directly via the sensor housing.

Examples of electric terminals

IO-Link



See <https://io-link.com>"IO-Link System Description"

Index

A

- Adapting the diagnostic behavior 71
- Ambient conditions
 - Vibration resistance and shock resistance 92
- Ambient temperature range 92
- Applicator 84
- Approvals 102

C

- Certificates 102
- Certificates and approvals 102
- Check
 - Connection 46
 - Installation 36
- Checking the storage conditions (checklist) 21
- Checklist
 - Post-connection check 46
 - Post-installation check 36
- Commissioning 57, 58
 - see Commissioning wizard
 - see Via SmartBlue App
 - Switching on the device 59
- Commissioning the device 60
- Compatibility 24
- Conductivity 94
- Connecting the connecting cable
 - Sensor connection housing 41
 - Transmitter connection housing 41

D

- Date of manufacture 17, 18
- Degree of protection 92
- Design
 - Device 22
- Device
 - Design 22
 - Disposal 82
 - Removal 82
- Device components 22
- Device description files 52
- Device history 24
- Device locking, status 62
- Device name
 - Sensor 18
 - Transmitter 17
- Diagnosis
 - Symbols 69
- Diagnostic information
 - Design, description 70
 - DeviceCare 70
 - FieldCare 70
 - LED 67
 - Local display 69
 - Overview 71
 - Remedial measures 71
- Diagnostic information in FieldCare or DeviceCare 70

- Diagnostic information via LED 67
- Diagnostic list 74
- Diagnostic message 69
- Display
 - Current diagnostic event 74
 - Previous diagnostic event 74
- Display values
 - For locking status 62
- Disposal 81
- Disposing of the device 82
- Drinking water approval 102

E

- Electromagnetic compatibility 93
- Electronics module 22
- Endress+Hauser services
 - Maintenance 80
- Environmental conditions
 - Ambient temperature 92
 - Storage temperature 92
- Error messages
 - see Diagnostic messages
- Event logbook 74
- Events list 74
- Extended order code
 - Sensor 18
 - Transmitter 17

F

- Filtering the event logbook 75
- Firmware history 24
- Fitted electrodes 100
- Flow limit 94

G

- Galvanic isolation 86
- General troubleshooting 66

I

- Identifying the device 17
- Incoming acceptance (checklist) 16
- Input 84
- Inspection
 - Received goods 16
- Installation
 - Mounting kit 31
- Intended use 16

L

- Local display
 - see Diagnostic message
 - see In alarm condition
- Low flow cut off 86

M

- Magnetism 30
- Magnetism and static electricity 30

Main electronics module	22	Reading off the device locking status	62
Maintenance tasks	80	Reading out the event logbook	74
Materials	99	Recycling of packaging materials	21
Maximum measurement error	91	Reference operating conditions	91
Measured variable		Registered trademarks	9
see Process variables		Removing the device	82
Measuring instrument		Repeatability	91
Mounting the sensor		Resetting the device	
Arranging the mounting bolts and centering		Settings	76
sleeves	33	S	
Measuring principle	16	Safety instructions	11
Measuring range	84	Sensor nameplate	18
Measuring tube specification	97	Serial number	17, 18
Medium temperature range	94	Services	80
Mounting bolts	100	Signal on alarm	86
Mounting kit	31	SmartBlue App	60
N		Standards and guidelines	103
Nameplate		Static electricity	30
Sensor	18	Status signals	69
Transmitter	17	Storage	21
Non-Ex approval	102	Storage conditions	21
O		Storage temperature	21, 92
Operable flow range	84	Storage temperature range	92
Operation	47, 61	Submenu	
Order code	17, 18	Device management	62
Output signal	85	Events list	74
Output variables	85	Switching on the device	59
Overview of diagnostic information	71	System design	
P		see Device design	
Packaging disposal	21	System integration	51
Parameter settings		T	
Device management (Submenu)	62	Temperature range	
Pending diagnostic events	74	Storage temperature	21
Performance characteristics	91	Tools	
Post-connection check	58	Transport	19
Post-connection check (checklist)	46	Transmitter nameplate	17
Post-installation check	58	Transport	
Post-installation check (checklist)	36	Transporting the device	19
Post-installation check and post-connection check	58	Troubleshooting	
Potential equalization	43	General	66
Pressure Equipment Directive	102	U	
Pressure loss	95	Using the device	
Pressure tightness	95	see Intended use	
Pressure/temperature ratings	95	V	
Process conditions		Vibration resistance and shock resistance	92
Conductivity	94	W	
Flow limit	94	W@M Device Viewer	17
Medium temperature	94	Weight	
Pressure loss	95	Compact version	96
Pressure tightness	95	Transport (notes)	19
Pressure/temperature ratings	95	Wiring the sensor connection housing	41
Process connections	100	Wiring the transmitter housing	41
Product design	22		
Product identification	17		
R			
Radio approval	103		



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