TI01037D/06/EN/08.25-00
71726180
2025-12-01

Technical Information
Proline Promass S 100

Coriolis flowmeter

Easy-to-clean measuring instrument with self-drainable single-tube system and an ultra-compact transmitter

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Dedicated to applications requiring optimal cleanability under hygienic conditions

Device properties

- Large range of hygienic process connections
- 3-A and EHEDG conform
- Fast recovery from CIP/SIP
- Robust, ultra-compact transmitter housing
- Highest degree of protection: IP69K
- Local display available

Your benefits

- Increased process safety – easily cleanable and fully self-drainable tube design
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in-/outlet run needs
- Space-saving transmitter – full functionality on smallest footprint
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology

Endress+Hauser
People for Process Automation

Table of contents

About this document

Symbols

Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	**Protective earth (PE)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: ▪ Interior ground terminal: protective earth is connected to the mains supply. ▪ Exterior ground terminal: device is connected to the plant grounding system.

Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

Symbols in graphics

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

Function and system design

Measuring principle

The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present in a system when both translational and rotational movements are superimposed.

$F_c = 2 \cdot \Delta m\ (v \cdot \omega)$

F_c = Coriolis force

Δm = moving mass

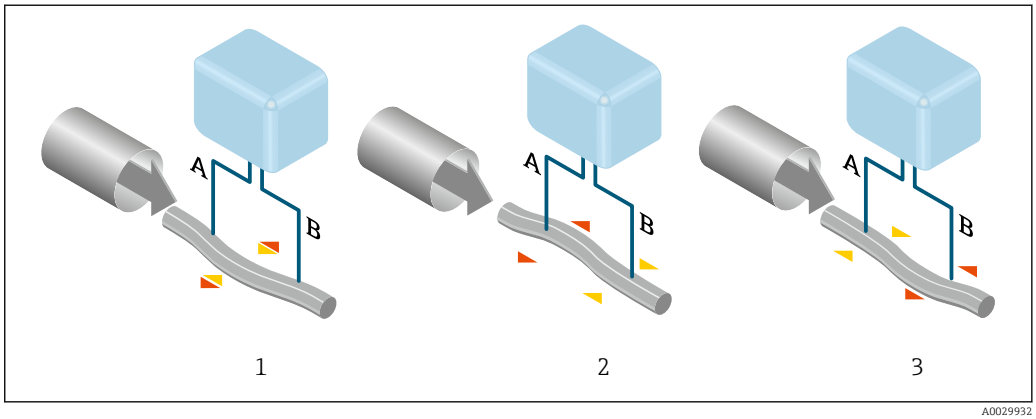
ω = rotational velocity

v = radial velocity in rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass Δm, its velocity v in the system and thus on the mass flow. Instead of a constant rotational velocity ω, the sensor uses oscillation.

In the sensor, an oscillation is produced in the measuring tube. The Coriolis forces produced at the measuring tube cause a phase shift in the tube oscillations (see illustration):

- If there is zero flow (i.e. when the medium is at a standstill), the oscillation measured at points A and B has the same phase (no phase shift) (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).



A0029932

The phase shift (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet. System balance is ensured by the antiphase oscillation of an eccentrically arranged swinging mass. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement
The measuring tube is continuously excited at its resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tube and medium) results in a corresponding, automatic adjustment in the oscillation frequency. The resonance frequency is thus a function of the medium density. The microprocessor utilizes this relationship to obtain a density signal.

Volume measurement
Together with the measured mass flow, this is used to calculate the volume flow.

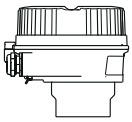
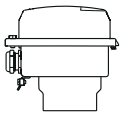
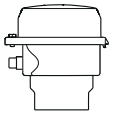
Temperature measurement
The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output signal.

Measuring system

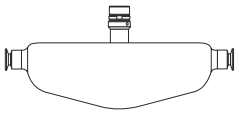
The device consists of a transmitter and a sensor. If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

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

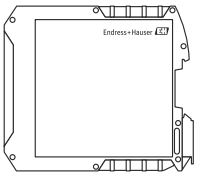
Transmitter

Proline 100  A0016693  A0016694  A0016695	Device versions and materials: ▪ Compact, aluminum, coated: Aluminum, AlSi10Mg, coated ▪ Compact, hygienic, stainless: Hygienic version, stainless steel 1.4301 (304) ▪ Ultra-compact, hygienic, stainless: Hygienic version, stainless steel 1.4301 (304) Configuration: ▪ Via operating tools (e.g. FieldCare, DeviceCare) ▪ Also for device version with local display (LCD): Via web browser ▪ Also for device version with 4-20 mA HART, pulse/frequency/switch output: Via web browser ▪ Also for device version with EtherNet/IP output: ▪ Via web browser ▪ Via Add-on Profile Level 3 for automation system from Rockwell Automation ▪ Via Electronic Data Sheet (EDS) ▪ Also for device version with PROFINET output: ▪ Via web browser ▪ Via device master file (GSD)

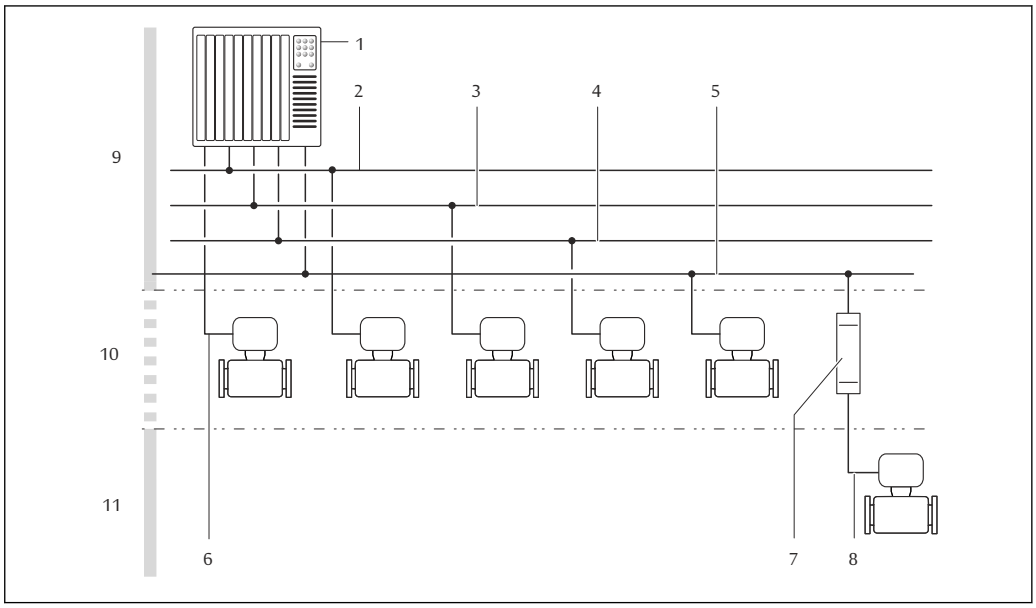
Sensor

Promass S  A0016509	▪ Bent single-tube system ▪ Hygienic design and sensitive fluid handling ▪ Simultaneous measurement of flow rate, volume flow, density and temperature (multivariable) ▪ Immune to process influences ▪ Nominal diameter range: DN 8 to 50 (⅜ to 2") ▪ Materials: ▪ Sensor: stainless steel, 1.4301 (304) ▪ Measuring tubes: stainless steel, 1.4435 (316L) ▪ Process connections: stainless steel, 1.4435 (316L), stainless steel, 1.4404 (F316/F316L) ▪ Surface quality: Ra ≤ 0.76 µm (30 µin)

Safety Barrier Promass 100

 A0016763	▪ Dual-channel safety barrier for installation in non-hazardous locations or zone 2/div. 2: ▪ Channel 1: DC 24 V power supply ▪ Channel 2: Modbus RS485 ▪ In addition to current, voltage and power limitation, it offers galvanic isolation of circuits for explosion protection. ▪ Easy top-hat rail mounting (DIN 35 mm) for installation in control cabinets

Equipment architecture



1 *Possibilities for integrating measuring instruments into a system*

1 Automation system (e.g. PLC)
2 EtherNet/IP
3 PROFIBUS DP
4 PROFINET
5 Modbus RS485
6 4-20 mA HART, pulse/frequency/switch output
7 Safety Barrier Promass 100
8 Modbus RS485, intrinsically safe
9 Non-hazardous area
10 Non-hazardous area and Zone 2/Div. 2
11 Hazardous area and Zone 1/Div. 1

Reliability

IT security

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

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

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

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	⅜	0 to 2 000	0 to 73.50
15	½	0 to 6 500	0 to 238.9
25	1	0 to 18 000	0 to 661.5
40	1½	0 to 45 000	0 to 1 654
50	2	0 to 70 000	0 to 2 573

Recommended measuring range

Flow limit → 📄 50

Operable flow range

Over 1000 : 1.

Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly.

Input signal

External measured values

To increase the measurement accuracy of certain measured variables, the automation system can continuously write various measured values to the measuring instrument:
- Operating pressure to increase measurement accuracy (Endress+Hauser recommends the use of a pressure measuring instrument for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase measurement accuracy (e.g. iTEMP)

Various pressure transmitters and temperature measuring instruments can be ordered from Endress+Hauser: see "Accessories" section → 📄 82

It is recommended to read in external measured values to calculate the following measured variables:
- Mass flow
- Corrected volume flow

HART protocol

The measured values are written from the automation system to the measuring device via the HART protocol. The pressure transmitter must support the following protocol-specific functions:
- HART protocol
- Burst mode

Digital communication

The measured values can be written by the automation system via:
- PROFIBUS DP
- Modbus RS485
- EtherNet/IP
- PROFINET

Output

Output signal

HART current output

Current output	4-20 mA HART (active)
Maximum output values	▪ DC 24 V (no flow) ▪ 22.5 mA
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Configurable: 0.07 to 999 s
Assignable measured variables	▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature The range of options increases if the measuring device has one or more application packages.

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	▪ DC 30 V ▪ 25 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	▪ Mass flow ▪ Volume flow ▪ Corrected volume flow
Frequency output	
Output frequency	Configurable: 0 to 10 000 Hz
Damping	Configurable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature The range of options increases if the measuring device has one or more application packages.
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s

Number of switching cycles	Unlimited

Assignable functions	▪ Off
	▪ On
	▪ Diagnostic behavior
	▪ Limit value
	  ▪ Mass flow
	  ▪ Volume flow
	  ▪ Corrected volume flow
	  ▪ Density
	  ▪ Reference density
	  ▪ Temperature
	  ▪ Totalizer 1-3
	▪ Flow direction monitoring
	▪ Status
	  ▪ Partially filled pipe detection
	  ▪ Low flow cut off
	The range of options increases if the measuring device has one or more application packages.

PROFIBUS DP

Signal encoding	NRZ code
Data transfer	9.6 kBaud...12 MBaud
Terminating resistor	Integrated, can be activated via DIP switches

Modbus RS485

Physical interface	In accordance with EIA/TIA-485-A standard
Terminating resistor	▪ For device version used in non-hazardous areas or Zone 2/Div. 2: integrated and can be activated via DIP switches on the transmitter electronics module ▪ For device version used in intrinsically safe areas: integrated and can be activated via DIP switches on the Safety Barrier Promass 100

EtherNet/IP

Standards	In accordance with IEEE 802.3

PROFINET

Standards	In accordance with IEEE 802.3

Signal on alarm

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

Current output

Current output 4-20 mA	
Failure mode	Configurable: ▪ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ▪ 4 to 20 mA in accordance with US ▪ Min. value: 3.59 mA ▪ Max. value: 22.5 mA ▪ Definable value between: 3.59 to 22.5 mA ▪ Actual value ▪ Last valid value

Pulse/frequency/switch output

Pulse output	
Failure mode	Configurable: ▪ Actual value ▪ No pulses
Frequency output	
Failure mode	Configurable: ▪ Actual value ▪ 0 Hz ▪ Definable value between: 0 to 12 500 Hz
Switch output	
Failure mode	Configurable: ▪ Current status ▪ Open ▪ Closed

PROFIBUS DP

Status and alarm messages	Diagnostics in accordance with PROFIBUS PA Profile 3.02

Modbus RS485

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

EtherNet/IP

Device diagnostics	Device condition can be read out in Input Assembly

PROFINET

Device diagnostics	According to "Application Layer protocol for decentralized periphery", Version 2.3

Local display

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

Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
  - HART protocol
  - PROFIBUS DP
  - Modbus RS485
  - EtherNet/IP
  - PROFINET
- Via service interface
  Service interface CDI-RJ45
- Plain text display
  With information on cause and remedial actions

Additional information on remote operation → 72

Web browser

Plain text display	With information on cause and remedial measures

LEDs

Status information	Status indicated by various LEDs The following information is displayed depending on the device version: ▪ Supply voltage active ▪ Data transmission active ▪ Device alarm/error has occurred ▪ Network available [1] ▪ Connection established [1] ▪ PROFINET blinking feature [2]

1) Only available for PROFINET, Ethernet/IP
2) Only available for PROFINET,

Ex connection data

These values only apply for the following device version:
Order code for "Output", option M "Modbus RS485", for use in intrinsically safe areas

Safety Barrier Promass 100

Safety-related values

Terminal numbers			
Supply voltage		**Signal transmission**	
2 (L-)	**1 (L+)**	**26 (B)**	**27 (A)**
U_{nom} = DC 24 V U_{max} = AC 260 V		U_{nom} = DC 5 V U_{max} = AC 260 V	

Intrinsically safe values

Terminal numbers			
Supply voltage		**Signal transmission**	
20 (L-)	**10 (L+)**	**62 (B)**	**72 (A)**
U_o = 16.24 V I_o = 623 mA P_o = 2.45 W For IIC [1]: L_o = 92.8 µH, C_o = 0.433 µF, L_o/R_o = 14.6 µH/Ω For IIC: L_o = 92.8 µH, C_o = 0.433 µF, L_o/R_o = 14.6 µH/Ω For IIB [1]: L_o= 372 µH, C_o = 2.57 µF, L_o/R_o = 58.3 µH/Ω			
For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the "Safety Instructions" (XA) document for the measuring device			

1) The gas group depends on the sensor and nominal diameter

Transmitter

Intrinsically safe values

Order code for "Approval"	Terminal numbers			
	Supply voltage		Signal transmission	
	20 (L-)	10 (L+)	62 (B)	72 (A)
▪ Option **BM**: ATEX II2G + IECEx Z1 Ex ia, II2D Ex tb ▪ Option **BO**: ATEX II1/2G + IECEx Z0/Z1 Ex ia, II2D ▪ Option **BQ**: ATEX II1/2G + IECEx Z0/Z1 Ex ia ▪ Option **BU**: ATEX II2G + IECEx Z1 Ex ia ▪ Option **C2**: CSA C/US IS Cl. I, II, III Div. 1 ▪ Option **85**: ATEX II2G + IECEx Z1 Ex ia + CSA C/US IS Cl. I, II, III Div. 1	U_i = 16.24 V I_i = 623 mA P_i = 2.45 W L_i = 0 µH C_i = 6 nF			
For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the "Safety Instructions" (XA) document for the measuring device				

Low flow cut off

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

Protocol-specific data

HART

Manufacturer ID	0x11
Device type ID	0x4A
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω

Dynamic variables	Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables. **Measured variables for PV (primary dynamic variable)** ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature **Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)** ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 The range of options increases if the measuring device has one or more application packages. **Heartbeat Technology application package** Additional measured variables are available with the Heartbeat Technology application package: ▪ Carrier pipe temperature ▪ Oscillation amplitude 0
Device variables	Read out the device variables: HART command 9 The device variables are permanently assigned. A maximum of 8 device variables can be transmitted: ▪ 0 = mass flow ▪ 1 = volume flow ▪ 2 = corrected volume flow ▪ 3 = density ▪ 4 = reference density ▪ 5 = temperature ▪ 6 = totalizer 1 ▪ 7 = totalizer 2 ▪ 8 = totalizer 3 ▪ 13 = target mass flow ▪ 14 = carrier mass flow ▪ 15 = concentration

PROFIBUS DP

Manufacturer ID	0x11
Ident number	0x1561
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files available at: ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com

Output values (from measuring instrument to automation system)	**Analog input 1 to 8** ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Target mass flow ▪ Carrier mass flow ▪ Density ▪ Reference density ▪ Concentration ▪ Temperature ▪ Carrier pipe temperature ▪ Electronics temperature ▪ Oscillation frequency ▪ Oscillation amplitude ▪ Frequency fluctuation ▪ Oscillation damping ▪ Tube damping fluctuation ▪ Signal asymmetry ▪ Exciter current **Digital input 1 to 2** ▪ Partially filled pipe detection ▪ Low flow cut off **Totalizer 1 to 3** ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow

Input values
(from automation system to measuring instrument)
	Analog output 1 to 3 (fixed assignment)
	▪ Pressure
	▪ Temperature
	▪ Reference density
	Digital output 1 to 3 (fixed assignment)
	▪ Digital output 1: switch positive zero return on/off
	▪ Digital output 2: perform zero adjustment
	▪ Digital output 3: switch switch output on/off
	Totalizer 1 to 3
	▪ Totalize
	▪ Reset and hold
	▪ Preset and hold
	▪ Stop
	▪ Operating mode configuration:
	  ▪ Net flow total
	  ▪ Forward flow total
	  ▪ Reverse flow total

Supported functions	▪ Identification & maintenance Straightforward device identification on the part of the control system and nameplate ▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download. ▪ Condensed status Straightforward and self-explanatory diagnostic information by categorizing diagnostic messages that occur
Configuration of the device address	▪ DIP switches on the I/O electronics module ▪ Via operating tools (e.g. FieldCare)

Modbus RS485

Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0

Function codes	▪ 03: Read holding register ▪ 04: Read input register ▪ 06: Write single registers ▪ 08: Diagnostics ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Broadcast messages	Supported by the following function codes: ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Supported baud rate	▪ 1200 BAUD ▪ 2400 BAUD ▪ 4800 BAUD ▪ 9600 BAUD ▪ 19200 BAUD ▪ 38400 BAUD ▪ 57600 BAUD ▪ 115200 BAUD
Data transfer mode	▪ ASCII ▪ RTU
Data access	Each device parameter can be accessed via Modbus RS485. For Modbus register information, see "Description of device parameters" documentation → 82

EtherNet/IP

Protocol	▪ The CIP Networks Library Volume 1: Common Industrial Protocol ▪ The CIP Networks Library Volume 2: Ethernet/IP Adaptation of CIP
Communication type	▪ 10Base-T ▪ 100Base-TX
Device profile	Generic device (product type: 0x2B)
Manufacturer ID	0x49E
Device type ID	0x104A
Baud rates	Automatic $^{10}/_{100}$ Mbit with half-duplex and full-duplex detection
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported CIP connections	Max. 3 connections
Explicit connections	Max. 6 connections
I/O connections	Max. 6 connections (scanner)
Configuration options for measuring instrument	▪ DIP switches on the electronics module for IP addressing ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Electronic Data Sheet (EDS) integrated in the measuring instrument
Configuration of the EtherNet interface	▪ Speed: 10 MBit, 100 MBit, auto (factory setting) ▪ Duplex: half-duplex, full-duplex, auto (factory setting)
Configuration of the device address	▪ DIP switches on the electronics module for IP addressing (last octet) ▪ DHCP ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Ethernet/IP tools, e.g. RSLinx (Rockwell Automation)
Device Level Ring (DLR)	No

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

Configurable Input Assembly	▪ Current device diagnostics ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 The range of options increases if the measuring device has one or more application packages.
Fix output	
Output Assembly	▪ Activation of reset totalizers 1-3 ▪ Activation of pressure compensation ▪ Activation of reference density compensation ▪ Activation of temperature compensation ▪ Reset totalizers 1-3 ▪ External pressure value ▪ Pressure unit ▪ External reference density ▪ Reference density unit ▪ External temperature ▪ Temperature unit
Configuration	

Configuration Assembly	Only the most common configurations are listed below.
	▪ Software write protection
	▪ Mass flow unit
	▪ Mass unit
	▪ Volume flow unit
	▪ Volume unit
	▪ Corrected volume flow unit
	▪ Corrected volume unit
	▪ Density unit
	▪ Reference density unit
	▪ Temperature unit
	▪ Pressure unit
	▪ Length
	▪ Totalizer 1-3:
	  ▪ Assignment
	  ▪ Unit
	  ▪ Mode of operation
	  ▪ Failure mode
	▪ Alarm delay

PROFINET

Protocol	"Application layer protocol for decentral device periphery and distributed automation", version 2.3
Conformity class	B
Communication type	100 Mbps
Device profile	Application interface identifier 0xF600 Generic device
Manufacturer ID	0x11
Device type ID	0x844A
Device description files (GSD, DTM)	Information and files available at: ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com
Baud rates	Automatic 100 Mbit/s with full-duplex detection

Periods	From 8 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	▪ 1 x AR (Application Relation) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation)
Configuration options for measuring instrument	▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Manufacturer-specific software (FieldCare, DeviceCare) ▪ Web browser ▪ Device master file (GSD), can be read out via the integrated web server of the measuring instrument
Configuration of the device name	▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol
Output values (from measuring instrument to automation system)	**Analog Input module (slot 1 to 14)** ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Target mass flow ▪ Carrier mass flow ▪ Density ▪ Reference density ▪ Concentration ▪ Temperature ▪ Carrier pipe temperature ▪ Electronics temperature ▪ Oscillation frequency ▪ Oscillation amplitude ▪ Frequency fluctuation ▪ Oscillation damping ▪ Tube damping fluctuation ▪ Signal asymmetry ▪ Exciter current **Discrete Input module (slot 1 to 14)** ▪ Empty pipe detection ▪ Low flow cut off **Diagnostics Input module (slot 1 to 14)** ▪ Last diagnostics ▪ Current diagnostics **Totalizer 1 to 3 (slot 15 to 17)** ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow **Heartbeat Verification module (fixed assignment)** Verification status (slot 23) The range of options increases if the measuring device has one or more application packages.

Input values
(from automation system to measuring instrument)
	Analog Output module (fixed assignment)
	▪ External pressure (slot 18)
	▪ External temperature (slot 19)
	▪ External reference density (slot 20)
	Discrete Output module (fixed assignment)
	▪ Activate/deactivate positive zero return (slot 21)
	▪ Perform zero adjustment (slot 22)
	Totalizer 1 to 3 (slot 15 to 17)
	▪ Totalize
	▪ Reset and hold
	▪ Preset and hold
	▪ Stop
	▪ Operating mode configuration:
	  ▪ Net flow total
	  ▪ Forward flow total
	  ▪ Reverse flow total
	Heartbeat Verification module (fixed assignment)
	Start verification (slot 23)
	The range of options increases if the measuring device has one or more application packages.

Supported functions	▪ Identification & maintenance
	Simple device identification via:
	  ▪ Control system
	  ▪ Nameplate
	▪ Measured value status
	The process variables are communicated with a measured value status
	▪ Blinking feature via the local display for simple device identification and assignment

Administration of software options

Input/output value	Process variable	Category	Slot
Output value	Mass flow	Process variable	1…14
	Volume flow		
	Corrected volume flow		
	Density		
	Reference density		
	Temperature		
	Electronics temperature		
	Oscillation frequency		
	Frequency fluctuation		
	Oscillation damping		
	Oscillation frequency		
	Signal asymmetry		
	Exciter current		
	Empty pipe detection		
	Low flow cut off		
	Current device diagnostics		
	Previous device diagnostics		
Output value	Target mass flow	Concentration [1]	1…14
	Carrier mass flow		
	Concentration		
Output value	Carrier pipe temperature	Heartbeat Technology [2]	1…14

Input/output value	Process variable	Category	Slot
	Oscillation damping 1		
	Oscillation frequency 1		
	Oscillation amplitude 0		
	Oscillation amplitude 1		
	Frequency fluctuation 1		
	Tube damping fluctuation 1		
	Exciter current 1		
Input value	External density	Process monitoring	18
	External temperature		19
	External reference density		20
	Flow override		21
	Zero adjustment		22
	Verification status	Heartbeat Verification [2)]	23

1) Only available with the "Concentration" application package.
2) Only available with the Heartbeat Technology application package.

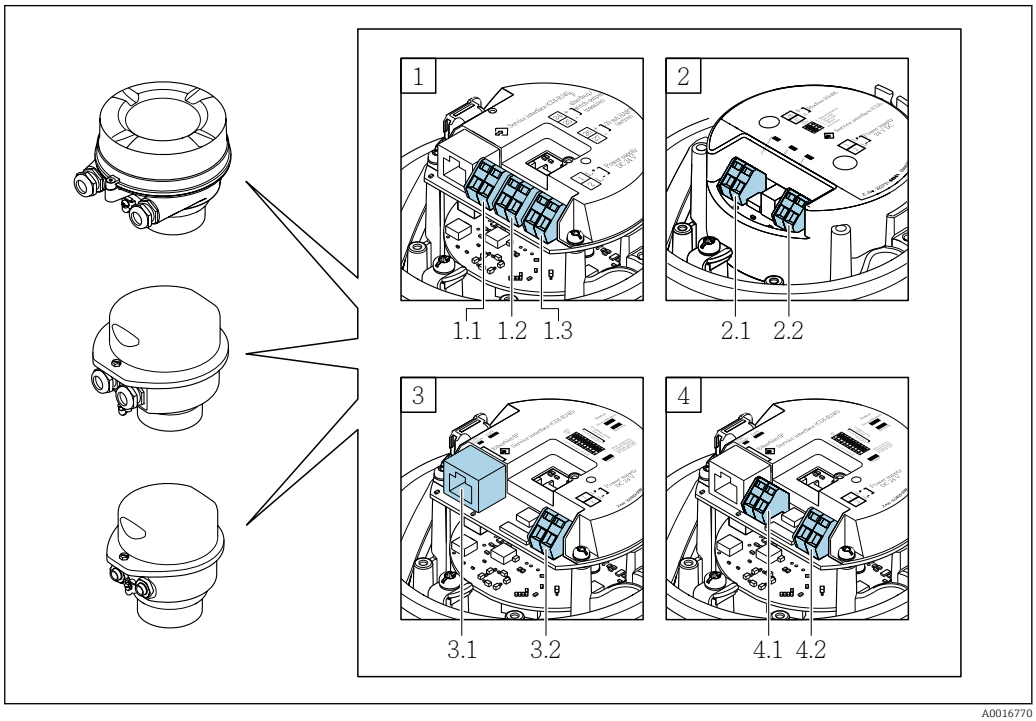
Startup configuration

Startup configuration (NSU)	If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used.
	
	The following configuration is taken from the automation system:
	▪ Management
	  ▪ Software revision
	  ▪ Write protection
	▪ System units
	  ▪ Mass flow
	  ▪ Mass
	  ▪ Volume flow
	  ▪ Volume
	  ▪ Corrected volume flow
	  ▪ Corrected volume
	  ▪ Density
	  ▪ Reference density
	  ▪ Temperature
	  ▪ Pressure
	▪ Concentration application package
	  ▪ Coefficients A0 to A4
	  ▪ Coefficients B1 to B3
	▪ Sensor adjustment
	▪ Process parameters
	  ▪ Damping (flow, density, temperature)
	  ▪ Flow override
	▪ Low flow cut off
	  ▪ Assign process variable
	  ▪ Switch-on/switch-off point
	  ▪ Pressure shock suppression
	▪ Empty pipe detection
	  ▪ Assign process variable
	  ▪ Limit values
	  ▪ Response time
	  ▪ Max. damping
	▪ Corrected volume flow calculation
	  ▪ External reference density
	  ▪ Fixed reference density
	  ▪ Reference temperature
	  ▪ Linear expansion coefficient
	  ▪ Square expansion coefficient
	▪ Measuring mode
	  ▪ Medium
	  ▪ Gas type
	  ▪ Reference sound velocity
	  ▪ Temperature coefficient sound velocity
	▪ External compensation
	  ▪ Pressure compensation
	  ▪ Pressure value
	  ▪ External pressure
	▪ Diagnostic settings
	▪ Diagnostic behavior for diverse diagnostic information

Power supply

Terminal assignment

Overview: housing version and connection versions



A Housing version: compact, aluminum coated
B Housing version: compact, hygienic, stainless
C Housing version: ultra-compact, hygienic, stainless
1 Connection version: 4-20 mA HART, pulse/frequency/switch output
1.1 Signal transmission: pulse/frequency/switch output
1.2 Signal transmission: 4-20 mA HART
1.3 Supply voltage
2 Connection version: Modbus RS485
2.1 Signal transmission
2.2 Supply voltage
3 Connection versions: EtherNet/IP and PROFINET
3.1 Signal transmission
3.2 Supply voltage
4 Connection version: PROFIBUS DP
4.1 Signal transmission
4.2 Supply voltage

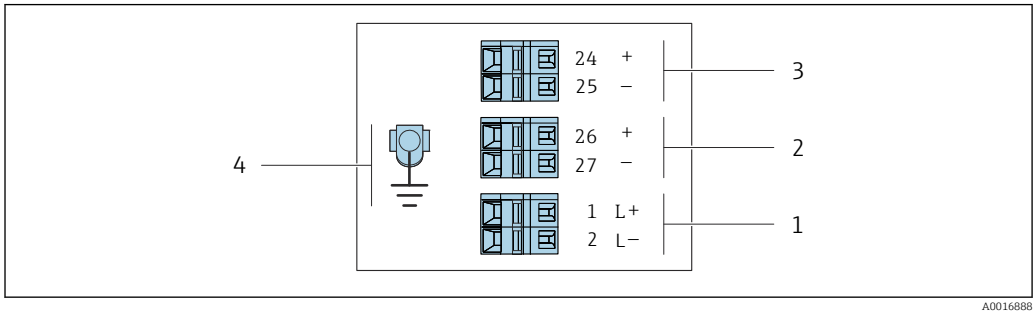
Transmitter

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

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Outputs	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
Options **A**, **B**	Device plug → 🖹 31	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 31	Device plug → 🖹 31	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



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

1 Power supply: DC 24 V
2 Output 1: 4-20 mA HART (active)
3 Output 2: pulse/frequency/switch output (passive)
4 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

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

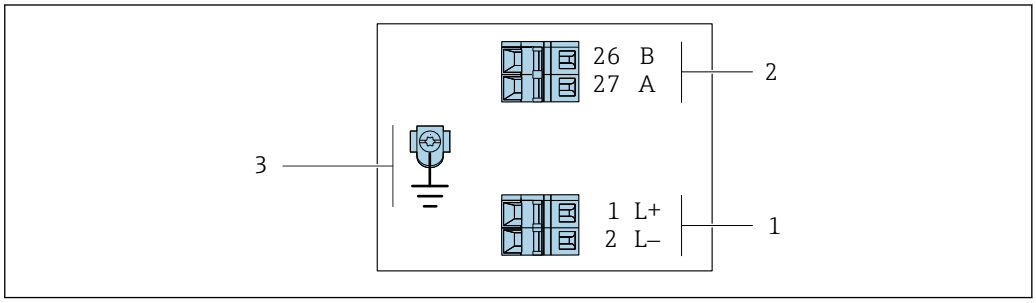
PROFIBUS DP connection version

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

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
Options **A**, **B**	Device plug → 🖹 31	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 31	Device plug → 🖹 31	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



3 PROFIBUS DP terminal assignment

1 Power supply: DC 24 V
2 PROFIBUS DP
3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

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

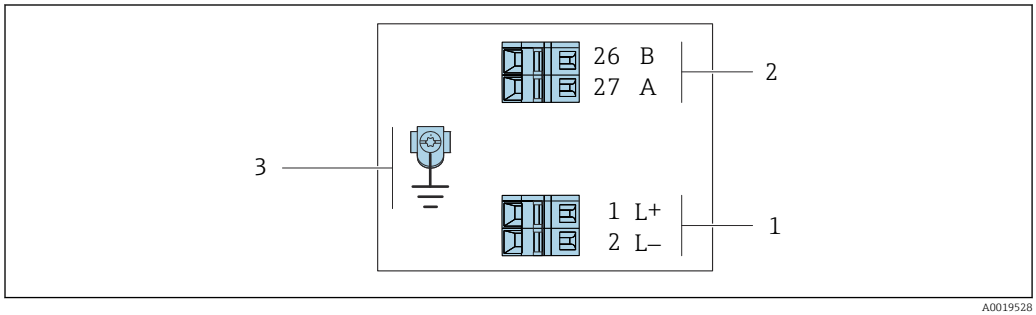
Modbus RS485 connection version

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

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
Options **A**, **B**	Device plug → 🖹 31	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 31	Device plug → 🖹 31	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



4 *Modbus RS485 terminal assignment, connection version for use in non-hazardous areas and Zone 2/Div. 2*

1 *Power supply: DC 24 V*
2 *Modbus RS485*
3 *Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".*

Order code for "Output"	Terminal number			
	Power supply		Output	
	1 (L+)	2 (L-)	26 (B)	27 (A)
Option **M**	DC 24 V		Modbus RS485	
Order code for "Output": Option **M**: Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2				

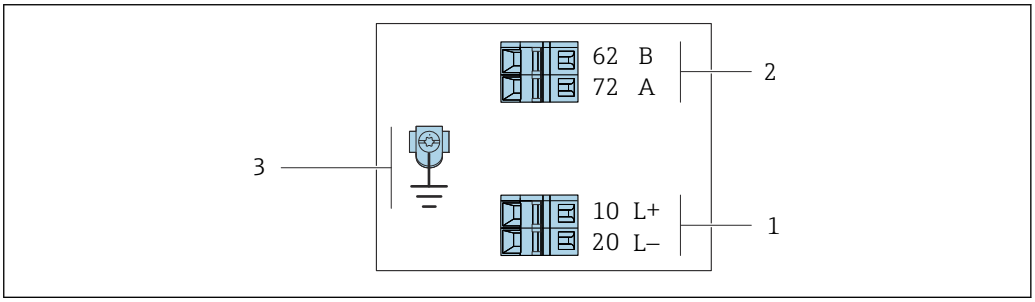
Modbus RS485 connection version

For use in the intrinsically safe area. Connection via Safety Barrier Promass 100.

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
A, **B**, **C**	Device plug → 🖹 31		Option **I**: plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



5 Modbus RS485 terminal assignment, connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)

1 Intrinsically safe power supply
2 Modbus RS485
3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

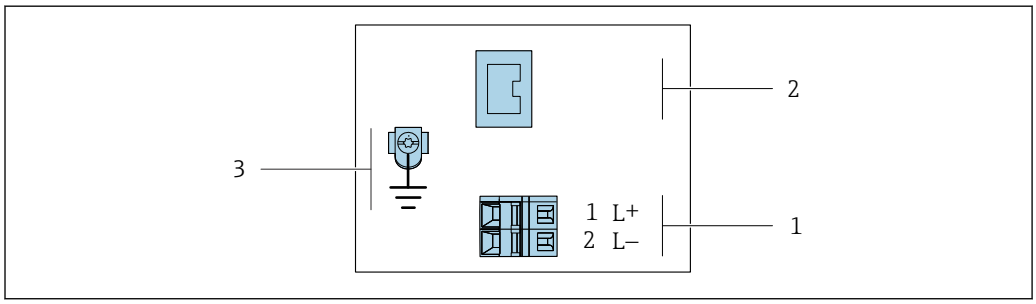
Order code for "Output"	10 (L+)	20 (L-)	62 (B)	72 (A)
Option **M**	Intrinsically safe supply voltage		Modbus RS485, intrinsically safe	
Order code for "Output": Option **M**: Modbus RS485, for use in the intrinsically safe area (connection via Safety Barrier Promass 100)				

EtherNet/IP connection version

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Device plug → 🖹 32	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 32	Device plug → 🖹 32	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



6 EtherNet/IP terminal assignment

1 Power supply: DC 24 V
2 EtherNet/IP
3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

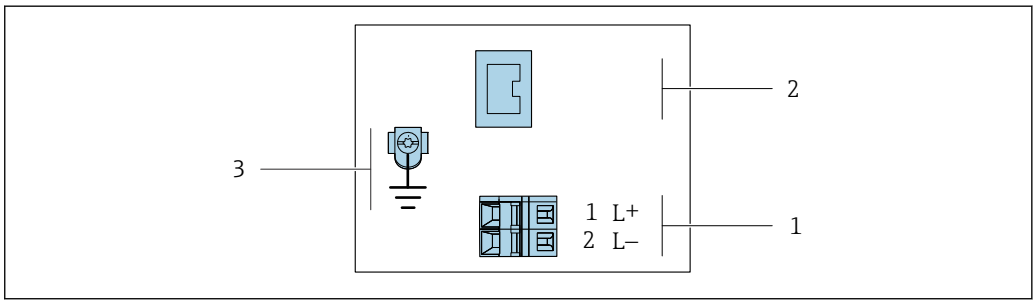
Order code for "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option **N**	DC 24 V		EtherNet/IP
Order code for "Output": Option **N**: EtherNet/IP			

PROFINET connection version

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Device plug → 🖹 30	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 30	Device plug → 🖹 30	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			

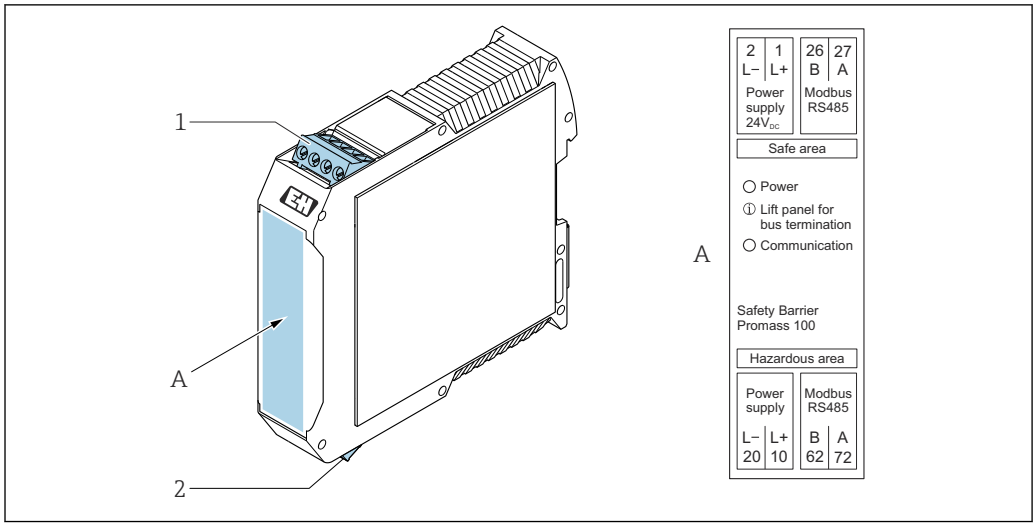


7 PROFINET terminal assignment

1 Power supply: DC 24 V
2 PROFINET
3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

Order code for "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option **R**	DC 24 V		PROFINET
Order code for "Output": Option **R**: PROFINET			

Safety Barrier Promass 100



8 Safety Barrier Promass 100 with terminals

1 Non-hazardous area: Zone 2; Class I, Division 2
2 Intrinsically safe area

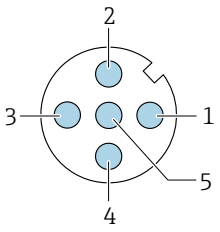
Pin assignment, device plug

Order codes for the M12x1 plugs, see the "Order code for **electrical connection**" column:
- 4-20 mA HART, pulse/frequency/switch output → 📄 23
- PROFIBUS DP→ 📄 25
- Modbus RS485 → 📄 26
- EtherNet/IP → 📄 28
- PROFINET→ 📄 29

Supply voltage

Intrinsically safe for all connection versions except MODBUS RS485, intrinsically safe (device side), male connection (plug)

Device plug MODBUS RS485, intrinsically safe with supply voltage → 📄 31



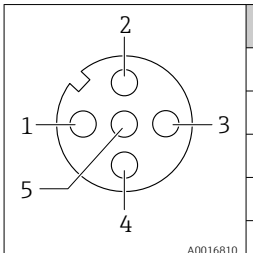
Pin		Assignment
1	L+	DC 24 V
2		Not used
3		Not used
4	L-	DC 24 V
5		Grounding/shielding [1]
Coding		**Plug/socket**
A		Plug

1) Connection for protective ground and/or shielding from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

The following is recommended as a socket:
- Binder, series 763, part no. 79 3440 35 05
- Alternatively: Phoenix part no. 1682951 SAC-5P-5.0-PUR/M12FS SH
  - With the order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
  - With the order code for "Output", option **N**: EtherNet/IP
- When using the device in a hazardous location: Use a suitably certified socket.

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

Device plug for signal transmission (device side), female connection



Pin		Assignment
1	+	4-20 mA HART (active)
2	-	4-20 mA HART (active)
3	+	Pulse/frequency/switch output (passive)
4	-	Pulse/frequency/switch output (passive)
5		Shielding [1]
Coding		**Plug/socket**
A		Socket

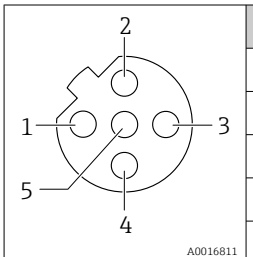
1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".
Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

- Recommended plug: Binder, series 763, part no. 79 3439 12 05
- When using the device in a hazardous location, use a suitably certified plug.

PROFIBUS DP

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

Device plug for signal transmission (device side)



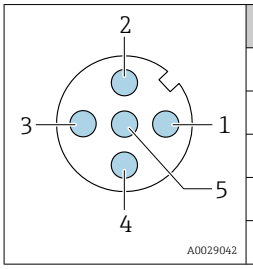
Pin		Assignment
1		Not used
2	A	PROFIBUS DP
3		Not used
4	B	PROFIBUS DP
5		Shielding [1]
Coding		**Plug/socket**
B		Socket

1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".
Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

- Recommended plug: Binder, series 763, part no. 79 4449 20 05
- When using the device in a hazardous location, use a suitably certified plug.

MODBUS RS485

Device plug for signal transmission with supply voltage (device side), MODBUS RS485 (intrinsically safe)



Pin		Assignment
1	L+	Supply voltage, intrinsically safe
2	A	Modbus RS485, intrinsically safe
3	B	
4	L-	Supply voltage, intrinsically safe
5		Grounding/shielding [1]

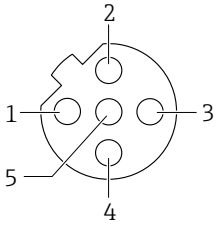
	Coding	Plug/socket
	A	Plug

1) Connection for protective ground and/or shielding from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

- Recommended socket: Binder, series 763, part no. 79 3439 12 05
- When using the device in a hazardous location: Use a suitably certified socket.

Device plug for signal transmission (device side), MODBUS RS485 (not intrinsically safe)

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



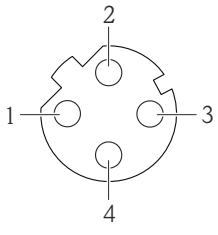
Pin		Assignment
1		Not used
2	A	Modbus RS485
3		Not used
4	B	Modbus RS485
5		Shielding [1]
Coding		**Plug/socket**
B		Socket

1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

- Recommended plug: Binder, series 763, part no. 79 4449 20 05
- When using the device in a hazardous location, use a suitably certified plug.

EtherNet/IP

Device plug for signal transmission (device side)

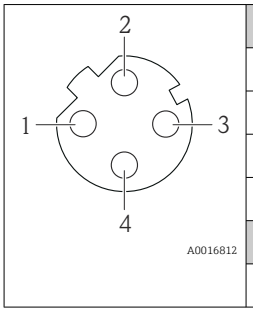


Pin		Assignment
1	+	Tx
2	+	Rx
3	-	Tx
4	-	Rx
Coding		**Plug/socket**
D		Socket

- There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug:
  - Binder, series 763, part no. 99 3729 810 04
  - Phoenix, part no. 1543223 SACC-M12MSD-4Q
  - When using the device in a hazardous location, use a suitably certified plug.

PROFINET

Device plug for signal transmission (device side)



Pin		Assignment
1	+	TD +
2	+	RD +
3	-	TD –
4	-	RD –

Coding	Plug/socket
D	Socket

- There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug:
  - Binder, series 763, part no. 99 3729 810 04
  - Phoenix, part no. 1543223 SACC-M12MSD-4Q
  - When using the device in a hazardous location, use a suitably certified plug.

Supply voltage

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

Transmitter

For device version with communication type:
- HART, PROFIBUS DP, EtherNet/IP: DC 20 to 30 V
- Modbus RS485, device version:
  - For use in the non-hazardous area and Zone 2/Div. 2: DC 20 to 30 V
  - For use in the intrinsically safe area: power supply via Safety Barrier Promass 100

Promass 100 safety barrier

DC 20 to 30 V

Power consumption

Transmitter

Order code for "Output"	Maximum Power consumption
Option **B**: 4-20 mA HART with pulse/frequency/switch output	3.5 W
Option **L**: PROFIBUS DP	3.5 W
Option **M** Modbus RS485, for use in non-hazardous areas and Zone 2/ Div. 2	3.5 W
Option **M**: Modbus RS485, for use in intrinsically safe areas	2.45 W
Option **N**: EtherNet/IP	3.5 W
Option **R**: PROFINET	3.5 W

Safety Barrier Promass 100

Order code for "Output"	Maximum Power consumption
Option **M**: Modbus RS485, for use in intrinsically safe areas	4.8 W

Current consumption

Transmitter

Order code for "Output"	Maximum current consumption	Maximum switch-on current
Option **B**: 4-20mA HART, pul./freq./switch output	145 mA	18 A (< 0.125 ms)
Option **L**: PROFIBUS DP	145 mA	18 A (< 0.125 ms)

Order code for "Output"	Maximum current consumption	Maximum switch-on current
Option **M** Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2	90 mA	10 A (< 0.8 ms)
Option **M**: Modbus RS485, for use in intrinsically safe areas	145 mA	16 A (< 0.4 ms)
Option **N**: EtherNet/IP	145 mA	18 A (< 0.125 ms)
Option **R**: PROFINET	145 mA	18 A (< 0.125 ms)

Safety Barrier Promass 100

Order code for "Output"	Maximum current consumption	Maximum switch-on current
Option **M**: Modbus RS485, for use in intrinsically safe areas	230 mA	10 A (< 0.8 ms)

Device fuse

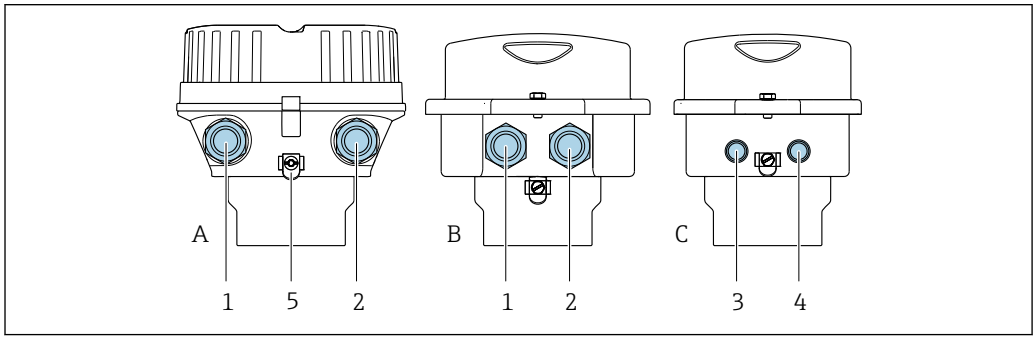
Fine-wire fuse (slow-blow) T2A

Power supply failure

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

Electrical connection

Transmitter connection



A0016924

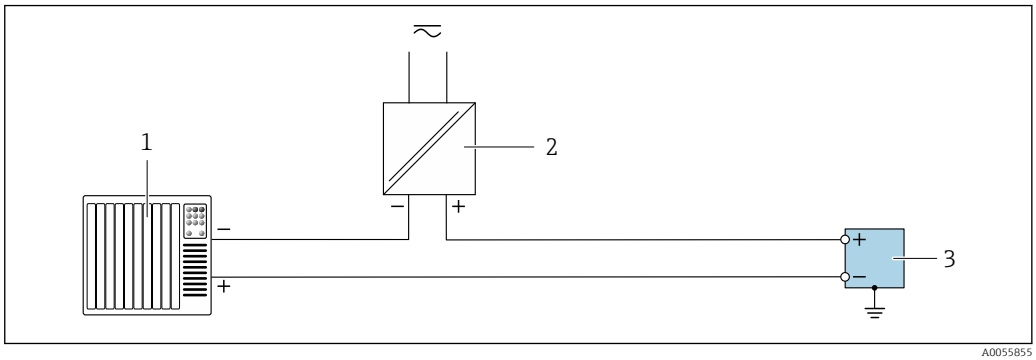
A Housing version: compact, coated, aluminum
B Housing version: compact, hygienic, stainless
C Housing version: ultra-compact, hygienic, stainless, M12 device plug
1 Cable entry or device plug for signal transmission
2 Cable entry or device plug for supply voltage
3 Device plug for signal transmission
4 Device plug for supply voltage
5 Ground terminal. Cable lugs, pipe clips or ground disks are recommended for optimization of the grounding/ shielding.

- Terminal assignment → 23
- Pin assignment, device plug → 30

In the case of device versions with a connector, the transmitter housing does not need to be opened to connect the signal cable or power supply cable.

Connection examples

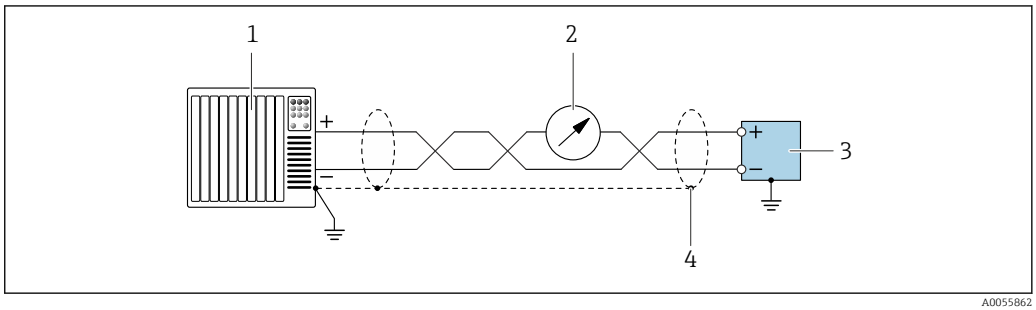
Pulse output/frequency output/switch output



9 Connection example for pulse output/frequency output/switch output (passive)

1 *Automation system with pulse input/frequency input/switch input (e.g. PLC)*
2 *Power supply*
3 *Transmitter with pulse output/frequency output/switch output (passive)*

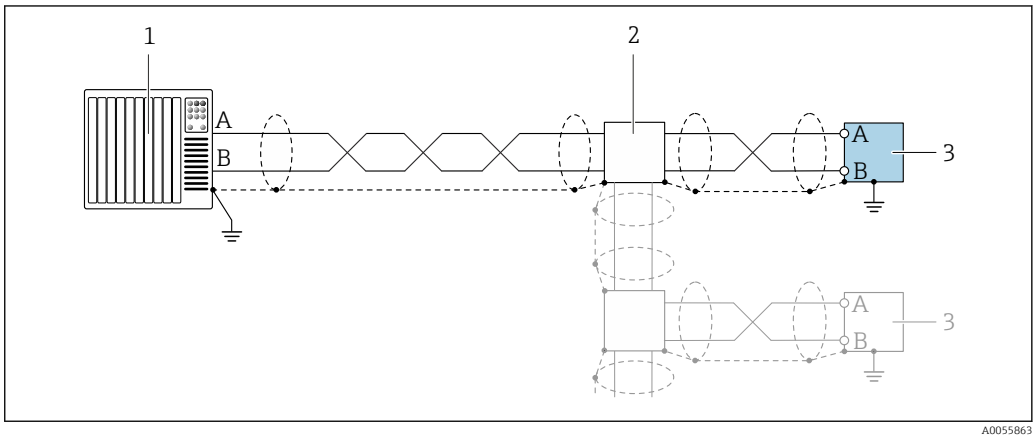
Current output 4 to 20 mA HART



10 Connection example for 4 to 20 mA current output with HART (active)

1 *Automation system with 4 to 20 mA current input with HART (e.g. PLC)*
2 *Optional display unit: Note maximum load*
3 *Transmitter with 4 to 20 mA current output with HART (active)*
4 *Ground cable shield at one end. For installations in compliance with NAMUR NE 89, grounding of the cable shield on both sides is required.*

Modbus RS485



11 Connection example for Modbus RS485

1 *Automation system with Modbus master (e.g. PLC)*
2 *Optional distribution box*
3 *Transmitter with Modbus RS485*

PROFIBUS DP

See https://www.profibus.com "PROFIBUS Installation Guidelines".

PROFINET

See https://www.profibus.com "PROFINET Planning guideline".

EtherNet/IP

See https://www.odva.org"EtherNet/IP Media Planning & Installation Manual".

Potential equalization

Requirements

For potential equalization:
- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electric potential
- Use a ground cable with a minimum cross-section of 6 mm² (10 AWG) and a cable lug for potential equalization connections

Terminals

Transmitter
Spring terminals for wire cross-sections0.5 to 2.5 mm² (20 to 14 AWG)

Promass 100 safety barrier
Plug-in screw terminals for wire cross-sections0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

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

Cable specification

Permitted temperature range

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

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

Standard installation cable is sufficient.

Signal cable

4 to 20 mA current output (without HART)

Standard installation cable is sufficient.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Current output 4 to 20 mA HART

Shielded twisted-pair cable.

See https://www.fieldcommgroup.org "HART PROTOCOL SPECIFICATIONS".

Modbus RS485

Shielded twisted-pair cable.

See https://modbus.org "MODBUS over Serial Line Specification and Implementation Guide".

PROFIBUS DP

Shielded twisted-pair cable. Cable type A is recommended.

See https://www.profibus.com "PROFIBUS Installation Guidelines".

PROFINET

Only PROFINET cables.

See https://www.profibus.com "PROFINET Planning guideline".

EtherNet/IP

Twisted-pair Ethernet CAT 5 or better.

See https://www.odva.org"EtherNet/IP Media Planning & Installation Manual".

Connecting cable between Safety Barrier Promass 100 and measuring device

Cable type	Shielded twisted-pair cable with 2x2 wires. When grounding the cable shield, observe the grounding concept of the plant.
Maximum cable resistance	2.5 Ω, one side

Comply with the maximum cable resistance specifications to ensure the operational reliability of the measuring device.

The maximum cable length for individual wire cross-sections is specified in the table below. Observe the maximum capacitance and inductance per unit length of the cable and connection values for hazardous areas .

Wire cross-section		Maximum cable length	
[mm²]	[AWG]	[m]	[ft]
0.5	20	70	230
0.75	18	100	328
1.0	17	100	328
1.5	16	200	656
2.5	14	300	984

Performance characteristics

Reference operating conditions

- Error limits based on ISO 11631
- Water
  - +15 to +45 °C (+59 to +113 °F)
  - 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 → 82

Maximum measurement error

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

Base accuracy

Design fundamentals → 40

Mass flow and volume flow (liquids)

±0.10 % o.r.

Density (liquids)

Under reference conditions [g/cm³]	Standard density calibration [1] [g/cm³]	Wide-range Density specification [2] [3] [g/cm³]
±0.0005	±0.01	±0.002

1) Valid over the entire temperature and density range
2) Valid range for special density calibration: 0 to 2 g/cm³, +10 to +80 °C (+50 to +176 °F)
3) order code for "Application package", option EE "Special density"

Temperature

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

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	⅜	0.20	0.007
15	½	0.65	0.024
25	1	1.80	0.066
40	1½	4.50	0.165
50	2	7.0	0.257

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
50	70 000	7 000	3 500	1 400	700	140

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
⅜	73.50	7.350	3.675	1.470	0.735	0.147
½	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
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

Accuracy of outputs

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

The outputs have the following base accuracy specifications:

Current output

Accuracy	Max. ±5 µA

Pulse/frequency output

o.r. = of reading

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

Repeatability

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

Base repeatability

Design fundamentals → 40

Mass flow and volume flow (liquids)

±0.05 % o.r.

Density (liquids)

±0.00025 g/cm³

Temperature

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

Response time

The response time depends on the configuration (damping).

Influence of ambient temperature

Current output

o.r. = of reading

Temperature coefficient	Max. ±0.005 % o.r./°C

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

Influence of medium temperature

Mass flow

o.f.s. = of full scale value

If there is a difference between the temperature during zero adjustment and the process temperature, the additional measurement error of the sensors is typically ±0.0002 %o.f.s./°C (±0.0001 % o. f.s./°F).

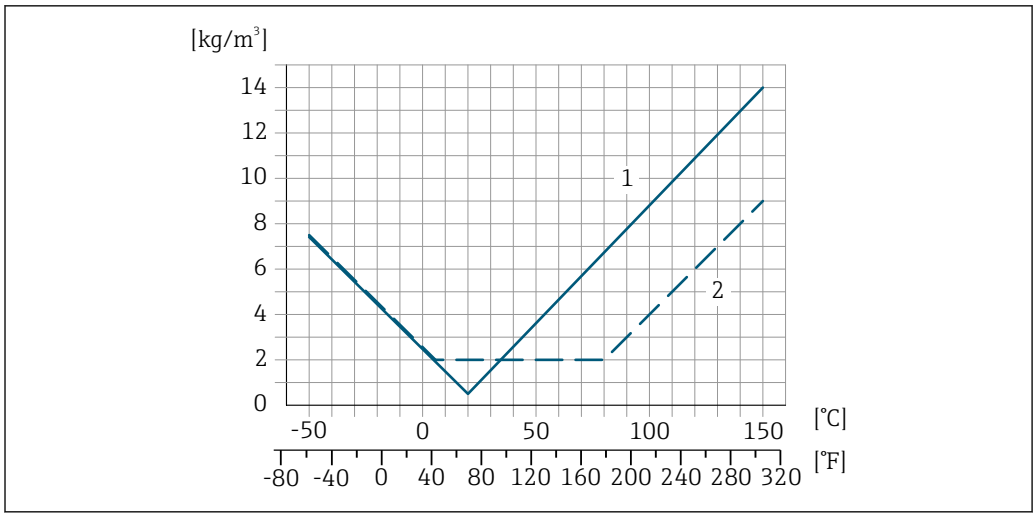
The influence is reduced when the zero adjustment is performed at process temperature.

Density

If there is a difference between the density calibration temperature and the process temperature, the measurement error of the sensors is typically ±0.0001 g/cm³/°C (±0.00005 g/cm³/°F). Field density adjustment is possible.

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range (→ 37) the measurement error is ±0.0001 g/cm³ /°C (±0.00005 g/cm³ /°F)



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

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

Influence of medium pressure

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

o.r. = of reading

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

Operating Instructions → 🖹 83.

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	⅜	−0.002	−0.0001
15	½	−0.006	−0.0004
25	1	−0.005	−0.0003
40	1½	−0.007	−0.0005
50	2	−0.006	−0.0004

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

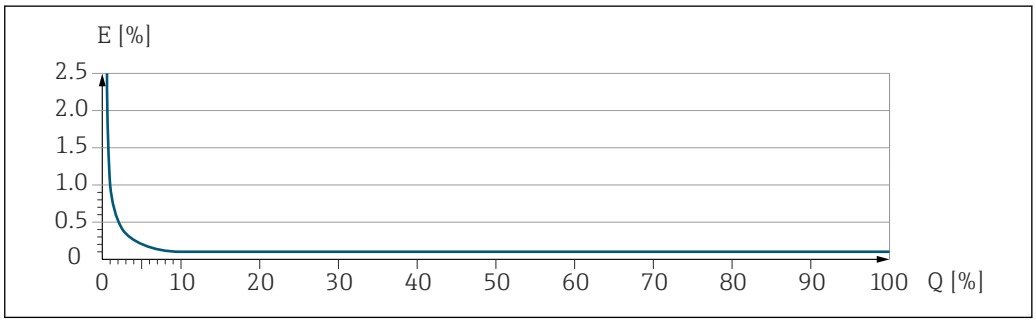
Calculation of the maximum measured error as a function of the flow rate

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

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

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{½ \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021335	$\pm$ BaseRepeat A0021340
$< \frac{½ \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021336	$\pm ½ \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021337

Example of maximum measurement error

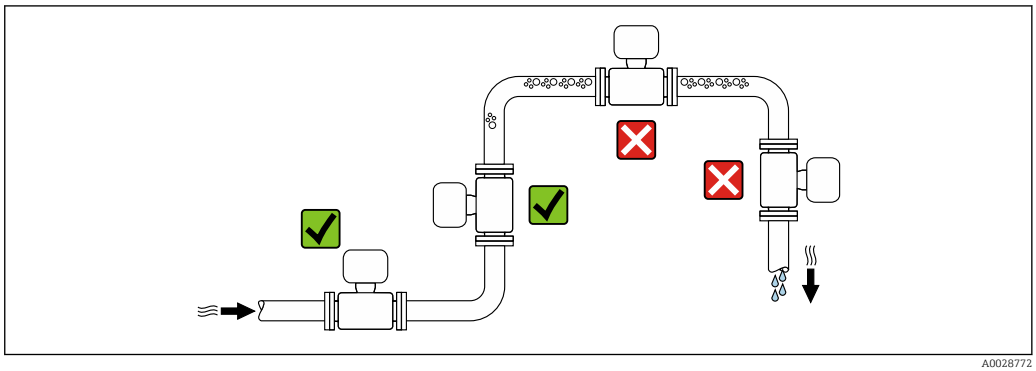


A0030317

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

Installation

Mounting location

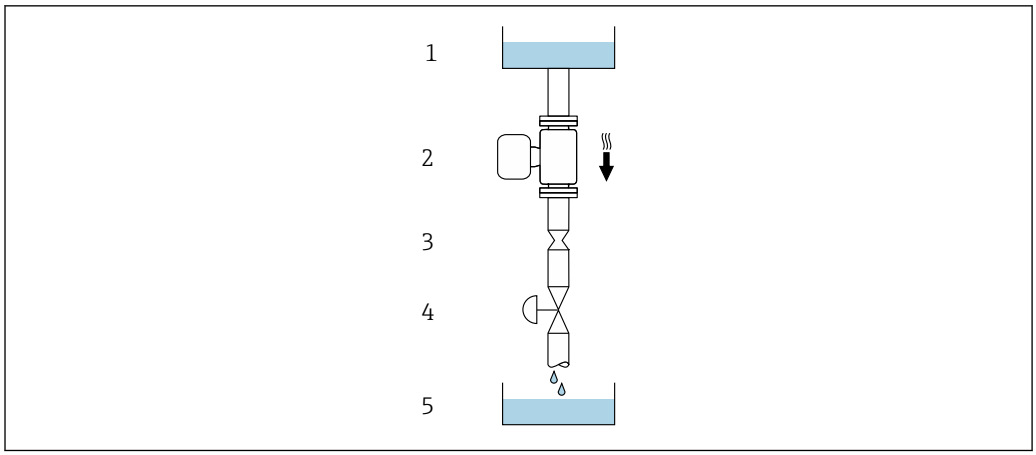


A0028772

To avoid measurement errors caused by gas bubble formation in the measuring tube, avoid the following installation locations in the pipe:
- Highest point of a pipeline
- Directly upstream of a free pipe outlet in a down pipe

Installation in down pipes

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



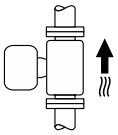
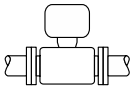
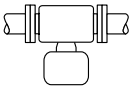
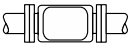
12 Installation in a down pipe (e.g. for batching applications)

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

DN/NPS		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	⅜	6	0.24
15	½	10	0.40
25	1	14	0.55
40	1 ½	22	0.87
50	2	28	1.10

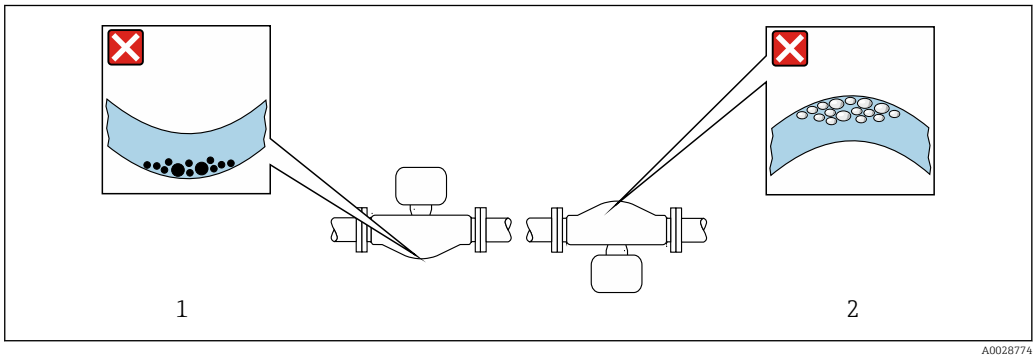
Orientation

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

Orientation			Recommendation
A	Vertical orientation	 A0015591	✓✓ 1)
B	Horizontal orientation, transmitter at top	 A0015589	✓✓ 2) Exception: → 13, 43
C	Horizontal orientation, transmitter at bottom	 A0015590	✓✓ 3) Exception: → 13, 43
D	Horizontal orientation, transmitter at side	 A0015592	✓✓

1) This orientation is recommended to ensure self-draining.
2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

If a sensor is installed horizontally with a curved measuring tube, match the position of the sensor to the medium properties.



13 *Orientation of sensor with curved measuring tube*

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

Inlet and outlet runs

No special precautions need to be taken for fittings that create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 50.

Special installation instructions

Drainability

When installed vertically, the measuring tubes can be drained completely and protected against buildup.

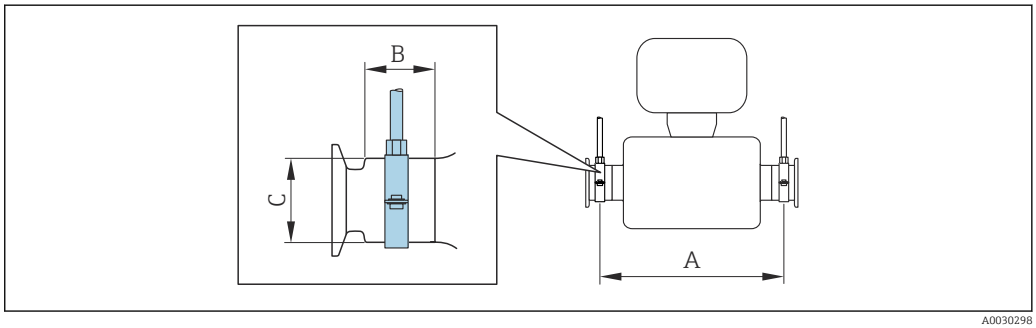
Hygienic compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 77

Securing with mounting clamp in the case of hygiene connections

It is not necessary to provide additional support for the sensor for operational performance purposes. If, however, additional support is required for installation purposes, the following dimensions must be observed.

Use mounting clamp with lining between clamp and measuring instrument.



DN		A		B		C	
[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
8	⅜	298	11.73	33	1.3	28	1.1
15	½	402	15.83	33	1.3	28	1.1
25	1	542	21.34	33	1.3	38	1.5
40	1 ½	658	25.91	36.5	1.44	56	2.2
50	2	772	30.39	44.1	1.74	75	2.95

Zero point verification and zero adjustment

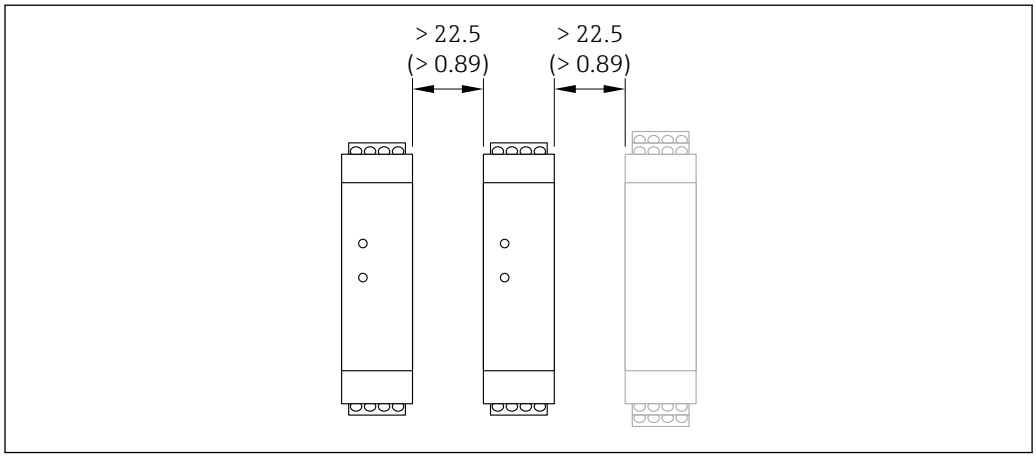
All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 37. Therefore, a zero adjustment in the field is generally not required.

Experience shows that zero adjustment is advisable only in special cases:
- To achieve maximum measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity media).

For information on checking the zero point and performing a zero adjustment, see the Operating Instructions for the device.

To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stress during operation.

Installing the Safety Barrier Promass 100



14 *Minimum distance between additional Safety Barrier Promass 100 or other modules. Engineering unit mm (in)*

Environment

Ambient temperature range

Measuring instrument	▪ −40 to +60 °C (−40 to +140 °F) ▪ Order code for "Test, certificate", option JM: −50 to +60 °C (−58 to +140 °F)
Safety Barrier Promass 100	−40 to +60 °C (−40 to +140 °F)

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

Storage temperature

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

−50 to +80 °C (−58 to +176 °F) (Order code for *"Test, certificate"*, option JM)

Climate class

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

Degree of protection

Transmitter and sensor
- Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
- With the order code for "Sensor options", option CM: IP69 can also be ordered
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

Safety Barrier Promass 100
IP20

Vibration resistance and shock resistance

Sinusoidal vibration similar to IEC 60068-2-6

- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 2 000 Hz, 1 g peak

Broadband random vibration similar to IEC 60068-2-64

- 10 to 200 Hz, 0.003 g^2/Hz
- 200 to 2 000 Hz, 0.001 g^2/Hz
- Total: 1.54 g rms

Half-sine shocks similar to IEC 60068-2-27

6 ms 30 g

Rough handling shocks similar to IEC 60068-2-31

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326
- As per NAMUR Recommendation 21 (NE 21), NAMUR Recommendation 21 (NE 21) is fulfilled when the device is installed in accordance with NAMUR Recommendation 98 (NE 98).
- As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
- Complies with emission limits for industry as per EN 55011 (class A)
- Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784

The following applies for PROFIBUS DP: If baud rates > 1.5 MBaud, an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.

Details are provided in the Declaration of Conformity.

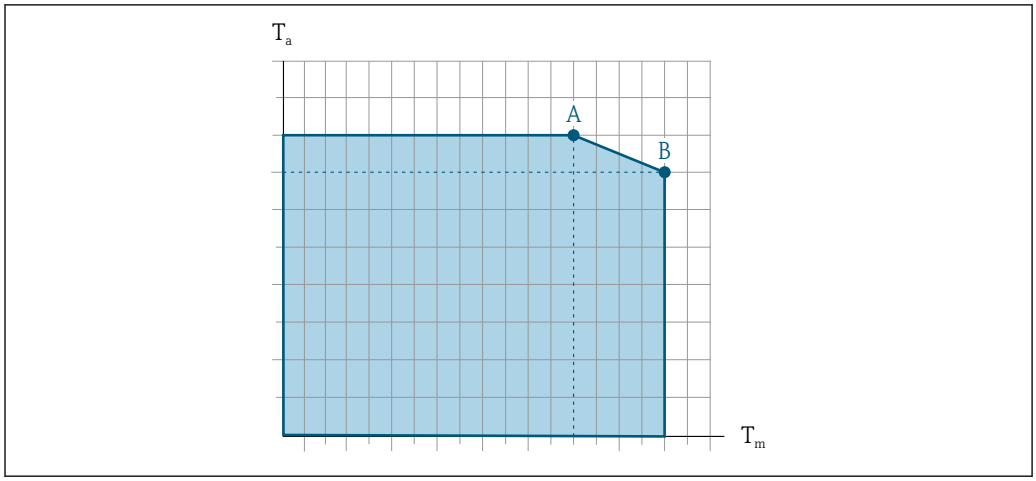
This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

Process

Medium temperature range

−50 to +150 °C (−58 to +302 °F)

Dependency of ambient temperature on medium temperature



15 *Exemplary representation, values in the table below.*

T_a *Ambient temperature*
T_m *Medium temperature*
A *Maximum permitted medium temperature T_m at $T_{a\,max}$ = 60 °C (140 °F); higher medium temperatures T_m require a reduction in the ambient temperature T_a*
B *Maximum permitted ambient temperature T_a for the maximum specified medium temperature T_m of the sensor*

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

Not insulated				Insulated			
A		B		A		B	
T_a	T_m	T_a	T_m	T_a	T_m	T_a	T_m
60 °C (140 °F)	150 °C (302 °F)	–	–	60 °C (140 °F)	120 °C (248 °F)	55 °C (131 °F)	150 °C (302 °F)

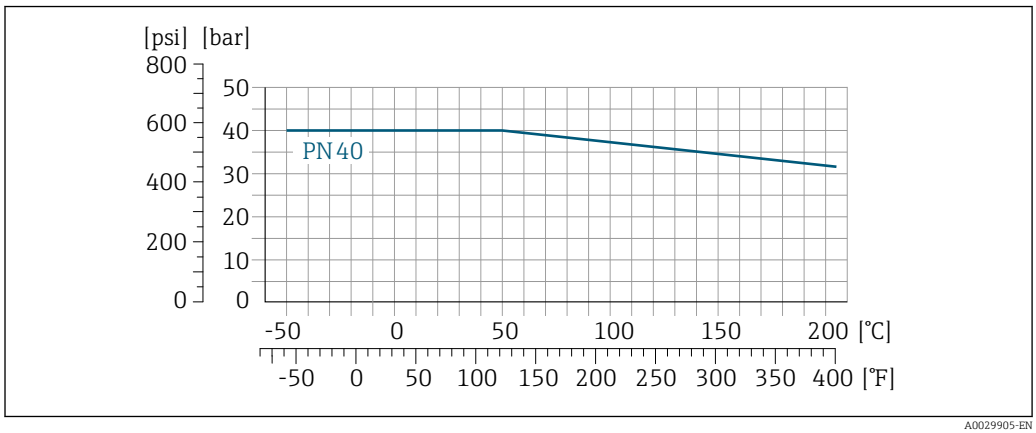
Medium density

0 to 5 000 kg/m³ (0 to 312 lb/cf)

Pressure-temperature ratings

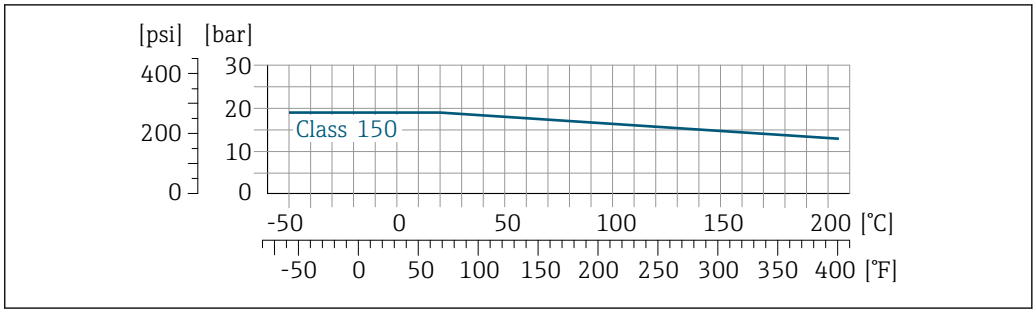
The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

Flange similar to EN 1092-1 (DIN 2501)



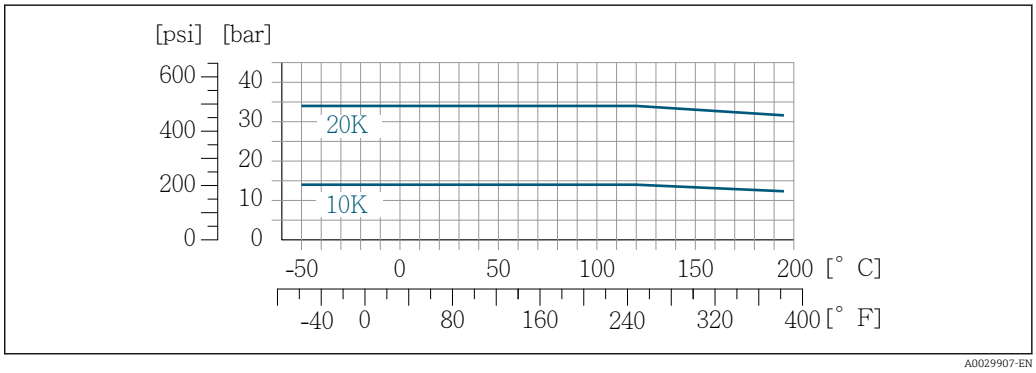
16 *With flange material 1.4404 (F316/F316L)*

Flange similar to ASME B16.5



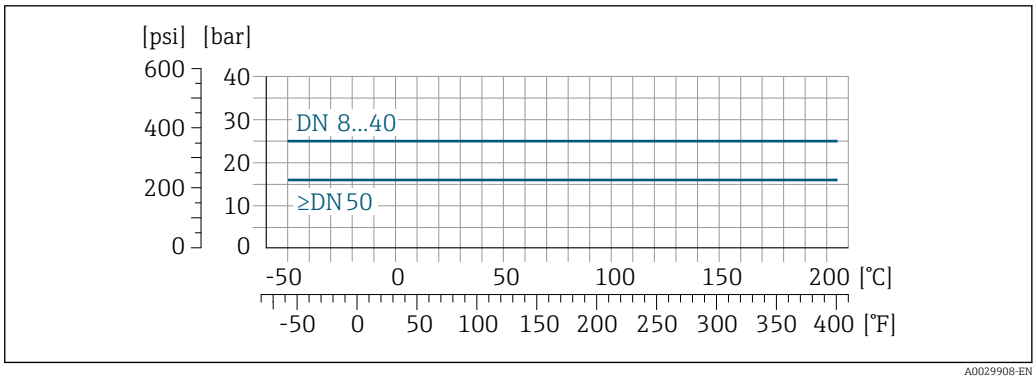
17 *With flange material 1.4404 (F316/F316L)*

Flange JIS B2220



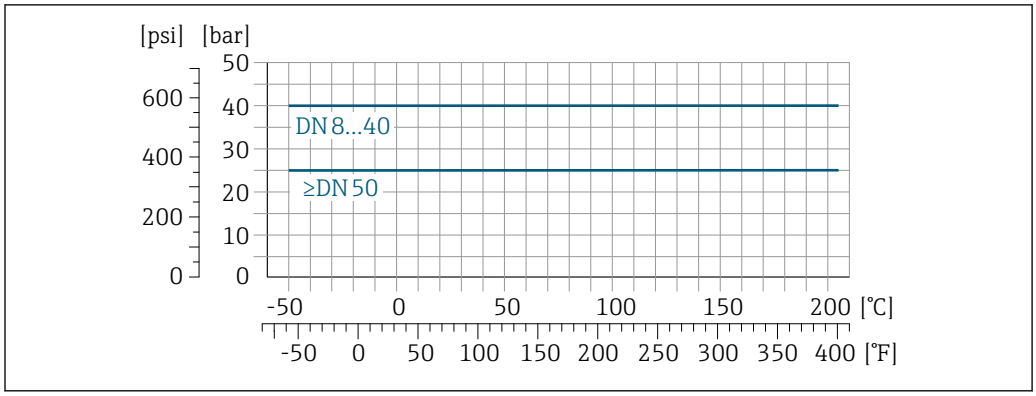
18 *With flange material 1.4404 (F316/F316L)*

Flange DIN 11864-2 Form A



19 *With flange material 1.4435 (316L)*

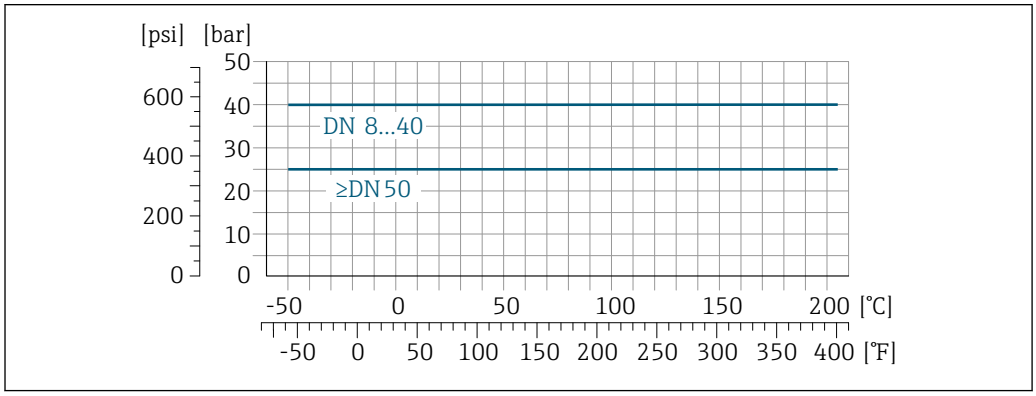
Threaded adapter DIN 11851



20 *With flange material 1.4435 (316L)*

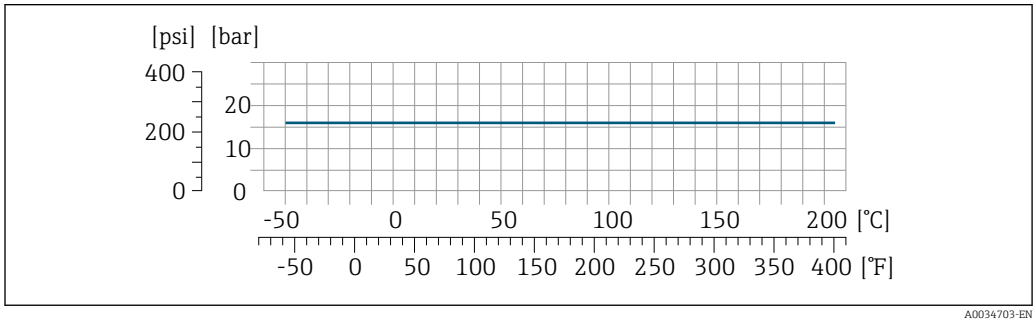
DIN 11851 allows for applications up to +140 °C (+284 °F) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

Thread DIN 11864-1 Form A



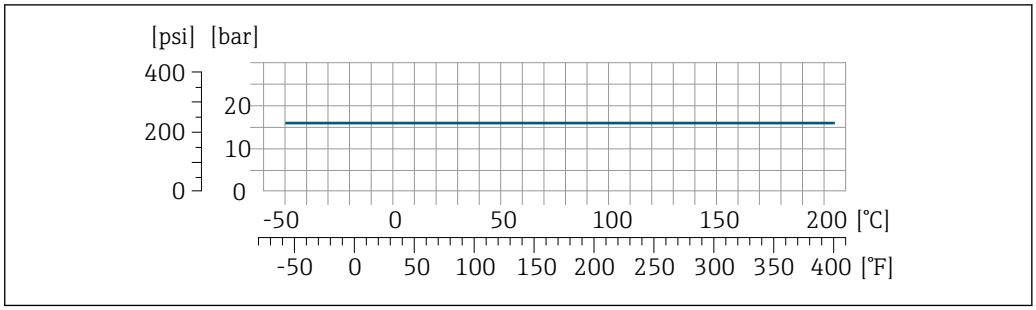
21 *With connection material 1.4435 (316L)*

Threaded adapter ISO 2853



22 *With connection material 1.4435 (316L)*

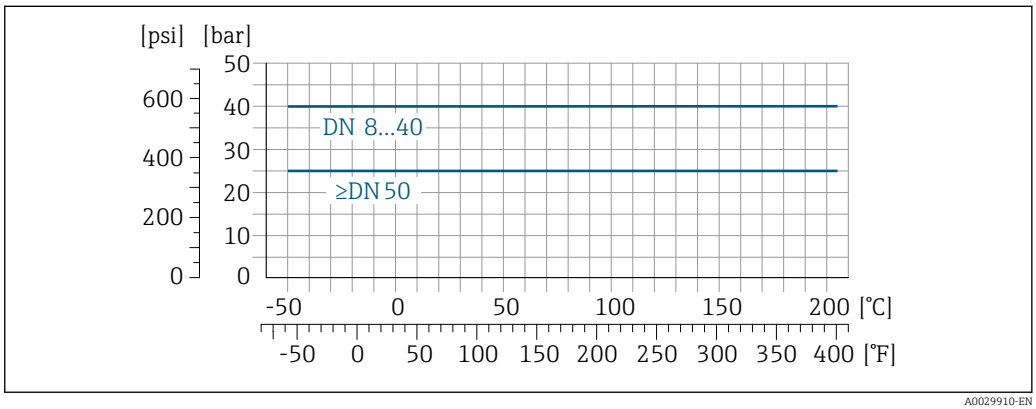
Threaded adapter SMS 1145



23 With connection material 1.4435 (316L)

SMS 1145 allows for applications up to 6 bar (87 psi) 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.

Clamp connections DIN 11864-3 Form A



24 With connection material 1.4435 (316L)

Tri-clamp

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.

If a measuring tube fails (e.g. due to process characteristics like corrosive or abrasive fluids), the fluid will initially be contained by the sensor housing.

If the sensor is to be purged with gas (gas detection), it should be equipped with purge connections.

Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge.

Maximum pressure: 5 bar (72.5 psi)

Burst pressure of the sensor housing

The following sensor housing burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (not opened/as delivered).

If a device fitted with purge connections (order code for "Sensor option", option CH "Purge connection") is connected to the purge system, the maximum pressure is determined by the purge system itself or by the device, depending on which component has the lower pressure classification.

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	190	2 755
15	½	175	2 538
25	1	165	2 392
40	1½	152	2 204
50	2	103	1 494

For information on the dimensions: see the "Mechanical construction" section

Internal cleaning

- CIP cleaning
- SIP cleaning
- Cleaning with pigs

Options
Oil- and grease-free version for wetted parts, without declaration
Order code for "Service", option HA [1)]

Flow limit

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

For an overview of the full scale values for the measuring range, see the "Measuring range" section → 8

- 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).

To calculate the flow limit, use the *Applicator* sizing tool → 82

Pressure loss

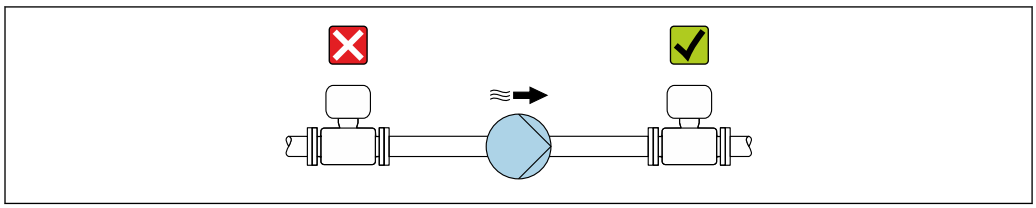
To calculate the pressure loss, use the *Applicator* sizing tool → 82

Static pressure

It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas. This is prevented by means of a sufficiently high static pressure.

For this reason, the following mounting locations are recommended:

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



A0028777

Thermal insulation

In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

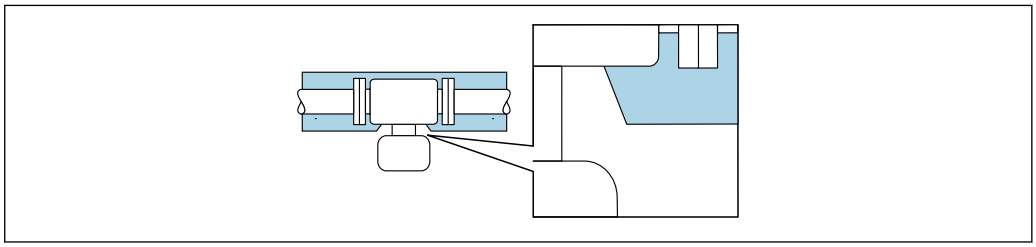
The following device versions are recommended for applications with thermal insulation:
Version with extended neck for insulation:
Order code for "Sensor option", option CG with an extended neck length of 105 mm (4.13 in).

1) Cleaning only refers to the measuring instrument. Any accessories that have been supplied are not cleaned.

NOTICE

Electronics overheating on account of thermal insulation!

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



A0034391

25 *Thermal insulation with exposed extension neck*

Heating

Some media require suitable measures to avoid loss of heat at the sensor.

Heating options

- Electrical heating, e.g. with electric band heaters [2)]
- Via pipes carrying hot water or steam
- Via heating jackets

Heating jackets for the sensors can be ordered as accessories from Endress+Hauser → 81.

NOTICE

Danger of overheating when heating

- Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F).
- Ensure that sufficient convection takes place at the transmitter neck.
- Ensure that a sufficiently large area of the transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.
- When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.
- Consider the behavior of the process diagnostics "830 Ambient temperature too high" and "832 Electronics temperature too high" if overheating cannot be avoided by a suitable system design.

Vibrations

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

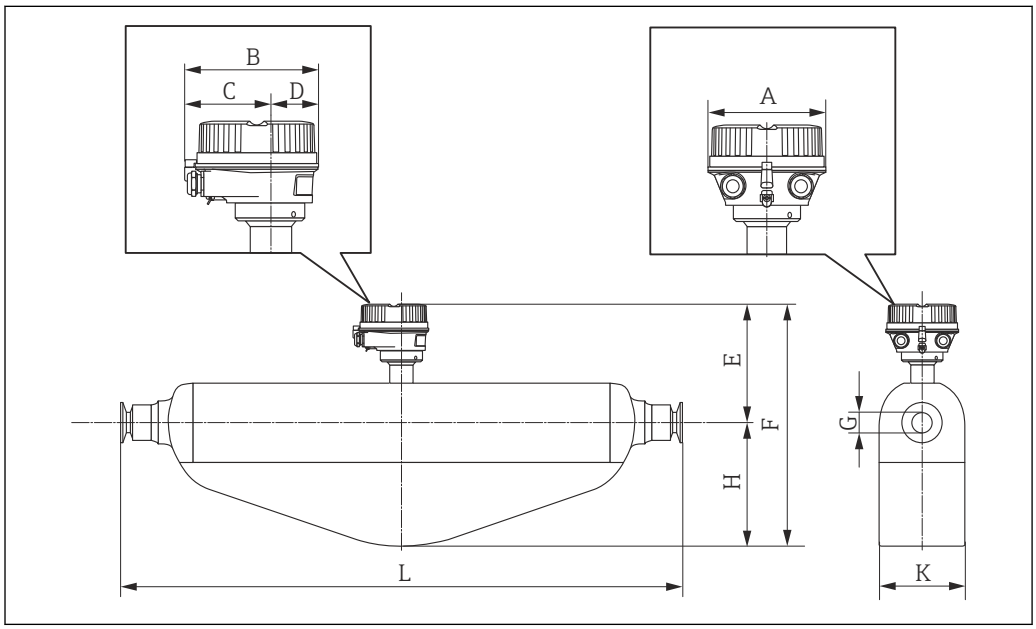
2) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" → 84

Mechanical construction

Dimensions in SI units

Compact version

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

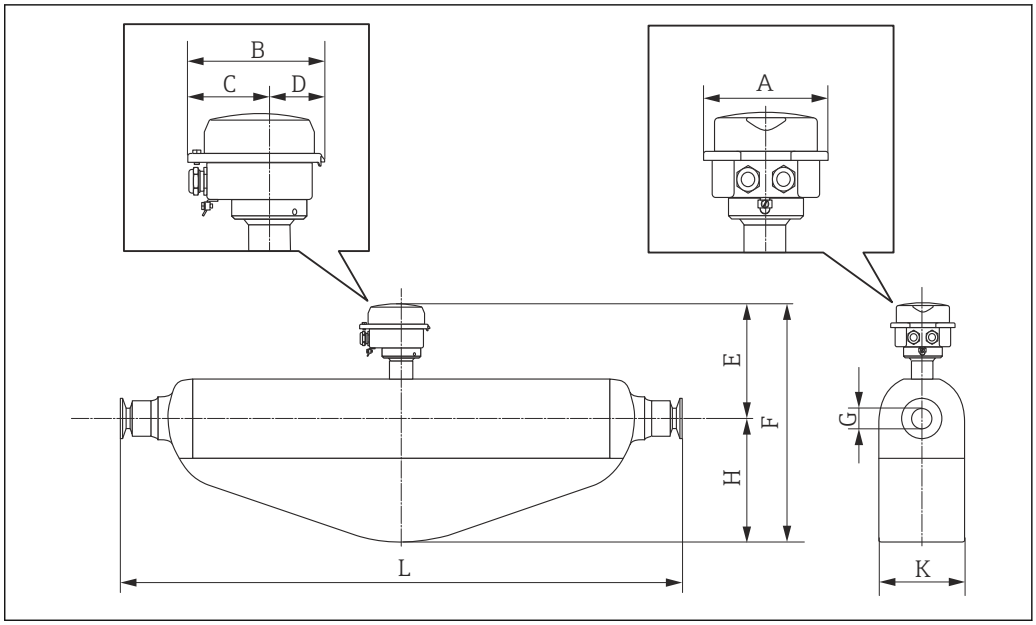


A0016525

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1) 2)] [mm]	F [1) 2)] [mm]	G [mm]	H [mm]	K [mm]	L [mm]
8	136	147.5	93.5	54	191	299	8.31	108	92	3)
15	136	147.5	93.5	54	191	299	12.00	108	92	3)
25	136	147.5	93.5	54	191	312	17.60	121	92	3)
40	136	147.5	93.5	54	231	407	26.00	176	141	3)
50	136	147.5	93.5	54	256	516	38.00	260	168	3)

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG: values +70 mm
2) If using a display, order code for "Display; Operation", option B: values +28 mm
3) Depends on the particular process connection

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

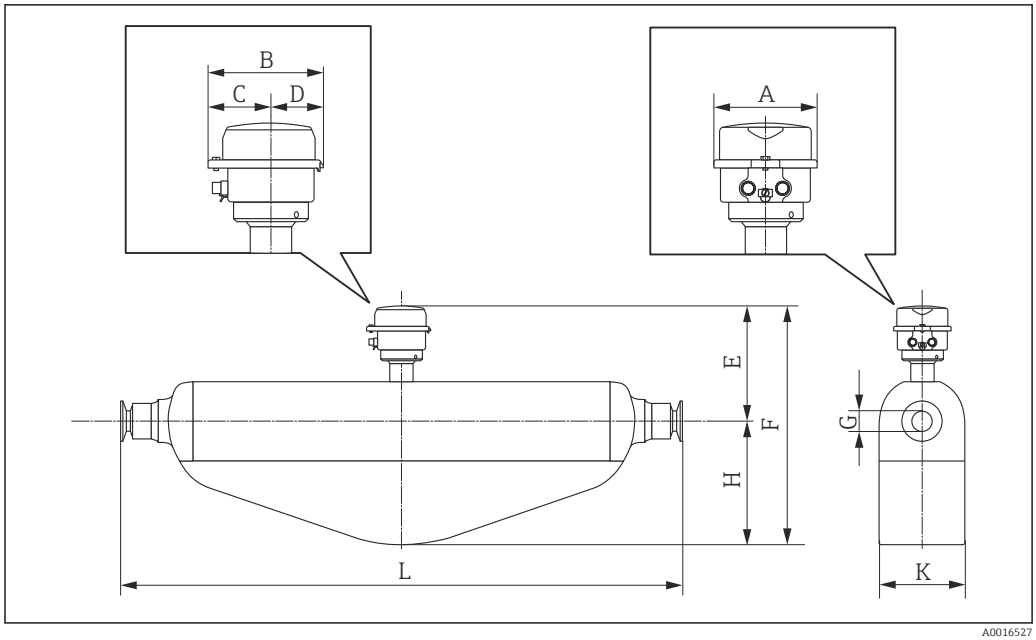


A0016526

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [2)] [mm]	F [1) 2)] [mm]	G [mm]	H [mm]	K [mm]	L [mm]
8	133.5	136.8	78	58.8	186	294	8.31	108	92	3)
15	133.5	136.8	78	58.8	186	294	12.00	108	92	3)
25	133.5	136.8	78	58.8	186	307	17.60	121	92	3)
40	133.5	136.8	78	58.8	226	402	26.00	176	141	3)
50	133.5	136.8	78	58.8	251	511	38.00	260	168	3)

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG: values +70 mm
2) If using a display, order code for "Display; Operation", option B: values +14 mm
3) Depends on the particular process connection

Order code for "Housing", option C "Ultra-compact hygienic, stainless"



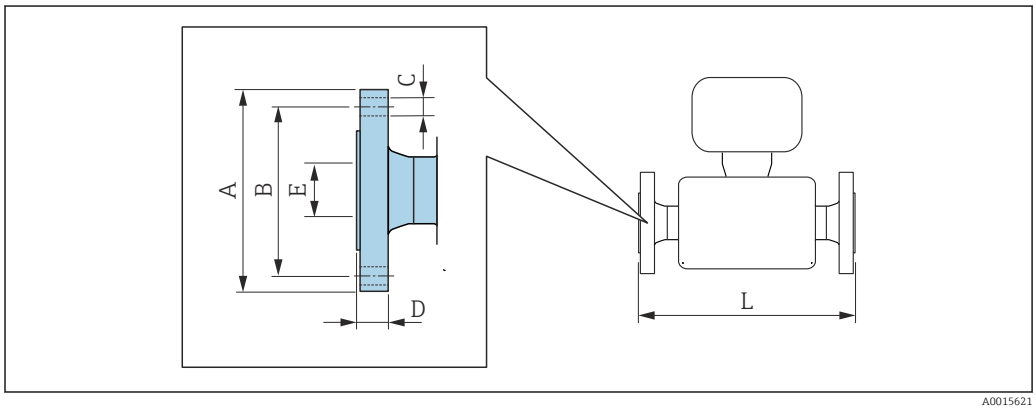
A0016527

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [2)] [mm]	F [1) 2)] [mm]	G [mm]	H [mm]	K [mm]	L [mm]
8	111.4	123.6	67.7	55.9	186	294	8.31	108	92	3)
15	111.4	123.6	67.7	55.9	186	294	12.00	108	92	3)
25	111.4	123.6	67.7	55.9	186	307	17.60	121	92	3)
40	111.4	123.6	67.7	55.9	226	402	26.00	176	141	3)
50	111.4	123.6	67.7	55.9	251	511	38.00	260	168	3)

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG: values +70 mm
2) If using a display, order code for "Display; Operation", option B: values +14 mm
3) Depends on the particular process connection

Flange connections

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



A0015621

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

Flange similar to EN 1092-1 (DIN 2501): PN 40
1.4404 (F316/F316L)
Order code for "Process connection", option **D2W**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8 [1]	95	65	4 × Ø14	17.0	17.3	336
15	95	65	4 × Ø14	20	17.3	440
25	115	85	4 × Ø14	19.0	28.5	580
40	150	110	4 × Ø18	21.0	43.1	707
50	165	125	4 × Ø18	25.0	54.5	828
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm						

1) DN 8 with DN 15 flanges as standard

Flange according to ASME B16.5, Cl 150
1.4404 (F316/F316L)
Order code for "Process connection", option **AAW**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8 [1]	90	60.3	4 × Ø15.7	17.1	15.7	336
15	90	60.3	4 × Ø15.7	17.1	15.7	440
25	110	79.4	4 × Ø15.7	17.6	26.7	580
40	125	98.4	4 × Ø15.7	18.6	40.9	707
50	150	120.7	4 × Ø19.1	25.1	52.6	828
Surface roughness (flange): Ra 3.2 to 6.3 µm						

1) DN 8 with DN 15 flanges as standard

Flange JIS B2220, 10K
1.4404 (F316/F316L)
Order code for "Process connection", option **NDW**

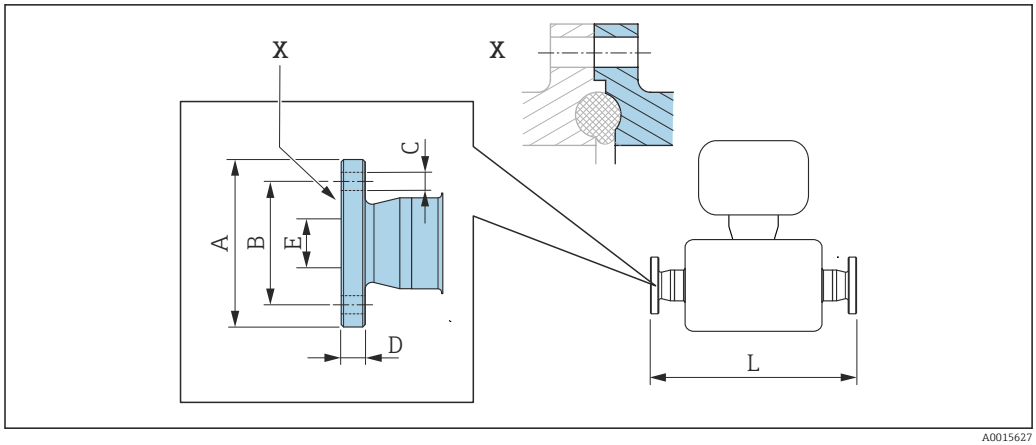
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
50	155	120	4 × Ø19.0	16	50	828
Surface roughness (flange): Ra 3.2 to 6.3 µm						

Flange JIS B2220, 20K
1.4404 (F316/F316L)
Order code for "Process connection", option **NEW**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8 [1]	95	70	4 × Ø15	16.0	15	336
15	95	70	4 × Ø15	16.0	15	440
25	125	90	4 × Ø19	17.5	25	580
40	140	105	4 × Ø19	20.0	40	707
50	155	120	8 × Ø19	27.5	50	828
Surface roughness (flange): Ra 3.2 to 6.3 µm						

1) DN 8 with DN 15 flanges as standard

Fixed flange DIN 11864-2



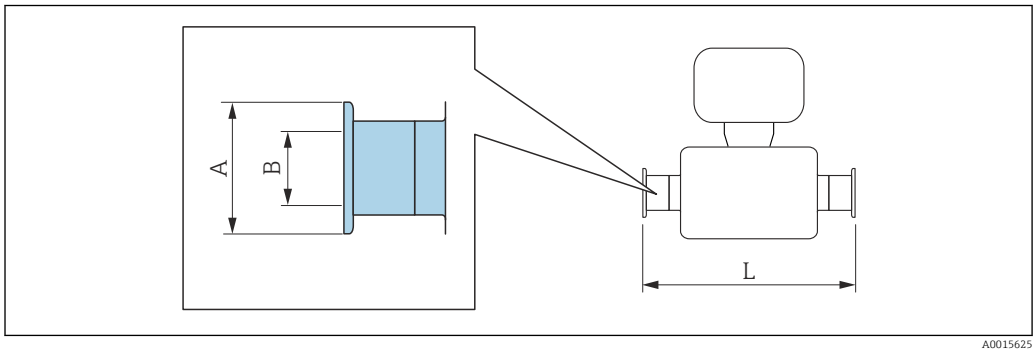
26 *Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.*

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

Flange DIN 11864-2 Form A, for pipe according to DIN11866 series A, flange with notch **1.4435 (316L)** *Order code for "Process connection", option* **KKW**						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**L [mm]**
8	59.0	42	4 × Ø9	10	16.00	384
15	59.0	42	4 × Ø9	10	16.00	488
25	70	53	4 × Ø9	10	26.00	626
40	82	65	4 × Ø9	10	38.00	753
50	94	77	4 × Ø9	10	50.00	877
3-A version: order code for "Additional approval", option LP						

Clamp connections

Tri-clamp



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

¾" Tri-Clamp, for pipe according to DIN11866 series C
1.4435 (316L)
Order code for "Process connection", option **FEW**

DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
8	¾	25.0	16.00	362
3-A version: order code for "Additional approval", option LP				

½" Tri-Clamp, for pipe according to DIN11866 series C
1.4435 (316L)
Order code for "Process connection", option **FBW**

DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
15	½	25.0	9.50	466
3-A version: order code for "Additional approval", option LP				

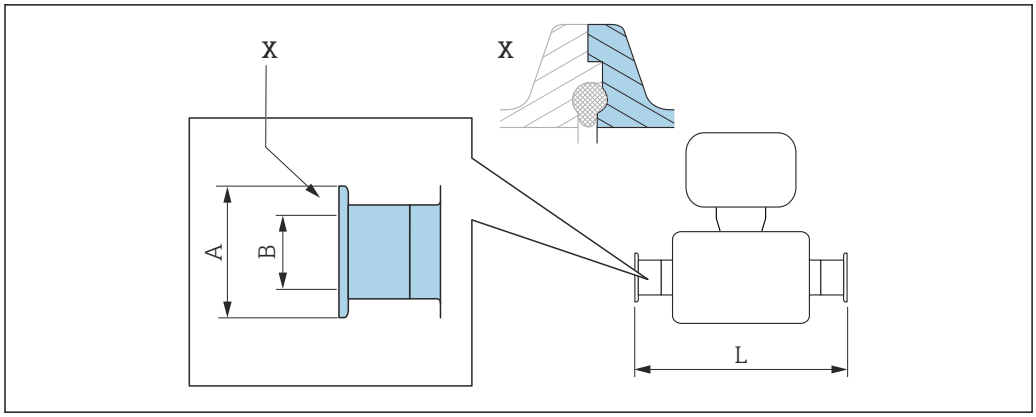
1" Tri-Clamp, for pipe according to DIN11866 series C
1.4435 (316L)
Order code for "Process connection", option **FNW**

DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
8	1	50.4	22.10	362
15	1	50.4	22.10	466
3-A version: order code for "Additional approval", option LP				

1", 1½", 2" Tri-Clamp, for pipe according to DIN11866 series C
1.4435 (316L)
Order code for "Process connection", option **FTW**

DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
8	½	25.0	9.50	362
15	¾	25.0	16.00	466
25	1	50.4	22.10	606
40	1½	50.4	34.80	731
50	2	63.9	47.50	853
3-A version: order code for "Additional approval", option LP				

Clamp connection DIN 11864-3

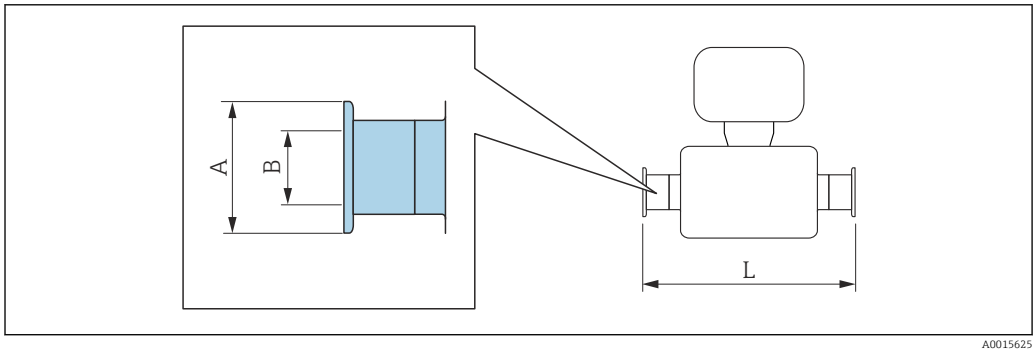


27 *Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.*

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

Clamp DIN 11864-3 Form A, aseptic liner, for pipe according to DIN11866 series A **1.4435 (316L)** *Order code for "Process connection", option* **KMW**			
DN [mm]	**A [mm]**	**B [mm]**	**L [mm]**
8	34.0	16.05	370
15	34.0	16.05	474
25	50.5	26.05	614
40	64.0	38.05	738
50	77.5	50.05	853
3-A version: order code for "Additional approval", option LP			

Clamp connection DIN 32676, ISO 2852



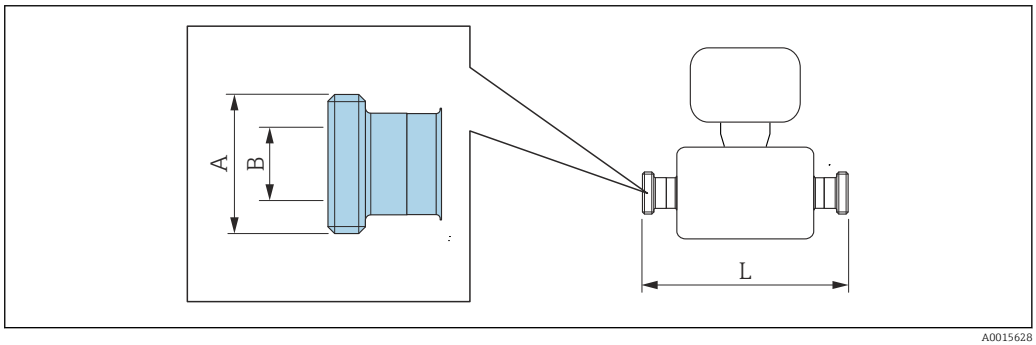
Length tolerance for dimension L in mm:
+1.5 / −2.0

Clamp DIN 32676, for pipe according to DIN11866 series A 1.4435 (316L) *Order code for "Process connection", option* **KQW**			
DN [mm]	**A [mm]**	**B [mm]**	**L [mm]**
8	34.0	16.00	362
15	34.0	16.00	466
25	50.5	26.00	606
40	50.5	38.00	732
50	64.0	50.00	854
3-A version: order code for "Additional approval", option LP			

Clamp ISO 2852, for pipe according to ISO 2037 1.4435 (316L) *Order code for "Process connection", option* **JSA**			
DN [mm]	**A [mm]**	**B [mm]**	**L [mm]**
8	50.5	22.6	362
15	50.5	22.6	466
25	50.5	22.6	606
40	50.5	35.6	731
50	64.0	48.6	853
3-A version: order code for "Additional approval", option LP			

Glands

Threaded adapter DIN 11851, DIN 11864-1, SMS 1145



A0015628

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

Threaded adapter DIN 11851, Rd 28 × ⅛, for pipe according to DIN11866 series A 1.4435 (316L) *Order code for "Process connection", option* **KAW**			
DN [mm]	**A [mm]**	**B [mm]**	**L [mm]**
8	Rd 28 × ⅛	10.00	362
15	Rd 28 × ⅛	10.00	466
3-A version: order code for "Additional approval", option LP			

Threaded adapter DIN 11851, ≥ Rd 34 × ⅛, for pipe according to DIN11866 series A
1.4435 (316L)
Order code for "Process connection", option **KCW**

DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 34 × ⅛	16	362
15	Rd 34 × ⅛	16	466
25	Rd 52 × ⅙	26	606
40	Rd 65 × ⅙	38	738
50	Rd 78 × ⅙	50	864
3-A version: order code for "Additional approval", option LP			

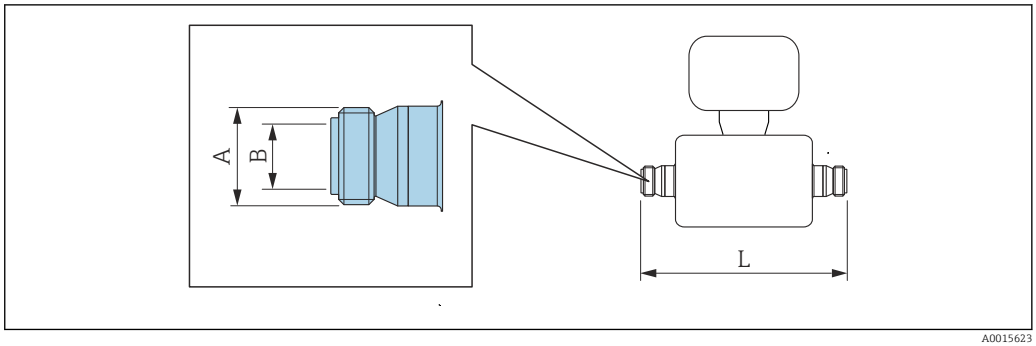
Threaded adapter DIN 11864-1 Form A, for pipe according to DIN11866 series A
1.4435 (316L)
Order code for "Process connection", option **KHW**

DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 28 × ⅛	16.00	362
15	Rd 34 × ⅛	16.00	466
25	Rd 52 × ⅙	26.00	620
40	Rd 65 × ⅙	38.00	738
50	Rd 78 × ⅙	50.00	864
3-A version: order code for "Additional approval", option LP			

Threaded adapter SMS 1145
1.4435 (316L)
Order code for "Process connection", option **SAW**

DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 40 × ⅙	22.5	362
15	Rd 40 × ⅙	22.5	466
25	Rd 40 × ⅙	22.5	606
40	Rd 60 × ⅙	35.5	742
50	Rd 70 × ⅙	48.5	864
3-A version: order code for "Additional approval", option LP			

Threaded adapter ISO 2853



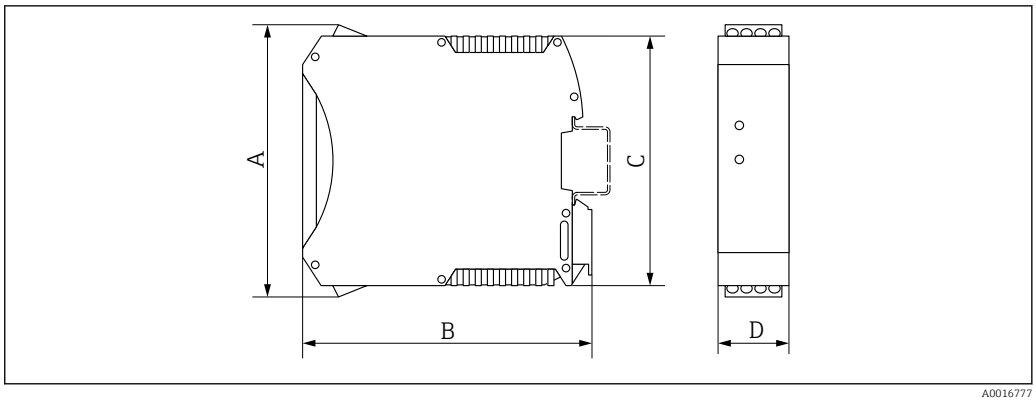
A0015623

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

Threaded adapter ISO 2853, for pipe according to ISO 2037 **1.4435 (316L)** *Order code for "Process connection", option* **JSE**			
DN [mm]	**A [mm]**	**B [mm]**	**L [mm]**
8	37.13	22.60	370
15	37.13	22.60	474
25	37.13	22.60	614
40	50.65	35.60	742
50	64.10	48.60	864
3-A version: order code for "Additional approval", option LP			

Safety Barrier Promass 100

Top-hat rail EN 60715:
- TH 35 x 7.5
- TH 35 x 15

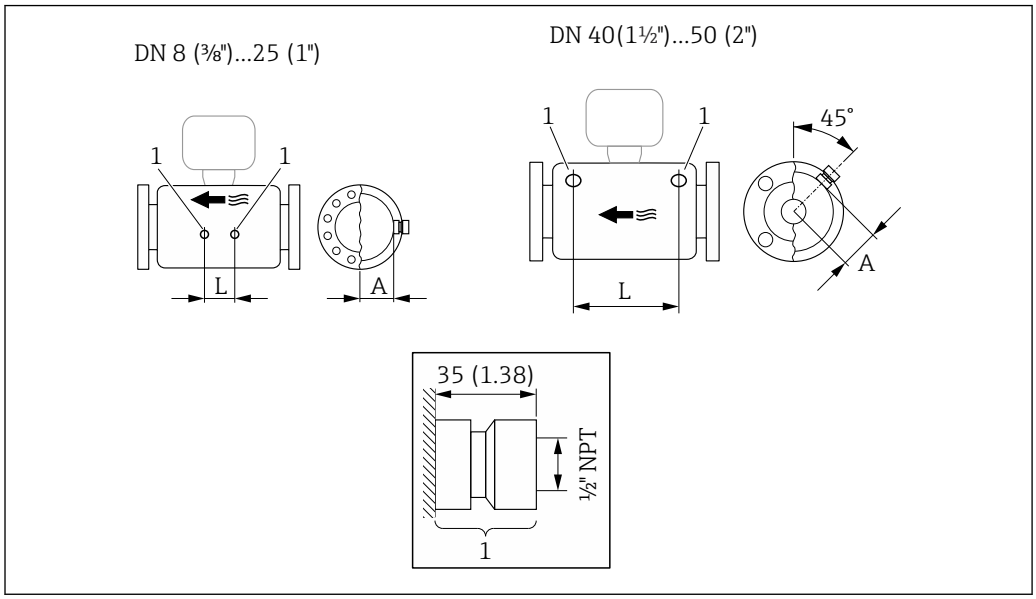


A0016777

A	B	C	D
[mm]	[mm]	[mm]	[mm]
108	114.5	99	22.5

Accessories

Rinse connections



28

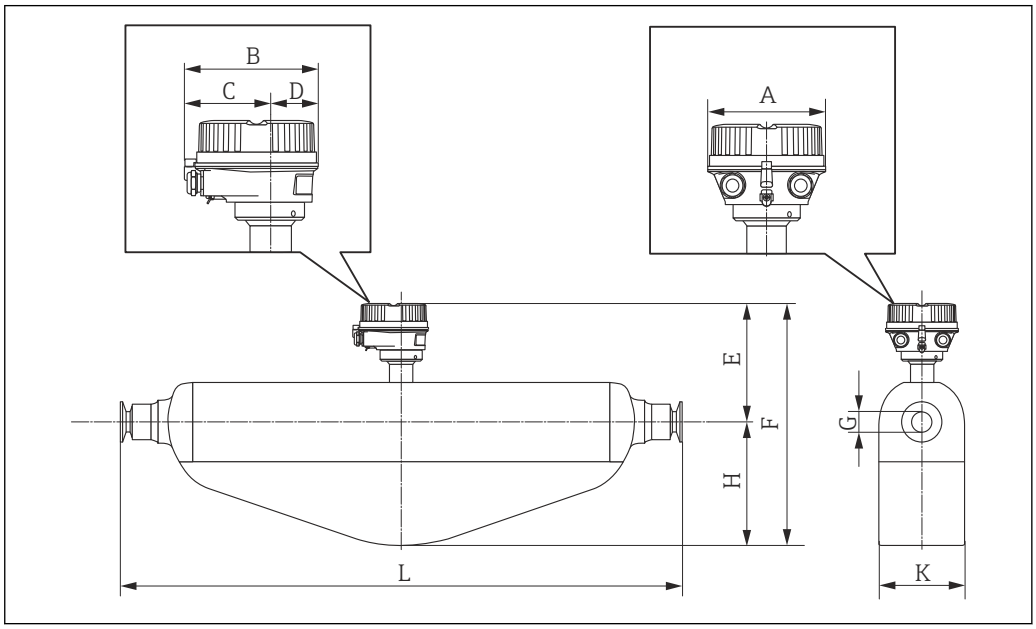
1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"

DN	A	L
[mm]	[mm]	[mm]
8	47	110
15	47	204
25	47	348
40	68.15	418
50	81.65	473

Dimensions in US units

Compact version

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

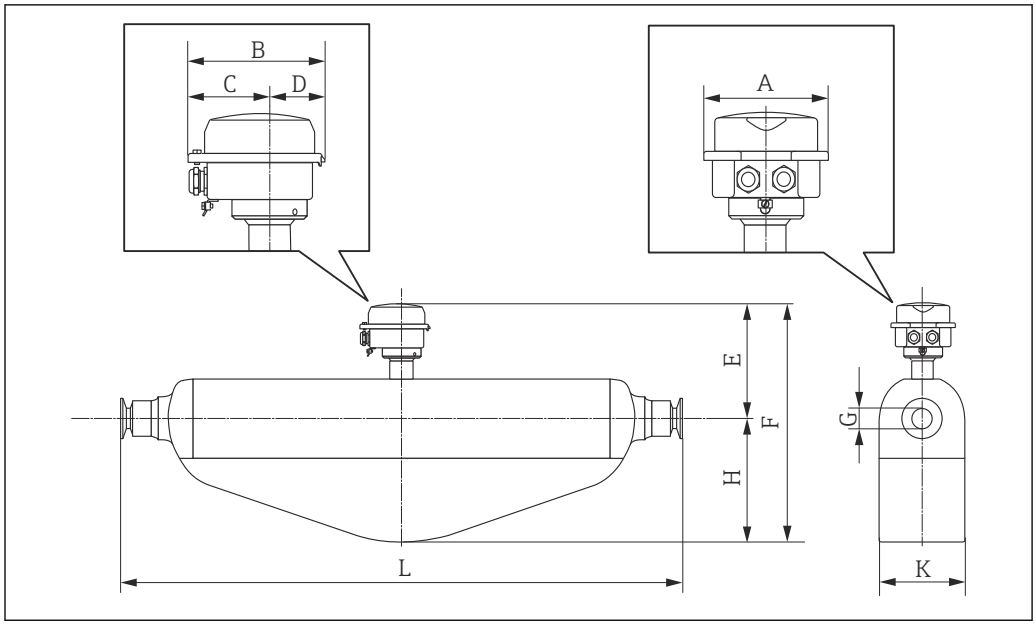


A0016525

DN [in]	A [in]	B [in]	C [in]	D [in]	E 1) 2) [in]	F 1) 2) [in]	G [in]	H [in]	K [in]	L [in]
⅜	5.35	5.81	3.68	2.13	7.52	11.77	0.33	4.25	3.62	3)
½	5.35	5.81	3.68	2.13	7.52	11.77	0.47	4.25	3.62	3)
1	5.35	5.81	3.68	2.13	7.52	12.28	0.69	4.76	3.62	3)
1½	5.35	5.81	3.68	2.13	9.09	16.02	1.02	6.93	5.55	3)
2	5.35	5.81	3.68	2.13	10.08	20.31	1.5	10.24	6.61	3)

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG: values +2.76 in
2) If using a display, order code for "Display; Operation", option B: values +1.1 in
3) Depends on the particular process connection

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

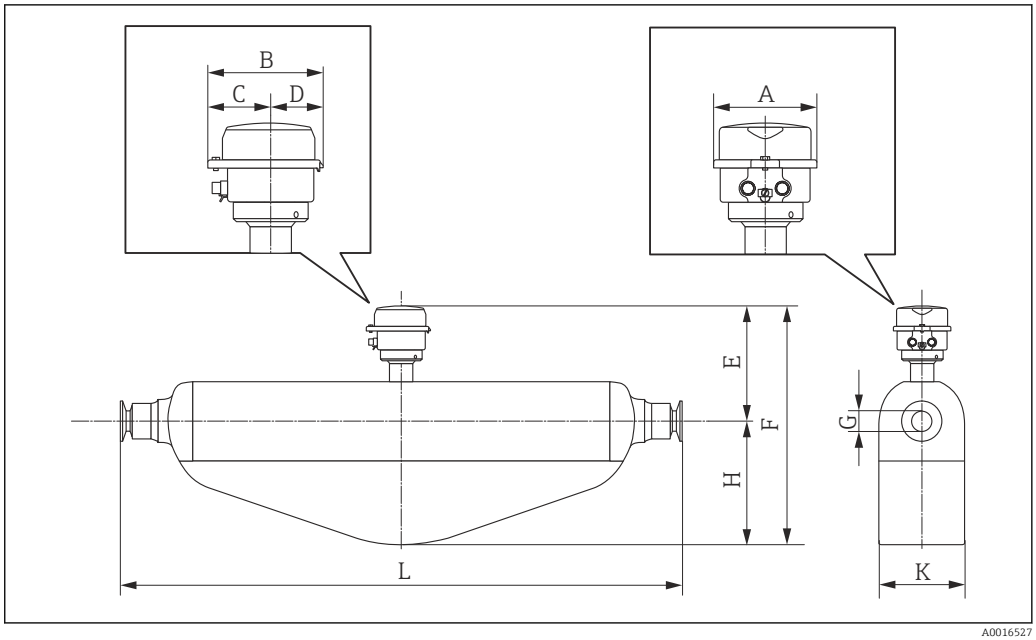


A0016526

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1) 2)] [in]	F [1) 2)] [in]	G [in]	H [in]	K [in]	L [in]
⅜	5.26	5.39	3.07	2.31	7.32	11.57	0.33	4.25	3.62	3)
½	5.26	5.39	3.07	2.31	7.32	11.57	0.47	4.25	3.62	3)
1	5.26	5.39	3.07	2.31	7.32	12.09	0.69	4.76	3.62	3)
1½	5.26	5.39	3.07	2.31	8.9	15.83	1.02	6.93	5.55	3)
2	5.26	5.39	3.07	2.31	9.88	20.12	1.5	10.24	6.61	3)

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG: values +2.76 in
2) If using a display, order code for "Display; Operation", option B: values +0.55 in
3) Depends on the particular process connection

Order code for "Housing", option C "Ultra-compact hygienic, stainless"

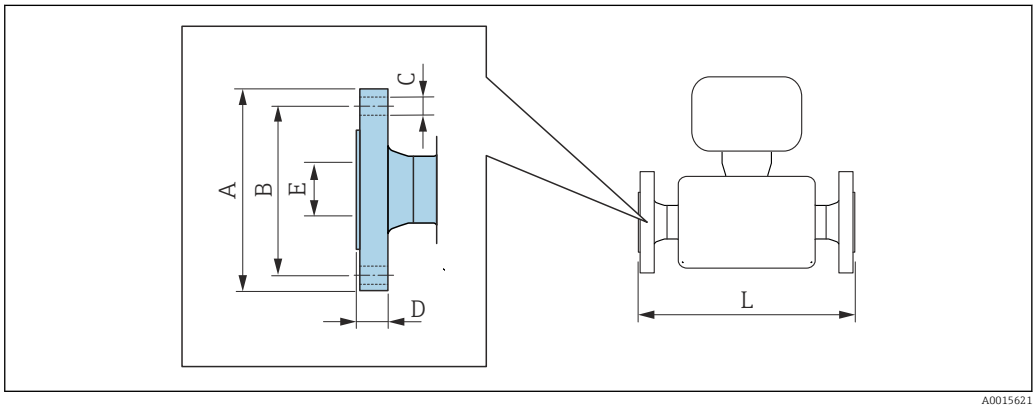


A0016527

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1) 2)] [in]	F [1) 2)] [in]	G [in]	H [in]	K [in]	L [in]
⅜	4.39	4.87	2.67	2.2	7.32	11.57	0.33	4.25	3.62	3)
½	4.39	4.87	2.67	2.2	7.32	11.57	0.47	4.25	3.62	3)
1	4.39	4.87	2.67	2.2	7.32	12.09	0.69	4.76	3.62	3)
1½	4.39	4.87	2.67	2.2	8.9	15.83	1.02	6.93	5.55	3)
2	4.39	4.87	2.67	2.2	9.88	20.12	1.5	10.24	6.61	3)

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG: values +2.76 in
2) If using a display, order code for "Display; Operation", option B: values +0.55 in
3) Depends on the particular process connection

Flange connections ASME B16.5



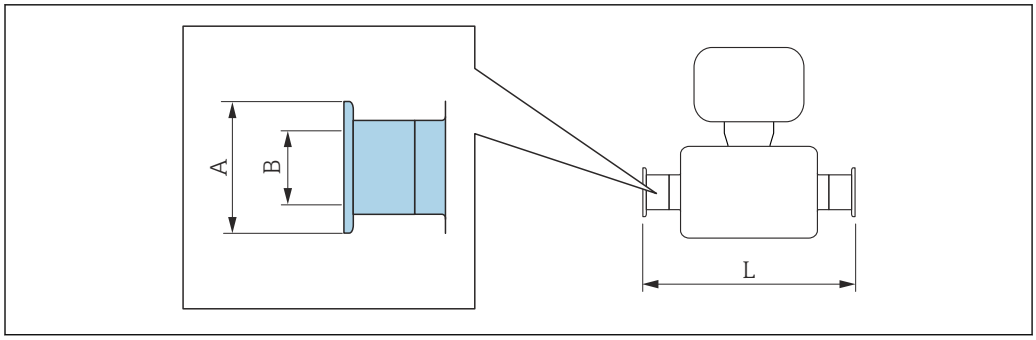
A0015621

Length tolerance for dimension L in inches: +0.06/−0.08

Flange similar to ASME B16.5, Cl 150 1.4404 (F316/F316L) *Order code for "Process connection", option* **AAW**						
DN [in]	**A [in]**	**B [in]**	**C [in]**	**D [in]**	**E [in]**	**L [in]**
⅜ [1]	3.54	2.37	4 × Ø0.62	0.67	0.62	13.23
½	3.54	2.37	4 × Ø0.62	0.67	0.62	17.32
1	4.33	3.13	4 × Ø0.62	0.69	1.05	22.83
1½	4.92	3.87	4 × Ø0.62	0.73	1.61	27.83
2	5.91	4.75	4 × Ø0.75	0.99	2.07	32.6
Surface roughness (flange): Ra 126 to 248 µin						

1) DN ⅜" with DN ½" flanges as standard

Tri-Clamp



A0015625

Length tolerance for dimension L in inch:
+0.06 / −0.08

¾" Tri-Clamp, for pipe according to DIN 11866 series C 1.4435 (316L) *Order code for "Process connection", option* **FEW**				
DN [in]	**Clamp [in]**	**A [in]**	**B [in]**	**L [in]**
⅜	¾	0.98	0.63	14.25
3-A version: order code for "Additional approval", option LP				

½" Tri-Clamp, for pipe according to DIN 11866 series C 1.4435 (316L) *Order code for "Process connection", option* **FBW**				
DN [in]	**Clamp [in]**	**A [in]**	**B [in]**	**L [in]**
½	½	0.98	0.37	18.35
3-A version: order code for "Additional approval", option LP				

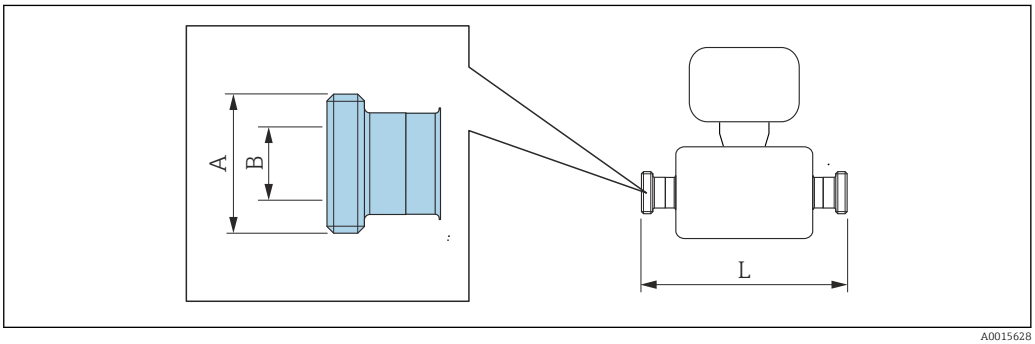
1" Tri-Clamp, for pipe according to DIN 11866 series C
1.4435 (316L)
Order code for "Process connection", option **FNW**

DN [in]	Clamp [in]	A [in]	B [in]	L [in]
⅜	1	1.98	0.87	14.25
½	1	1.98	0.87	18.35
3-A version: order code for "Additional approval", option LP				

1", 1½", 2" Tri-Clamp, for pipe according to DIN 11866 series C
1.4435 (316L)
Order code for "Process connection", option **FTW**

DN [in]	Clamp [in]	A [in]	B [in]	L [in]
⅜	½	0.98	0.37	14.25
½	¾	0.98	0.63	18.35
1	1	1.98	0.87	23.86
1½	1½	1.98	1.37	28.78
2	2	2.52	1.87	33.58
3-A version: order code for "Additional approval", option LP				

Threaded adapter connections SMS 1145



A0015628

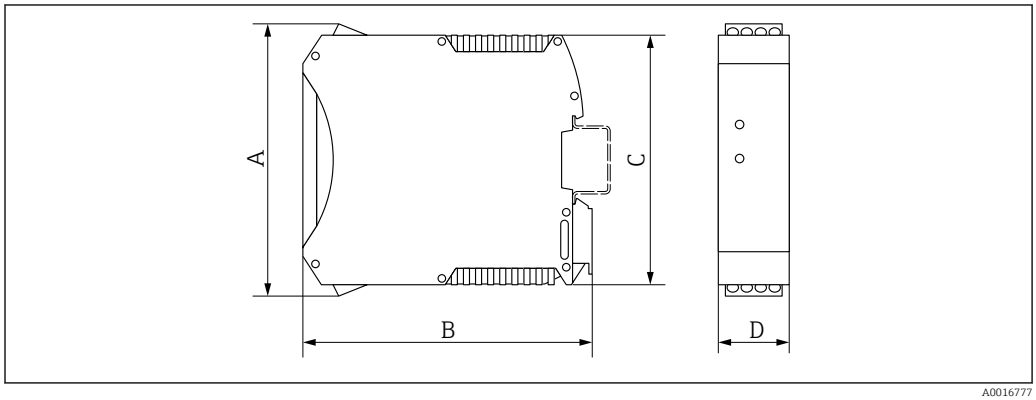
Length tolerance for dimension L in inch:
+0.06 / −0.08

Threaded adapter SMS 1145
1.4435 (316L)
Order code for "Process connection", option **SAW**

DN [in]	A [in]	B [in]	L [in]
⅜	Rd 40 × ⅙	0.89	14.25
½	Rd 40 × ⅙	0.89	18.35
1	Rd 40 × ⅙	0.89	23.86
1½	Rd 60 × ⅙	1.4	29.21
2	Rd 70 × ⅙	1.91	34.02
3-A version: order code for "Additional approval", option LP			

Safety Barrier Promass 100

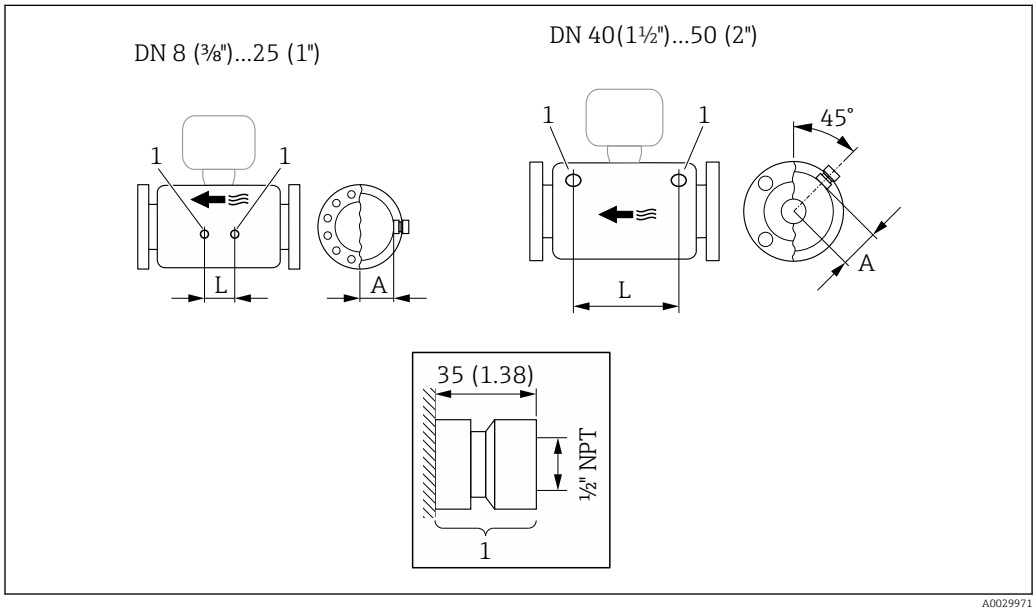
Top-hat rail EN 60715:
- TH 35 x 7.5
- TH 35 x 15



A	B	C	D
[in]	[in]	[in]	[in]
4.25	4.51	3.9	0.89

Accessories

Rinse connections



29

1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"

DN	A	L
[in]	[in]	[in]
⅜	1.85	4.33
½	1.85	8.03
1	1.85	13.7

DN	A	L
[in]	[in]	[in]
1½	2.683	16.46
2	3.215	18.62

Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges. Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Weight in SI units

DN [mm]	Weight [kg]
8	11
15	13
25	19
40	35
50	58

Weight in US units

DN [in]	Weight [lbs]
3/8	24
½	29
1	42
1½	77
2	128

Safety Barrier Promass 100

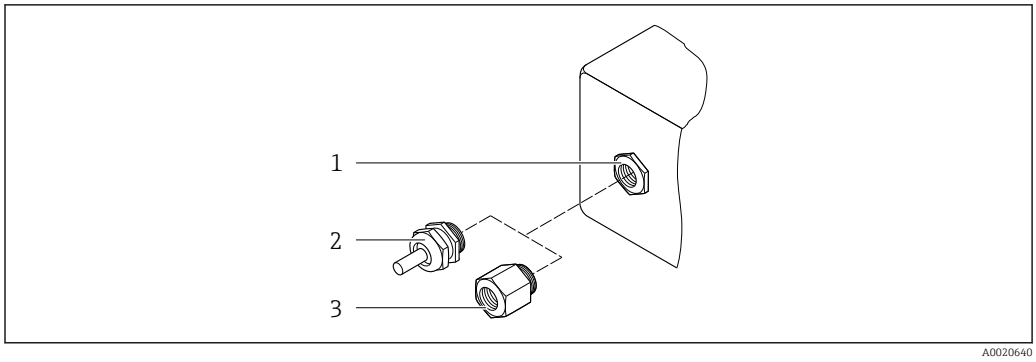
49 g (1.73 ounce)

Materials

Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, hygienic, stainless": Hygienic version, stainless steel 1.4301 (304)
- Order code for "Housing", option **C** "Ultra-compact, hygienic, stainless": Hygienic version, stainless steel 1.4301 (304)
- Window material for optional local display (→ 72):
  - For order code for "Housing", option **A**: glass
  - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands



30 Possible cable entries/cable glands

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

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

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

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

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

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

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

Device plug

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

Sensor housing

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

Measuring tubes

Stainless steel, 1.4435 (316L)

Process connections

Flange similar to EN 1092-1 (DIN 2501)/ASME B16.5/JIS B2220:	Stainless steel, 1.4404 (F316/F316L)
All other process connections:	Stainless steel, 1.4435 (316L)

Available process connections → 71

Seals

Welded process connections without internal seals

Accessories

Safety Barrier Promass 100

Housing: Polyamide

Process connections

- Fixed flange connections:
  - EN 1092-1 (DIN 2501) flange
  - EN 1092-1 (DIN 2512N) 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
  - DIN 11864-3 Form A clamp, DIN 11866 series A, with notch
  - DIN 32676 clamp, DIN 11866 series A
  - ISO 2852 clamp, ISO 2037
- Thread:
  - DIN 11851 thread, DIN 11866 series A
  - SMS 1145 thread
  - ISO 2853 thread, ISO 2037
  - DIN 11864-1 Form A thread, DIN 11866 series A

Process connection materials

Surface roughness

All data relate to parts in contact with medium.

The following surface roughness categories can be ordered:

Category	Method	Option(s)/Order code "Measuring tube mat., wetted surface"
Ra ≤ 0.76 µm (30 µin) [1]	Mechanically polished	SB

1) Ra according to ISO 21920

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Fast and safe commissioning

- Individual menus for applications
- Menu guidance with brief descriptions of the individual parameter functions

Reliable operation

- Operation in the following languages:
  - Via "FieldCare", "DeviceCare" operating tool:
    English, German, French, Spanish, Italian, Chinese, Japanese
  - Via integrated web browser (only available for device versions with HART, PROFIBUS DP, PROFINET and EtherNet/IP):
    English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish, Korean
- Uniform operating philosophy applied to operating tools and web browser
- If replacing the electronic module, transfer the device configuration via the plug-in memory (HistoROM DAT) which contains the process and measuring instrument data and the event logbook. No need to reconfigure.
  For devices with Modbus RS485, the data recovery function is implemented without the plug-in memory (HistoROM DAT).

Efficient diagnostic behavior increases measurement reliability

- Remedial action can be called up via the operating tools and web browser
- Diverse simulation options
- Status indicated by several light emitting diodes (LEDs) on the electronic module in the housing compartment

Local display

A local display is only available for device versions with the following communication protocols: HART, PROFIBUS-DP, PROFINET, EtherNet/IP

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

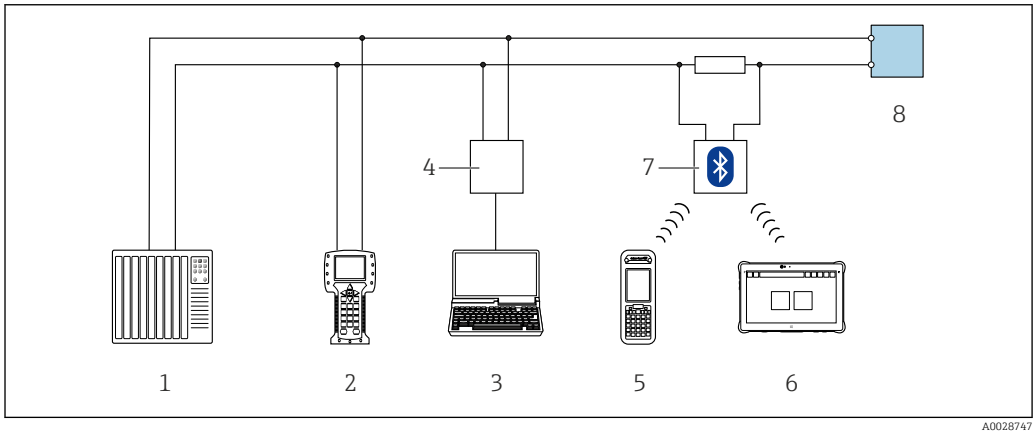
Display element

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

Remote operation

Via HART protocol

This communication interface is available in device versions with a HART output.

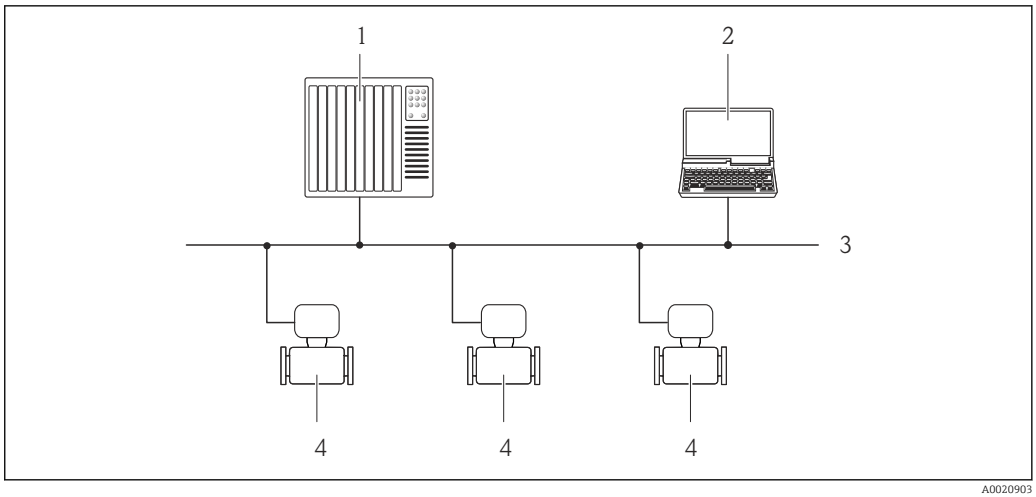


31 Options for remote operation via HART protocol

1 *Automation system (e.g. PLC)*
2 *Field Communicator 475*
3 *Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)*
4 *Commubox FXA195 (USB)*
5 *Field Xpert SFX350 or SFX370*
6 *Field Xpert SMT70*
7 *VIATOR Bluetooth modem with connecting cable*
8 *Transmitter*

Via PROFIBUS DP network

This communication interface is available in device versions with PROFIBUS DP.



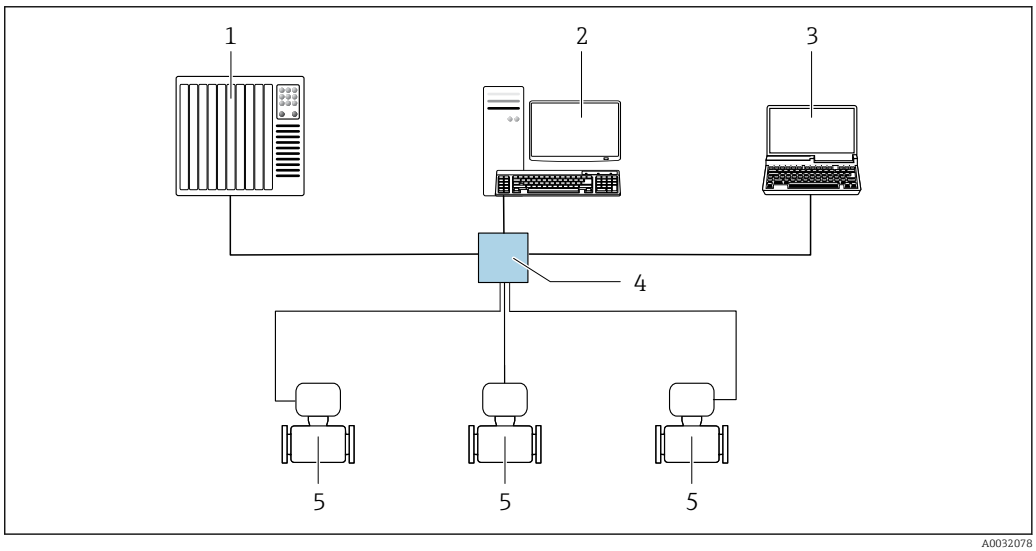
32 *Options for remote operation via PROFIBUS DP network*

1 Automation system
2 Computer with PROFIBUS network card
3 PROFIBUS DP network
4 Measuring instrument

Via EtherNet/IP network

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

Star topology



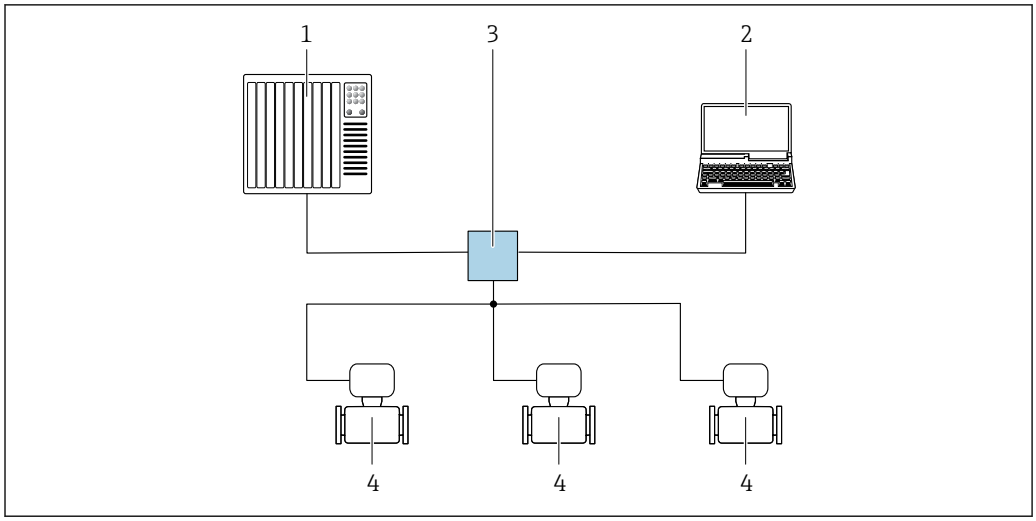
33 *Options for remote operation via Ethernet/IP network: star topology*

1 Automation system, z. B. "RSLogix" (Rockwell Automation)
2 Workstation for measuring instrument operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
3 Computer with web browser for accessing the integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
4 Standard Ethernet switch, e.g. Scalance X204 (Siemens)
5 Measuring instrument

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



34 Options for remote operation via PROFINET network: star topology

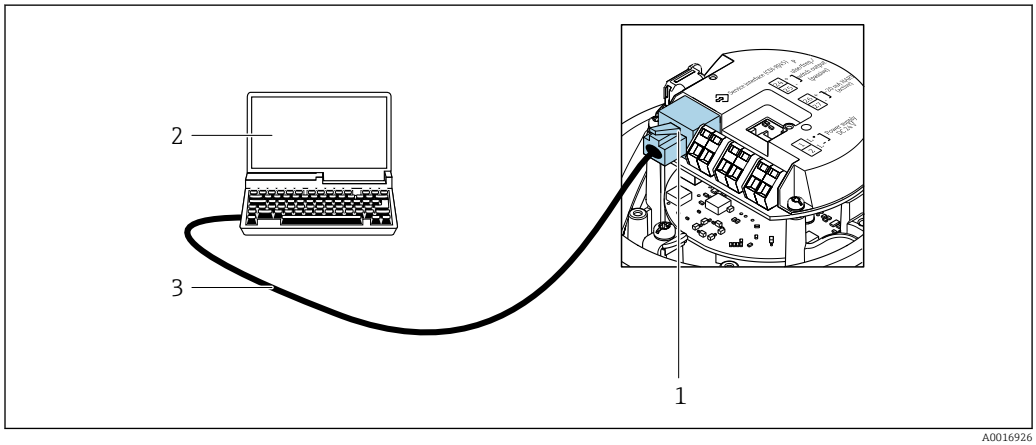
1 Automation system, e.g. Simatic S7 (Siemens)
2 Computer with web browser for accessing integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
3 Standard Ethernet switch, e.g. Scalance X204 (Siemens)
4 Measuring instrument

Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:
- Order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
- Order code for "Output", option **L**: PROFIBUS DP
- Order code for "Output", option **N**: Ethernet/IP
- Order code for "Output", option **R**: PROFINET

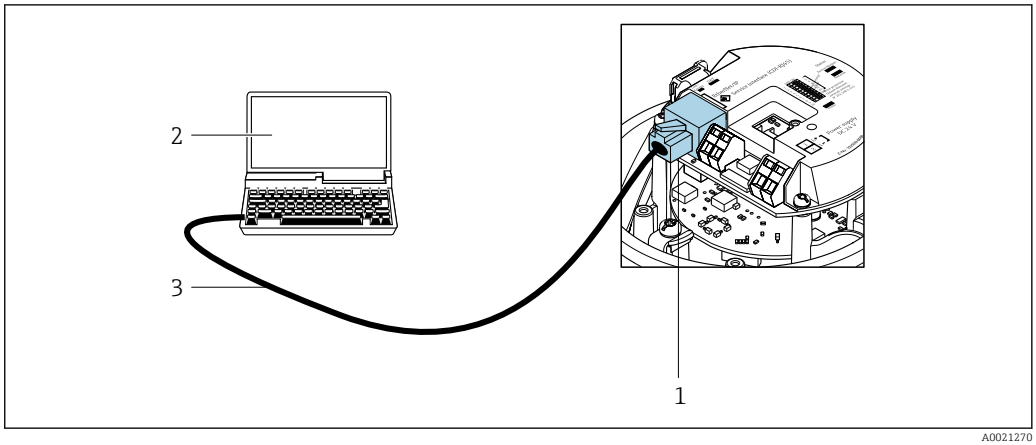
HART



35 Connection for the order code for "Output", option B: 4-20 mA HART, pulse/frequency/switch output

1 Service interface (CDI-RJ45) of the measuring instrument with access to the integrated web server
2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
3 Standard Ethernet connecting cable with RJ45 plug

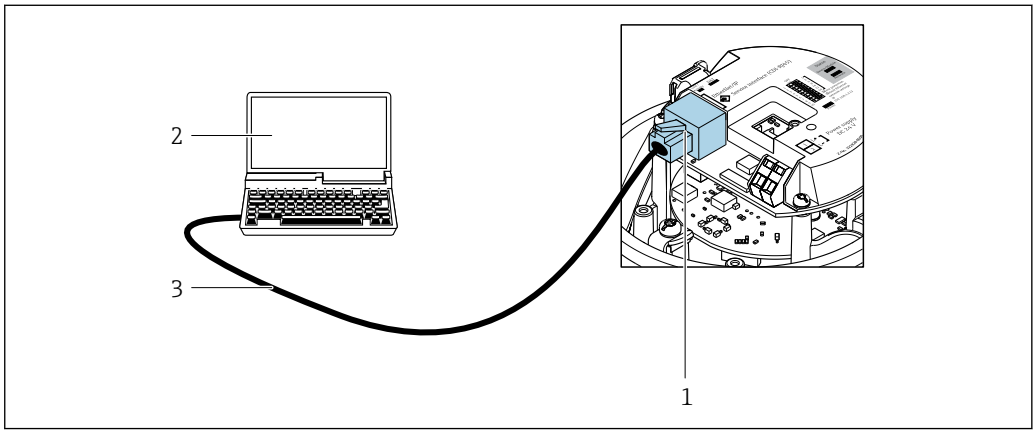
PROFIBUS DP



36 Connection for order code for "Output", option L: PROFIBUS DP

1 Service interface (CDI-RJ45) of the measuring instrument with access to the integrated web server
2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
3 Standard Ethernet connecting cable with RJ45 plug

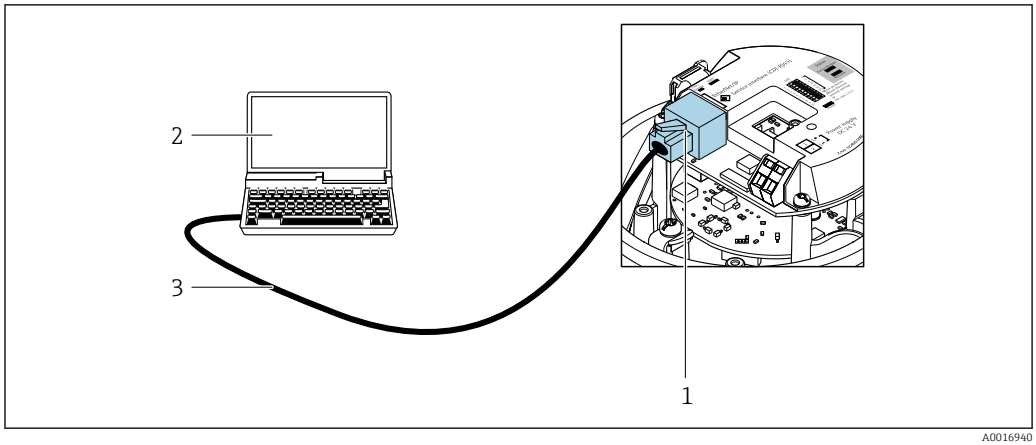
EtherNet/IP



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

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

PROFINET



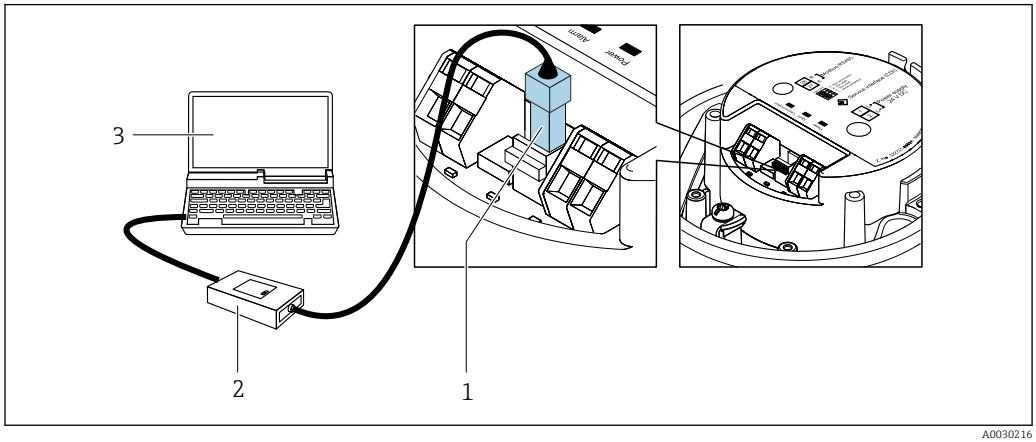
38 Connection for order code for "Output", option R: PROFINET

1 *Service interface (CDI-RJ45) and PROFINET interface of the measuring instrument with access to the integrated web server*
2 *Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"*
3 *Standard Ethernet connecting cable with RJ45 plug*

Via service interface (CDI)

This communication interface is present in the following device version:
Order code for "Output", option **M**: Modbus RS485

Modbus RS485



1 *Service interface (CDI) of the measuring instrument*
2 *Commubox FXA291*
3 *Computer with FieldCare operating tool with COM DTM "CDI Communication FXA291"*

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

UKCA marking

The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

Contact address Endress+Hauser UK:
Endress+Hauser Ltd.
Floats Road
Manchester M23 9NF
United Kingdom
www.uk.endress.com

RCM marking

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

Ex approval

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

The separate Ex documentation (XA) containing all the relevant explosion protection data is available from your Endress+Hauser sales center.

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.
    A remote display module must be installed in accordance with the 3-A Standard.
  - Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.
    Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG-tested (Type EL Class I)
  Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.
  To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedg.org).
  To meet the requirements for EHEDG certification, the orientation of the device must ensure drainability.
  Test criteria for cleanability according to EHEDG is a flow velocity of 1.5 m/s in the process line. This speed must be ensured for EHEDG-compliant cleaning.
- FDA CFR 21
- Food Contact Materials Regulation (EC) 1935/2004
- Food Contact Materials Regulation GB 4806
- The requirements of the Food Contact Material regulations must be observed when selecting the material versions.

Observe special installation instructions

Pharmaceutical compatibility

- FDA 21 CFR 177
- USP <87>
- USP <88> Class VI 121 °C
- 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.

HART certification

HART interface

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:
- Certified according to HART 7
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFIBUS

PROFIBUS interface

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
- Certified according to PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFINET

PROFINET interface

The measuring instrument is certified and registered by the PROFIBUS Nutzerorganisation e.V. (PNO). The measuring system meets all the requirements of the following specifications:
- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET Netload Class 2 100 Mbit/s
- The device can also be operated with certified devices of other manufacturers (interoperability).
- The device supports PROFINET S2 system redundancy.

EtherNet/IP certification

The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:
- Certified in accordance with the ODVA Conformance Test
- EtherNet/IP Performance Test
- EtherNet/IP PlugFest compliance
- The device can also be operated with certified devices of other manufacturers (interoperability)

Modbus RS485 certification

The measuring instrument meets all the requirements of the MODBUS RS485 conformity test and has the "MODBUS RS485 Conformance Test Policy, Version 2.0". The measuring instrument has successfully passed all the test procedures carried out.

Pressure Equipment Directive

The measuring instruments can be ordered with or without PED or PESR. If a device with PED or PESR is required, this must be ordered explicitly. For devices with nominal diameters less than or equal to DN 25 (NPS 1"), this is neither possible nor necessary. A UK order option must be selected for PESR under the order code for "Approvals".

- With the marking
  a) PED/G1/x (x = category) or
  b) PESR/G1/x (x = category)
  on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"
  a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
  b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices bearing this marking (PED or PESR) are suitable for the following types of medium:
  - Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
  - Unstable gases
- Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of
  a) Art. 4, Section 3 of the Pressure Equipment Directive 2014/68/EU or
  b) Part 1, Section 8 of Statutory Instruments 2016 No. 1105.
  The scope of application is indicated
  a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or
  b) in Schedule 3, Section 2 of Statutory Instruments 2016 No. 1105.

Additional certification

CRN approval

Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.

Tests and certificates

- EN10204-3.1 material certificate, wetted parts and sensor housing (order code for "Test, certificate", option JA)
- Pressure test, internal process, test report (order code for "Test, certificate", option JB)
- Surface roughness test ISO4287/Ra, (wetted parts), test report (option JE)
- Compliance with requirements derived from cGMP, Declaration (option JG)

External standards and guidelines

- 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.
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- GB 30439.5
  Safety requirements for industrial automation products - Part 5: Flowmeter safety requirements
- EN 61326-1/-2-3
  EMC requirements for electrical equipment for measurement, control and laboratory use
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
  The application of the pressure equipment directive to process control devices
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnostics of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications
- NAMUR NE 132
  Coriolis mass meter
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components.
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Product generation index

Release date	Product root	On change
01.06.2012	8S1B	Original
01.03.2016	8S1C	DN 08 to 50 measuring tube material 1.4435/316L DN 40 to 50 reduction in length DN 40 to 50 reduction in weight

More information is available from your Sales Center or at:
www.service.endress.com → Downloads

Application packages

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

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

Detailed information on the application packages:
Special Documentation → 83

Heartbeat Technology

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Heartbeat Verification
Meets the requirement for traceable verification in accordance with DIN ISO 9001:2015 Clause 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other 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
Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:
- Draw conclusions - using these data and other information - about the impact the process influences (e.g. corrosion, abrasion, deposit buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.g. gas pockets.

Detailed information on Heartbeat Technology:
Special Documentation → 83

Concentration measurement

Order code for "Application package", option ED "Concentration"

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:
Concentration calculation from user-defined tables.

The measured values are output via the digital and analog outputs of the measuring instrument.

For detailed information, see the Special Documentation for the device.

Special density

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

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

The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.

The following information can be found in the calibration certificate supplied:

- Density performance in air
- Density performance in liquids with different density
- Density performance in water with different temperatures

For detailed information, see the Operating Instructions for the device.

Accessories

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

Device-specific accessories

For the sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids. If using oil as a heating medium, please consult with Endress+Hauser. ▪ If ordered together with the measuring device: Order code for "Accessory enclosed" ▪ Option RB "Heating jacket, G 1/2" female thread" ▪ Option RC "Heating jacket, G 3/4" female thread" ▪ Option RD "Heating jacket, NPT 1/2" female thread" ▪ Option RE "Heating jacket, NPT 3/4" female thread" ▪ If ordered subsequently: Use the order code with the product root DK8003. Special Documentation SD02162D

Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. Technical Information TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. Technical Information TI00405C
HART loop converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. Operating Instructions BA00061S

Service-specific accessories

Accessory	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring instruments: ▪ Choice of measuring instruments for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy. ▪ Graphic display of the calculation results ▪ Determining the partial order code. Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: Via the Internet: https://portal.endress.com/webapp/applicator
Netilion	IIoT ecosystem: Unlock knowledge With the Netilion IIoT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem that enables you to gain useful insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant. www.netilion.endress.com
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices. ▪ Technical Information: TI01134S ▪ Innovation brochure: IN01047S

System components

Accessories	Description
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick. ▪ Technical Information TI00133R ▪ Operating Instructions BA00247R
iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature. "Fields of Activity" document FA00006T

Documentation

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

Standard documentation

Supplementary information on the semi-standard options is available in the relevant Special Documentation in the TSP database.

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring instrument	Documentation code
Proline Promass S	KA01287D

Brief Operating Instructions for the transmitter

	Documentation code				
Measuring instrument	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Proline Promass 100	KA01334D	KA01333D	KA01335D	KA01332D	KA01336D

Operating Instructions

	Documentation code				
Measuring device	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promass S 100	BA01193D	BA01254D	BA01060D	BA01068D	BA01432D

Description of Device Parameters

Measuring instrument	Documentation code				
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promass 100	GP01033D	GP01034D	GP01035D	GP01036D	GP01037D

Supplementary device-dependent documentation

Safety Instructions

Content	Documentation code
ATEX/IECEx Ex i	XA00159D
ATEX/IECEx Ex nA	XA01029D
cCSAus IS	XA00160D
INMETRO Ex i	XA01219D
INMETRO Ex nA	XA01220D
NEPSI Ex i	XA01249D
NEPSI Ex nA	XA01262D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Concentration measurement Ethernet/IP, HART, Modbus RS485, PROFIBUS DP	SD01152D
Concentration measurement PROFINET	SD01503D
Heartbeat Technology EtherNet/IP, HART, Modbus RS485, PROFIBUS DP	SD01153D
Heartbeat Technology PROFINET	SD01493D
Web server HART	SD01820D
Web server PROFIBUS DP	SD01821D

Contents	Documentation code
Web server EtherNet/IP	SD01822D
Web server PROFINET	SD01823D

Installation Instructions

Contents	Note
Installation instructions for spare part sets and accessories	The corresponding documentation code is listed with the relevant accessory.→ 🖹 81.

Registered trademarks

HART®
Registered trademark of the FieldComm Group, Austin, Texas USA

PROFIBUS®
Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

Ethernet/IP™
Trademark of ODVA, Inc.

PROFINET®
Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

TRI-CLAMP®
Registered trademark of Ladish & Co., Inc., Kenosha, USA

71726180

www.addresses.endress.com