

Operating Instructions

Proline Promass K 10

Coriolis flowmeter
IO-Link

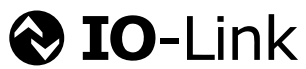


Table of contents

1	About this document	6	8	Commissioning	52
	Document function	6		Post-installation check and post-connection check	52
	Related documentation	6		IT security	52
	Symbols	7		Device-specific IT security	52
	Registered trademarks	9		Switching on the device	53
2	Safety instructions	12		Commissioning the device	54
	Requirements for specialist personnel	12		Backing up or duplicating the device data	54
	Requirements for operating personnel	12	9	Operation	56
	Incoming acceptance and transport	12		Operational display	56
	Adhesive labels, tags and engravings	12		Reading off the device locking status	56
	Environment and process	12		Zero point adjustment	57
	Workplace safety	12		HistoROM data management	58
	Installation	12	10	Diagnosis and troubleshooting	60
	Electrical connection	12		General troubleshooting	60
	Surface temperature	13		Diagnostic information via LED	61
	Commissioning	13		Diagnostic information on local display	62
	Modifications to the device	13		Diagnostic information in FieldCare or DeviceCare	63
3	Product information	16		Changing the diagnostic information	64
	Measuring principle	16		Overview of diagnostic information	64
	Designated use	16		Pending diagnostic events	67
	Incoming acceptance	16		Diagnostic list	67
	Product identification	17		Event logbook	67
	Transport	19		Resetting the device	69
	Checking the storage conditions	21	11	Maintenance	72
	Recycling of packaging materials	21		Maintenance work	72
	Product design	22		Services	72
	Firmware history	23	12	Disposal	74
	Device history and compatibility	23		Removing the device	74
4	Installation	26		Disposing of the device	74
	Installation requirements	26	13	Technical data	76
	Installing the device	31		Input	76
	Post-installation check	33		Output	78
5	Electrical connection	36		Energy supply	80
	Connecting requirements	36		Cable specification	81
	Transmitter connection	37		Performance characteristics	82
	Ensuring potential equalization	37		Environment	86
	Hardware settings	38		Process	88
	Post-connection check	39		Mechanical construction	93
6	Operation	42		Local display	96
	Overview of the operating options	42		Certificates and approvals	97
	Operation via SmartBlue App	42		Application packages	99
7	System integration	46	14	Dimensions in SI units	102
	Device description files	46		Compact version	102
	Process data	46		Fixed flange	104
	Information on IO-Link communication	48		Clamp connections	108
	Switching signals	48		Couplings	109

Accessories	111
15 Dimensions in US units	114
Compact version	114
Fixed flange	116
Clamp connections	117
Couplings	117
Accessories	118
16 Accessories	120
Device-specific accessories	120
Communication-specific accessories	121
Service-specific accessory	121
System components	122
17 Appendix	124
Examples of electric terminals	124

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



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



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



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



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






- 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 a step
-  Help in the event of a problem
-  Visual inspection
-  Write-protected parameter

Explosion protection

-  Hazardous area
-  Non-hazardous area

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.

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.
- ▶ 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
Designated 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	23
Device history and compatibility	23

Measuring principle

Mass flow measurement according to the Coriolis measuring principle.

Designated use

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

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

Devices for use in a hazardous area, in hygienic applications, or where there is an increased risk due to process 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-designated 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"/>

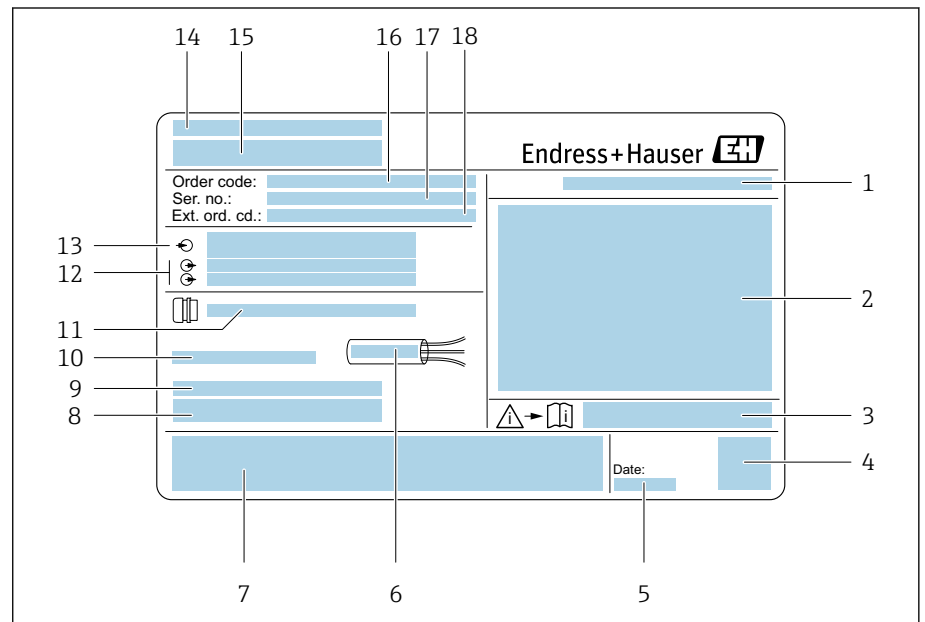
Product identification

Device tag

The device comprises the following parts:

- Proline 10 transmitter
- Promass K sensor

Transmitter nameplate

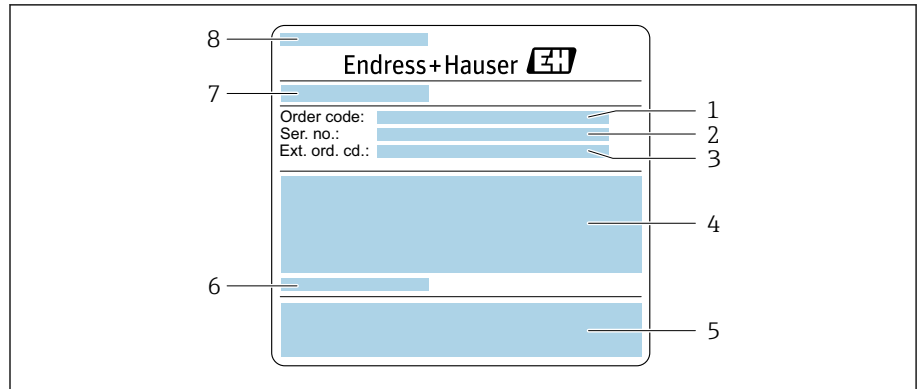


A0042943

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

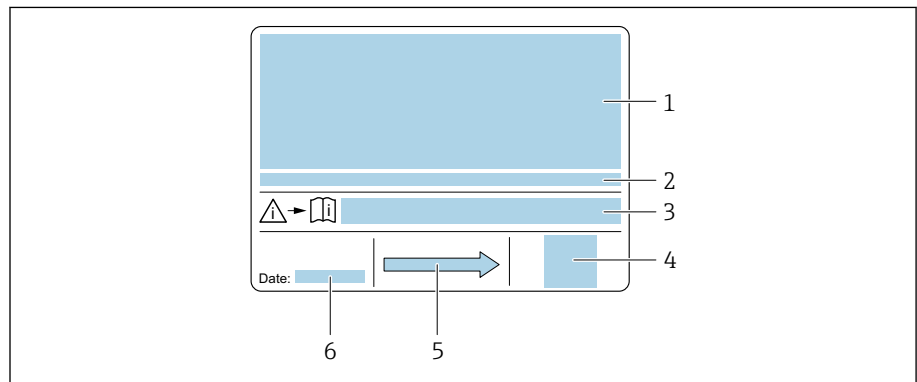
Sensor nameplate



A0044152

2 Example of a sensor nameplate, part 1

- 1 Order code
- 2 Serial number (ser. no.)
- 3 Extended order code (ext. ord. cd.)
- 4 Nominal diameter of the sensor; flange nominal diameter/nominal pressure; sensor test pressure; medium temperature range; material of measuring pipe and manifold
- 5 CE mark, C-Tick
- 6 Sensor-specific information
- 7 Place of manufacture
- 8 Name of the sensor



A0044143

3 Example of a sensor nameplate, part 2

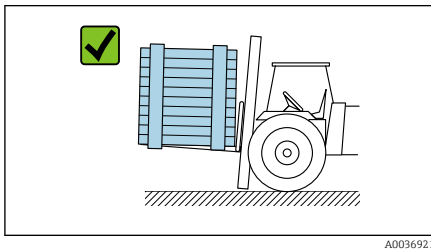
- 1 Approval information for explosion protection, Pressure Equipment Directive and degree of protection
- 2 Permitted ambient temperature (T_a)
- 3 Document number of safety-related supplementary documentation
- 4 2-D matrix code
- 5 Flow direction
- 6 Manufacturing date: year-month

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



A0036921

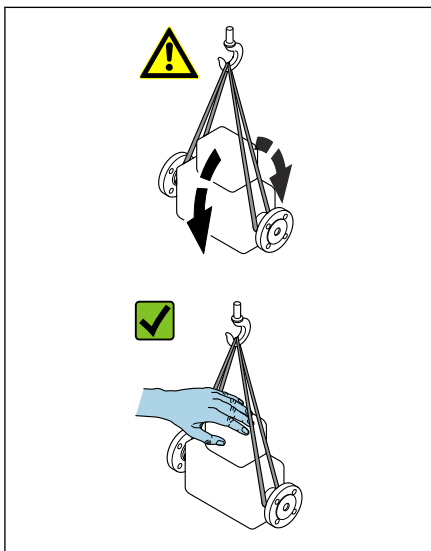
NOTICE

Original packaging is missing!

Damage to the device.

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

Transporting without lifting lugs



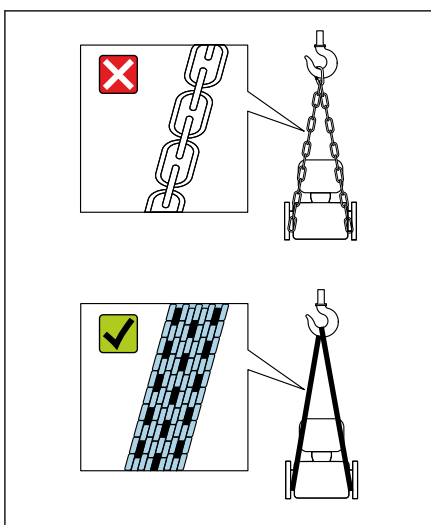
A0043054

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.



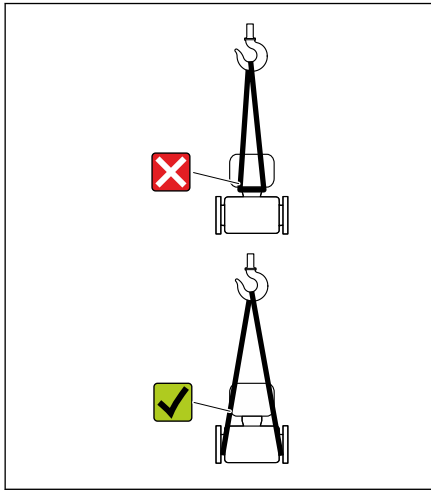
A0043055

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"/>

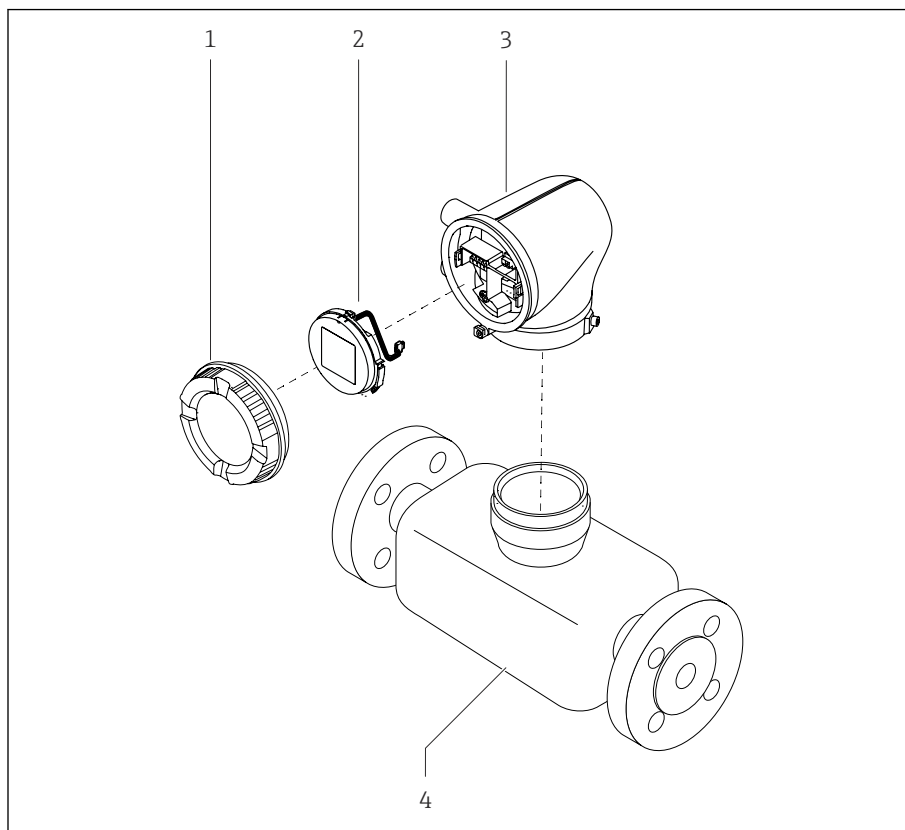
Recycling of packaging materials

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

The transmitter and sensor form a mechanical unit.



4 Main device components

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

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	2024-05-01	-
Version of the Operating Instructions	01.24	
Compatibility with previous model	-	


4 Installation

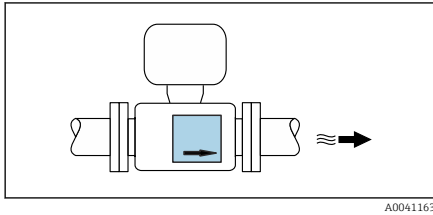
Installation requirements	26
Installing the device	31
Post-installation check	33

Installation requirements

Flow direction

Install the device in the direction of flow.

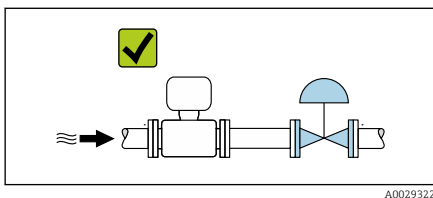
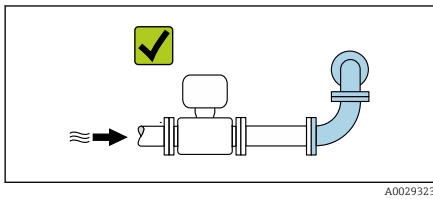
 Note the direction of arrow on the nameplate.



Inlet runs and outlet runs

If no cavitation effects occur, requirements regarding inlet and outlet runs do not need to be considered during the installation.

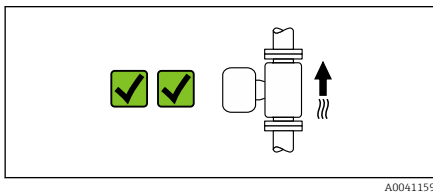
To avoid negative pressure, install the sensor upstream from assemblies that produce turbulence, e.g. valves, T-sections, and downstream from pumps .



Orientations

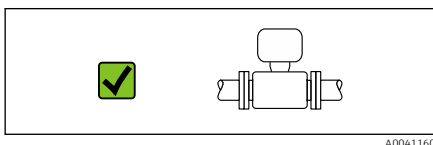
Vertical orientation, upward direction of flow

For all applications e.g. self-draining applications



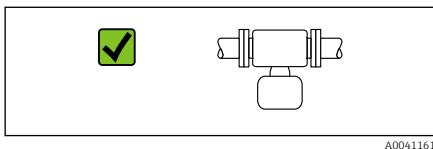
Horizontal orientation, transmitter at top

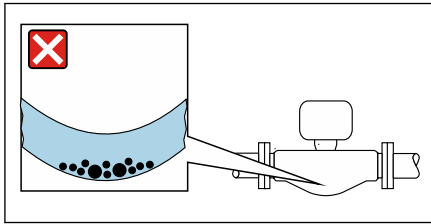
- For applications with low process temperatures in order to maintain the minimum ambient temperature for the transmitter.
- For outgassing media in order to avoid the accumulation of gas.



Horizontal orientation, transmitter at bottom

- For applications with high process temperatures in order to maintain the maximum ambient temperature for the transmitter.
- For media with entrained solids in order to avoid the accumulation of solids.

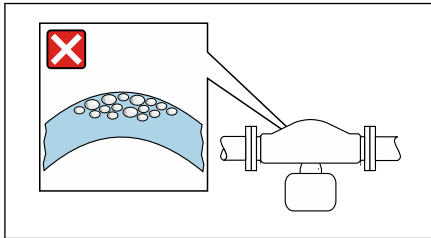




A0043063

Horizontal orientation, transmitter with measuring pipe curved downwards

Match the sensor position to the medium properties.
 Not suitable for media with entrained solids: solids may accumulate.



A0044717

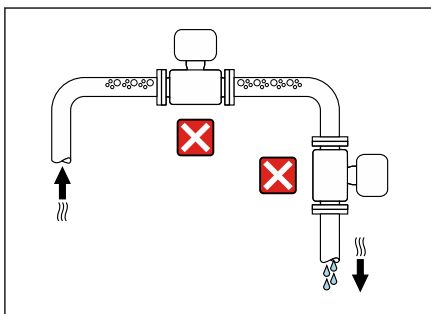
Horizontal orientation, transmitter with measuring pipe curved upwards

Match the sensor position to the medium properties.
 Not suitable for outgassing media: gas may accumulate.

Special mounting instructions

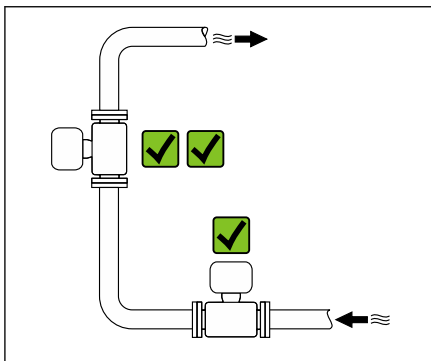
- **Drainability**
 When installed vertically, the measuring tubes can be drained completely and protected against buildup.
- **Sanitary compatibility**
 When installing in hygienic applications, please refer to the information in the "Certificates and approvals/sanitary compatibility" section → *Hygienic compatibility* , 98

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.

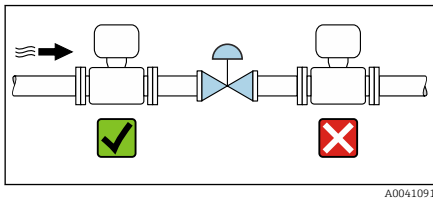


A0042317

The device should ideally be installed in an ascending pipe.

Installation near control valves

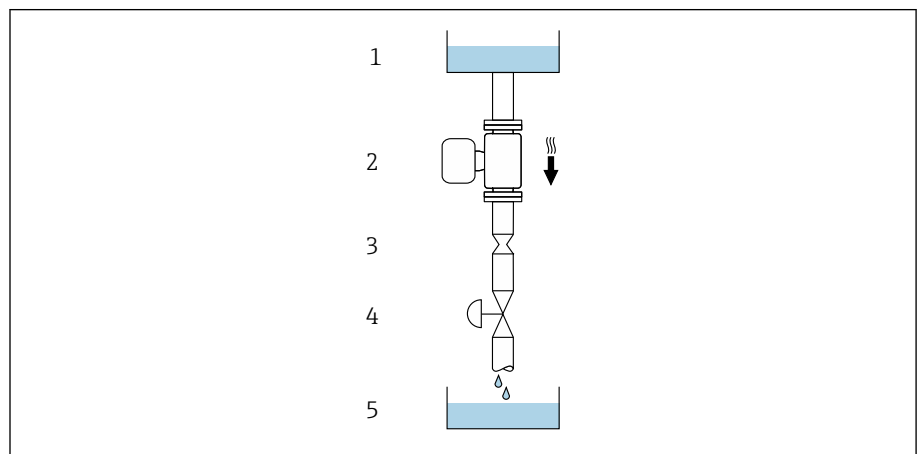
Install the device in the direction of flow upstream from the control valve.



A0041091

Installation in a down pipe

Installation suggestion for installation in an open down pipe, e.g. for bottling applications. A pipe restriction or the use of an orifice plate with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.



A0028773

- 1 Supply tank
- 2 Sensor
- 3 Orifice plate or pipe restriction
- 4 Valve
- 5 Filling container

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	3/8	6	0.24
15	1/2	10	0.40
25	1	14	0.55
40	1 1/2	22	0.87
50	2	28	1.10
80	3	50	1.97

Rupture disk

Information that is relevant to the process → *Rupture disk*, 92.

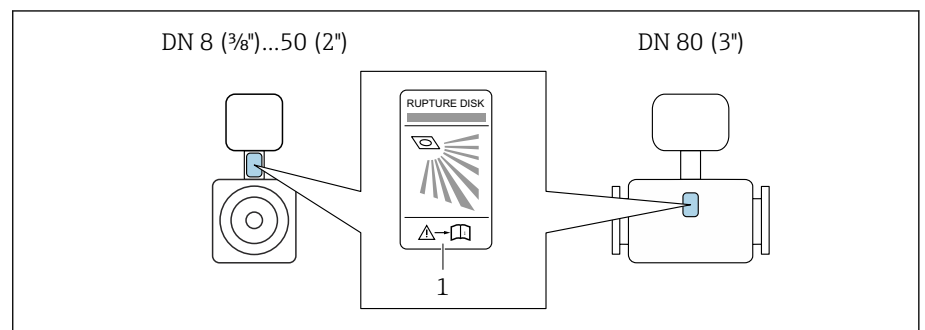
⚠ WARNING**A missing or damaged rupture disk can put staff at risk!**

Medium escaping under pressure can cause serious injury or material damage.

- ▶ Ensure that any danger to persons or material damage is ruled out if the rupture disk is actuated.
- ▶ Observe information on the rupture disk sticker.
- ▶ Make sure that the function and operation of the rupture disk is not impeded during the installation of the device.
- ▶ Do not use a heating jacket.
- ▶ Do not remove or damage the rupture disk.

- ▶ After the rupture disk is actuated, do not operate the device any longer.

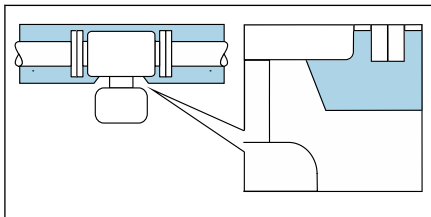
The position of the rupture disk is indicated by a sticker affixed to the device. If the rupture disk is triggered, the sticker is destroyed. The disk can therefore be visually monitored.



A0029956

1 Rupture disk sticker

Sensor thermal insulation



A0044122

NOTICE

If the meter electronics overheat this can damage the device!

- ▶ Keep the housing support completely free (heat dissipation).

- ▶ Fit insulation up as far as the upper edge of the sensor body.

Heating

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.

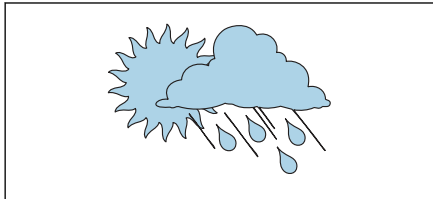
- ▶ Mount the device correctly.

Heating options

- Electrical heating, e.g. with electric band heaters ¹⁾
- Via pipes carrying hot water or steam
- Via heating jackets


i Heating jackets for the sensors can be ordered as accessories from Endress +Hauser: → *Sensor*,  120

Outdoor use



A0023989

- Avoid exposure to direct sunlight.
- Install in a location protected from sunlight.
- Avoid direct exposure to weather conditions.
- Use a weather protection cover → *Transmitter*,  120.

1) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" → *Related documentation*,  6

Installing the device

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.

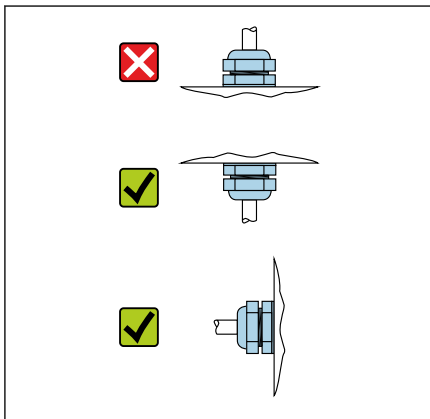
NOTICE

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

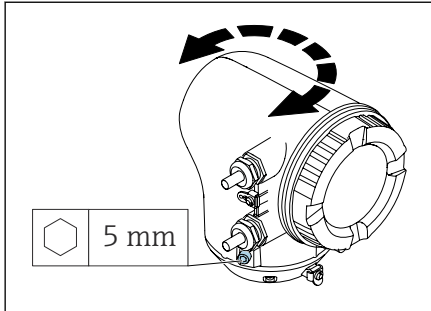
1. Ensure that the direction of the arrow on the sensor matches the flow direction of the medium.
2. Install and turn the device or transmitter housing in such a way that the cable entries point down or to the side.



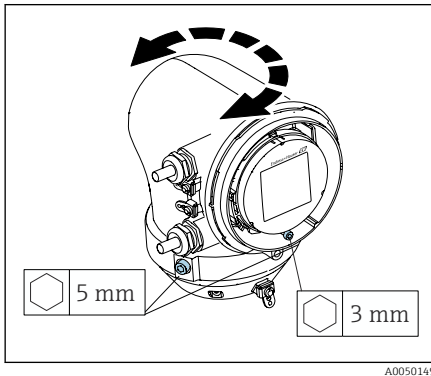
A0044192

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.

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"/>

5 Electrical connection

Connecting requirements	36
Transmitter connection	37
Ensuring potential equalization	37
Hardware settings	38
Post-connection check	39

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.

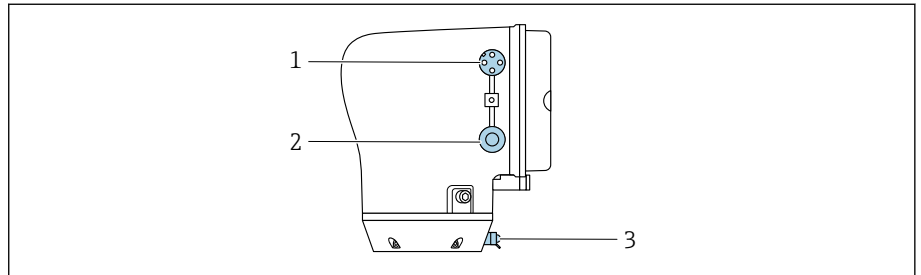
Additional protective measures

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*,  124

Transmitter connection

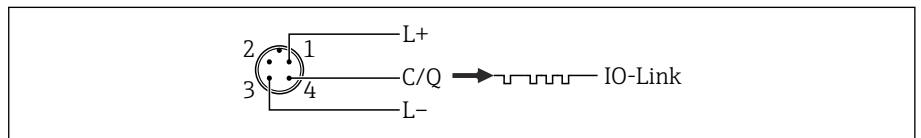
Transmitter terminal connections



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

- 5 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

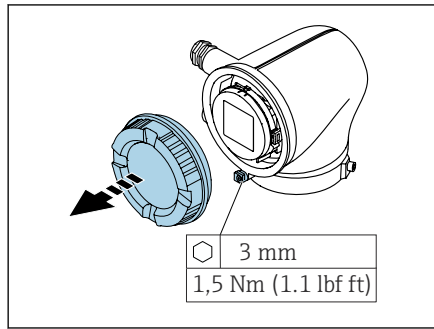
- i** Pay attention to the requirements for the power supply cable and signal cable → *Requirements for connecting cable*, 81 .
- i**
 - Connect protective earthing to the outer signal terminals.
 - Connect the IO-Link signal cable to M12.

Ensuring potential equalization

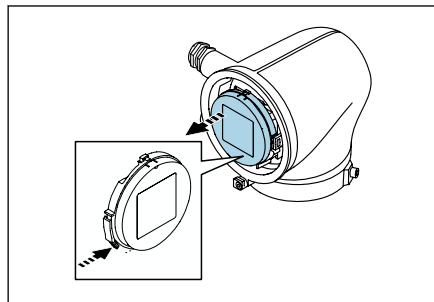
No special measures for potential equalization are required.

Hardware settings

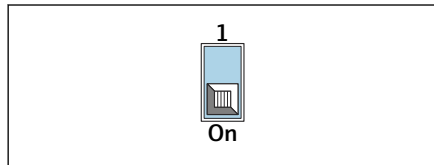
Enabling write protection



A0041094



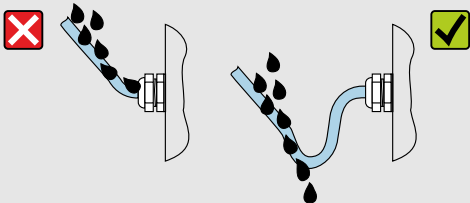
A0041330



A0044412

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

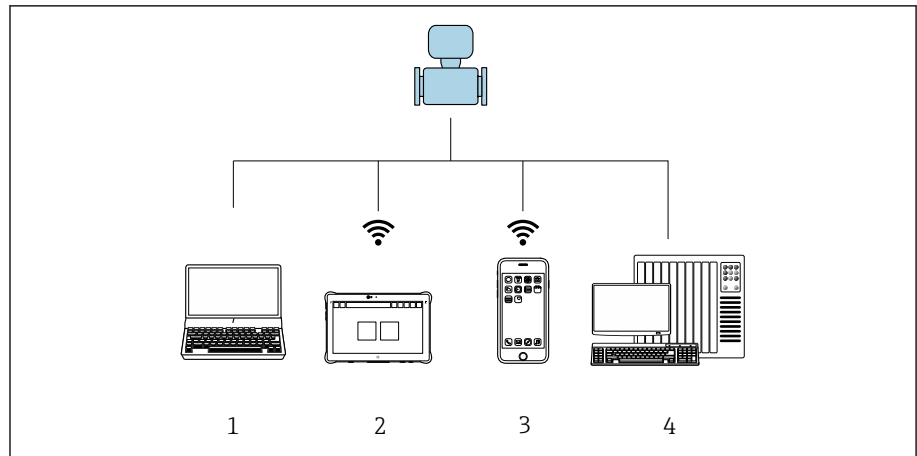
Is the protective earthing established correctly?	<input type="checkbox"/>
Are the device and cable undamaged (visual check)?	<input type="checkbox"/>
Do the cables meet the requirements?	<input type="checkbox"/>
Is the terminal assignment correct?	<input type="checkbox"/>
Are all the cable glands installed, 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	42
Operation via SmartBlue App	42

Overview of the operating options



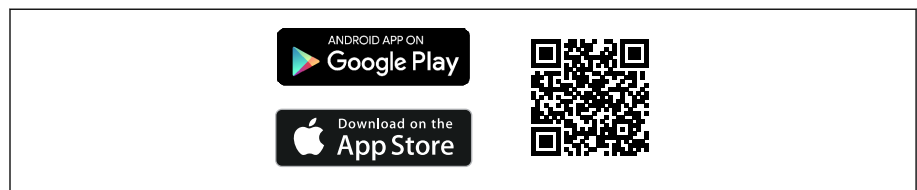
A0054834

- 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



6 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
-  Change the password after logging in for the first time.
 -  Forgotten your password? Contact Endress+Hauser Service.

7 System integration

Device description files	46
Process data	46
Information on IO-Link communication	48
Switching signals	48

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	Promass10 IOL	Guidance → Commissioning → Device identification → Device name
Device ID	9728513	<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
←	Mass flow	Density	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
Mass flow	float32	Current mass flow	$-1.4 \cdot 10^{+21}$ to $1.4 \cdot 10^{+21}$	kg/s
Density ¹⁾	float32	Current density	$-1.4 \cdot 10^{+21}$ to $1.4 \cdot 10^{+21}$	kg/m ³
Temperature	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		-
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 variant is not suitable: $+3.3 \cdot 10^{+38}$ and substituted in IODD by "No measured data".

Process data output

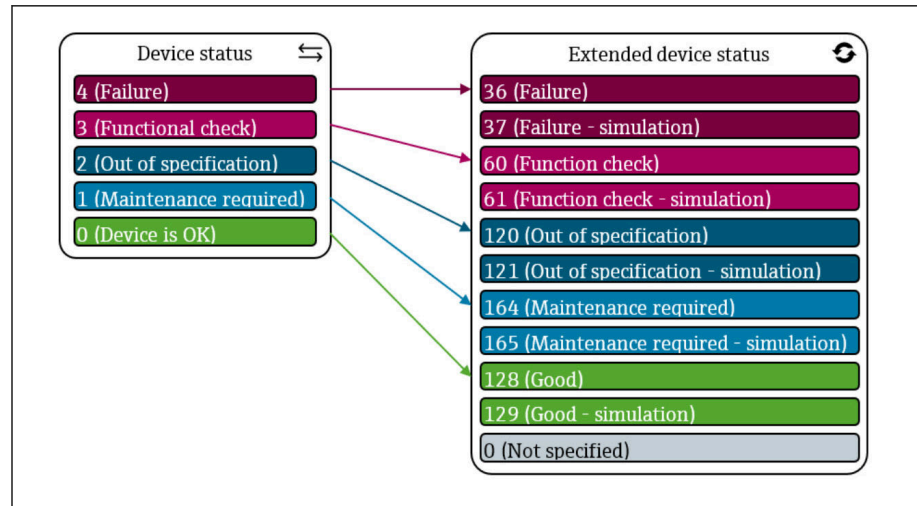
Transmission direction	bool	bool	bool	bool	bool	bool	bool	bool	bool	bool
←	Totalizer 1 – Totalize	Totalizer 1 – Reset + hold	Totalizer 1 – Reset + totalize	Totalizer 1 – Hold	Flow override	Device search	CSC 4 – Totalizer 1	CSC 3 – Temperature	CSC 2 – Density	CSC 1 – Mass flow

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 for example during cleaning processes.	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 measurement value. When the function is activated, the process data input is set to "No measurement data".	Off On
Control signal channel 3 – Temperature	bool		Off On
Control signal channel 2 – Density	bool		Off On
Control signal channel 1 – Mass flow	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.



A0055077

7 Extended device status

Information on IO-Link communication

- i** The following content is covered 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 on the device → *Related documentation*, 6

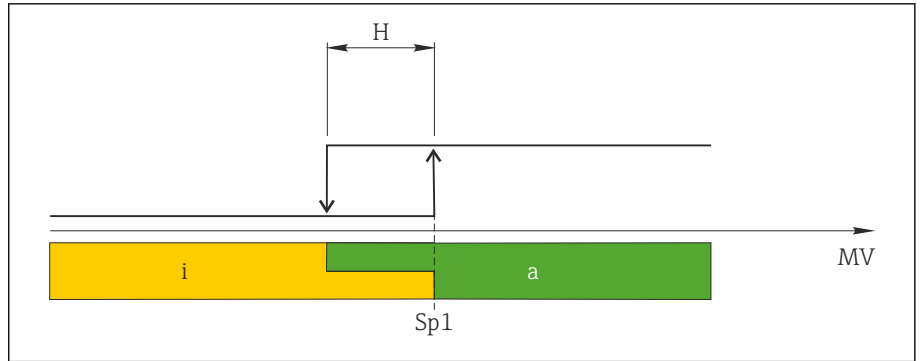
Switching signals

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. 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.



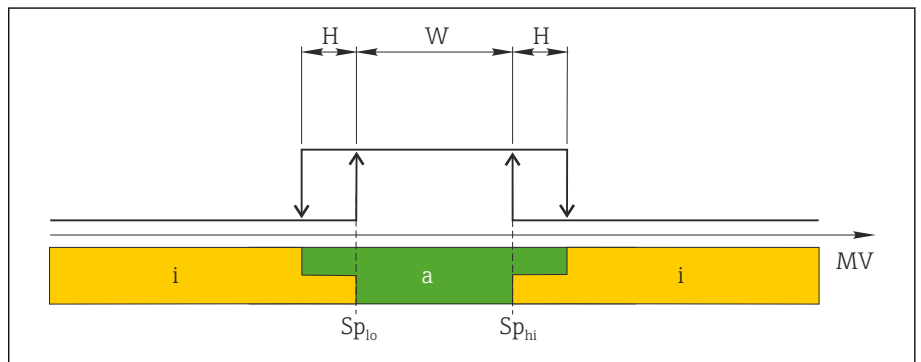
A0055074

8 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.



A0055075

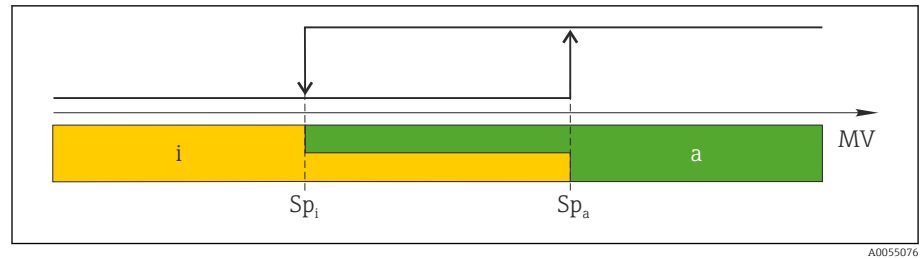
9 SSC, window

- 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.



10 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	52
IT security	52
Device-specific IT security	52
Switching on the device	53
Commissioning the device	54
Backing up or duplicating the device data	54

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*,  33
- Post-connection check → *Post-connection check*,  39

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:

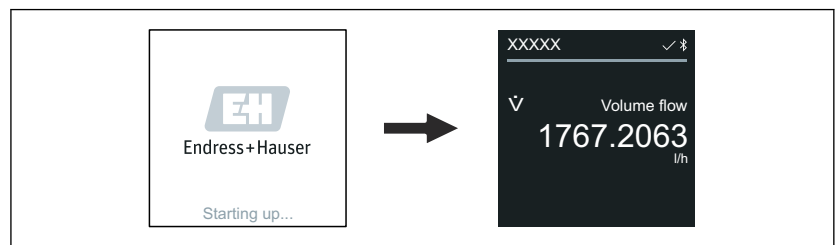
- Disabled: write access to the parameters
- Enabled: read-only access to the parameters

Write protection is enabled with the write protection switch on the back of the display module → *Hardware settings*,  38.



 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.




A0042938


 If device startup is not successful, the device displays an error message to this effect → *Diagnosis and troubleshooting*,  60.

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), 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

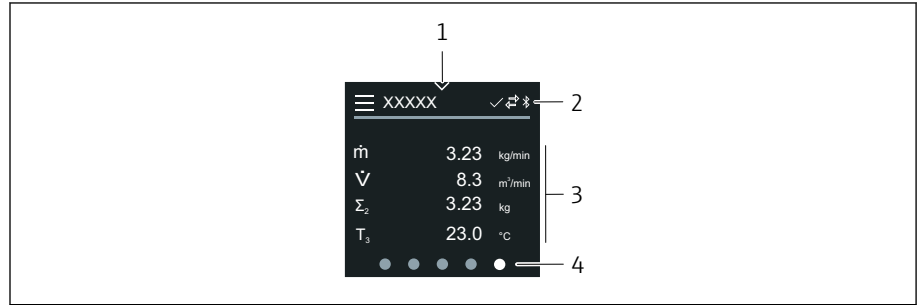
Operational display	56
Reading off the device locking status	56
Zero point adjustment	57
HistoROM data management	58

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



A0042992

- 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)

Zero point adjustment

All devices are calibrated in accordance with state-of-the-art technology and under reference conditions. Zero point adjustment is not generally required.

Zero point adjustment is advisable only in special cases:

- To achieve maximum measurement accuracy even with low flow rates
- In the event of extreme process conditions or operating conditions, e.g. very high process temperatures or very high-viscosity media.
- For gas applications with low pressure.

i To optimize measurement accuracy at low flow rates, the installation must shield the sensor from mechanical stresses during operation.

To get a representative zero point, ensure that:

- any flow in the device is prevented during the adjustment
- the process conditions. (e.g. pressure, temperature) are stable and representative.

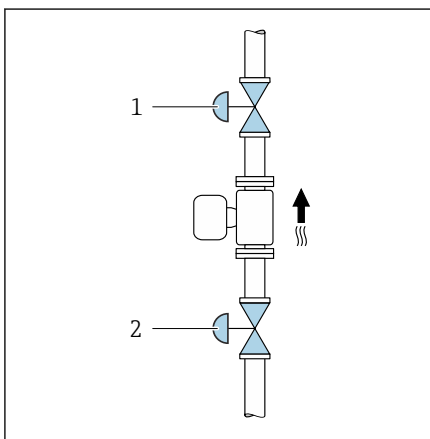
Verification and adjustment cannot be performed if the following process conditions are present:

- Gas pockets
Ensure that the system has been sufficiently flushed with the medium. Repeat flushing can help to eliminate gas pockets
- Thermal circulation
In the event of temperature differences (e.g. between the measuring tube inlet and outlet section), induced flow can occur even if the valves are closed due to thermal circulation in the device
- Leaks at the valves
If the valves are not leak-tight, flow is not sufficiently prevented when determining the zero point

If these conditions cannot be avoided, it is advisable to keep the factory setting for the zero point.

Prerequisite

- Zero adjustment can only be performed with media that have no gas or solid contents.
- Zero adjustment is performed at operating pressure and operating temperature with the measuring pipes completely filled and at zero flow ($v = 0$ m/s). For this purpose, shut-off valves (for example) can be provided upstream or downstream from the sensor, or existing valves and gate valves may be used.



A0043181

- Normal operation: shutoff valve 1 and 2 open.
- Zero adjustment with pump pressure: shutoff valve 1 closed, shutoff valve 2 open.
- Zero adjustment without pump pressure: shutoff valve 1 open, shutoff valve 2 closed.

Performing the zero adjustment

1. Let the system run until process conditions and operating conditions are normal.
2. Stop the flow.
3. Check that the sealing of the shutoff valves is tight (no leaks).
4. Check the operating pressure.
5. Application → Sensor → Sensor adjustment → Zero adjustment → Zero adjustment control must be selected.
 - ↳ The zero adjustment is started. In the **Status** parameter, the **Busy** option is displayed. When the zero adjustment is finished, the **Ok** option is displayed.

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 Diagnosis and troubleshooting

General troubleshooting	60
Diagnostic information via LED	61
Diagnostic information on local display	62
Diagnostic information in FieldCare or DeviceCare	63
Changing the diagnostic information	64
Overview of diagnostic information	64
Pending diagnostic events	67
Diagnostic list	67
Event logbook	67
Resetting the device	69

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.

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.

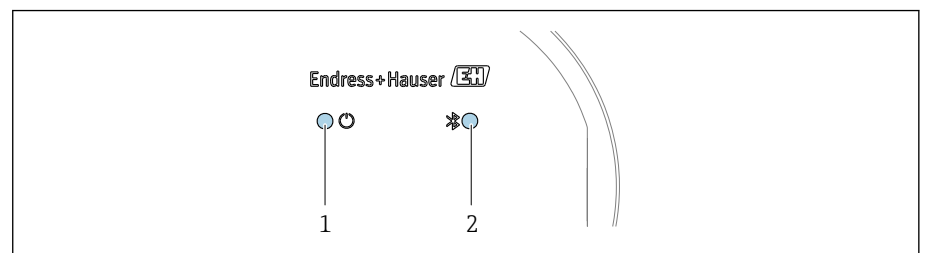
Access and communication

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.

Fault	Possible causes	Remedy
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

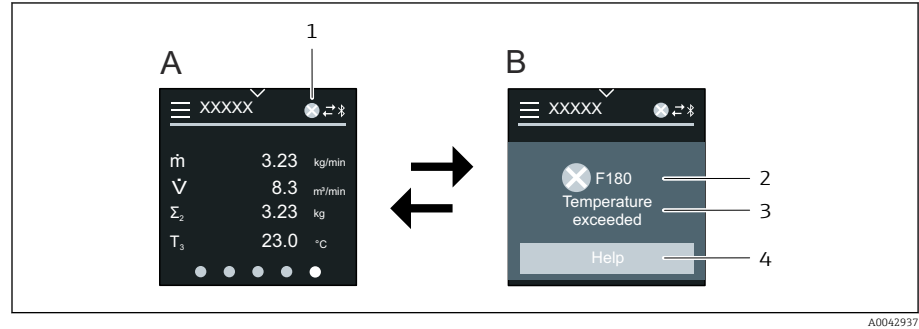
A0044231

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.
2 Bluetooth	Off	Bluetooth is disabled.
	Permanently blue	Bluetooth is enabled.
	Flashing blue	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
 - Via DeviceCare
 - Via IO-Link

Status signals

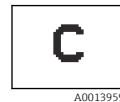
The status signals provide information on the state and reliability of the device by categorizing the cause of the diagnostic information (diagnostic event).

- 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



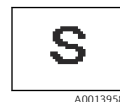
Failure

- 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.

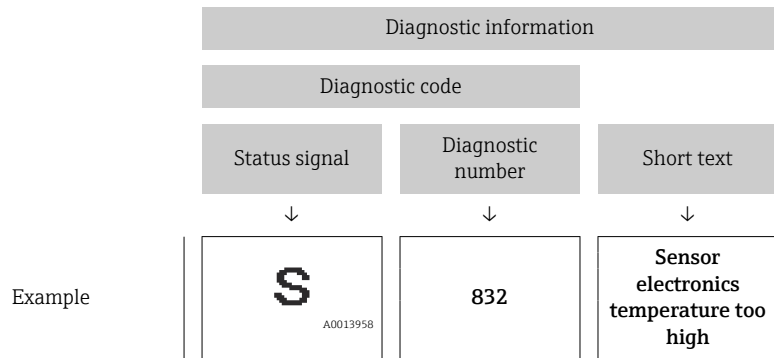


Maintenance required

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

Diagnostic information

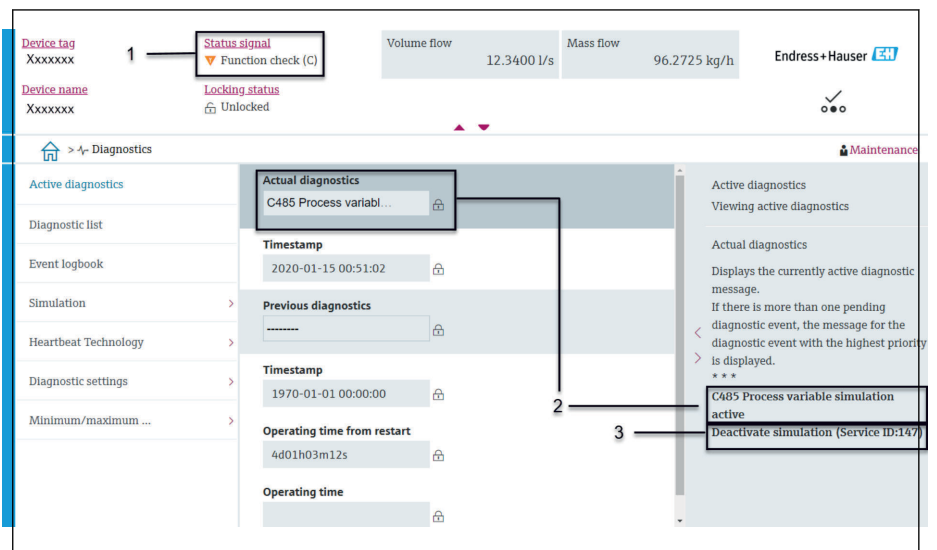
The fault can be identified using the diagnostic information. The short text displays a tip about the fault.



Diagnostic information in FieldCare or DeviceCare

Diagnostic options

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

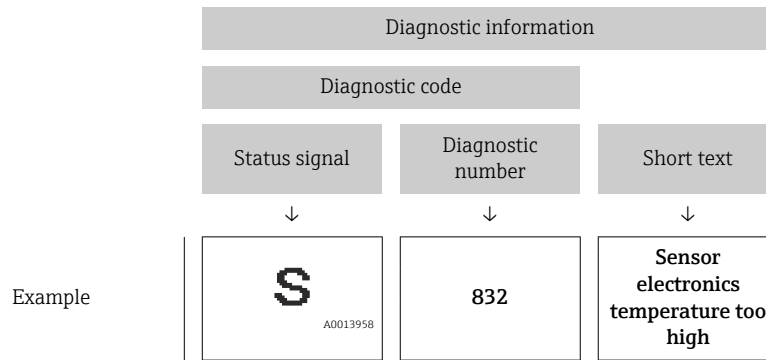


- 1 Status area with diagnostic behavior and status signal
- 2 Diagnostic code and short message
- 3 Troubleshooting measures with service ID

- 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				
022	Temperature sensor defective	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	F	Alarm
046	Sensor limit exceeded	1. Check process conditions 2. Check sensor	S	Warning ¹⁾
062	Sensor connection faulty	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	F	Alarm
063	Exciter current faulty	1. Replace sensor electronic module (ISEM) 2. Replace sensor	F	Alarm
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
140	Sensor signal asymmetrical	1. If available: Check connection cable between sensor and transmitter 2. Check or replace sensor electronic module (ISEM) 3. Replace sensor	S	Alarm ¹⁾
144	Measurement error too high	1. Check process conditions 2. Check or change sensor	F	Alarm ¹⁾
Diagnostic of electronic				
201	Electronics faulty	1. Restart device 2. Replace electronics	F	Alarm
222	Voltage drift detected	Replace sensor electronic module (ISEM)	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
270	Electronic module defective	Replace electronic module	F	Alarm
278	Display module defective	Replace display module	F	Alarm
283	Memory content inconsistent	Restart device	F	Alarm

Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
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
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
374	Sensor electronics (ISEM) faulty	1. Restart device 2. Check if failure recurs 3. Replace sensor electronic module (ISEM)	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
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⁾
834	Process temperature too high	Reduce process temperature	S	Warning ¹⁾
835	Process temperature too low	Increase process temperature	S	Warning ¹⁾


Diagnostic number	Short text	Remedy instructions	Status signal [from the factory]	Diagnostic behavior [from the factory]
842	Process value below limit	Low flow cut off active! Check low flow cut off configuration	S	Warning ¹⁾
862	Partly filled pipe	1. Check for gas in process 2. Adjust detection limits	S	Warning ¹⁾
910	Tubes not oscillating	1. Check sensor electronic module (ISEM) 2. Check sensor	F	Alarm
912	Medium inhomogeneous	1. Check process cond. 2. Increase system pressure	S	Warning ¹⁾
913	Medium unsuitable	1. Check process conditions 2. Check electronic modules or sensor	S	Warning ¹⁾
944	Monitoring failed	Check process conditions for Heartbeat Monitoring	S	Warning ¹⁾
948	Oscillation damping too high	Check process conditions	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*,  64
- Information event → *Overview of information events*,  68

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 .

Info number	Info name
I1000	----- (Device ok)
I1079	Sensor changed
I1089	Power on
I1090	Configuration reset
I1091	Configuration changed
I11036	Date/time set successfully
I1111	Density adjust failure
I11167	Date/time resynchronized
I1137	Display module replaced
I1151	History reset
I1155	Sensor electronics temperature reset
I1157	Memory error event list
I1209	Density adjustment ok
I1221	Zero point adjust failure
I1222	Zero point adjustment ok
I1256	Display: access status changed
I1335	Firmware changed

Info number	Info name
I1351	Empty pipe detection adjustment failure
I1353	Empty pipe detection adjustment ok
I1397	Fieldbus: access status changed
I1398	CDI: access status changed
I1444	Device verification passed
I1445	Device verification failed
I1448	Application reference data recorded
I1449	Recording application ref. data 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 work	72
Services	72

Maintenance work

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 of surfaces not in contact with medium

1. Recommendation: Use a dry or slightly damp lint-free cloth.
2. Do not use any sharp objects or aggressive cleaning agents that could damage surfaces (e.g. displays, housing) and seals.
3. Do not use high-pressure steam.
4. Observe the degree of protection of the device.

NOTICE

Surface damage caused by cleaning agents

Using the wrong cleaning agents can cause damage to surfaces.

- ▶ Do not use cleaning agents containing concentrated mineral acids, alkaline solutions or organic solvents e. g. benzyl alcohol, methylene chloride, xylene, concentrated glycerol cleaner 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	74
Disposing of the device	74

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*, 94

13 Technical data

Input	76
Output	78
Energy supply	80
Cable specification	81
Performance characteristics	82
Environment	86
Process	88
Mechanical construction	93
Local display	96
Certificates and approvals	97
Application packages	99

Input

Measured variable

Direct measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Temperature ■ Density* <p>* Visibility depends on order options or device settings</p>
Calculated measured variables	<ul style="list-style-type: none"> ■ Volume flow ■ Corrected volume flow

Operable flow range

Over 1000 : 1

Flow rates above the set end value do not overload the electronics. The totalized flow volume is measured correctly.

Measuring range

Measuring range for liquids

DN		Measuring range full scale values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0 to 2 000	0 to 73.50
15	$\frac{1}{2}$	0 to 6 500	0 to 238.9
25	1	0 to 18 000	0 to 661.5
40	$1\frac{1}{2}$	0 to 45 000	0 to 1 654
50	2	0 to 70 000	0 to 2 573
80	3	0 to 180 000	0 to 6 615



Measuring range for gases

The full scale value depends on the density and the sound velocity of the gas used and can be calculated with the formula below:

$$\dot{m}_{\max(G)} = \text{minimum} (\dot{m}_{\max(F)} \cdot \rho_G : x ; m = \rho_G \cdot (c_G/2) \cdot d_i^2 \cdot (\pi/4) \cdot n \cdot 3600)$$

$\dot{m}_{\max(G)}$	Maximum full scale value for gas [kg/h]
$\dot{m}_{\max(F)}$	Maximum full scale value for liquid [kg/h]
$\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$	$\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$
ρ_G	Gas density in [kg/m ³] at operating conditions
x	Limitation constant for max. gas flow [kg/m ³]
m	Mass [kg/s]
ρ_{oG}	Density during operation [kg/m ³]
c_G	Sound velocity (gas) [m/s]
d_i	Measuring tube internal diameter [m]
π	Pi
n	Number of pipes

DN		x
[mm]	[in]	[kg/m ³]
8	3/8	85
15	1/2	110
25	1	125
40	1 1/2	125
50	2	125
80	3	155

 To calculate the measuring range, use the *Applicator* sizing tool → *Service-specific accessory*,  121

Calculation example for gas

- Sensor: Promass K, DN 50
- Gas: Air with a density of 60.3 kg/m³ (at 20 °C and 50 bar)
- Measuring range (liquid): 70 000 kg/h
- x = 125 kg/m³ (for Promass K, DN 50)

Maximum possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_G : x = 70\,000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 : 125 \text{ kg/m}^3 = 33\,800 \text{ kg/h}$$

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 output is galvanically isolated from earth.

Protocol-specific data

IO-Link specification	Version 1.1.3
Device ID	9728513
Manufacturer ID	17
Smart Sensor Profile	Smart Sensor Profile 2nd Edition V1.2; supports <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 parametrization	Yes
Device operational	6 s The device is operational once the supply voltage has been applied.
System integration	Cyclic input variables: <ul style="list-style-type: none"> ■ Mass flow [kg/s] ■ Density [kg/m³], depending on the order options or device settings ■ Temperature [°C] ■ Totalizer 1 [kg] Cyclic output 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 transfer 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>

Energy 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> , 80
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 specification

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

Performance characteristics

Reference operating conditions


- Error limits based on ISO 11631
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

 To obtain measured errors, use the *Applicator* sizing tool → *Service-specific accessory*,  121

Maximum measurement error

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

Base accuracy

→ *Design fundamentals*,  84

Mass flow and volume flow (liquids)	±0.5 % o.r. <ul style="list-style-type: none"> ▪ Order code for "Calibration flow" option G: ±0.2 % ▪ Order code for "Calibration flow" option O: ±0.15 %
Mass flow (gases)	±0.75 % o.r.
Density (liquids)	Only devices with the order code for "Application package", option EF <ul style="list-style-type: none"> ▪ Under reference operating conditions: ±0.0005 g/cm³ ▪ Standard density calibration: ±0.003 g/cm³
Temperature	±0.5 °C ± 0.005 · T °C (±0.9 °F ± 0.003 · (T - 32) °F)

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	3/8	0.20	0.007
15	1/2	0.65	0.024
25	1	1.80	0.066
40	1 1/2	4.50	0.165
50	2	7.0	0.257
80	3	18.0	0.6615

Flow values

Flow values as turndown parameters depending on nominal diameter.


SI units	DN	1:1	1:10	1:20	1:50	1:100	1:500
	[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
	8	2 000	200	100	40	20	4
	15	6 500	650	325	130	65	13
	25	18 000	1 800	900	360	180	36
	40	45 000	4 500	2 250	900	450	90

SI units	DN	1:1	1:10	1:20	1:50	1:100	1:500
	[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
	50	70 000	7 000	3 500	1 400	700	140
	80	180 000	18 000	9 000	3 600	1 800	360

US units	DN	1:1	1:10	1:20	1:50	1:100	1:500
	[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
	$\frac{3}{8}$	73.50	7.350	3.675	1.470	0.735	0.147
	$\frac{1}{2}$	238.9	23.89	11.95	4.778	2.389	0.478
	1	661.5	66.15	33.08	13.23	6.615	1.323
	1½	1 654	165.4	82.70	33.08	16.54	3.308
	2	2 573	257.3	128.7	51.46	25.73	5.146
	3	6 615	661.5	330.8	132.3	66.15	13.23

Repeatability

o.r. = of reading; T = medium temperature

→ *Design fundamentals*,  84

Mass flow (liquids)	± 0.1 % o.r.
Mass flow (gases)	± 0.5 % o.r.
Density (liquids)	Only devices with the order code for "Application package", option EF ± 0.00025 g/cm ³ (1 kg/l)
Temperature	± 0.25 °C $\pm 0.0025 \cdot T$ °C (± 0.45 °F $\pm 0.0015 \cdot (T-32)$ °F)

Response time

The response time depends on the configuration (damping).

Influence of medium temperature

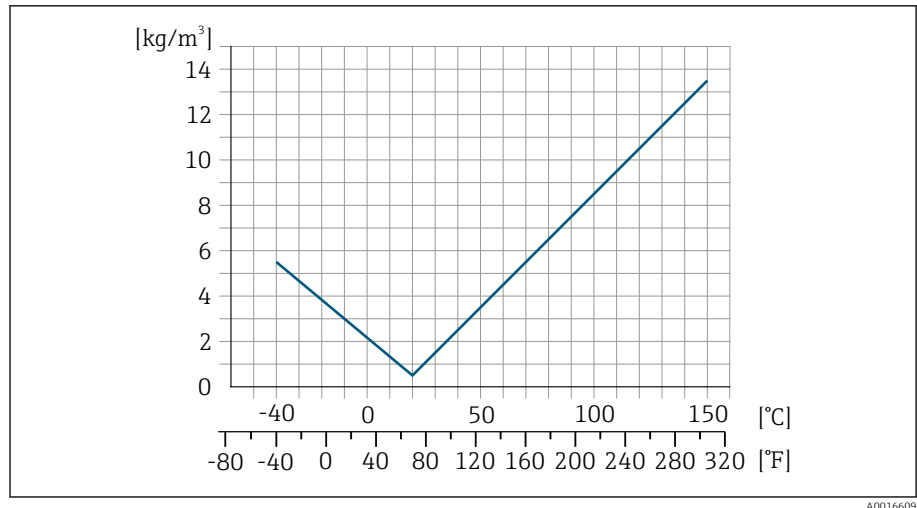
o.f.s. = of full scale value

Mass flow and volume flow

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

Density

When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is ± 0.0001 g/cm³ /°C (± 0.00005 g/cm³ /°F). Field density calibration is possible.



11 Field density calibration, for example at +20 °C (+68 °F)

Temperature

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

Influence of medium pressure

o.r. = of reading

The following table shows how the pressure (gauge pressure) affects the accuracy of the mass flow.

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

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	3/8	no influence	
15	1/2	no influence	
25	1	no influence	
40	1 1/2	no influence	
50	2	-0.009	-0.0006
80	3	-0.020	-0.0014

Design fundamentals

o.r. = of reading

BaseAccu = base accuracy as % o.r

BaseRepeat = base repeatability as % o.r.

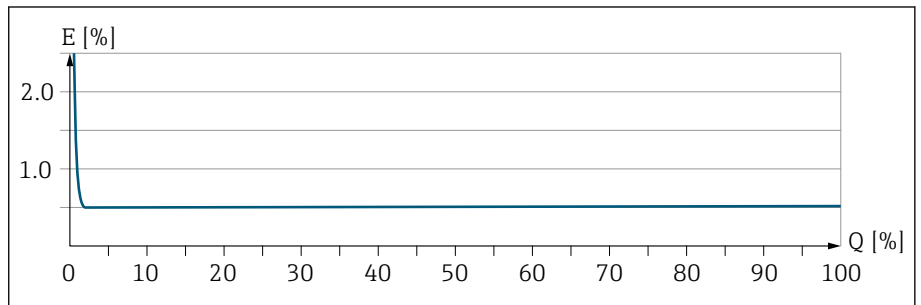
MeasValue = measured value

ZeroPoint = zero point stability

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

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

Example for maximum measured error



A0044672




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

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

Flow rate	$\geq \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$	$< \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$
Maximum measured error in % o.r.	$\pm \text{BaseRepeat}$	$\pm 1/2 \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$

Environment

Ambient temperature range

Transmitter and sensor	-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.
	<p> Dependency of ambient temperature on medium temperature → <i>Medium temperature range</i>,  88</p> <p> If using the device in hazardous areas, observe the "Safety Instructions" documentation.</p>

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)

Atmosphere

According to IEC 60529: If a plastic housing is permanently exposed to certain steam and air mixtures, this can damage the housing.

 More Informationen: Endress+Hauser sales organizations.

Climate class

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

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

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.

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

-40 to +150 °C (-40 to +302 °F)

Density

0 to 5 000 kg/m³ (0 to 312 lb/cf)

Flow limit

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

i For an overview of the measuring range full scale values: → *Measuring range*, 76

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- For the most common applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
- For gas measurement the following rules apply:
 - The flow velocity in the measuring pipes should not exceed half the sound velocity (0.5 Mach).
 - The maximum mass flow depends on the density of the gas: formula → *Measuring range for gases*, 76

i To calculate the flow limit, use the *Applicator* sizing tool → *Service-specific accessory*, 121

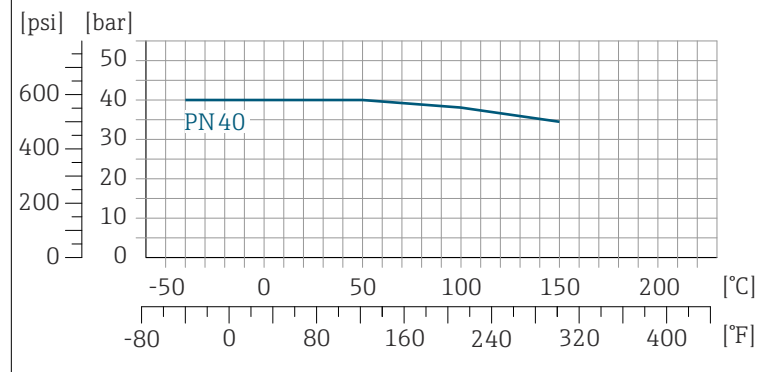
Pressure-temperature ratings

Maximum permitted medium pressure as a function of the medium temperature.

The data relate to all pressure bearing parts of the device.

Flange similar to EN 1092-1

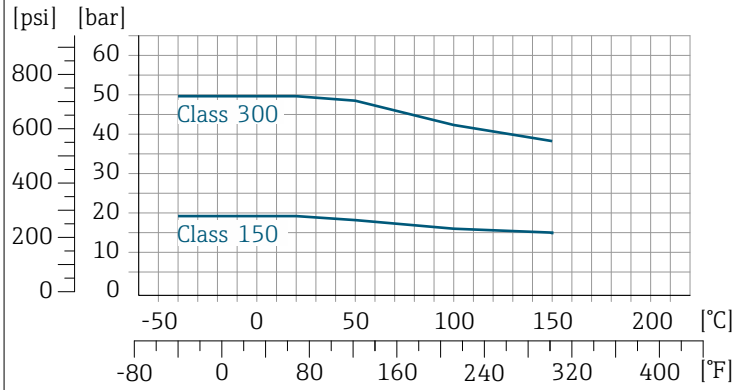
Flange material 1.4404 (F316/F316L)



A0047032-EN

Flange similar to ASME B16.5

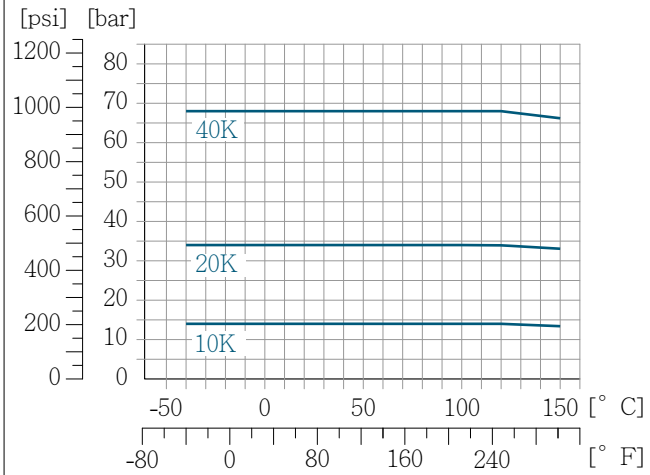
Flange material 1.4404 (F316/F316L)



A0047033-EN

Fixed flange JIS B2220

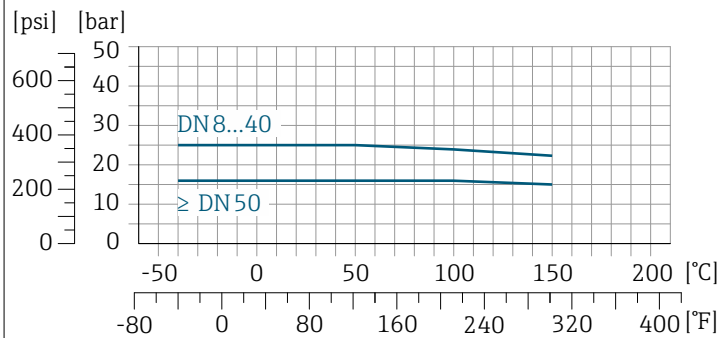
Flange material 1.4404 (F316/F316L)



A0047034-EN

Flange DIN 11864-2 Form A

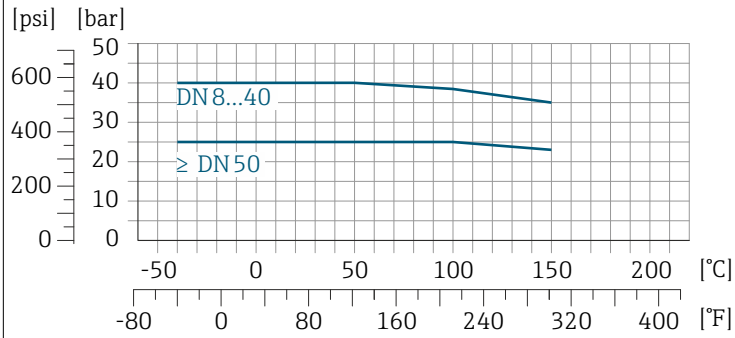
Flange material 1.4404 (F316/F316L)



A0029839-EN

Thread DIN 11864-1 Form A

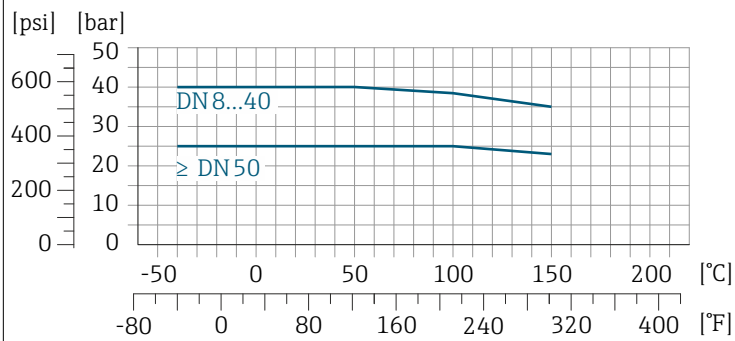
Connection material 1.4404 (F316/
F316L)



A0029848-EN

Thread DIN 11851

Connection material 1.4404 (F316/
F316L)

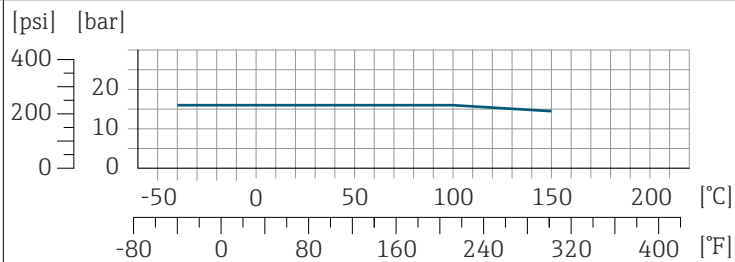


A0029848-EN

DIN 11851 allows for applications up to +140 °C (+284 °F) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

Thread ISO 2853

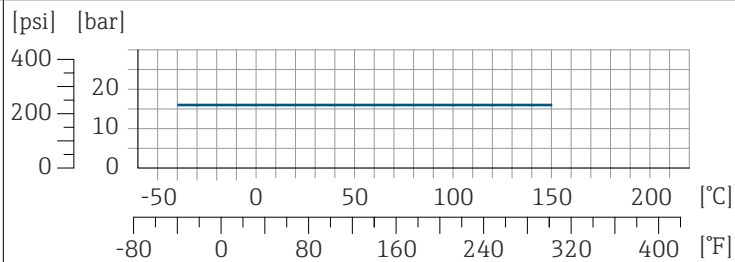
Connection material 1.4404 (F316/
F316L)



A0029853-EN

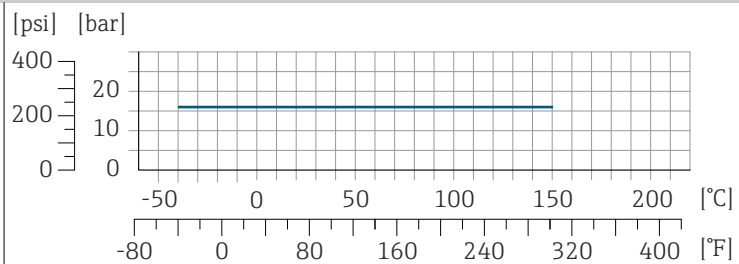
Thread SMS 1145

Connection material 1.4404 (F316/
F316L)



A0032218-EN

Tri-Clamp



A0032218-EN

The clamp connections are suitable up to a maximum pressure of 16 bar (232 psi). Please observe the operating limits of the clamp and seal used as they can be over 16 bar (232 psi). The clamp and seal are not included in the scope of supply.

Sensor housing

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

i If a measuring pipe fails, e.g. due to process characteristics like corrosive or abrasive media, the medium will be contained by the sensor housing.

If a measuring pipe fails, the pressure level inside the sensor housing will rise according to the operating pressure. If the user judges that the sensor housing burst pressure does not provide an adequate safety margin, the device can be fitted with a rupture disk. The rupture disk prevents excessively high pressure from forming inside the sensor housing. The rupture disk is urgently recommended in the following applications:

- For high gas pressures
- Process pressure is higher than 2/3 of the burst pressure of the sensor housing.

Sensor housing burst pressure

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

The sensor housing burst pressure refers to a typical internal pressure which is reached prior to mechanical failure of the sensor housing and which was determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option LN "Sensor housing burst pressure, type test").

DN		Sensor housing burst pressure	
[mm]	[in]	[bar]	[psi]
8	3/8	250	3 620
15	1/2	250	3 620
25	1	250	3 620
40	1 1/2	200	2 900
50	2	180	2 610
80	3	120	1 740



For information on the dimensions: see the "Mechanical construction" section → *Mechanical construction*, 93.

Rupture disk

- Order code for "Sensor option", option CA
- Trigger pressure: 10 to 15 bar (145 to 217.5 psi)

The use of a rupture disk cannot be combined with a heating jacket.

Pressure loss

-  To calculate the pressure loss, use the *Applicator* sizing tool → *Service-specific accessory*,  121

Mechanical construction

Weight

All values refer to devices with EN/DIN PN 40 flanges
Weight information including transmitter as per order code for "Housing", option A "Aluminum, coated".

Different values due to different transmitter versions:

Transmitter version for the hazardous area: +1 kg (+2.2 lbs)

Transmitter version, order code for "Housing", option D "Polycarbonate":
-1 kg (-2.2 lbs)

Weight in SI units

DN [mm]	Weight [kg]
8	6
15	6.5
25	8
40	12
50	17
80	33

Weight in US units

DN [in]	Weight [lbs]
3/8	13
1/2	14
1	18
1 1/2	26
2	37
3	73

Materials

Transmitter housing

Order code for "Housing"	<ul style="list-style-type: none"> ■ Option A: coated aluminum ■ Option D: polycarbonate ■ Option G: coated aluminum + polycarbonate inspection window
Window material	<ul style="list-style-type: none"> ■ Order code for "Housing", option A: glass ■ Order code for "Housing", option D: polycarbonate ■ Order code for "Housing", option G: polycarbonate
Neck adapter	Order code for "Housing", option A, D and G: coated aluminum

Cable glands and entries

Cable gland M20 × 1.5	<ul style="list-style-type: none"> ■ Non-hazardous area: plastic ■ Hazardous area: brass
Adapter for cable entry with female thread G ½" or NPT ½"	Nickel-plated brass
M12 plug-in connector	Stainless steel 1.4301 (304)

Sensor housing

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

Measuring tubes

Stainless steel: 1.4539 (904L)
 Manifold: stainless steel, 1.4404 (316L)

Seals

Welded process connections without internal seals

Process connections

<ul style="list-style-type: none"> ■ EN 1092-1 (DIN 2501) ■ ASME B16.5 ■ JIS B2220 	Stainless steel, 1.4404 (F316/F316L)
Other process connections	Stainless steel, 1.4404 (316/316L)

Accessories

Protective cover	Stainless steel, 1.4404 (316L)
------------------	--------------------------------

Process connections

- Fixed flange connections:
 - EN 1092-1 (DIN 2501) flange
 - ASME B16.5 flange
 - JIS B2220 flange
 - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
- Clamp connections:
Tri-Clamp (OD tubes), DIN 11866 series C
- Thread:
 - DIN 11851 thread, DIN 11866 series A
 - SMS 1145 thread
 - ISO 2853 thread, ISO 2037
 - DIN 11864-1 Form A thread, DIN 11866 series A

Surface roughness

The following surface roughness categories can be ordered. All data refer to parts in contact with the medium.

Category	Method	Option(s) order code "Meas. Tube Mat., Wetted Parts Surface"
Not polished	–	SA
Ra < 0.76 µm (30 µin) ¹⁾	Mechanically polished ²⁾	BB

1) Ra according to ISO 21920

2) Inaccessible tube to manifold welds excluded


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 ▪ Standardized operating concept on the 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 troubleshooting measures 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 measures
- Simulation options

IODD download

Two options for downloading the IODD:

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

www.endress.com/download



1. Select "Device drivers".
2. Under "Type", select the "IO Device Description (IODD)" item.
3. Select "Product root".
4. Click "Search".
 - ↳ A list of search results is displayed.

Select and download the appropriate version.

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

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

Select and download the appropriate version.

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

Operation options

Local display	Display element: <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. III
- PESR Cat. III

Hygienic compatibility

- 3-A approval
 - Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval.
 - The 3-A approval refers to the measuring instrument.
 - When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument. Remote transmitters must be installed in accordance with the 3-A Standard.
 - Accessories (e.g. heating jacket, weather protection cover) must be installed in accordance with the 3-A Standard. Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG-tested
 - Only measuring instruments with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.
 - To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedg.org).
 - To meet the requirements for EHEDG certification, the device must be installed in an orientation that ensures drainability → *Special mounting instructions*,  27.
- Food Contact Materials Regulation (EC) 1935/2004
A declaration for a specific serial number that confirms compliance with the requirements of (EC) 1935/2004 is only generated for measuring instruments with the order code for "Test, Certificate", option J1 "EU Food Contact Materials (EC) 1935/2004.
- FDA
A declaration for a specific serial number that confirms compliance with FDA requirements is only generated for measuring instruments with the order code for "Test, Certificate", option J2 "US Food Contact Materials FDA CFR 21".
- Food Contact Materials Regulation GB 4806
A declaration for a specific serial number that confirms compliance with the requirements of GB 4806 is only generated for measuring instruments with the order code for "Test, Certificate", option J3 "CN Food Contact Materials GB 4806.

Pharmaceutical compatibility

- FDA
- USP Class VI
- TSE/BSE Certificate of Suitability
- cGMP
Devices with the order code for "Test, certificate", option JG "Conformity with cGMP-derived requirements, declaration" comply with the requirements of cGMP with regard to the surfaces of parts in contact with the medium, design, FDA 21 CFR material conformity, USP Class VI tests and TSE/BSE conformity. A serial number-specific declaration is generated.

Radio approval

The device has radio approvals.

Additional certification

IO-Link

Self-certification with manufacturer's declaration

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: vibrate (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.
- 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)
- 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 9001:2008 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. These data enable the operator to:

- Draw conclusions - using these data and other information - about the impact the process influences, e.g. corrosion, abrasion, formation of buildup, have on the measuring performance over time.
- Schedule servicing in time.
- Monitor the process quality or product quality, e.g. gas pockets.

Density output

Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the medium and makes this value available to the control system.

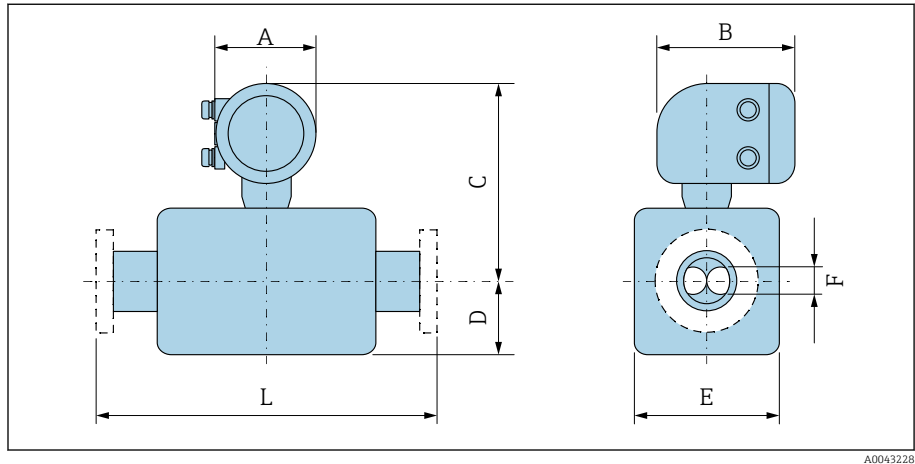
With this application package, the density can be assigned as a process variable and displayed.

14 Dimensions in SI units

Compact version	102
Order code for "Housing", option A and G "Aluminum, coated"	102
Order code for "Housing", option D "Polycarbonate"	103
Fixed flange	104
Flange according to EN 1092-1 (DIN 2501): PN 40	104
Flange similar to ASME B16.5: Class 150	105
Flange similar to ASME B16.5: Class 300	105
Flange JIS B2220: 20K	106
Flange JIS B2220: 40K	106
Flange DIN 11864-2 Form A, flange with notch	107
Clamp connections	108
Tri-Clamp	108
Couplings	109
Thread similar to DIN 11851	109
Thread similar to DIN 11864-1 Form A	109
Thread similar to SMS 1145	110
Thread similar to ISO 2853	110
Accessories	111
Protective cover	111

Compact version

Order code for "Housing", option A and G "Aluminum, coated"

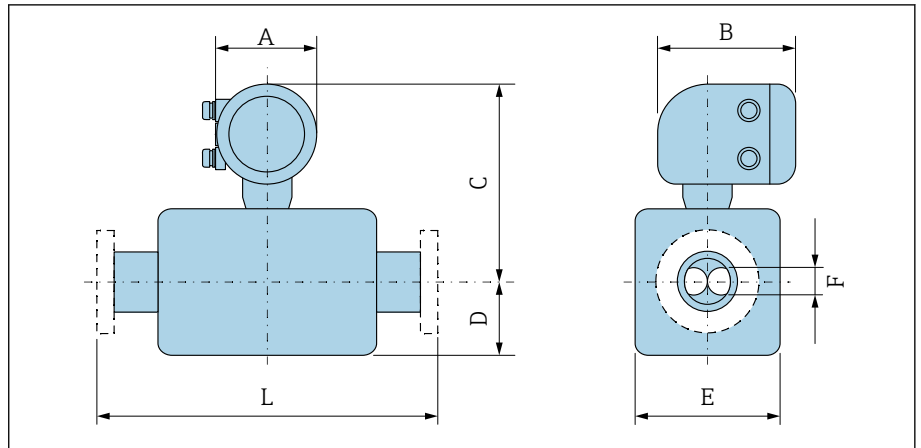


Dimension L depends on the relevant process connection:

DN [mm]	A ¹⁾ [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	139	178	254	89	45	5.35
15	139	178	254	100	45	8.30
25	139	178	251	102	51	12.0
40	139	178	257	121	65	17.6
50	139	178	271	175.5	95	26.0
80	139	178	291	205	127	40.5

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

Order code for "Housing", option D "Polycarbonate"



A0043228

Dimension L depends on the relevant process connection:

DN [mm]	A ¹⁾ [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	132	172	251	89	45	5.35
15	132	172	251	100	45	8.30
25	132	172	248	102	51	12.0
40	132	172	254	121	65	17.6
50	132	172	268	175.5	95	26.0
80	132	172	287	205	127	40.5

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

Fixed flange

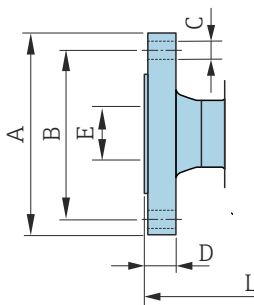
Flange according to EN 1092-1 (DIN 2501): PN 40

Order code for "Process connection", option D2S

1.4404 (F316/F316L)

DN 8 with DN 15 flanges as standard

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 μm



The technical drawing shows a side view of a fixed flange. Dimension A is the total height of the flange. Dimension B is the height of the main flange body. Dimension E is the height of the raised face. Dimension C is the thickness of the raised face. Dimension D is the thickness of the main flange body. Dimension L is the length of the flange.

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	95	65	4 × Ø14	16	17.3	232
15	95	65	4 × Ø14	16	17.3	279
25	115	85	4 × Ø14	18	28.5	329
40	150	110	4 × Ø18	18	43.1	445
50	165	125	4 × Ø18	20	54.5	556
80	200	160	8 × Ø18	24	82.5	611

A0042813

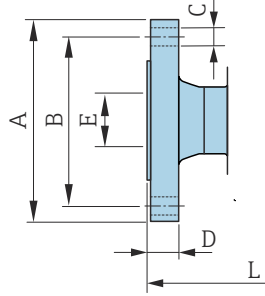
Flange similar to ASME B16.5: Class 150

Order code for "Process connection", option AAS

1.4404 (F316/F316L)

DN 8 with DN 15 flanges as standard

Surface roughness (flange): Ra 3.2 to 12.5 µm



A0042813

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	90	60.3	4 × Ø15.7	11.2	15.7	232
15	90	60.3	4 × Ø15.7	11.2	15.7	279
25	110	79.4	4 × Ø15.7	14.2	26.7	329
40	125	98.4	4 × Ø15.7	17.5	40.9	445
50	150	120.7	4 × Ø19.1	19.1	52.6	556
80	190	152.4	4 × Ø19.1	23.9	78.0	611

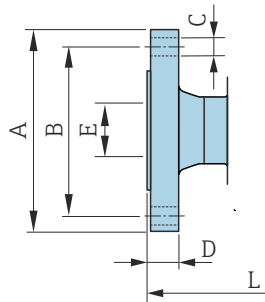
Flange similar to ASME B16.5: Class 300

Order code for "Process connection", option ABS

1.4404 (F316/F316L)

DN 8 with DN 15 flanges as standard

Surface roughness (flange): Ra 3.2 to 12.5 µm



A0042813

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	95	66.7	4 × Ø15.7	14.2	15.7	232
15	95	66.7	4 × Ø15.7	14.2	15.7	279
25	125	88.9	4 × Ø19.0	17.5	26.7	329
40	155	114.3	4 × Ø22.3	20.6	40.9	445
50	165	127	8 × Ø19.0	22.3	52.6	556
80	210	168.3	8 × Ø22.3	28.4	78.0	611

Flange JIS B2220: 20K

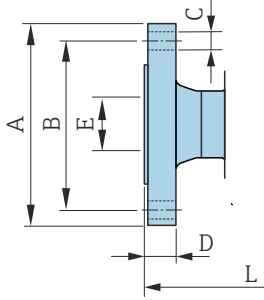
Order code for "Process connection", option NES

1.4404 (F316/F316L)

DN 8 with DN 15 flanges as standard

Surface roughness (flange): Ra 3.2 to 12.5 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	95	70	4 × Ø15	14	15	232
15	95	70	4 × Ø15	14	15	279
25	125	90	4 × Ø19	16	25	329
40	140	105	4 × Ø19	18	40	445
50	155	120	8 × Ø19	18	50	556
80	200	160	8 × Ø23	22	80	603



A0042813

Flange JIS B2220: 40K

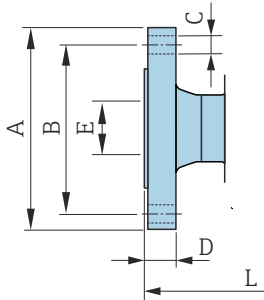
Order code for "Process connection", option NGS

1.4404 (F316/F316L)

DN 8 with DN 15 flanges as standard

Surface roughness (flange): Ra 3.2 to 12.5 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	115	80	4 × Ø19	20	15	261
15	115	80	4 × Ø19	20	15	300
25	130	95	4 × Ø19	22	25	375
40	160	120	4 × Ø23	24	38	496
50	165	130	8 × Ø19	26	50	601
80	210	170	8 × Ø23	32	75	661



A0042813

Flange DIN 11864-2 Form A, flange with notch

Order code for "Process connection", option KCS

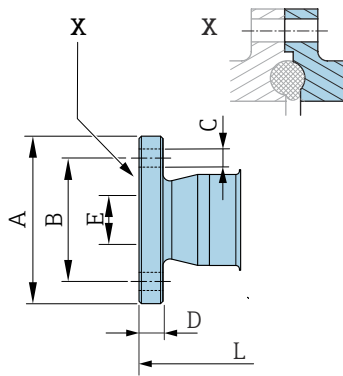
1.4404 (316/316L)

Suitable for pipe similar to DIN 11866 series A, flange with notch

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 0.76 \mu m$)



Length tolerance for dimension L in mm:
+1.5 / -2.0



A0042819

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	54	37	4 × Ø9	10	10	249
15	59	42	4 × Ø9	10	16	293
25	70	53	4 × Ø9	10	26	344
40	82	65	4 × Ø9	10	38	456
50	94	77	4 × Ø9	10	50	562
80	133	112	8 × Ø11	12	81	671

Clamp connections

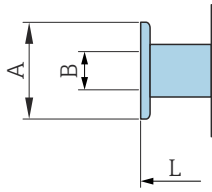
Tri-Clamp

Order code for "Process connection", option FTS

1.4404 (316/316L)

Suitable for pipe similar to DIN 11866 series C

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 0.76 \mu m$)



A0043179

DN [mm]	Clamp [mm]	A [mm]	B [mm]	L [mm]
8	1	50.4	22.1	229
15	1	50.4	22.1	273
25	1	50.4	22.1	324
40	1½	50.4	34.8	456
50	2	63.9	47.5	562
80	3	90.9	72.9	671

Couplings

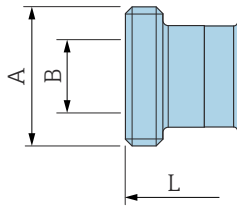
Thread similar to DIN 11851

Order code for "Process connection", option FMW

1.4404/316L

Suitable for pipe similar to DIN11866, series A

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 0.76 \mu m$)



A0043257

DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd $34 \times \frac{1}{8}$	16	229
15	Rd $34 \times \frac{1}{8}$	16	273
25	Rd $52 \times \frac{1}{6}$	26	324
40	Rd $65 \times \frac{1}{6}$	38	456
50	Rd $78 \times \frac{1}{6}$	50	562
80	Rd $110 \times \frac{1}{4}$	81	671

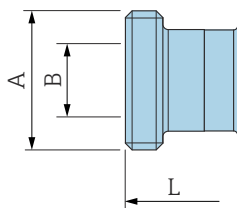
Thread similar to DIN 11864-1 Form A

Order code for "Process connection", option FLW

1.4404/316L

Suitable for pipe similar to DIN11866, series A

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 0.76 \mu m$)



A0043257

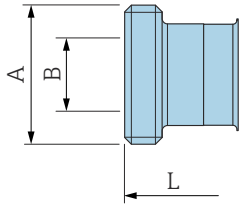
DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd $28 \times \frac{1}{8}$	10	229
15	Rd $34 \times \frac{1}{8}$	16	273
25	Rd $52 \times \frac{1}{6}$	26	324
40	Rd $65 \times \frac{1}{6}$	38	456
50	Rd $78 \times \frac{1}{6}$	50	562
80	Rd $110 \times \frac{1}{4}$	81	671

Thread similar to SMS 1145

Order code for "Process connection", option SCS

1.4404 (316/316L)

3-A version available: order code for "Additional approval", option LP in conjunction with order code "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 0.76 \mu\text{m}$)



A0043257

DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd $40 \times \frac{1}{6}$	22.5	229
15	Rd $40 \times \frac{1}{6}$	22.5	273
25	Rd $40 \times \frac{1}{6}$	22.5	324
40	Rd $60 \times \frac{1}{6}$	35.5	456
50	Rd $70 \times \frac{1}{6}$	48.5	562
80	Rd $98 \times \frac{1}{6}$	72.9	671

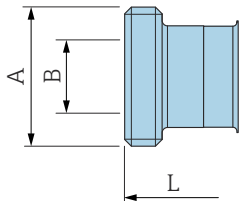
Thread similar to ISO 2853

Order code for "Process connection", option JSF

1.4404 (316/316L)

Max. thread diameter A similar to ISO 2853 Annex A

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 0.76 \mu\text{m}$)

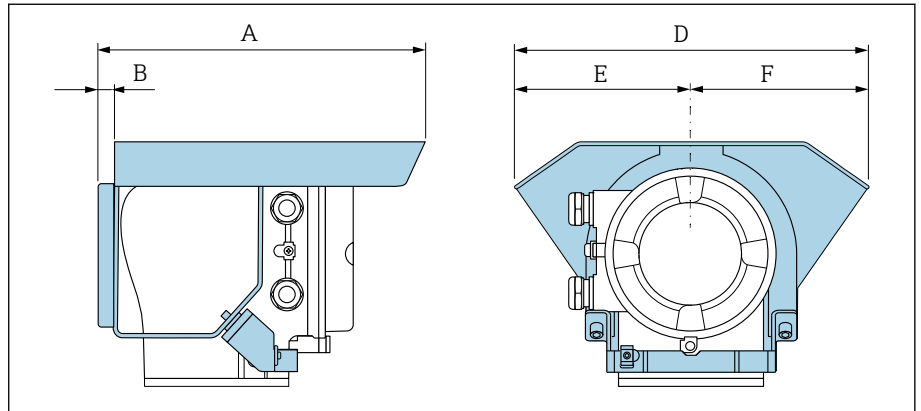


A0043257

DN [mm]	A [mm]	B [mm]	L [mm]
8	37.13	22.6	229
15	37.13	22.6	273
25	37.13	22.6	324
40	50.68	35.6	456
50	64.16	48.6	562
80	91.19	72.9	671

Accessories

Protective cover



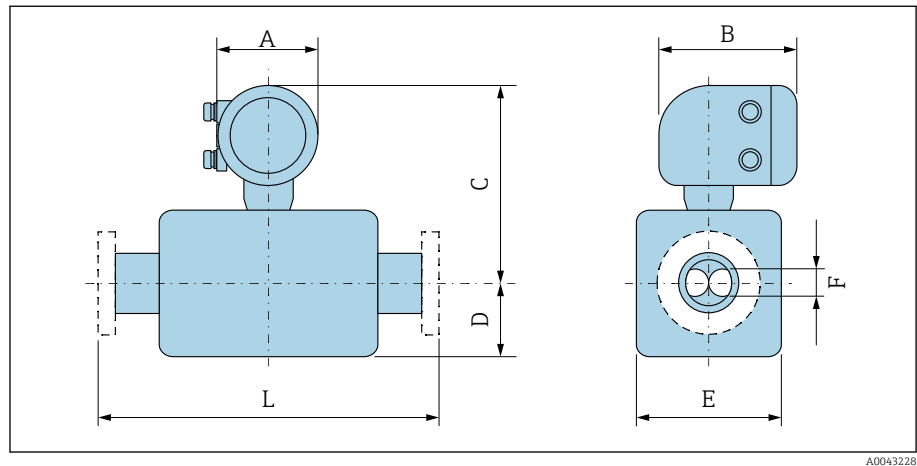
A [mm]	B [mm]	D [mm]	E [mm]	F [mm]
257	12	280	140	140

15 Dimensions in US units

Compact version	114
Order code for "Housing", option A and G "Aluminum, coated"	114
Order code for "Housing", option D "Polycarbonate"	115
Fixed flange	116
Flange similar to ASME B16.5: Class 150	116
Flange similar to ASME B16.5: Class 300	116
Clamp connections	117
Tri-Clamp	117
Couplings	117
Threaded coupling similar to SMS 1145	117
Accessories	118
Protective cover	118

Compact version

Order code for "Housing", option A and G "Aluminum, coated"

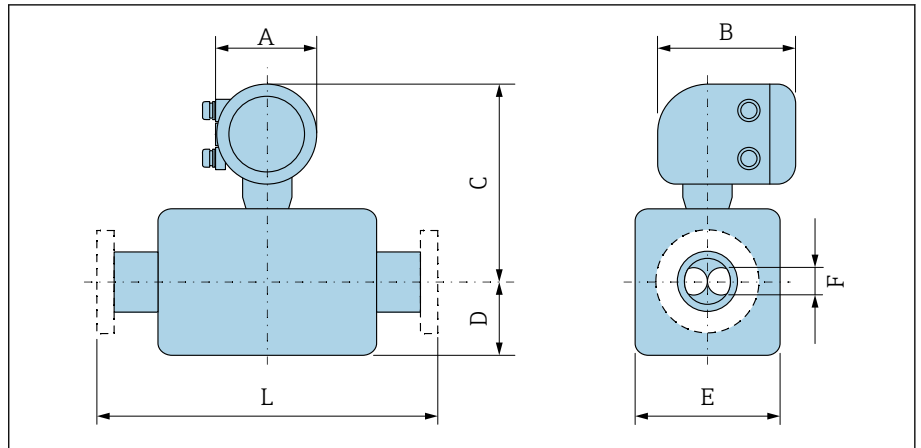


Dimension L depends on the relevant process connection:

DN [in]	A ¹⁾ [in]	B [in]	C [in]	D [in]	E [in]	F [in]
3/8	5.47	7.01	10	3.5	1.77	0.21
1/2	5.47	7.01	10	3.94	1.77	0.33
1	5.47	7.01	9.88	4.02	2.01	0.47
1 1/2	5.47	7.01	10.12	4.76	2.56	0.69
2	5.47	7.01	10.67	6.91	3.74	1.02
3	5.47	7.01	11.46	8.07	5	1.59

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

Order code for "Housing", option D "Polycarbonate"



A0043228

Dimension L depends on the relevant process connection:

DN [in]	A ¹⁾ [in]	B [in]	C [in]	D [in]	E [in]	F [in]
3/8	5.2	6.77	9.88	3.5	1.77	0.21
1/2	5.2	6.77	9.88	3.94	1.77	0.33
1	5.2	6.77	9.76	4.02	2.01	0.47
1 1/2	5.2	6.77	10	4.76	2.56	0.69
2	5.2	6.77	10.55	6.91	3.74	1.02
3	5.2	6.77	11.3	8.07	5	1.59

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

Fixed flange

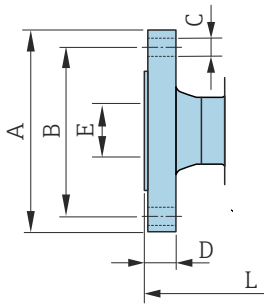
Flange similar to ASME B16.5: Class 150

Order code for "Process connection", option AAS

1.4404 (F316/F316L)

DN 3/8" with DN 1/2" flanges as standard

Surface roughness (flange): Ra 12.5 to 492 µin



A0042813

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3/8	3.54	2.37	4 × Ø0.62	0.44	0.62	9.13
1/2	3.54	2.37	4 × Ø0.62	0.44	0.62	10.98
1	4.33	3.13	4 × Ø0.62	0.56	1.05	12.95
1 1/2	4.92	3.87	4 × Ø0.62	0.69	1.61	17.52
2	5.91	4.75	4 × Ø0.75	0.75	2.07	21.89
3	7.48	6	4 × Ø0.75	0.94	3.07	24.06

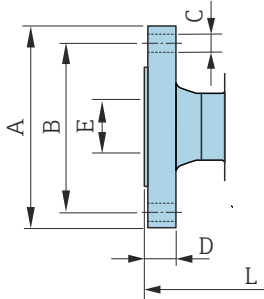
Flange similar to ASME B16.5: Class 300

Order code for "Process connection", option ABS

1.4404 (F316/F316L)

DN 3/8" with DN 1/2" flanges as standard

Surface roughness (flange): Ra 12.5 to 492 µin



A0042813

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3/8	3.74	2.63	4 × Ø0.62	0.56	0.62	9.13
1/2	3.74	2.63	4 × Ø0.62	0.56	0.62	10.98
1	4.92	3.5	4 × Ø0.75	0.69	1.05	12.95
1 1/2	6.1	4.5	4 × Ø0.88	0.81	1.61	17.52
2	6.5	5	8 × Ø0.75	0.88	2.07	21.89
3	8.27	6.63	8 × Ø0.88	1.12	3.07	24.06

Clamp connections

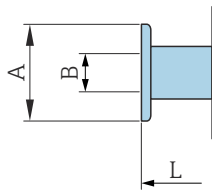
Tri-Clamp

Order code for "Process connection", option FTS

1.4404 (316/316L)

Suitable for pipe similar to DIN 11866 series C

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 30 \mu\text{in}$)



A0043179

DN [in]	Clamp [in]	A [in]	B [in]	L [in]
$\frac{3}{8}$	1	1.98	0.87	9.02
$\frac{1}{2}$	1	1.98	0.87	10.75
1	1	1.98	0.87	12.76
$1\frac{1}{2}$	$1\frac{1}{2}$	1.98	1.37	17.95
2	2	2.52	1.87	22.13
3	3	3.58	2.87	26.42

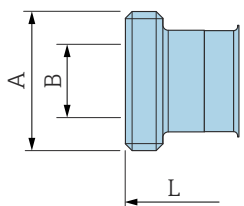
Couplings

Threaded coupling similar to SMS 1145

Order code for "Process connection", option SCS

1.4404 (316/316L)

3-A version available: order code for "Additional approval", option LP in combination with order code for "Measuring tube mat., wetted surface", option BB ($Ra_{max} = 30 \mu\text{in}$)

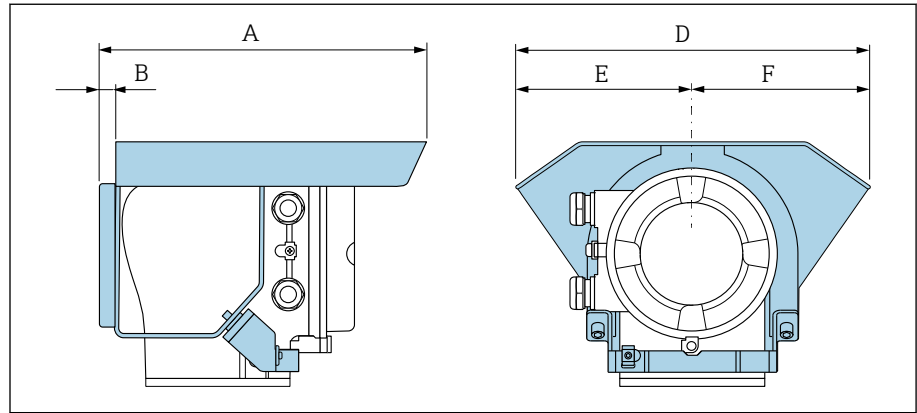


A0043257

DN [in]	A [in]	B [in]	L [in]
$\frac{3}{8}$	Rd $40 \times \frac{1}{6}$	0.89	9.02
$\frac{1}{2}$	Rd $40 \times \frac{1}{6}$	0.89	10.75
1	Rd $40 \times \frac{1}{6}$	0.89	12.76
$1\frac{1}{2}$	Rd $60 \times \frac{1}{6}$	1.4	17.95
2	Rd $70 \times \frac{1}{6}$	1.91	22.13
3	Rd $98 \times \frac{1}{6}$	2.87	26.42

Accessories

Protective cover



A0042332



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	120
Communication-specific accessories	121
Service-specific accessory	121
System components	122

Device-specific accessories





Transmitter

Accessories	Description	Order code
Proline 10 transmitter	 Installation Instructions EA01350D	8XBBXX-*...*
Weather protection cover	Protects the device from weather exposure:  Installation Instructions EA01351D	71502730

Sensor



Accessories	Description
Heating jacket	<p>The heating jacket is used to stabilize the temperature of the media in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as the medium.</p> <p> If using oil as a heating medium, please consult with an Endress+Hauser service organization.</p> <p>Heating jackets cannot be used with sensors fitted with a rupture disk.</p> <ul style="list-style-type: none"> ▪ If ordering with the device: order code for "Accessory enclosed" ▪ If ordering subsequently: use the order code with the product root DK8003. <p>Special Documentation SD02695D</p>

Communication-specific accessories





Accessories	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

Accessories	Description	Order code
Applicator	Software for selecting and sizing Endress+Hauser devices.	https://portal.endress.com/webapp/applicator
Netilion	IloT ecosystem: Unlock knowledge With the Netilion IloT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IloT ecosystem designed to effortlessly extract insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately driving higher profitability for your plant.	www.netilion.endress.com

Accessories	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.  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
Cerabar M	Pressure equipment: <ul style="list-style-type: none"> ▪ Measure the absolute pressure and gauge pressure of gases, vapors and liquids ▪ Read the operating pressure value  <ul style="list-style-type: none"> ▪ Technical Information TI00426P and TI00436P ▪ Operating Instructions BA00200P and BA00382P
Cerabar S	Pressure equipment: <ul style="list-style-type: none"> ▪ Measure the absolute pressure and gauge pressure of gases, vapors and liquids ▪ Read the operating pressure value  <ul style="list-style-type: none"> ▪ Technical Information TI00383P ▪ Operating Instructions BA00271P

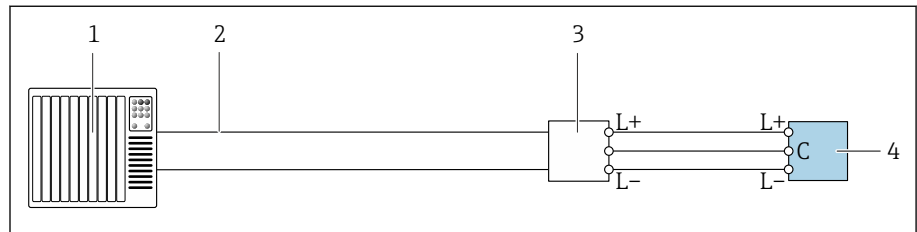
17 Appendix

Examples of electric terminals

124

Examples of electric terminals

IO-Link



12 Connection example for IO-Link, only non-hazardous area

- 1 Automation system (e.g. PLC)
- 2 Industrial Ethernet or fieldbus
- 3 IO-Link master
- 4 Transmitter

Index

A

- Adapting the diagnostic behavior 64
- Ambient conditions
 - Ambient temperature 86
 - Vibration-resistance and shock-resistance 86
- Ambient temperature range 86
- Applicator 76
- Approvals 97

C

- Certificates 97
- Certificates and approvals 97
- Check
 - Connection 39
 - Installation 33
- Checking the storage conditions (checklist) 21
- Checklist
 - Post-connection check 39
 - Post-installation check 33
- Cleaning of surfaces not in contact with medium 72
- Climate class 86
- Commissioning 51, 52
 - see Commissioning wizard
 - see Via SmartBlue App
 - Switching on the device 53
- Commissioning the device 54
- Compatibility 23

D

- Date of manufacture 17, 18
- Degree of protection 86
- Density 88
- Design
 - Device 22
- Design fundamentals
 - Measured error 84
 - Repeatability 84
- Designated use 16
- Device
 - Design 22
 - Disposal 74
 - Removal 74
- Device components 22
- Device description files 46
- Device history 23
- Device locking, status 56
- Device name
 - Sensor 18
 - Transmitter 17
- Device usage
 - see Designated use
- Diagnosis
 - Symbols 62
- Diagnostic information
 - Design, description 63
 - DeviceCare 63

- FieldCare 63
- Light emitting diodes
 - LED 61
- Local display 62
- Overview 64
- Remedial measures 64
- Diagnostic information in FieldCare or DeviceCare 63
- Diagnostic information via LED 61
- Diagnostic list 67
- Diagnostic message 62
- Display
 - Current diagnostic event 67
 - Previous diagnostic event 67
- Display values
 - For locking status 56
- Disposal 73
- Disposing of the device 74
- Down pipe 28

E

- Electromagnetic compatibility 87
- Electronics module 22
- Endress+Hauser services
 - Maintenance 72
- Environment
 - Storage temperature 86
- Error messages
 - see Diagnostic messages
- Event logbook 67
- Events list 67
- Extended order code
 - Sensor 18
 - Transmitter 17

F

- Filtering the event logbook 68
- Firmware history 23
- Flow limit 88

G

- Galvanic isolation 79
- General troubleshooting 60

I

- Identifying the device 17
- Incoming acceptance (checklist) 16
- Influence
 - Medium pressure 84
 - Medium temperature 83
- Input 76
- Inspection
 - Received goods 16
- Installation conditions
 - Rupture disk 28

L

- Local display
 - see Diagnostic message
 - see In alarm condition
- Low flow cut off 79

M

- Main electronics module 22
- Maintenance work 72
- Maximum measurement error 82
- Measured variables
 - see Process variables
- Measuring principle 16
- Measuring range
 - Calculation example for gas 77
 - For gases 76
 - For liquids 76
- Medium pressure
 - Influence 84
- Medium temperature
 - Influence 83
- Medium temperature range 88
- Mounting requirements
 - Down pipe 28
 - Sensor heating 29

N

- Nameplate
 - Sensor 18
 - Transmitter 17
- Non-Ex approval 97

O

- Operable flow range 76
- Operation 41, 55
- Order code 17, 18
- Output signal 78
- Output variables 78
- Overview of diagnostic information 64

P

- Packaging disposal 21
- Parameter settings
 - Device management (Submenu) 56
- Pending diagnostic events 67
- Performance characteristics 82
- Pharmaceutical compatibility 98
- Post-connection check 52
- Post-connection check (checklist) 39
- Post-installation check 52
- Post-installation check (checklist) 33
- Post-installation check and post-connection check 52
- Pressure Equipment Directive 97
- Pressure loss 92
- Pressure-temperature ratings 88
- Process conditions
 - Flow limit 88
 - Medium temperature 88
 - Pressure-temperature ratings 88

- Process connections 95
- Product design 22
- Product identification 17

R

- Radio approval 98
- Reading off the device locking status 56
- Reading out the event logbook 67
- Recycling of packaging materials 21
- Reference operating conditions 82
- Registered trademarks 9
- Removing the device 74
- Repeatability
 - Base repeatability 83
- Resetting the device
 - Settings 69
- Response time 83
- Rupture disk
 - Safety instructions 28
 - Triggering pressure 92

S

- Safety instructions 11
- Sensor heating 29
- Sensor housing 91
- Sensor nameplate 18
- Serial number 17, 18
- Services 72
- Signal on alarm 79
- SmartBlue App 54
- Standards and guidelines 99
- Status signals 62
- Storage 21
- Storage conditions 21
- Storage temperature 21, 86
- Storage temperature range 86
- Submenu
 - Device management 56
 - Events list 67
- Surface roughness 95
- Switching on the device 53
- System design
 - see Device design
- System integration 45

T

- Temperature range
 - Storage temperature 21
- Tools
 - Transport 19
- Transmitter nameplate 17
- Transport
 - Transporting the device 19
- Troubleshooting
 - General 60

V

- Vibration-resistance and shock-resistance 86

W

W@M Device Viewer 17

Weight

SI units 93

Transport (notes) 19

US units 93

Z

Zero point adjustment 57



www.addresses.endress.com
