Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Proline Promass F 100

Coriolis Mass Flow Measuring System
Unsurpassed accuracy and robustness combined with seamless system integration

Application

- Highest measurement accuracy for liquids and gases under varying process conditions.
- The Coriolis measuring principle operates independently of physical fluid properties, such as viscosity and density.

Device properties
- Mass flow: PremiumCal 0.05 %
- Immunity to varying process pressure and medium temperature
- Secondary containment: Max. 40 bar (580 psi)
- Ultra compact transmitter made of aluminum or stainless steel (316L)
- Communication via 4-20 mA HART, Pulse/ frequency/switch, EtherNet/IP and Modbus RS485
- Ex approvals accepted worldwide: ATEX, IECEx, cCSAus, NEPSI

Your benefits

Sensor for unsurpassed accuracy and robustness in demanding applications combined with an ultra compact transmitter

Sizing – correct product selection
Applicator– the reliable, easy-to-use tool for selecting and sizing measuring devices for every application

Installation – simple and efficient
- Immune to external piping forces and vibration
- No inlet/outlet runs required
- Reduced effort for wiring thanks to device plugs

Commissioning – reliable and intuitive
Integrated web server for fast commissioning

Operation – increased measurement availability
- Multivariable measurement: flow and density
- Immune to process influences
- Diagnostics; Automatic data restore by HistoROM

Cost-effective Life Cycle Management by W@M

TI01034D/06/EN/01.12
71165098

Endress+Hauser
People for Process Automation

Table of contents

Document information

Symbols used

Electrical symbols

Symbol	Meaning
A0011197	**Direct current** A terminal to which DC voltage is applied or through which direct current flows.
A0011198	**Alternating current** A terminal to which alternating voltage is applied or through which alternating current flows.
A0017381	**Direct current and alternating current** ■ A terminal to which alternating voltage or DC voltage is applied. ■ A terminal through which alternating current or direct current flows.
 A0011200	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 A0011199	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.
 A0011201	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

Symbols for certain types of information

Symbol	Meaning
 A0011182	**Allowed** Indicates procedures, processes or actions that are allowed.
 A0011183	**Preferred** Indicates procedures, processes or actions that are preferred.
 A0011184	**Forbidden** Indicates procedures, processes or actions that are forbidden.
 A0011193	**Tip** Indicates additional information.
 A0011194	**Reference to documentation** Refers to the corresponding device documentation.
 A0011195	**Reference to page** Refers to the corresponding page number.
 A0011196	**Reference to graphic** Refers to the corresponding graphic number and page number.

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
 A0013441	Flow direction

Symbol	Meaning
 A0011187	**Hazardous area** Indicates a hazardous area.
 A0011188	**Safe area (non-hazardous area)** Indicates a non-hazardous area.

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.

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

F_c = Coriolis force

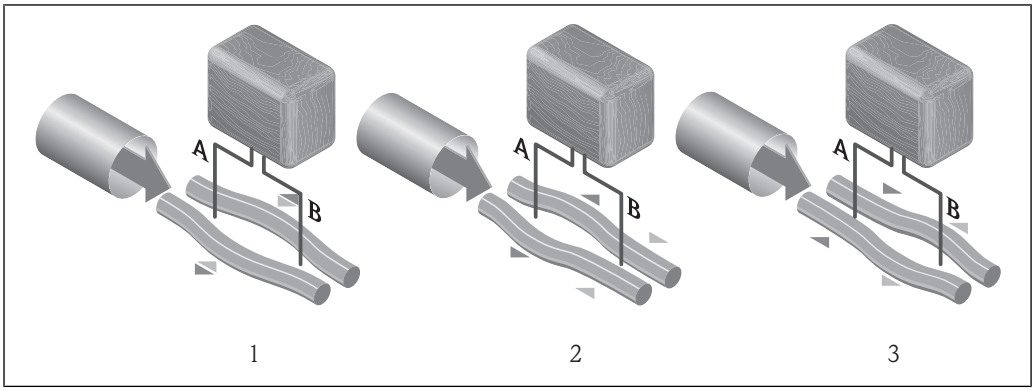
Δm = moving mass

ω = Rotational velocity

ν = radial velocity in rotating or oscillating system

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

In the sensor, two parallel measuring tubes containing flowing fluid oscillate in antiphase, acting like a tuning fork. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):
- At zero flow (when the fluid is at a standstill) the two tubes oscillate in phase (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).



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The phase difference (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 the two measuring tubes. 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 fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency is thus a function of fluid 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.

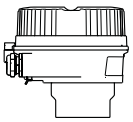
Measuring system

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.

One device version is available: compact version, transmitter and sensor form a mechanical unit.

Transmitter

Promass 100



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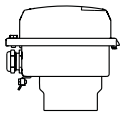

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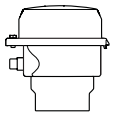

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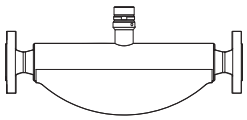
Device versions and materials:
- Compact:
  - Aluminum coating AlSi10Mg
  - Hygienic version, stainless steel 1.4301/304
  - Hygienic version, stainless steel 1.4404/316L
- Ultra-compact:
  - Hygienic version, stainless steel 1.4301/304
  - Hygienic version, stainless steel 1.4404/316L

Configuration:
- Via operating tools (e.g. FieldCare)
- Also for device version with 4-20 mA HART, pulse/frequency/switch output: Via Web browser (e.g. Microsoft Internet Explorer)
- Also for device version with EtherNet/IP output:
  - Via Web browser (e.g. Microsoft Internet Explorer)
  - Via Add-on Profile Level 3 for automation system from Rockwell Automation
  - Via Electronic Data Sheet (EDS)

Sensor

Promass F



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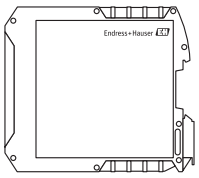
- Excellent performance across a wide range of applications
- Simultaneous measurement of flow, volume flow, density and temperature (multivariable)
- Immune to process influences
- Nominal diameters: DN 8 to 250 (3/8 to 10")
- Materials:
  - Sensor: Stainless steel 1.4301/304; optional 1.4404/316L
  - Measuring tubes: Stainless steel 1.4539/904L; 1.4404/316L; Alloy C-22 2.4602/N 06022
  - Stainless steel 1.4404/316L; Alloy C-22 2.4602/N 06022

Safety Barrier Promass 100



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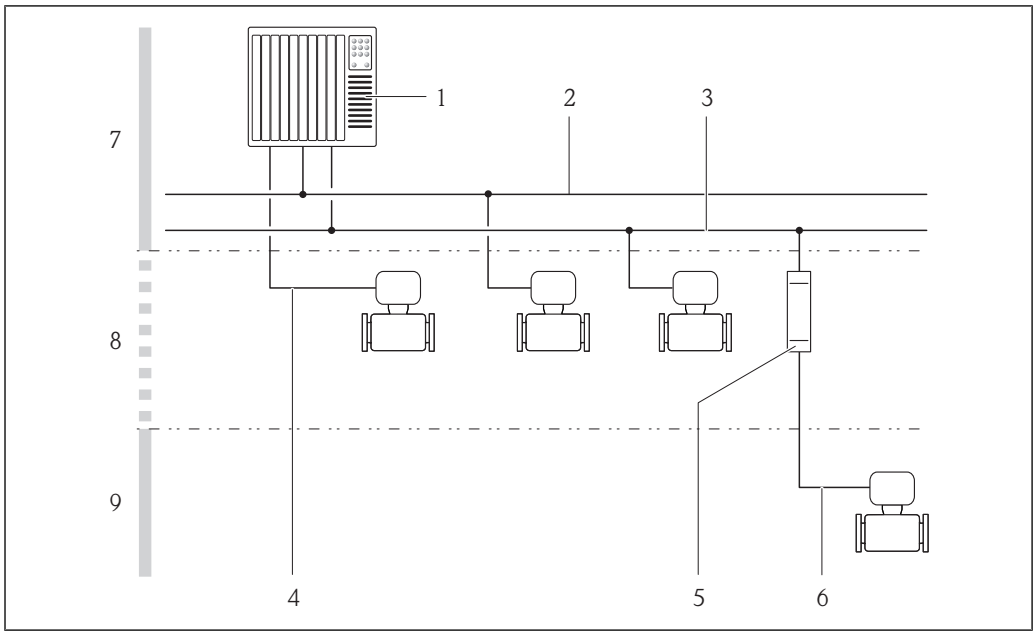
- Dual-channel safety barrier for installation in non-hazardous locations or zone 2/div. 2:
  - Channel 1: DC 24 V power supply
  - Channel 2: Modbus RS485
- In addition to current, voltage and power limitation, it offers galvanic isolation of circuits for explosion protection.
- Easy top-hat rail mounting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

Device architecture



1 Possibilities for integrating measuring devices into a system

1 Control system (e.g. PLC)
2 EtherNet/IP
3 Modbus RS485
4 4-20 mA HART, pulse/frequency/switch output
5 Safety Barrier Promass 100
6 Modbus RS485 intrinsically safe
7 Non-hazardous area
8 Non-hazardous area and zone 2/div. 2
9 Intrinsically safe area

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring ranges for liquids

DN		Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	3/8	0 to 2000	0 to 73.5
15	½	0 to 6500	0 to 238
25	1	0 to 18000	0 to 660
40	1 ½	0 to 45000	0 to 1650
50	2	0 to 70000	0 to 2570
80	3	0 to 180000	0 to 6600
100	4	0 to 350000	0 to 12860

DN		Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
150	6	0 to 800 000	0 to 29 400
250	10	0 to 2 200 000	0 to 80 840

Measuring ranges for gases

The full scale values depend on the density of the gas and can be calculated with the formula below:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_G : x$

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

DN		x
[mm]	[in]	[kg/m³]
8	3/8	60
15	½	80
25	1	90
40	1 ½	90
50	2	90
80	3	110
100	4	130
150	6	200
250	10	200

To calculate the measuring range, use the *Applicator* sizing tool (→ 67)

Calculation example for gas
- Sensor: Promass F, DN 50
- Gas: Air with a density of 60.3 kg/m³ (at 20 °C and 50 bar)
- Measuring range (liquid): 70 000 kg/h
- x = 90 kg/m³ (for Promass F, DN 50)

Maximum possible full scale value:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_G : x = 70\,000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 : 90 \text{ kg/m}^3 = 46\,900 \text{ kg/h}$

Recommended measuring range

"Flow limit" section (→ 39)

Operable flow range

Over 1000 : 1. Flow rates above the preset full scale value are not overridden by the electronics unit, with the result that the totalizer values are registered correctly.

Input signal

Fieldbuses

To increase the accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring device via Modbus RS485 or EtherNet/IP:
- Process pressure or fluid temperature to increase accuracy (e.g. external values from Cerabar M, Cerabar S or iTEMP)
- Reference density for calculating the corrected volume flow

- Various pressure transmitters and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section (→ 67)
- Please comply with the special mounting instructions if using pressure transmitters and temperature measuring devices (→ 30)

Output

Output signal

Current output

Current output	4-20 mA HART (active)
Maximum output values	■ DC 24 V (when idle) ■ 22.5 mA
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Adjustable: 0 to 999 s
Assignable measured variables	■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature

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	Adjustable: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	Adjustable: 0 to 10 000 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s

Number of switching cycles	Unlimited
Assignable functions	■ Off ■ On ■ Diagnostic behavior ■ Limit value ■ Flow direction monitoring ■ Status – Partial filled pipe detection – Low flow cut off

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

Signal on alarm

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

Current output

4-20 mA

Failure mode	Selectable (as per NAMUR recommendation NE 43): ■ Minimum alarm: 3.6 mA ■ Maximum alarm: 22 mA ■ Adjustable value: 3.59 to 22.5 mA

HART

Device diagnostics	Device condition can be read out via HART Command 48

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: ■ Actual value ■ No pulses
Frequency output	
Failure mode	Choose from: ■ Actual value ■ Defined value: 0 to 12 500 Hz ■ 0 Hz
Switch output	
Failure mode	Choose from: ■ Current status ■ Open ■ Closed

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

Operating tool

- Via digital communication: HART protocol
- Via service interface

Plain text display	With information on cause and remedial measures

Additional information on remote operation (→ 62)

Web browser

Plain text display	With information on cause and remedial measures

Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes The following information is displayed depending on the device version: ■ Supply voltage active ■ Data transmission active ■ Device alarm/error has occurred ■ EtherNet/IP network available ■ EtherNet/IP connection established

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 (A)**	**27 (B)**
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 (A)**	**72 (B)**

U_o = 16.24 V I_o = 623 mA P_o = 2.45 W For IIC*: L_o = 92.8 µH, C_o = 0.433 µF, L_o/R_o = 14.6 µH/Ω For IIB*: L_o= 372 µH, C_o = 2.57 µF, L_o/R_o = 58.3 µH/Ω
* The gas group depends on the sensor and nominal diameter. 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

Transmitter

Intrinsically safe values

Order code for "Approvals"	Terminal numbers			
	Supply voltage		Signal transmission	
	20 (L-)	10 (L+)	62 (A)	72 (B)
■ 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			
* The gas group depends on the sensor and nominal diameter. 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.

Galvanic isolation

The following connections are galvanically isolated from each other:
- Outputs
- Voltage supply

Protocol-specific data

HART

Manufacturer ID	0x11
Device type ID	0x4A
HART protocol revision	6.0
Device description files (DTM, DD)	Information and files under: www.endress.com

HART load	Min. 250 Ω
Dynamic variables	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

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	■ 1 200 BAUD ■ 2 400 BAUD ■ 4 800 BAUD ■ 9 600 BAUD ■ 19 200 BAUD ■ 38 400 BAUD ■ 57 600 BAUD ■ 115 200 BAUD
Data transmission mode	■ ASCII ■ RTU
Data access	Each device parameter can be accessed via Modbus RS485.  For Modbus register information (→ 68)

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

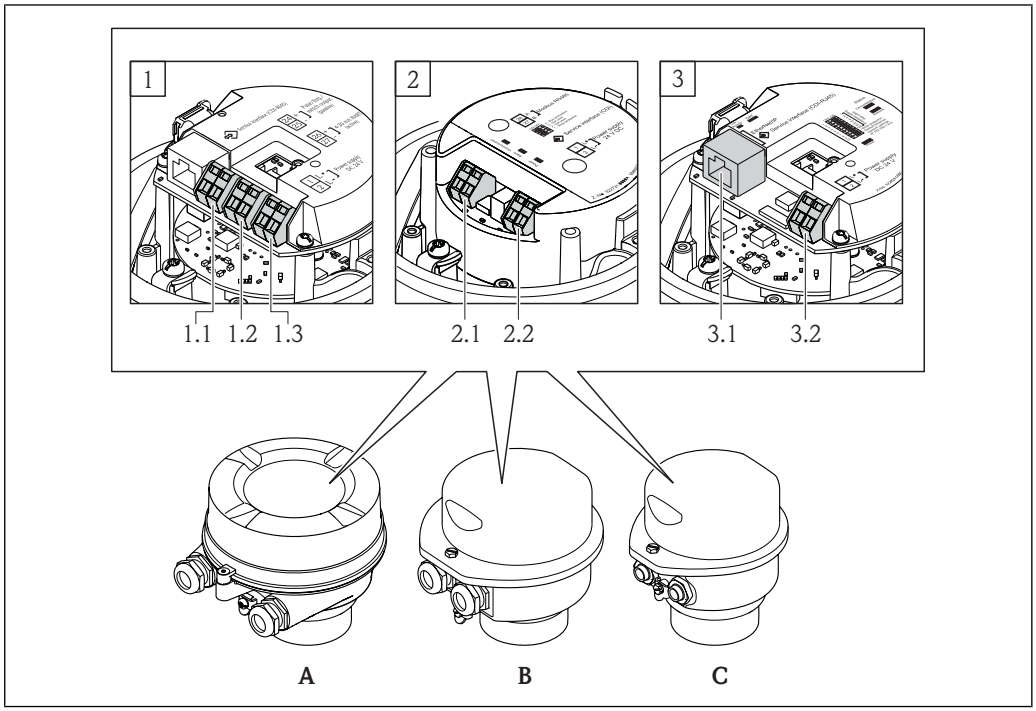
Device profile	Generic device (product type: 0x43)			
Baud rates	Automatic 10/100 Mbit with half-duplex and full-duplex detection			
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs			
Supported CIP connections	Max. 3 connections			
Explicit connections	Max. 5 connections			
I/O connections	Max. 4 connections (scanner)			
Configuration options for measuring device	■ 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) embedded in the measuring device			
Configuration of MAC parameters	■ Speed: Auto ■ Duplex: Auto			
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				
Exclusive Owner Multicast		Instance	Size [Byte]	RPI [ms]
	Instance configuration:	0x68	398	-
	O → T configuration:	0x66	64	5
	T → O configuration:	0x64	44	5
Input only Multicast		Instance	Size [Byte]	RPI [ms]
	Instance configuration:	0x68	398	-
	O → T configuration:	0x67	0	-
	T → O configuration:	0x64	44	5
Input Assembly	■ Current device diagnostics ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3			
Configurable Input				
Exclusive Owner Multicast		Instance	Size [Byte]	RPI [ms]
	Instance configuration:	0x68	398	-
	O → T configuration:	0x66	64	5
	T → O configuration:	0x65	88	5

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	■ 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 – Operating mode – Failure mode ■ Alarm delay

Power supply

Terminal assignment

Overview: housing version - signal transmission - terminals/connectors



A Housing version: compact, aluminum coated
B Housing version: compact hygienic, stainless
C Housing version: ultra-compact hygienic, stainless, connector M12
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 version: EtherNet/IP
3.1 Signal transmission
3.2 Supply voltage

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

- Order code for "Housing", option **A**: compact, aluminum coated
- Order code for "Housing", option **B**: compact hygienic, stainless

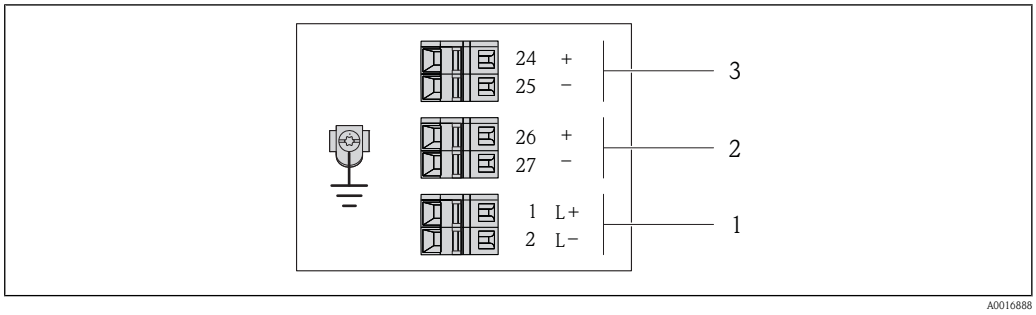
Order code for "Output"	Connection method		Order code for "Electrical connection"
	For supply voltage	For output	
■ Option **B**: 4-20 mA HART, pulse/ frequency/switch output ■ Option **M**: Modbus RS485, for use in intrinsically safe areas ■ Option **M**: Modbus RS485, for use in non-hazardous areas and Zone 2/ Div. 2	Terminals(→ 17)	Terminals(→ 17)	■ Option **A**: coupling M20x1 ■ Option **B**: thread M20x1 ■ Option **C**: thread G ½" ■ Option **D**: thread NPT ½"
■ Option **B**: 4-20 mA HART, pulse/ frequency/switch output ■ Option **M**: Modbus RS485, for use in non-hazardous areas and Zone 2/ Div. 2 ■ Option **N**: EtherNet/IP	Terminals(→ 17)	Connector (→ 18)	■ Option **L**: connector M12 + thread NPT ½" ■ Option **N**: connector M12x1 + coupling M20 ■ Option **P**: connector M12x1 + thread G ½" ■ Option **U**: connector M12x1 + thread M20
■ Option **B**: 4-20 mA HART, pulse/ frequency/switch output ■ Option **M**: Modbus RS485, for use in non-hazardous areas and Zone 2/ Div. 2 ■ Option **N**: EtherNet/IP	Connector (→ 18)	Connector (→ 18)	Option **Q**: 2 x connector M12x1
Option **M**: Modbus RS485, for use in intrinsically safe areas	Connector (→ 18)		Option **I**: connector M12x1

Order code for "Housing", option **C**: ultra-compact hygienic, stainless, connector M12

Order code for "Output"	Connection method		Order code for "Electrical connection"
	For supply voltage	For output	
■ Option **B**: 4-20 mA HART, pulse/ frequency/switch output ■ Option **M**: Modbus RS485, for use in non-hazardous areas and Zone 2/ Div. 2 ■ Option **N**: EtherNet/IP	Connector (→ 18)	Connector (→ 18)	Option **Q**: 2 x connector M12x1
Option **M**: Modbus RS485, for use in intrinsically safe areas	Connector (→ 18)		Option **I**: connector M12x1

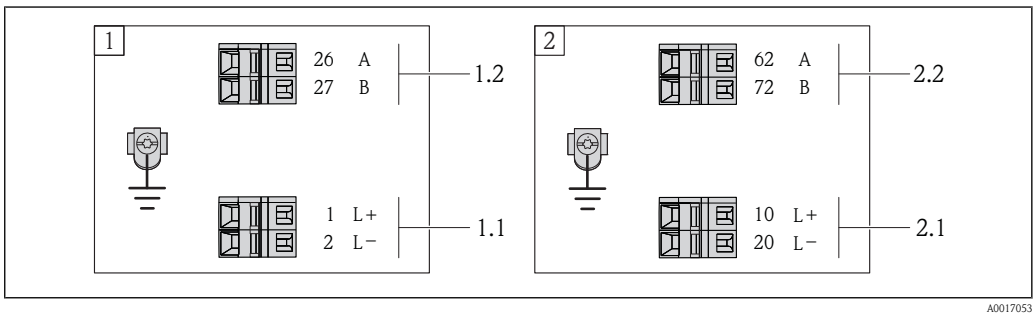
Transmitter

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



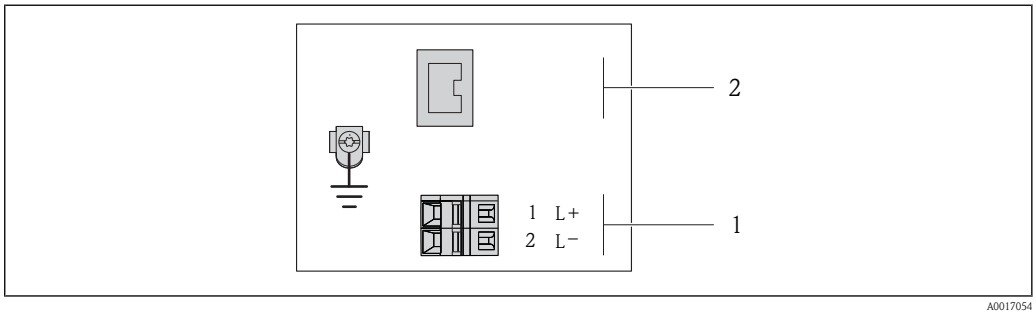
1 Order code for "Power supply", option D: DC 24 V
2 Order code for "Output", option B: 4-20 mA HART (active, output 1)
3 Order code for "Output", option B: pulse/frequency/switch output (passive, output 2)

Modbus RS485 connection version



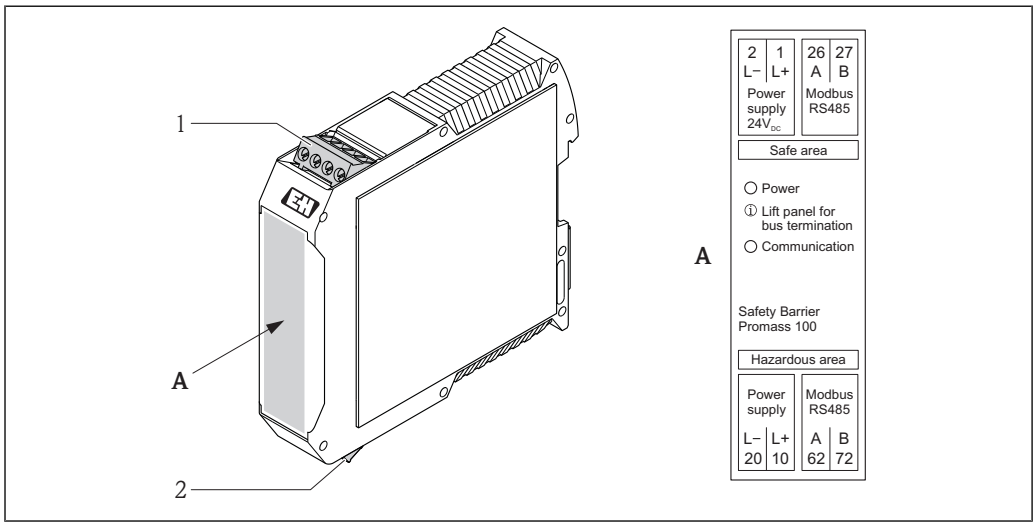
1 Connection version for use in non-hazardous areas and Zone 2/Div. 2
1.1 Order code for "Power supply", option D: DC 24 V
1.2 Order code for "Output", option M: Modbus RS485
2 Connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)
2.1 Order code for "Power supply", option D: DC 24 V
2.2 Order code for "Output", option M: Modbus RS485

EtherNet/IP connection version



1 Order code for "Power supply", option D: DC 24 V
2 Order code for "Output", option N: EtherNet/IP

Safety Barrier Promass 100



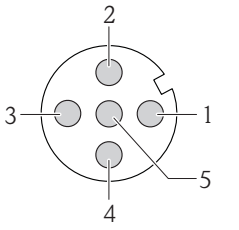
2 Safety Barrier Promass 100 with terminals

1 Non-hazardous area and Zone 2/Div. 2
2 Intrinsically safe area

Pin assignment, device plug

For information on the order codes for the M12x1 connector (→ 16), see the "**Electrical connection**" order code column.

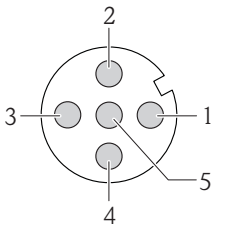
Supply voltage for all communication types except Modbus RS485 intrinsically safe (on the device side)



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

The following is recommended as a socket:
- Binder, series 763, part no. 79 3440 35 05
- Alternatively: Phoenix part no. 1669767 SAC-5P-M12MS
  - For the order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
  - For the order code for "Output", option **N**: EtherNet/IP
- When using the device in a hazardous location: Use a suitably certified socket.

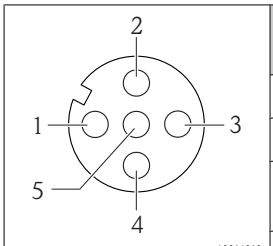
Modbus RS485 intrinsically safe with supply voltage (on the device side)



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

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

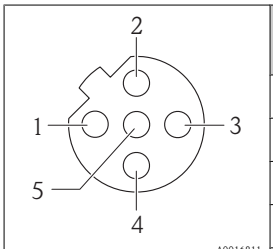
4-20 mA HART, pulse/frequency/switch output (on the device side)



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

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

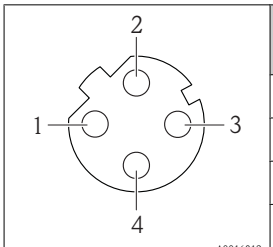
Modbus RS485, non-hazardous areas and zone 2/Div. 2 (on the device side)



Pin	Assignment		Coding	Connector/ socket
1			B	Socket
2	A	Modbus RS485		
3				
4	B	Modbus RS485		
5		Shielding		

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

EtherNet/IP (on the device side)



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

Recommended connector:
- 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 connector.

Supply voltage

Transmitter

- For device version with all communication methods except Modbus RS485 intrinsically safe: DC 20 to 30 V
- For device version with Modbus RS485 intrinsically safe: power supply via Safety Barrier Promass 100

Safety Barrier Promass 100

DC 20 to 30 V

Power consumption

Transmitter

Order code for "Output"	Maximum power consumption
Option **B**: 4-20mA HART, Pulse/frequency/switch output Option **N**: EtherNet/IP Option **M**: Modbus RS485, for use in non-hazardous areas and zone 2/div. 2	3.3 W

Option **M**: Modbus RS485, for use in intrinsically safe areas	2.45 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, pulse/frequency/switch output	145 mA	18 A (< 0.125 ms)
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)

Safety Barrier Promass 100

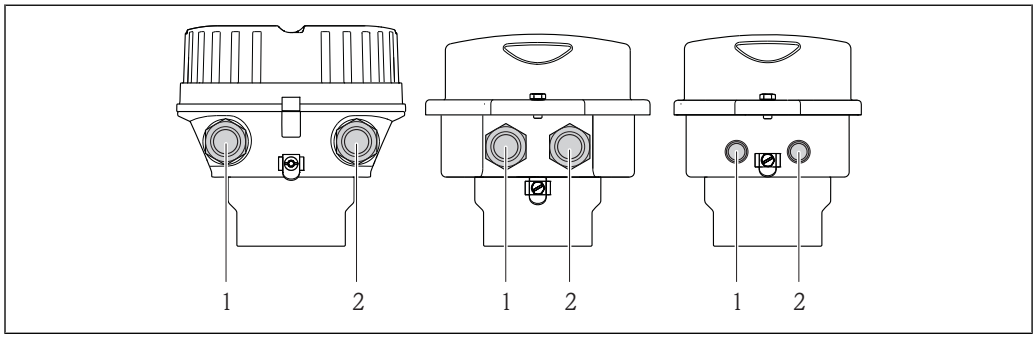
Order code for "Output"	Maximum current consumption	Maximum switch-on current
Option **M**: Modbus RS485, for use in intrinsically safe areas	230 mA	10 A (< 0.8 ms)

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

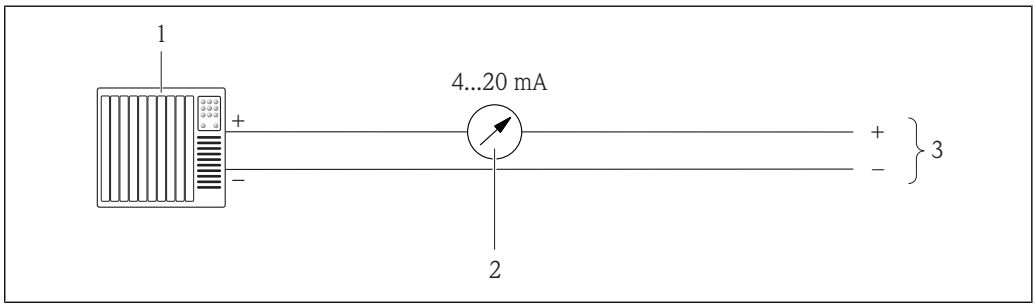
Connecting the transmitter



1 Cable entry or connector for signal transmission
2 Cable entry or connector for supply voltage

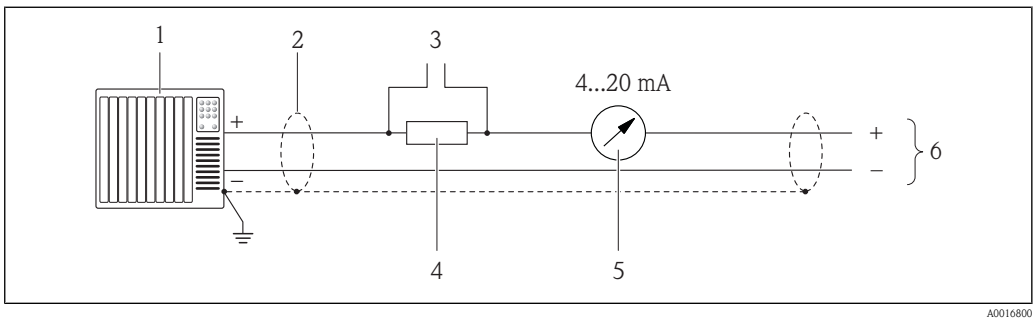
In the case of device versions with a connector, the transmitter housing does not need to be opened to connect the signal cable or power supply cable.

Connection examples



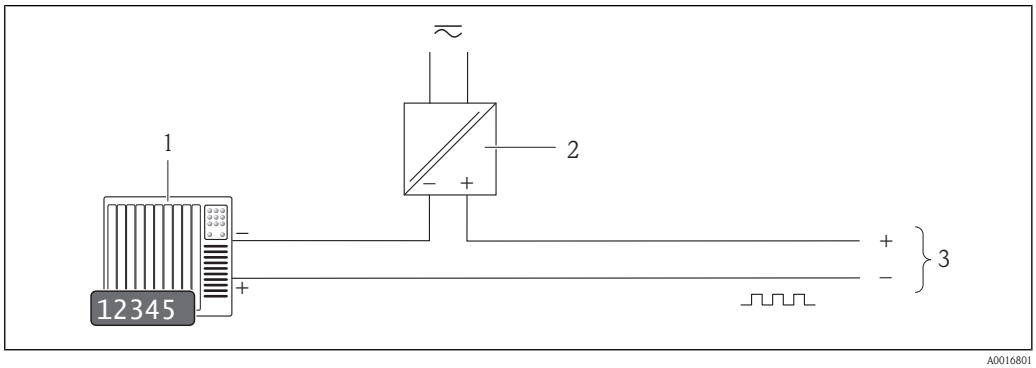
3 Connection example for 4-20 mA current output (active)

1 Automation system with current input (e.g. PLC)
2 Analog display unit: observe maximum load (→ 8)
3 Transmitter



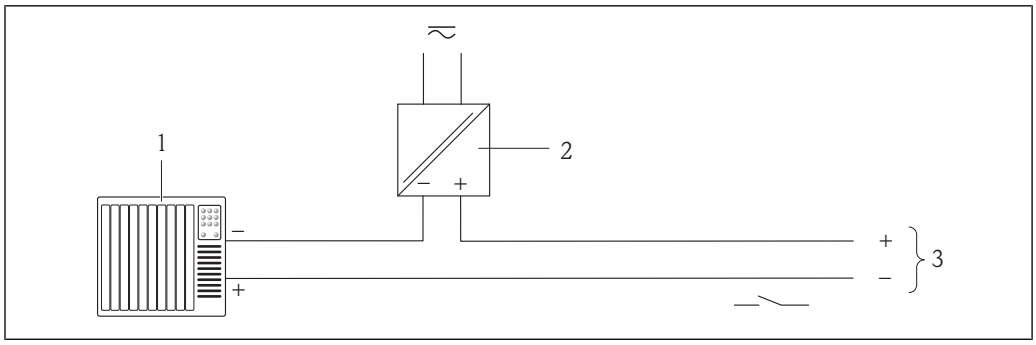
4 Connection example for 4-20 mA HART current output (active)

1 Automation system with current input (e.g. PLC)
2 Observe cable specification (→ 23)
3 Connection for HART operating devices (→ 62)
4 Resistor for HART communication (≥ 250 Ω): observe maximum load (→ 8)
5 Analog display unit: observe maximum load (→ 8)
6 Transmitter



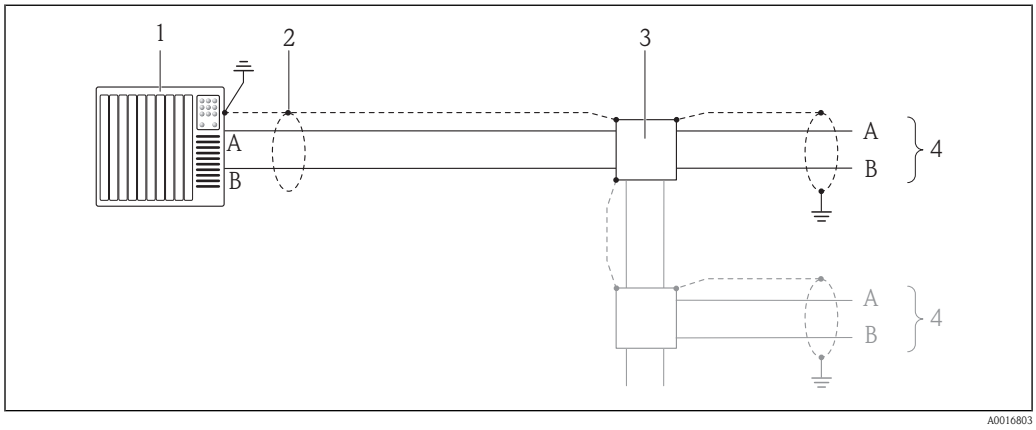
5 Connection example for pulse/frequency output (passive)

1 Automation system with pulse/frequency input (e.g. PLC)
2 Voltage supply
3 Transmitter: observe input values (→ 8)



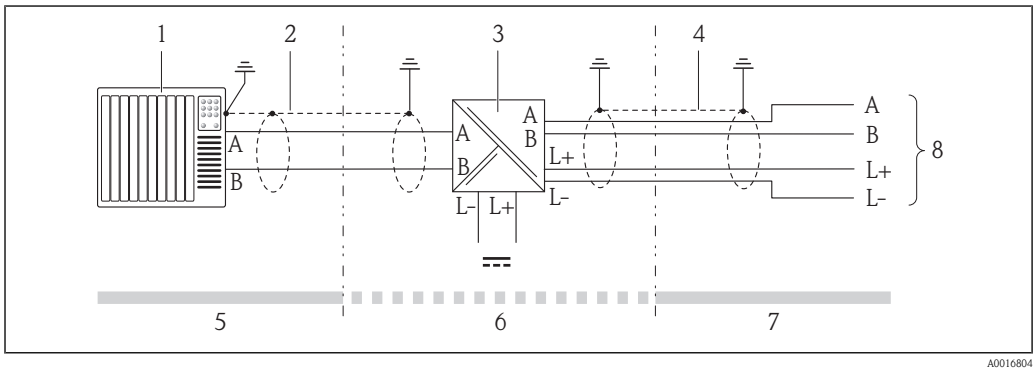
6 *Connection example for switch output (passive)*

1 *Automation system with switch input (e.g. PLC)*
2 *Voltage supply*
3 *Transmitter: observe input values (→ 8)*



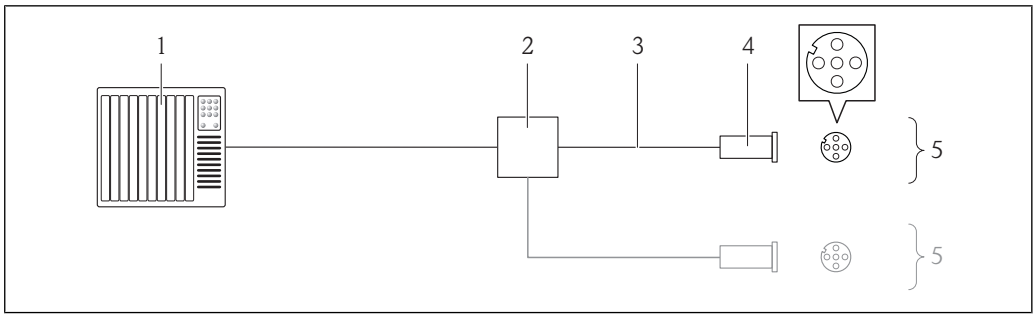
7 *Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2*

1 *Control system (e.g. PLC)*
2 *The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications (→ 23)*
3 *Distribution box*
4 *Transmitter*



8 *Connection example for Modbus RS485 intrinsically safe*

1 *Control system (e.g. PLC)*
2 *Observe cable specification (→ 23)*
3 *Safety Barrier Promass 100*
4 *Observe cable specification (→ 23)*
5 *Non-hazardous area*
6 *Non-hazardous area and Zone 2/Div. 2*
7 *Intrinsically safe area*
8 *Transmitter*



9 Connection example for EtherNet/IP

1 Control system (e.g. PLC)
2 Ethernet switch
3 Observe cable specification (→ 24)
4 Connector
5 Transmitter

Potential equalization

No special measures for potential equalization are required.

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

Terminals

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

Safety Barrier Promass 100
Plug-in screw terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

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

Cable specification

Permitted temperature range

- –40 °C (–40 °F)...≥ 80 °C (176 °F)
- Minimum requirement: cable temperature range ≥ ambient temperature + 20 K

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output

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

Pulse/frequency/switch output

Standard installation cable is sufficient.

Modbus RS485

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

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	< 30 pF/m
Core cross-section	> 0.34 mm² (22 AWG)

Cable type	Twisted pairs
Loop resistance	≤ 110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shielding	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

EtherNet/IP

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

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

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 (→ 🖹 10).

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 with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol ±5 °C (±9 °F) and ±2 bar (±29 psi)
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.

To obtain measured errors, use the *Applicator* sizing tool (→ 🖹 67)

Maximum measured error

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

Base accuracy

Mass flow and volume flow (liquids)
±0.05 % o.r. (PremiumCal, for mass flow)
±0.10 %

Mass flow (gases)
±0.35 % o.r.

Design fundamentals (→ 🖹 28)

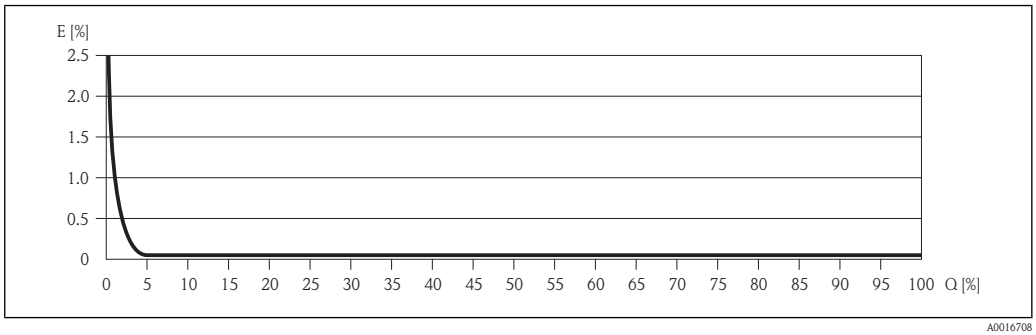
Density (liquids)
- Reference conditions: ±0.0005 g/cm³
- Wide-range density specification: ±0.001 g/cm³ (valid range for special density calibration: 0.0 to 2 g/cm³, +5 to +80 °C (+41 to +176 °F))

Temperature
±0.5 °C ± 0.005 · T °C (±0.9 °F ± 0.005 · (T – 32) °F)

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	3/8	0.030	0.001
15	1/2	0.200	0.007
25	1	0.540	0.019
40	1½	2.25	0.083
50	2	3.50	0.129
80	3	9.00	0.330
100	4	14.00	0.514
150	6	32.00	1.17
250	10	88.00	3.23

Example for max. measured error



E *Error: Maximum measured error as % o.r. (example using PremiumCal)*
Q *Flow rate as %*

Design fundamentals (→ 28)

Flow values

Flow values as turndown parameter depending on nominal diameter.

SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
8	2000	200	100	40	20	4
15	6500	650	325	130	65	13
25	18000	1800	900	360	180	36
40	45000	4500	2250	900	450	90
50	70000	7000	3500	1400	700	140

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]
80	180 000	18 000	9 000	3 600	1 800	360
100	350 000	35 000	17 500	7 000	3 500	700
150	800 000	80 000	40 000	16 000	8 000	1 600
250	2 200 000	220 000	110 000	44 000	22 000	4 400

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]
3/8	73.5	7.35	3.675	1.47	0.735	0.147
1/2	238	23.8	11.9	4.76	2.38	0.476
1	660	66	33	13.2	6.6	1.32
1½	1 650	165	82.5	33	16.5	3.3
2	2 570	257	128.5	51.4	25.7	5.14
3	6 600	660	330	132	66	13.2
4	12 860	1 286	643	257.2	128.6	25.72
6	29 400	2 940	1 470	588	294	58.8
10	80 840	8 084	4 042	1 616.8	808.4	161.68

Accuracy of outputs

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

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

Current output

Accuracy	Max. ±0.05 % o.f.s. or ±10 µA

Pulse/frequency output

Accuracy	Max. ±50 ppm o.r.

Repeatability

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

Mass flow and volume flow (liquids)
±0.025 % o.r. (PremiumCal, for mass flow)
±0.05 % o.r.

Mass flow (gases)
±0.25 % o.r.

Design fundamentals (→ 28)

Density (liquids)
±0.00025 g/cm³

Temperature
±0.25 °C ± 0.0025 · T °C (±0.45 °F ± 0.0025 · (T–32) °F)

Response time

- The response time depends on the configuration (damping).
- Response time in the event of erratic changes in the measured variable (only mass flow): after 100 ms 95 % of the full scale value

Influence of ambient temperature

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

Current output

Temperature coefficient	Max. ±50 ppm/°C o.f.s. or ±1 µA/°C

Pulse/frequency output

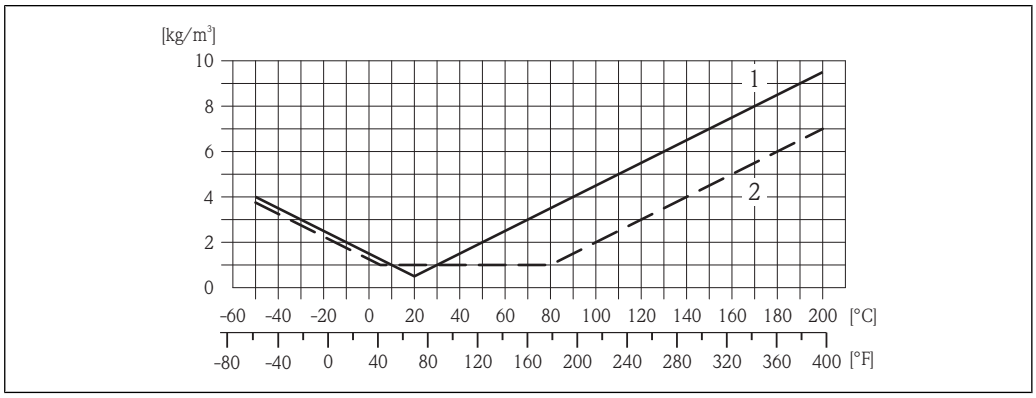
Temperature coefficient	Max. ±50 ppm o.r./100 °C

Influence of medium temperature

Mass flow and volume flow
When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the sensor is ±0.0002 % of the full scale value/°C (±0.0001 % of the full scale value/°F).

Density
When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is ±0.00005 g/cm³ /°C (±0.000025 g/cm³ /°F). Field density calibration is possible.

Wide-range density specification (special density calibration)
If the process temperature is outside the calibrated range (+5 to +80 °C (+41 to +176 °F)), the measured error is ±0.00005 g/cm³ /°C (±0.000025 g/cm³ /°F)



1 Field density calibration
2 Special density calibration

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

Influence of medium pressure

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

o.r. = of reading

DN		[% o.r./bar]
[mm]	[in]	
8	3/8	no influence
15	½	no influence
25	1	no influence
40	1½	–0.003
50	2	–0.008
80	3	–0.009
100	4	–0.007

DN		[% o.r./bar]
[mm]	[in]	
150	6	–0.009
250	10	–0.009

Design fundamentals

Dependent on the flow:
Flow ≥ zero point stability : (base accuracy : 100)
– Maximum measured error as % o.r.: ±Base accuracy
– Repeatability as % o.r.: ±½ · Base accuracy

Flow < zero point stability : (base accuracy : 100)
– Maximum measured error as % o.r.: ± (zero point stability : measured value) · 100
– Repeatability as % o.r..: ±½ · (zero point stability : measured value) · 100

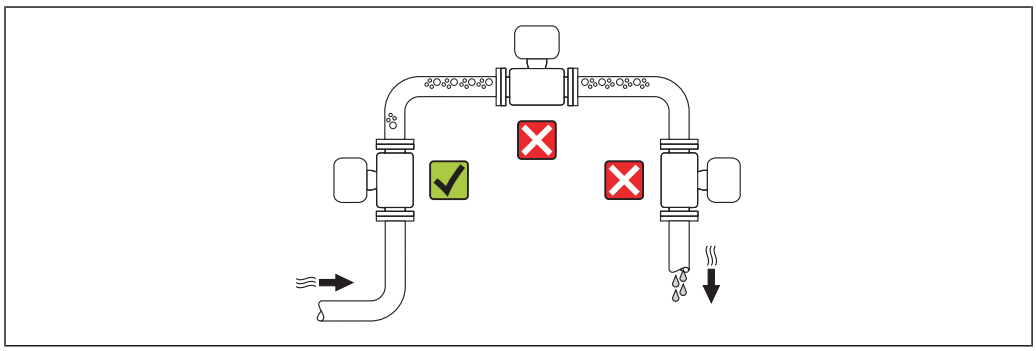
o.r. = of reading

Base accuracy for	[% o.r.]
Mass flow, liquids, PremiumCal	0.05
Mass flow, liquids	0.10
Volume flow, liquids	0.10
Mass flow, gases	0.35

Installation

No special measures such as supports are necessary. External forces are absorbed by the construction of the device.

Mounting location

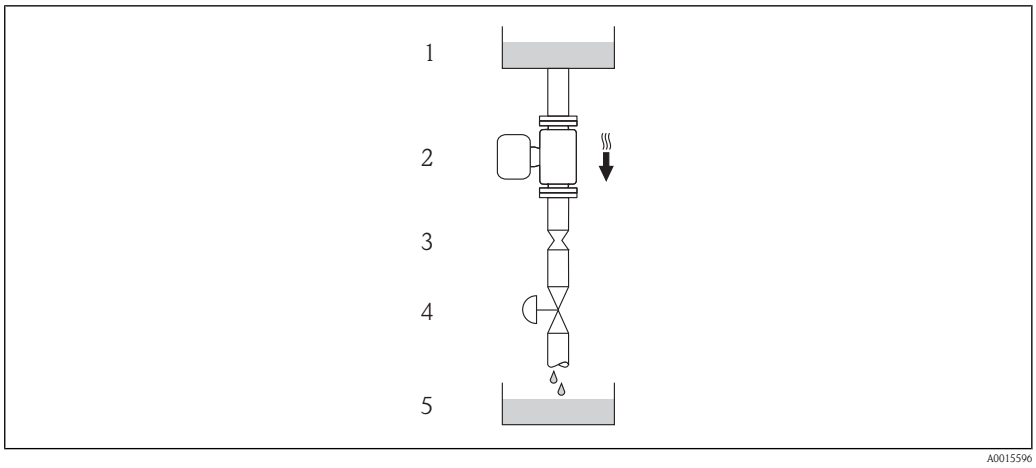


A0015595

To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:
- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

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



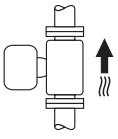
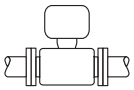
10 Installation in a down pipe (e.g. for batching applications)

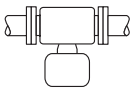
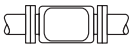
1 Supply tank
2 Sensor
3 Orifice plate, pipe restriction
4 Valve
5 Batching tank

DN		∅ Orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	3/8	6	0.24
15	½	10	0.40
25	1	14	0.55
40	1½	22	0.87
50	2	28	1.10
80	3	50	2.00
100	4	65	2.60
150	6	90	3.54
250	10	150	5.91

Orientation

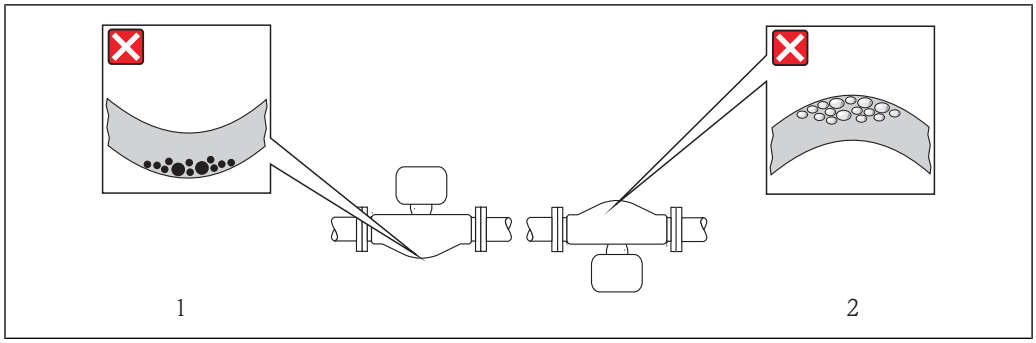
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

Orientation			Recommendation
A	Vertical orientation	 A0015591	✓✓
B	Horizontal orientation, transmitter head up	 A0015589	✓✓ Exception: (→ 11, 30)

Orientation			Recommendation
C	Horizontal orientation, transmitter head down	 A0015590	✓✓ 1) Exception: (→ 11, 30)
D	Horizontal orientation, transmitter head at side	 A0015592	✗

1) 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 fluid properties.



A0014057

11 *Orientation of sensor with curved measuring tube*

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

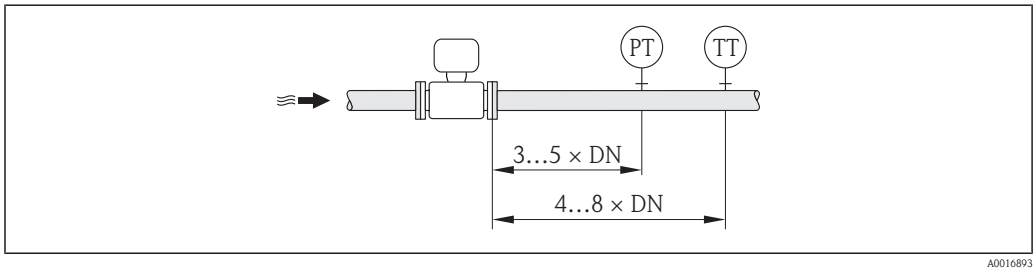
Inlet and outlet runs

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs (→ 39).

Special mounting instructions

Outlet run for peripheral device

If a pressure and temperature measuring device are installed downstream from the measuring device, make sure there is sufficient distance between the two devices.



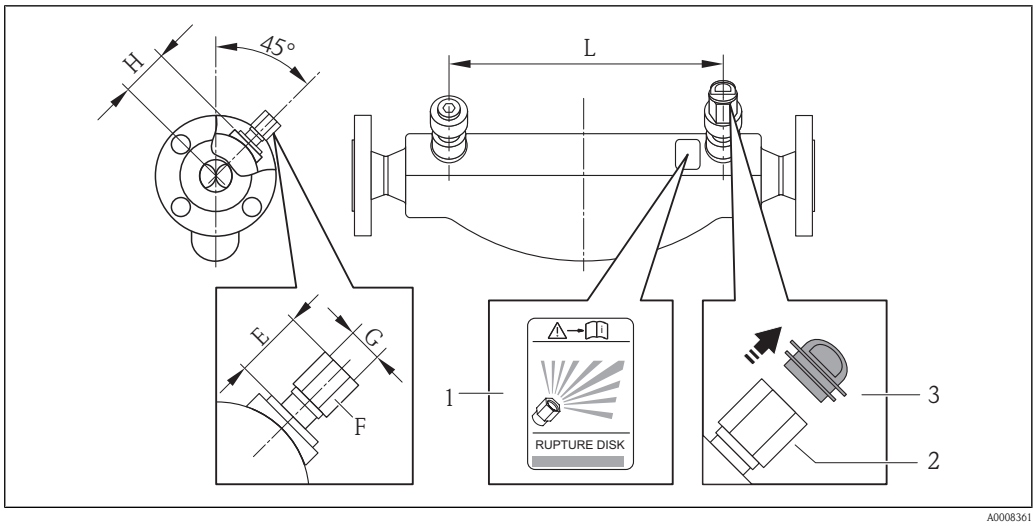
A0016893

PT Pressure measuring device
TT Temperature measuring device

Rupture disk

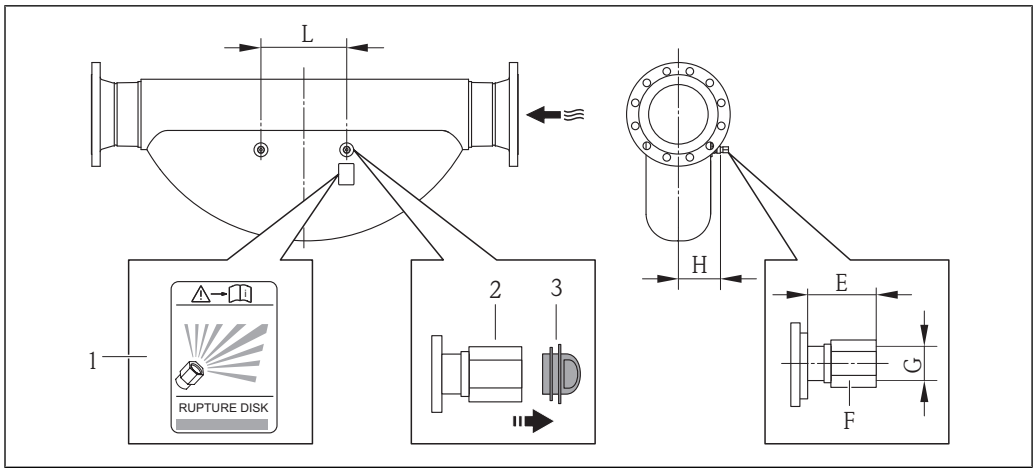
Make sure that the function and operation of the rupture disk is not impeded through the installation of the device. The position of the rupture disk is indicated on a sticker beside it.

The existing connecting nozzles are not designed for a rinse or pressure monitoring function.



1 Indication label for the rupture disk
2 Rupture disk with 1/2" NPT internal thread with 1" width across flat
3 Transport protection

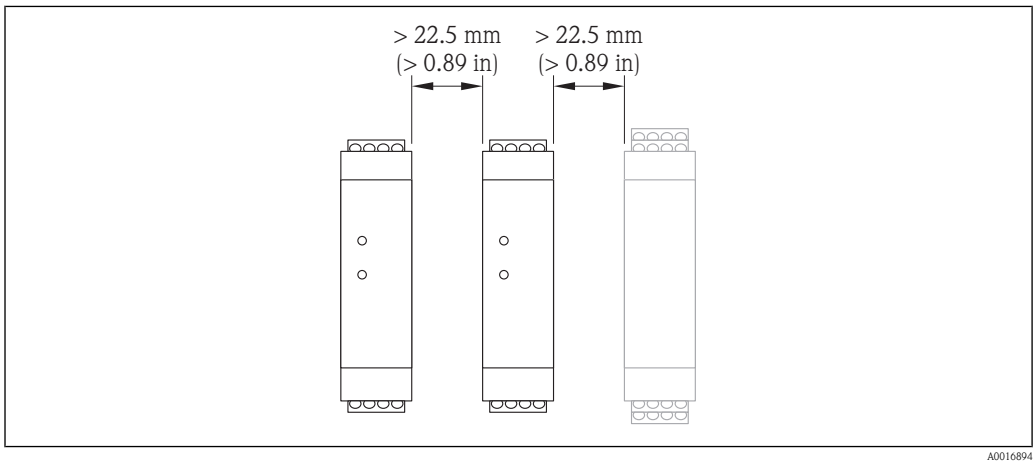
DN		E		F	G	H		L	
[mm]	[in]	[mm]	[in]	[in]	[in]	[mm]	[in]	[mm]	[in]
8	3/8	Approx. 42	Approx. 1.65	AF 1	½ NPT	62	2.44	216	8.50
15	1/2	Approx. 42	Approx. 1.65	AF 1	½ NPT	62	2.44	220	8.66
25	1	Approx. 42	Approx. 1.65	AF 1	½ NPT	62	2.44	260	10.24
40	1½	Approx. 42	Approx. 1.65	AF 1	½ NPT	67	2.64	310	12.20
50	2	Approx. 42	Approx. 1.65	AF 1	½ NPT	79	3.11	452	17.78
80	3	Approx. 42	Approx. 1.65	AF 1	½ NPT	101	3.98	560	22.0
100	4	Approx. 42	Approx. 1.65	AF 1	½ NPT	120	4.72	684	27.0
150	6	Approx. 42	Approx. 1.65	AF 1	½ NPT	141	5.55	880	34.6



1 Indication label for the rupture disk
2 Rupture disk with 1/2" NPT internal thread with 1" width across flat
3 Transport protection

DN		E		F	G	H		L	
[mm]	[in]	[mm]	[in]	[in]	[in]	[mm]	[in]	[mm]	[in]
250	10	Approx. 42	Approx. 1.65	AF 1	½ NPT	182	7.17	380	14.96

Mounting Safety Barrier Promass100



12 Minimum distance between additional Safety Barrier Promass 100 or other modules

Environment

Ambient temperature range

Measuring device	–40 to +60 °C (–40 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.

Temperature tables

The following interdependencies between the permitted ambient and fluid temperatures apply when operating the device in hazardous areas:

Ex ia, $_{C}CSA_{US}$ IS

SI units

Order code for "Housing"	T_a [°C]	T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
Option A "Compact coated alu" Option B "Compact hygienic, stainless"	35	50	85	120	150	150	150
	50	–	85	120	150	150	150
	60	–	–	120	150	150	150
Option C "Ultra compact hygienic, stainless, M12 device plug"	35	50	85	120	150	150	150
	45	–	85	120	150	150	150
	50	–	–	120	150	150	150

US units

Order code for "Housing"	T_a [°F]	T6 [185 °F]	T5 [212 °F]	T4 [275 °F]	T3 [392 °F]	T2 [572 °F]	T1 [842 °F]
Option A "Compact coated alu" Option B "Compact hygienic, stainless"	95	122	185	248	302	302	302
	122	–	185	248	302	302	302
	140	–	–	248	302	302	302
Option C "Ultra compact hygienic, stainless, M12 device plug"	95	122	185	248	302	302	302
	113	–	185	248	302	302	302
	122	–	–	248	302	302	302

Ex nA, $_{C}CSA_{US}$ NI

SI units

Order code for "Housing"	T_a [°C]	T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
Option A "Compact coated alu" Option B "Compact hygienic, stainless"	35	50	85	120	150	150	150
	50	–	85	120	150	150	150
	60	–	–	120	150	150	150
Option C "Ultra compact hygienic, stainless, M12 device plug"	50	–	85	120	150	150	150
	60	–	–	120	150	150	150

US units

Order code for "Housing"	T_a [°F]	T6 [185 °F]	T5 [212 °F]	T4 [275 °F]	T3 [392 °F]	T2 [572 °F]	T1 [842 °F]
Option A "Compact coated alu" Option B "Compact hygienic, stainless"	95	122	185	248	302	302	302
	122	–	185	248	302	302	302
	140	–	–	248	302	302	302
Option C "Ultra compact hygienic, stainless, M12 device plug"	122	–	185	248	302	302	302
	140	–	–	248	302	302	302

Storage temperature

–40 to +80 °C (–40 to +176 °F), preferably at +20 °C (+68 °F)

Climate class

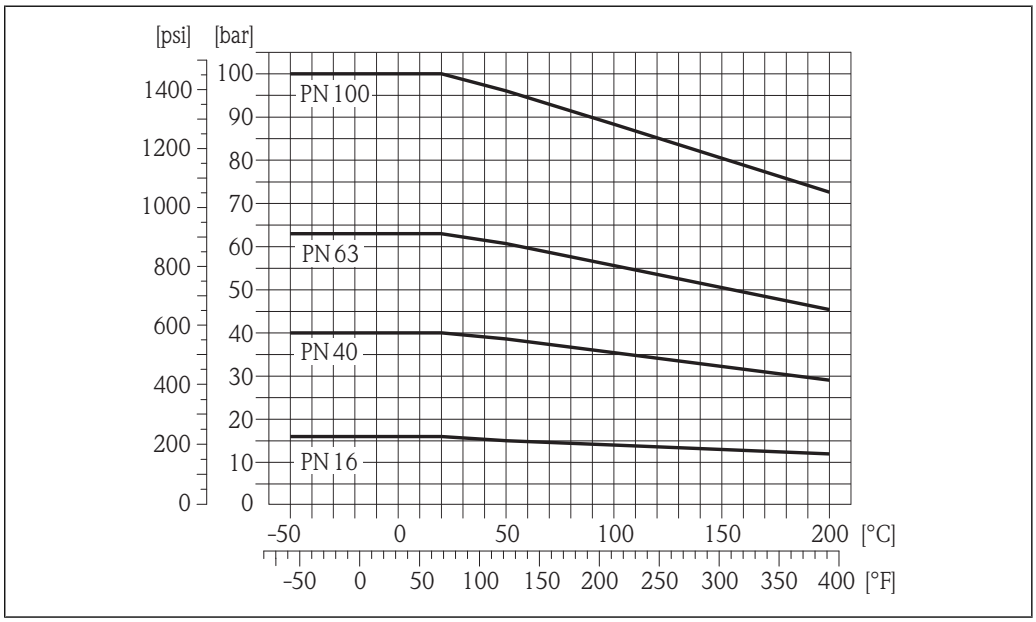
DIN EN 60068-2-38 (test Z/AD)

Degree of protection	**Transmitter and sensor** ■ As standard: IP66/67, type 4X enclosure ■ With the order code for "Sensor options", option **CM**: IP69K can also be ordered ■ When housing is open: IP20, type 1 enclosure **Safety Barrier Promass 100** IP20
Shock resistance	As per IEC/EN 60068-2-31
Vibration resistance	Acceleration up to 1 g, 10 to 150 Hz, based on IEC/EN 60068-2-6
Interior cleaning	■ SIP cleaning ■ CIP cleaning
Electromagnetic compatibility (EMC)	■ As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21) ■ Device version with Modbus RS485 or EtherNet/IP: Complies with emission limits for industry as per EN 55011 (Class A) ■ Device version with 4-20 mA HART: Complies with emission limits for industry as per EN 55011 Details are provided in the Declaration of Conformity.

Process

Medium temperature range	**Sensor** ■ –50 to +150 °C (–58 to +302 °F) ■ –50 to +200 °C (–58 to +392 °F) with extended temperature (order code for "Measuring tube mat." option SD, SE, SF, TH) **Seals** No internal seals
Medium density	0 to 5 000 kg/m^3 (0 to 312 lb/cf)
Pressure-temperature ratings	The following material load diagrams refer to the entire device and not just the process connection.

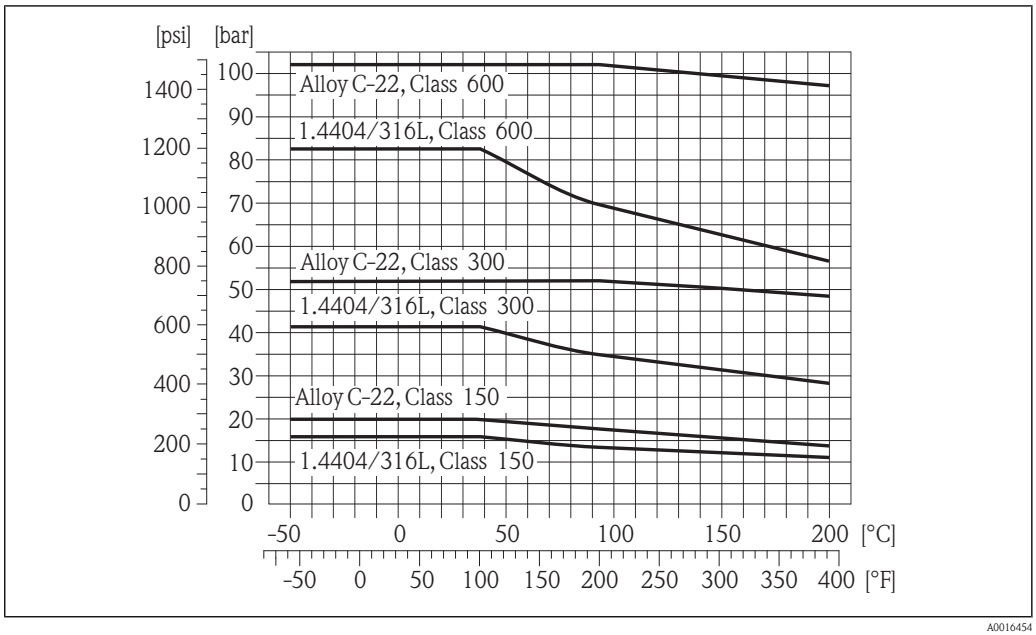
Flange connection according to EN 1092-1 (DIN 2501)



13 With flange material 1.4404/316L, Alloy C-22

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

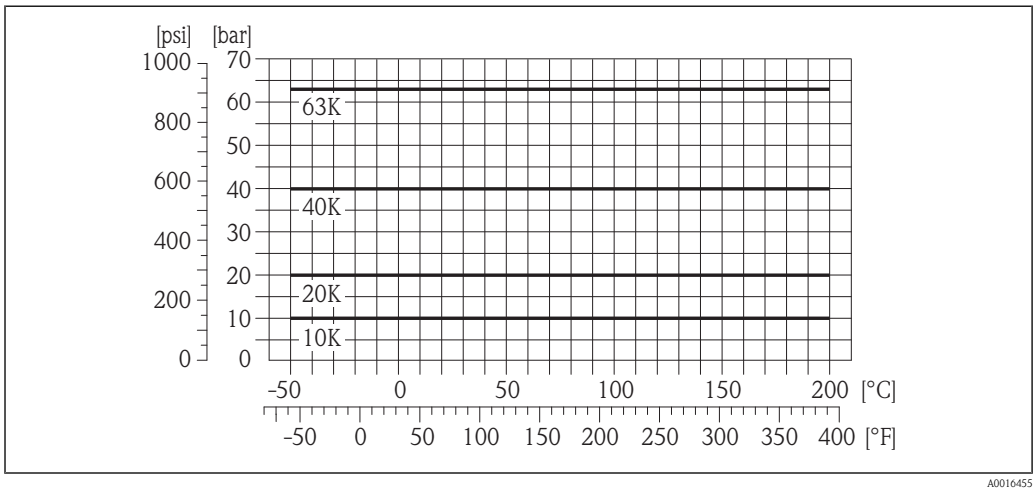
Flange connection according to ASME B16.5



14 With flange material 1.4404/316L, Alloy C-22

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

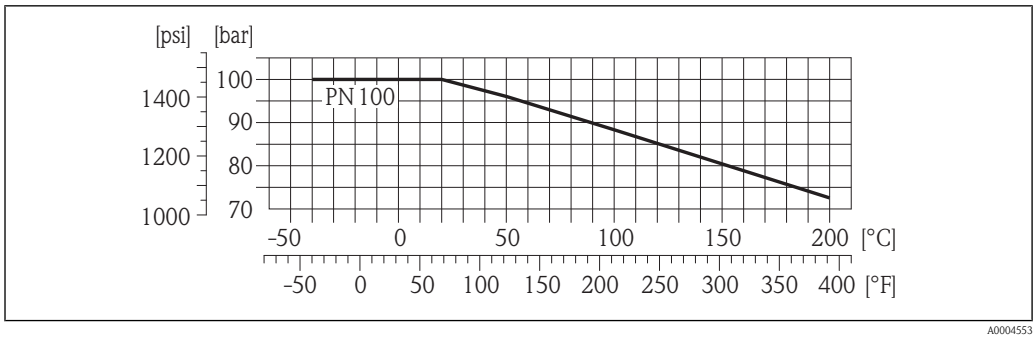
Flange connection to JIS B2220



15 With flange material SUS 316L, Alloy C-22

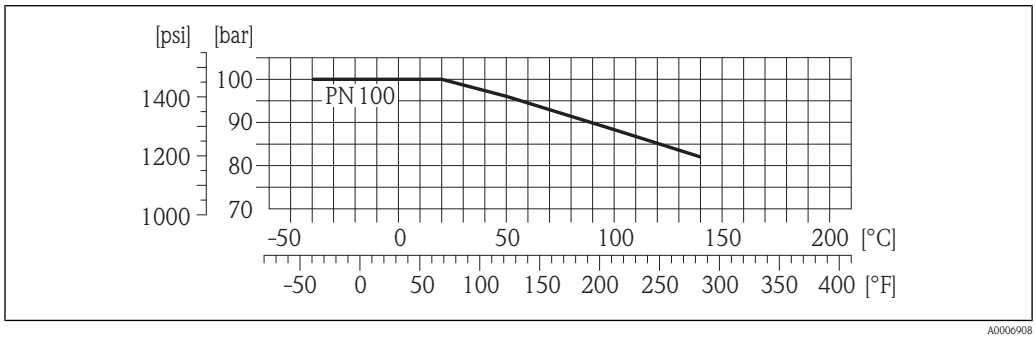
The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

VCO process connection



16 With connection material 1.4404/316L

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

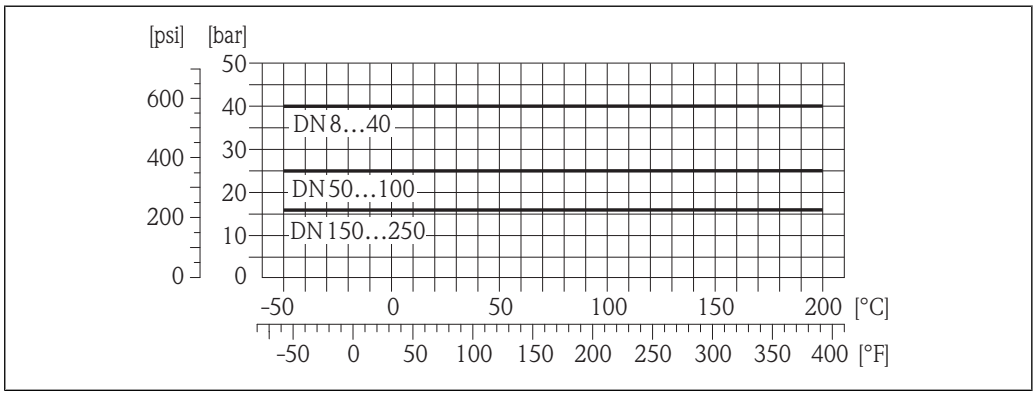


17 With connection material 1.4404/316L

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 could be under 16 bar (232 psi) . The clamp and seal are not included in the scope of supply.

Process connection to DIN 11851

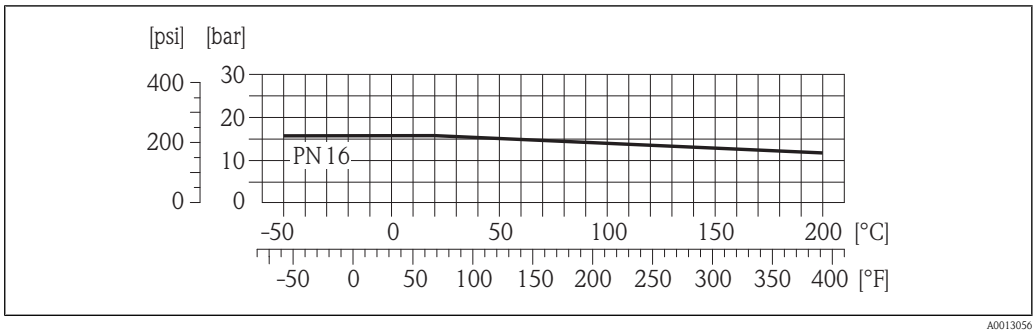


18 With connection material 1.4404/316L

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F)apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

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.

Process connection to SMS 1145

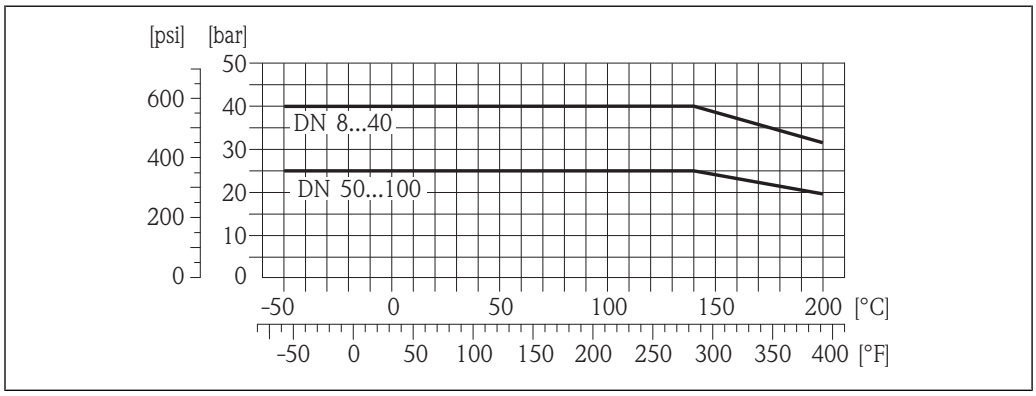


19 With connection material 1.4404/316L

The material load curves for the temperature range+150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

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.

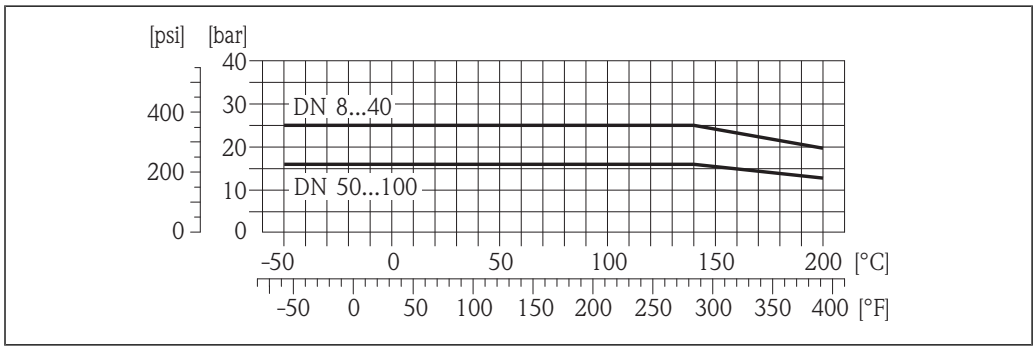
DIN 11864-1 Form A (threaded hygienic connection)



20 With connection material 1.4404/316L

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

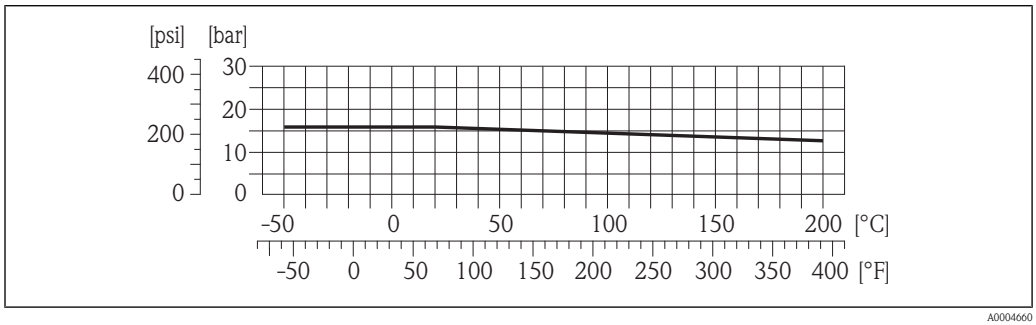
Flange connection to DIN 11864-2 Form A (flange with notch)



21 With connection material 1.4404/316L

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

Threaded hygienic connection to ISO 2853



22 With flange material 1.4404/316L

The material load curves for the temperature range +150 to +200 °C (+302 to +392 °F) apply only to the order code for "Measuring tube material" option SD, SE, SF, TH

Secondary containment pressure range

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

- DN 8 to 50 (3/8 to 2"): 40 bar (580 psi)
- DN 80 (3"): 25 bar (362 psi)
- DN 100 to 150 (4 to 6"): 16 bar (232 psi)
- DN 250 (10"): 10 bar (145 psi)

Rupture disk

To increase the level of safety, a device version with a rupture disk with a triggering pressure of 10 to 15 bar (145 to 217.5 psi) can be used.

Flow limit

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

For an overview of the measuring range full scale values, see the "Measuring range" section (→ 6)

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- Select a lower full scale value for abrasive substances (such as liquids with entrained solids): flow velocity <1 m/s (<3 ft/s).
- For gas measurement the following rules apply:
  - The flow velocity in the measuring tubes should not exceed half the sonic velocity (0.5 Mach).
  - The maximum mass flow depends on the density of the gas: formula (→ 7)

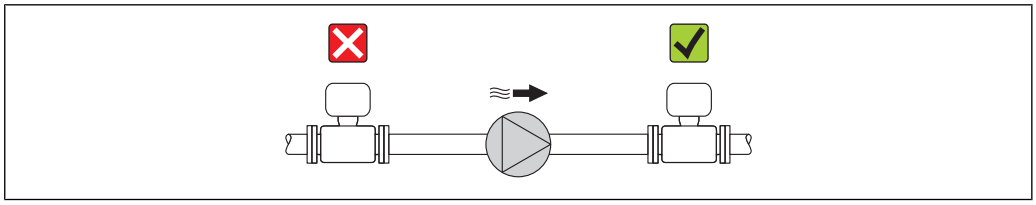
Pressure loss

To calculate the pressure loss, use the *Applicator* sizing tool (→ 67)

System 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 system 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)



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Heating

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

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

Heating jackets for the sensor can be ordered as accessories from Endress+Hauser (→ 66).

Vibrations

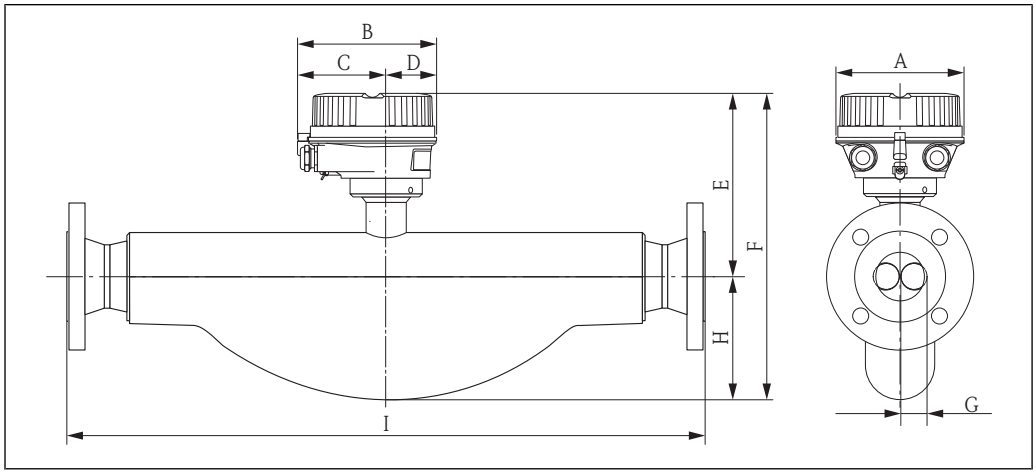
The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

Mechanical construction

Design, dimensions

Compact version

Order code for "Housing", option A "compact coated alu"



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Dimensions SI units

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]
8	136	147.5	93.5	54	185	260	5.35	75	1)
15	136	147.5	93.5	54	185	260	8.30	75	1)
25	136	147.5	93.5	54	185	260	12.0	75	1)
40	136	147.5	93.5	54	189.5	294.5	17.6	105	1)
50	136	147.5	93.5	54	199.5	340.5	26.0	141	1)
80	136	147.5	93.5	54	219.5	419.5	40.5	200	1)
100	136	147.5	93.5	54	238	492	51.2	254	1)
150	136	147.5	93.5	54	259	637	68.9	378	1)
250	136	147.5	93.5	54	302.5	850.5	102.26	548	1)

1) dependent on respective process connection

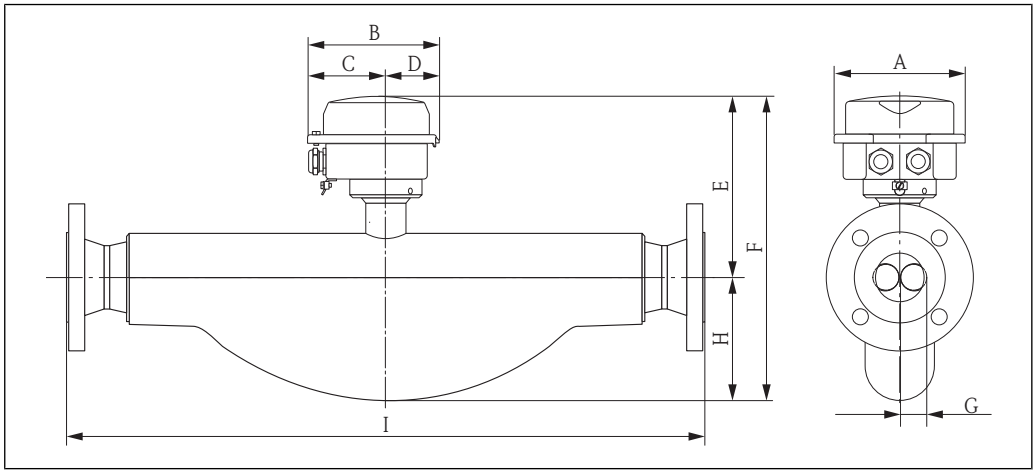
Dimensions US units

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
3/8	5.35	5.81	3.68	2.13	7.28	10.24	0.21	2.95	1)
½	5.35	5.81	3.68	2.13	7.28	10.24	0.33	2.95	1)
1	5.35	5.81	3.68	2.13	7.28	10.24	0.47	2.95	1)
1½	5.35	5.81	3.68	2.13	7.46	11.59	0.69	4.13	1)
2	5.35	5.81	3.68	2.13	7.85	13.41	1.02	5.55	1)
3	5.35	5.81	3.68	2.13	8.64	16.52	1.59	7.87	1)
4	5.35	5.81	3.68	2.13	9.37	19.37	2.01	10	1)

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
6	5.35	5.81	3.68	2.13	10.2	25.08	2.71	14.88	1)
10	5.35	5.81	3.68	2.13	11.91	33.48	4.03	21.57	1)

1) dependent on respective process connection

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



Dimensions SI units

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]
8	133.5	136.8	78	58.8	180	255	5.35	75	1)
15	133.5	136.8	78	58.8	180	255	8.30	75	1)
25	133.5	136.8	78	58.8	180	255	12.0	75	1)
40	133.5	136.8	78	58.8	184.5	289.5	17.6	105	1)
50	133.5	136.8	78	58.8	194.5	335.5	26.0	141	1)
80	133.5	136.8	78	58.8	214.5	414.5	40.5	200	1)
100	133.5	136.8	78	58.8	233	487	51.2	254	1)
150	133.5	136.8	78	58.8	254	632	68.9	378	1)
250	133.5	136.8	78	58.8	297.5	845.5	102.26	548	1)

1) dependent on respective process connection

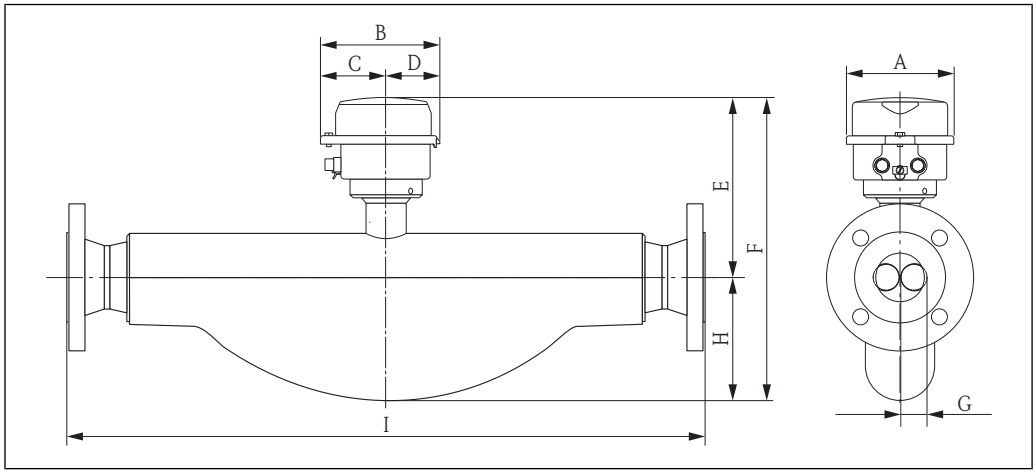
Dimensions US units

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
3/8	5.26	5.39	3.07	2.31	7.09	10.04	0.21	2.95	1)
½	5.26	5.39	3.07	2.31	7.09	10.04	0.33	2.95	1)
1	5.26	5.39	3.07	2.31	7.09	10.04	0.47	2.95	1)
1½	5.26	5.39	3.07	2.31	7.26	11.4	0.69	4.13	1)
2	5.26	5.39	3.07	2.31	7.66	13.21	1.02	5.55	1)
3	5.26	5.39	3.07	2.31	8.44	16.32	1.59	7.87	1)
4	5.26	5.39	3.07	2.31	9.17	19.17	2.01	10	1)

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
6	5.26	5.39	3.07	2.31	10	24.88	2.71	14.88	1)
10	5.26	5.39	3.07	2.31	11.71	33.29	4.03	21.57	1)

1) dependent on respective process connection

Order code for "Housing", option C "Ultra compact hygienic, stainless, M12 device plug"



Dimensions SI units

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]
8	111.4	123.6	67.7	55.9	180	255	5.35	75	1)
15	111.4	123.6	67.7	55.9	180	255	8.30	75	1)
25	111.4	123.6	67.7	55.9	180	255	12.0	75	1)
40	111.4	123.6	67.7	55.9	184.5	289.5	17.6	105	1)
50	111.4	123.6	67.7	55.9	194.5	335.5	26.0	141	1)
80	111.4	123.6	67.7	55.9	214.5	414.5	40.5	200	1)
100	111.4	123.6	67.7	55.9	233	487	51.2	254	1)
150	111.4	123.6	67.7	55.9	254	632	68.9	378	1)
250	111.4	123.6	67.7	55.9	297.5	845.5	102.26	548	1)

1) dependent on respective process connection

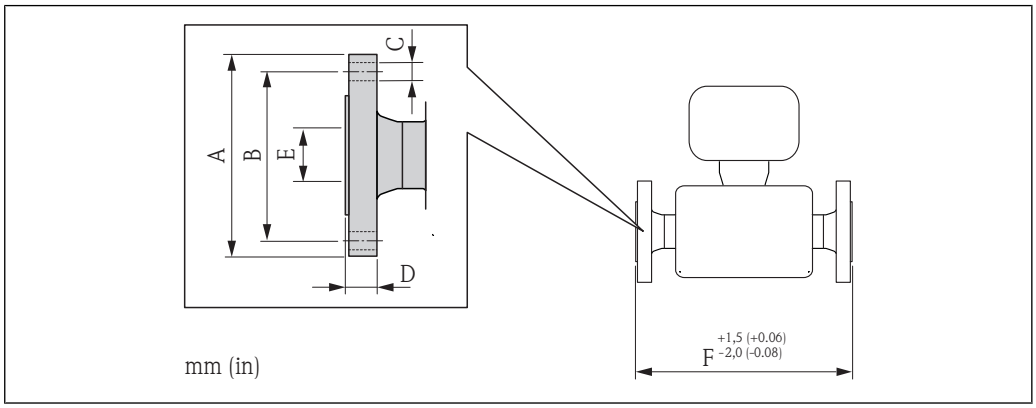
Dimensions US units

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
3/8	4.39	4.87	2.67	2.2	7.09	10.04	0.211	2.95	
½	4.39	4.87	2.67	2.2	7.09	10.04	0.327	2.95	1)
1	4.39	4.87	2.67	2.2	7.09	10.04	0.472	2.95	1)
1½	4.39	4.87	2.67	2.2	7.26	11.4	0.693	4.13	1)
2	4.39	4.87	2.67	2.2	7.66	13.21	1.02	5.55	1)
3	4.39	4.87	2.67	2.2	8.44	16.32	1.59	7.87	1)
4	4.39	4.87	2.67	2.2	9.17	19.17	2.02	10	1)

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
6	4.39	4.87	2.67	2.2	10	24.88	2.71	14.88	1)
10	4.39	4.87	2.67	2.2	11.71	33.29	4.03	21.57	1)

Process connections in SI units

Flange connections EN (DIN)



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Flange based on EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 16: 1.4404/316L (order code for "Process connection", option D1S), alloy (order code for "Process connection", option D1C)

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
100	220	180	8 × ∅18	20	107.1	1 128
150	285	240	8 × ∅22	22	159.3	1 330
250 [2]	405	355	12 × ∅26	26	260.4	1 780

1) flange with groove based on EN 1092-1 Form D (DIN 2512N) available (order code for "Process connection", option D5S), alloy (order code for "Process connection", option D5C)
2) Not available in alloy

Flange based on EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 40: 1.4404/316L (order code for "Process connection", option D2S), alloy (order code for "Process connection", option D2C)

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	95	65	4 × ∅14	16	17.3	370
15	95	65	4 × ∅14	16	17.3	404
25	115	85	4 × ∅14	18	28.5	440
40	150	110	4 × ∅18	18	43.1	550
50	165	125	4 × ∅18	20	54.5	715
80	200	160	8 × ∅18	24	82.5	840
100	235	190	8 × ∅22	24	107.1	1 128

Flange based on EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 40: 1.4404/316L (order code for "Process connection", option D2S), alloy (order code for "Process connection", option D2C)

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
150	300	250	8 × ∅26	28	159.3	1 370
250 [2]	450	385	12 × ∅33	38	258.8	1 850

1) Flange with groove based on EN 1092-1 Form D (DIN 2512N) available (order code for "Process connection", option D6S), alloy (order code for "Process connection", option D6C)
2) Not available in alloy

Flange based on EN 1092-1 (DIN 2501) / PN 40 (with DN 25 flanges): 1.4404/316L (order code for "Process connection", option R2S)

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	115	85	4 × ∅14	18	28.5	440
15	115	85	4 × ∅14	18	28.5	440

Flange based on EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 63: 1.4404/316L (order code for "Process connection", option D3S), alloy (order code for "Process connection", option D3C)

Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form C), Ra 0.8 to 3.2 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
50	180	135	4 × ∅22	26	54.5	724
80	215	170	8 × ∅22	28	81.7	875
100	250	200	8 × ∅26	30	106.3	1 128
150	345	280	8 × ∅33	36	157.1	1 410
250 [2]	470	400	12 × ∅36	46	255.4	1 890

1) Flange with groove based on EN 1092-1 Form D (DIN 2512N) available (order code for "Process connection", option D7S), alloy (order code for "Process connection", option D7C)
2) Not available in alloy

Flange based on EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 100: 1.4404/316L (order code for "Process connection", option D4S), alloy (order code for "Process connection", option D4C)

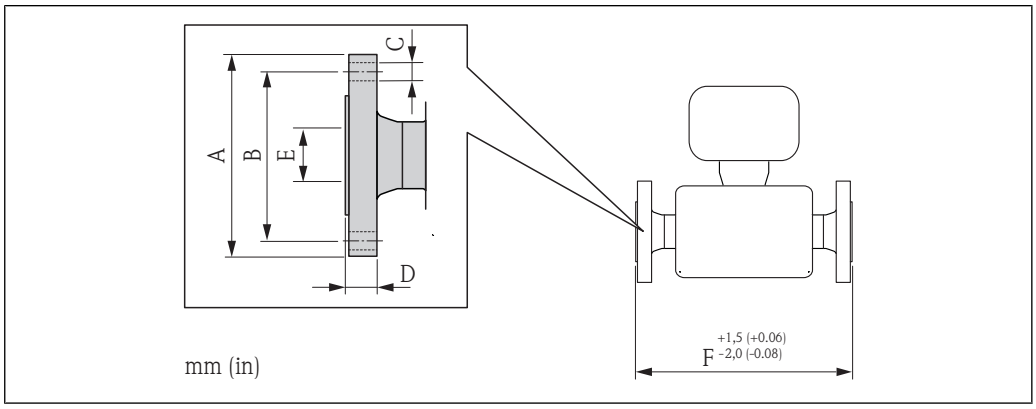
Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form C), Ra 0.8 to 3.2 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	105	75	4 × ∅14	20	17.3	400
15	105	75	4 × ∅14	20	17.3	420
25	140	100	4 × ∅18	24	28.5	470
40	170	125	4 × ∅22	26	42.5	590
50	195	145	4 × ∅26	28	53.9	740
80	230	180	8 × ∅26	32	80.9	885

Flange based on EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 100: 1.4404/316L (order code for "Process connection", option D4S), alloy (order code for "Process connection", option D4C) Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form C), Ra 0.8 to 3.2 µm						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**F [mm]**
100	265	210	8 × ∅30	36	104.3	1 128
150	355	290	12 × ∅33	44	154.0	1 450

1) Flange with groove based on EN 1092-1 Form D (DIN 2512N) available (order code for "Process connection", option D8S), alloy (order code for "Process connection", option D8C)

Flange connections ASME B16.5



Flange based on ASME B16.5 / Cl 150: 1.4404/316L (order code for "Process connection", option AAS), alloy (order code for "Process connection", option AAC) Surface roughness (flange): Ra 3.2 to 6.3 µm						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**F [mm]**
8	88.9	60.5	4 × ∅15.7	11.2	15.7	370
15	88.9	60.5	4 × ∅15.7	11.2	15.7	404
25	108.0	79.2	4 × ∅15.7	14.2	26.7	440
40	127.0	98.6	4 × ∅15.7	17.5	40.9	550
50	152.4	120.7	4 × ∅19.1	19.1	52.6	715
80	190.5	152.4	4 × ∅19.1	23.9	78.0	840
100	228.6	190.5	8 × ∅19.1	23.9	102.4	1 128
150	279.4	241.3	8 × ∅22.4	25.4	154.2	1 398
250 [1]	406.4	362.0	12 × ∅25.4	30.2	254.5	1 836.8

1) Not available in alloy

Flange based on ASME B16.5 / Cl 300: 1.4404/316L (order code for "Process connection", option ABS), alloy (order code for "Process connection", option ABC)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	95.2	66.5	4 × ∅15.7	14.2	15.7	370
15	95.2	66.5	4 × ∅15.7	14.2	15.7	404
25	123.9	88.9	4 × ∅19.0	17.5	26.7	440
40	155.4	114.3	4 × ∅22.3	20.6	40.9	550
50	165.1	127.0	8 × ∅19.0	22.3	52.6	715
80	209.5	168.1	8 × ∅22.3	28.4	78.0	840
100	254.0	200.1	8 × ∅22.3	31.7	102.4	1 128
150	317.5	269.7	12 × ∅22.3	36.5	154.2	1 417
250 [1]	444.5	387.3	16 × ∅28.4	47.4	254.5	1 868.2

1) Not available in alloy

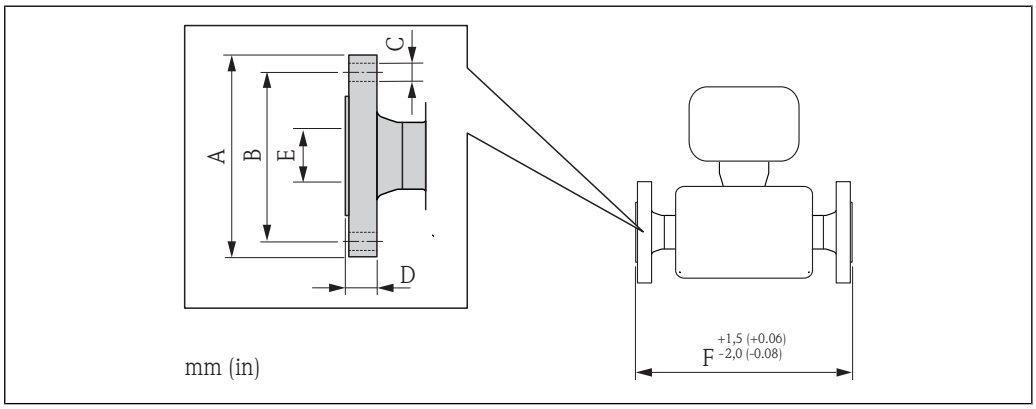
Flange based on ASME B16.5 / Cl 600: 1.4404/316L (order code for "Process connection", option ACS), alloy (order code for "Process connection", option ACC)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	95.3	66.5	4 × ∅15.7	20.6	13.9	400
15	95.3	66.5	4 × ∅15.7	20.6	13.9	420
25	124.0	88.9	4 × ∅19.1	23.9	24.3	490
40	155.4	114.3	4 × ∅22.4	28.7	38.1	600
50	165.1	127.0	8 × ∅19.1	31.8	49.2	742
80	209.6	168.1	8 × ∅22.4	38.2	73.7	900
100	273.1	215.9	8 × ∅25.4	48.4	97.3	1 158
150	355.6	292.1	12 × ∅28.4	47.8	154.2	1 467
250 [1]	508.0	431.8	16 × ∅35.1	69.9	254.5	1 951.2

1) Not available in alloy

Flange connections JIS



Flange JIS B2220 / 10K: SUS 316L (order code for "Process connection", option NDS), alloy (order code for "Process connection", option NDC)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
50	155	120	4 × ∅19	16	50	715
80	185	150	8 × ∅19	18	80	832
100	210	175	8 × ∅19	18	100	1 128
150	280	240	8 × ∅23	22	150	1 354
250 [1)]	400	355	12 × ∅25	24	250	1 780

1) Not available in alloy

Flange JIS B2220 / 20K: SUS 316L (order code for "Process connection", option NES), alloy (order code for "Process connection", option NEC)

Surface roughness (flange): Ra 1.6 to 3.2 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	95	70	4 × ∅15	14	15	370
15	95	70	4 × ∅15	14	15	404
25	125	90	4 × ∅19	16	25	440
40	140	105	4 × ∅19	18	40	550
50	155	120	8 × ∅19	18	50	715
80	200	160	8 × ∅23	22	80	832
100	225	185	8 × ∅23	24	100	1 128
150	305	260	12 × ∅25	28	150	1 368
250 [1)]	430	380	12 × ∅27	34	250	1 850

1) Not available in alloy

Flange JIS B2220 / 40K: SUS 316L (order code for "Process connection", option NGS), alloy (order code for "Process connection", option NGC)

Surface roughness (flange): Ra 1.6 to 3.2 µm

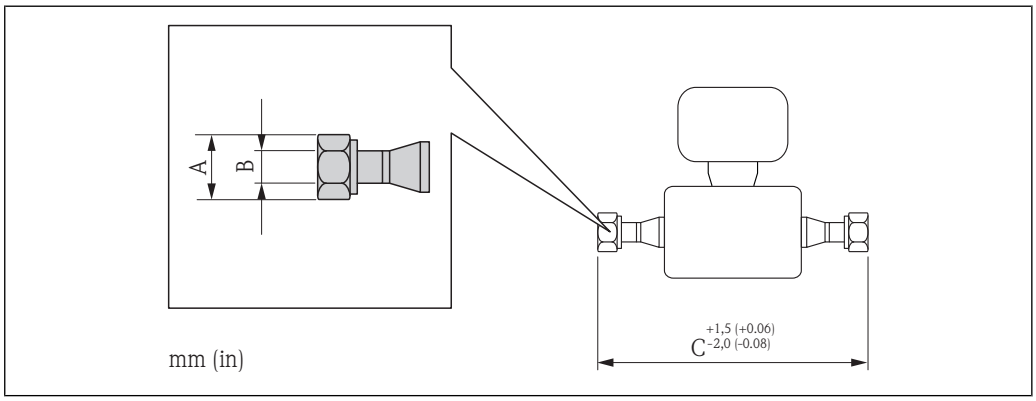
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	115	80	4 × ∅19	20	15	400
15	115	80	4 × ∅19	20	15	425
25	130	95	4 × ∅19	22	25	485
40	160	120	4 × ∅23	24	38	600
50	165	130	8 × ∅19	26	50	760
80	210	170	8 × ∅23	32	75	890
100	250	205	8 × ∅23	36	100	1 168
150	355	295	12 × ∅25	44	150	1 498

Flange JIS B2220 / 63K: SUS 316L (order code for "Process connection", option NHS), alloy (order code "Process connection", option NHC)

Surface roughness (flange): Ra 1.6 to 3.2 µm

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]
8	120	85	4 × ∅19	23	12	420
15	120	85	4 × ∅19	23	12	440
25	140	100	4 × ∅23	27	22	494
40	175	130	4 × ∅25	32	35	620
50	185	145	8 × ∅23	34	48	775
80	230	185	8 × ∅25	40	73	915
100	270	220	8 × ∅27	44	98	1 168
150	365	305	12 × ∅33	54	146	1 528

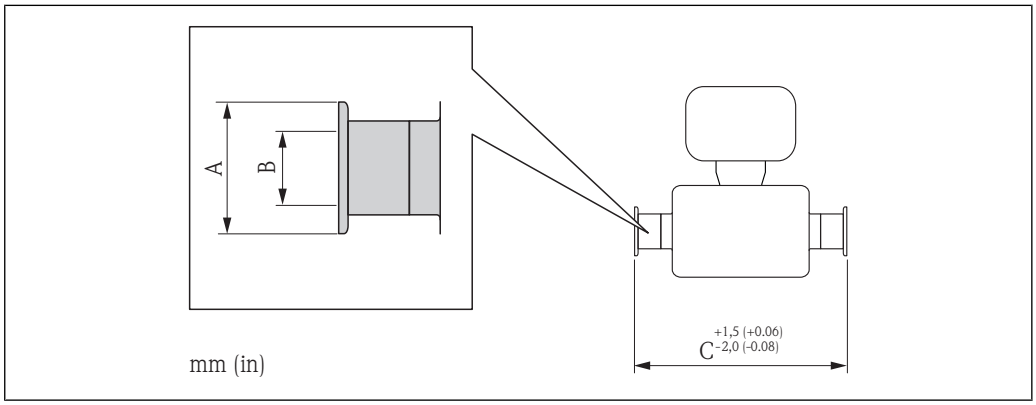
VCO connections



VCO connections: 1.4404/316L			
DN [mm]	**A [in]**	**B [mm]**	**C [mm]**
8 [1]	AF 1	10.2	390
15 [2]	AF 1½	15.7	430

1) 8-VCO-4 (½"): Order code for "Process connection", option CVS
2) 12-VCO-4 (¾"): Order code for "Process connection", option CWS

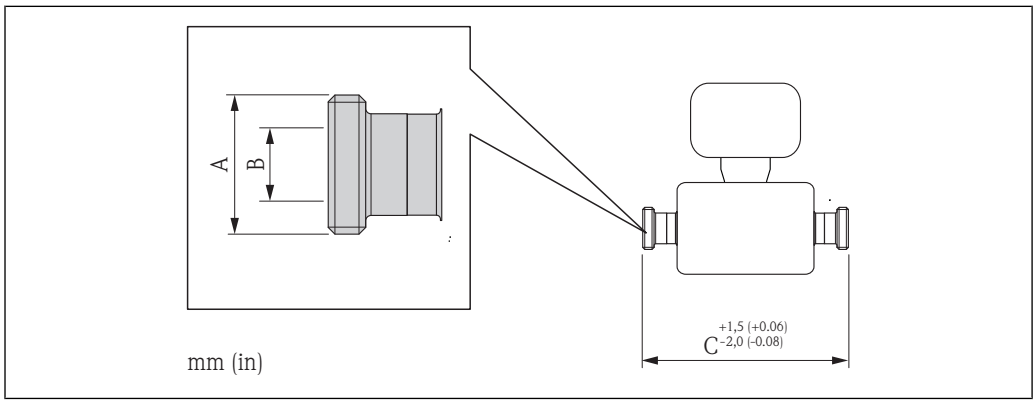
Tri-Clamp



1", 1½", 2" Tri-Clamp: 1.4404/316L (order code for "Process connection", option FTS)				
DN [mm]	**Clamp [in]**	**A [mm]**	**B [mm]**	**C [mm]**
8	1	50.4	22.1	367
15	1	50.4	22.1	398
25	1	50.4	22.1	434
40	1½	50.4	34.8	560
50	2	63.9	47.5	720
80	3	90.9	72.9	900
100	4	118.9	97.4	1 128
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)				

½" Tri-Clamp: 1.4404/316L (order code for "Process connection", option FDW)				
DN [mm]	**Clamp [in]**	**A [mm]**	**B [mm]**	**C [mm]**
8	½	25.0	9.5	367
15	½	25.0	9.5	398
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)				

DIN 11851 threaded hygienic connection (sanitary connection)



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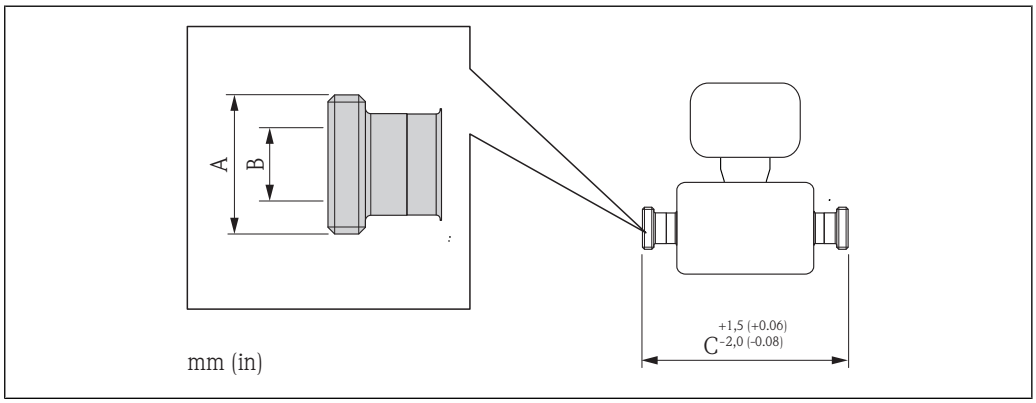
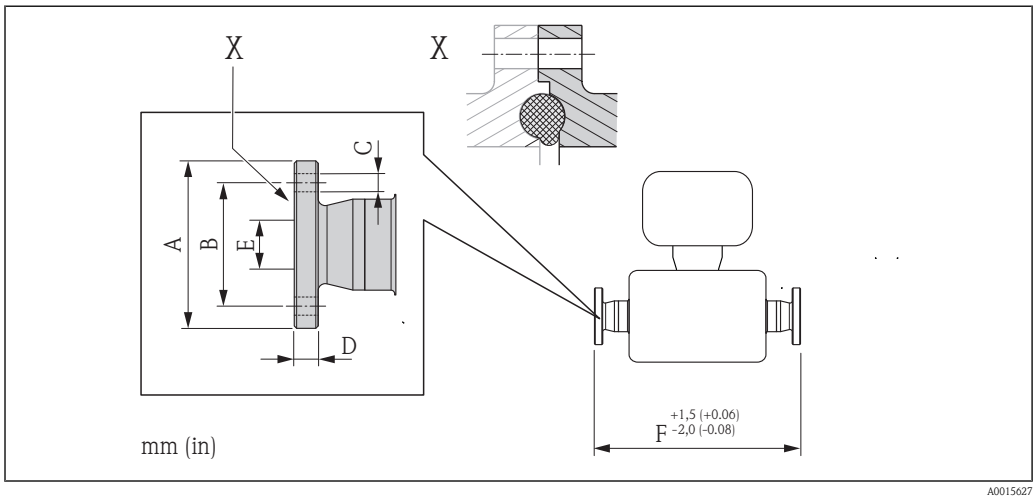
Threaded hygienic connection (sanitary connection) DIN 11851: 1.4404/316L (order code for "Process connection", option FMW)			
DN [mm]	**A [in]**	**B [mm]**	**C [mm]**
8	Rd 34 × 1/8	16	367
15	Rd 34 × 1/8	16	398
25	Rd 52 × 1/6	26	434
40	Rd 65 × 1/6	38	560
50	Rd 78 × 1/6	50	720
80	Rd 110 × 1/4	81	900
100	Rd 130 × 1/4	100	1 128
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm(order code for "Measuring tube material", option SB, SE)			

DIN 11864-1 Form A (threaded hygienic connection)



Threaded hygienic connection DIN 11864-1 Form A: 1.4404/316L (order code for "Process connection", option FLW)			
DN [mm]	**A [in]**	**B [mm]**	**C [mm]**
8	Rd 28 × 1/8	10	367
15	Rd 34 × 1/8	16	398
25	Rd 52 × 1/8	26	434
40	Rd 65 × 1/6	38	560
50	Rd 78 × 1/6	50	720
80	Rd 110 × 1/4	81	900
100	Rd 130 × 1/4	100	1 128
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)			

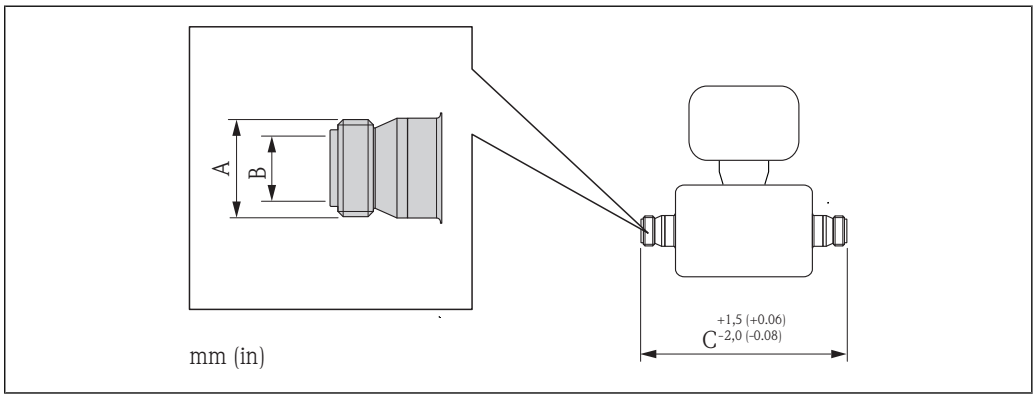
DIN 11864-2 Form A (flange with notch)



23 Detail X: Asymmetrical process connection; the part shown in gray is provided by the supplier.

DIN 11864-2 Form A (flange with notch): 1.4404/316L (order code for "Process connection", option KCS)						
DN [mm]	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**F [mm]**
8	54	37	4 × ∅9	10	10	387
15	59	42	4 × ∅9	10	16	418
25	70	53	4 × ∅9	10	26	454
40	82	65	4 × ∅9	10	38	560
50	94	77	4 × ∅9	10	50	720
80	133	112	8 × ∅11	12	81	900
100	159	137	8 × ∅11	14	100	1 128
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)						

ISO 2853 (threaded hygienic connection)



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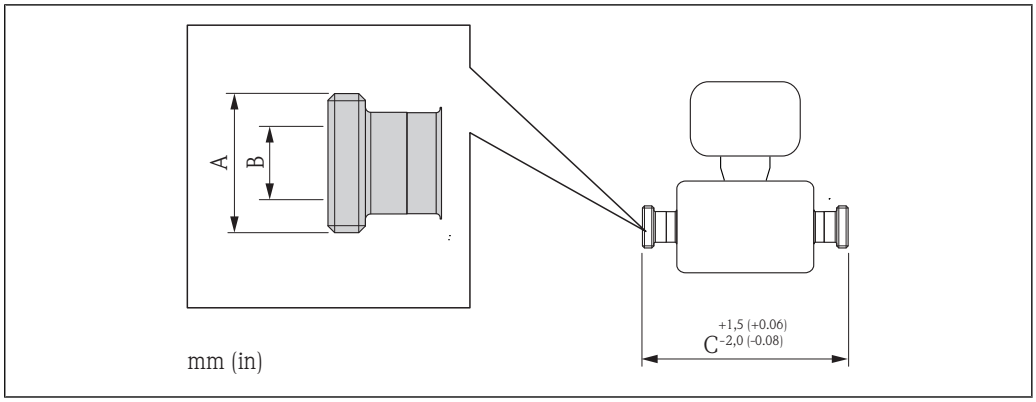
Threaded hygienic connection ISO 2853: 1.4404/316L (order code for "Process connection", option JSF)			
DN [mm]	**A [1] [mm]**	**B [mm]**	**C [mm]**
8	37.13	22.6	367
15	37.13	22.6	398
25	37.13	22.6	434
40	52.68	35.6	560
50	64.16	48.6	720
80	91.19	72.9	900
100	118.21	97.6	1 128
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)			

1) Max. thread diameter as per ISO 2853 Annex A

SMS 1145 (threaded hygienic connection)



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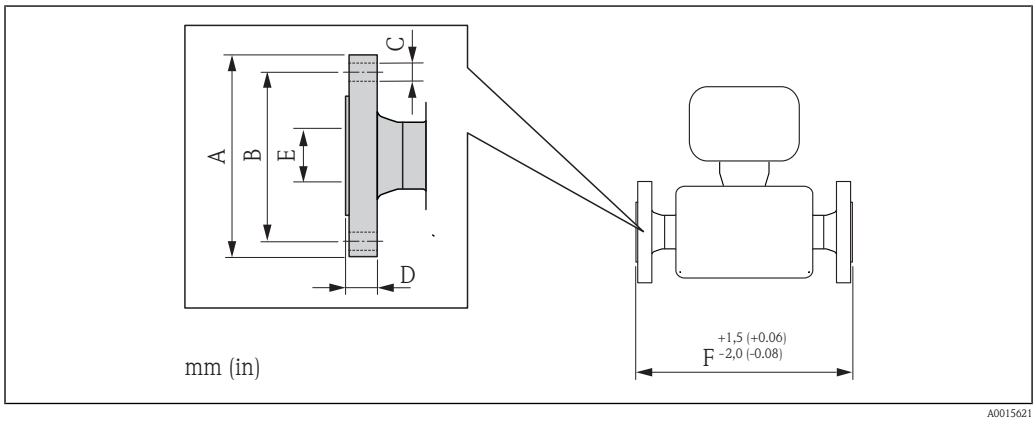
Threaded hygienic connection SMS 1145: 1.4404/316L (order code for "Process connection", option SCS)			
DN [mm]	**A [in]**	**B [mm]**	**C [mm]**
8	Rd 40 × 1/6	22.6	367
15	Rd 40 × 1/6	22.6	398

Threaded hygienic connection SMS 1145: 1.4404/316L (order code for "Process connection", option SCS)			
DN [mm]	**A [in]**	**B [mm]**	**C [mm]**
25	Rd 40 × 1/6	22.6	434
40	Rd 60 × 1/6	35.6	560
50	Rd 70 × 1/6	48.6	720
80	Rd 98 × 1/6	72.9	900
100	Rd 132 × 1/6	97.6	1 128
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm(order code for "Measuring tube material", option SB, SE)			

Process connections in US units

Flange connections ASME B16.5



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Flange based on ASME B16.5 / Cl 150: 1.4404/316L (order code for "Process connection", option AAS), alloy (order code for "Process connection", option AAC) Surface roughness (flange): Ra 3.2 to 6.3 µm						
DN [in]	**A [in]**	**B [in]**	**C [in]**	**D [in]**	**E [in]**	**F [in]**
3/8	3.50	2.38	4 × ∅0.62	0.44	0.62	14.6
½	3.50	2.38	4 × ∅0.62	0.44	0.62	15.9
1	4.25	3.12	4 × ∅0.62	0.56	1.05	17.3
1½	5.00	3.88	4 × ∅0.62	0.69	1.61	21.7
2	6.00	4.75	4 × ∅0.75	0.75	2.07	28.1
3	7.50	6.00	4 × ∅0.75	0.94	3.07	33.1
4	9.00	7.50	8 × ∅0.75	0.94	4.03	44.4
6	11.0	9.50	8 × ∅0.88	0.99	6.07	55.0
10 [1)]	16.00	14.25	12 × ∅1.0	1.19	10.0	72.3

1) Not available in alloy

Flange based on ASME B16.5 / Cl 300: 1.4404/316L (order code for "Process connection", option ABS), alloy (order code for "Process connection", option ABC

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]
3/8	3.75	2.62	4 × ∅0.62	0.56	0.62	14.57
½	3.75	2.62	4 × ∅0.62	0.56	0.62	15.91
1	4.88	3.50	4 × ∅0.75	0.69	1.05	17.32
1½	6.12	4.50	4 × ∅0.88	0.81	1.61	21.65
2	6.50	5.00	8 × ∅0.75	0.88	2.07	28.15
3	8.25	6.62	8 × ∅0.88	1.12	3.07	33.07
4	10.00	7.88	8 × ∅0.88	1.25	4.03	44.41
6	12.50	10.62	12 × ∅0.88	1.44	6.07	55.79
10 [1)]	17.50	15.25	16 × ∅1.12	1.87	10.0	73.55

1) Not available in alloy

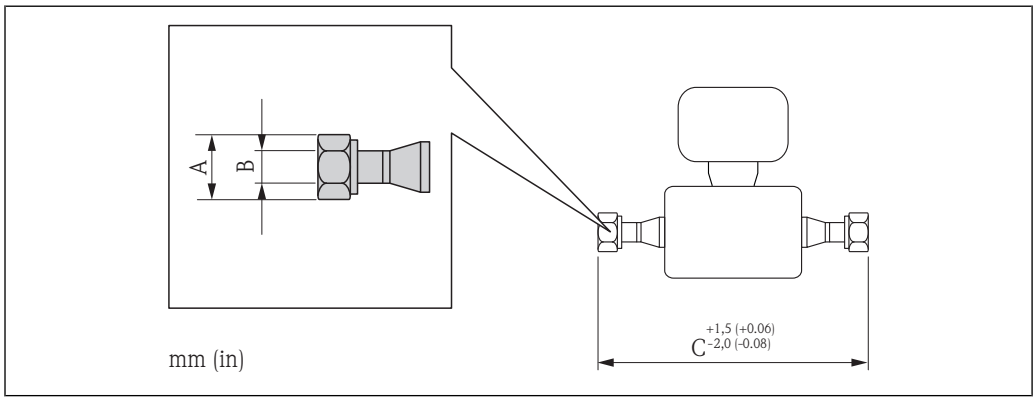
Flange based on ASME B16.5 / Cl 600: 1.4404/316L (order code for "Process connection", option ACS), alloy (order code for "Process connection", option ACC)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]
3/8	3.75	2.62	4 × ∅0.62	0.81	0.55	15.75
½	3.75	2.62	4 × ∅0.62	0.81	0.55	16.54
1	4.88	3.50	4 × ∅0.75	0.94	0.96	19.29
1½	6.12	4.50	4 × ∅0.88	1.13	1.50	23.62
2	6.50	5.00	8 × ∅0.75	1.25	1.94	29.21
3	8.25	6.62	8 × ∅0.88	1.50	2.90	35.43
4	10.75	8.50	8 × ∅1.00	1.91	3.83	45.59
6	14.00	11.50	12 × ∅1.12	1.88	6.07	57.76
10 [1)]	20.00	17.00	16 × ∅1.38	2.75	10.02	76.82

1) Not available in alloy

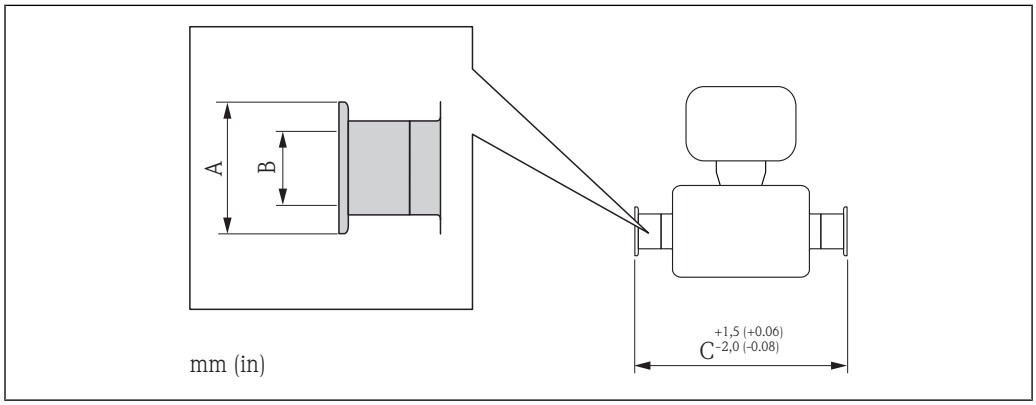
VCO connections



VCO connections: 1.4404/316L			
DN [mm]	**A [in]**	**B [in]**	**C [in]**
3/8 [1]	AF 1	0.40	9.92
1/2 [2]	AF 1½	0.62	12.01

1) 8-VCO-4 (½"): Order code for "Process connection", option CVS
2) 12-VCO-4 (¾"): Order code for "Process connection", option CWS

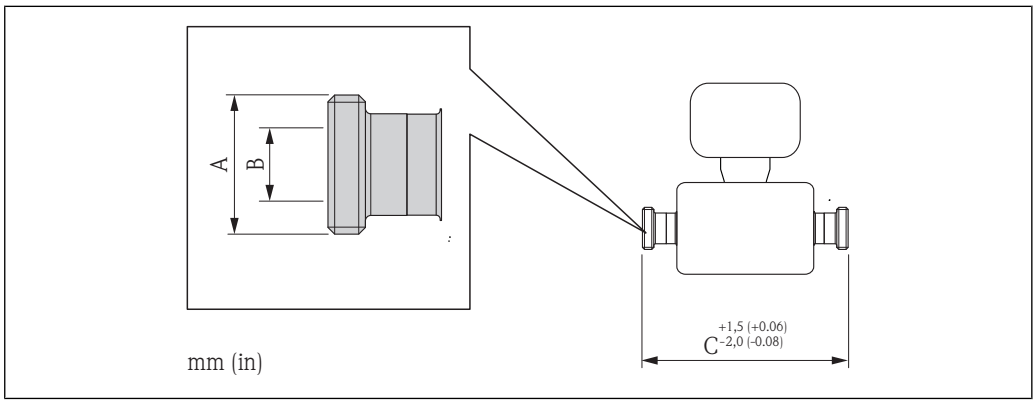
Tri-Clamp



1", 1½", 2" Tri-Clamp: 1.4404/316L (order code for "Process connection", option FTS)				
DN [in]	**Clamp [in]**	**A [in]**	**B [in]**	**C [in]**
3/8	1	1.98	0.87	14.4
½	1	1.98	0.87	15.7
1	1	1.98	0.87	17.1
1½	1½	1.98	1.37	22.0
2	2	2.52	1.87	28.3
3	3	3.58	2.87	35.4
4	4	4.68	3.83	44.4
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)				

½" Tri-Clamp: 1.4404/316L (order code for "Process connection", option FDW)				
DN [in]	**Clamp [in]**	**A [in]**	**B [in]**	**C [in]**
3/8	½	0.98	0.37	14.4
½	½	0.98	0.37	15.7
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm Ra ≤ 0.4 µm (order code for "Measuring tube material", option SB, SC, SE, SF)				

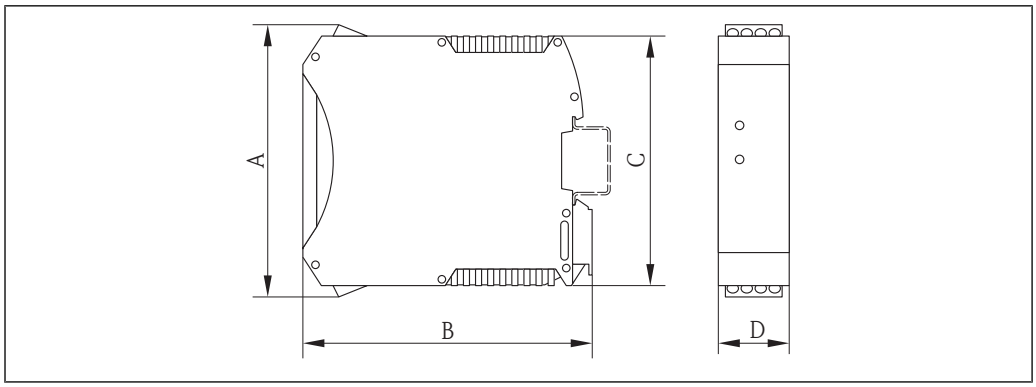
SMS 1145 (threaded hygienic connection)



Threaded hygienic connection SMS 1145: 1.4404/316L (order code for "Process connection", option SCS)			
DN [in]	**A [in]**	**B [in]**	**C [in]**
3/8	Rd 40 × 1/6	0.904	14.68
½	Rd 40 × 1/6	0.904	15.92
1	Rd 40 × 1/6	0.904	17.36
1½	Rd 60 × 1/6	1.424	22.40
2	Rd 70 × 1/6	1.944	28.80
3	Rd 98 × 1/6	2.916	36.00
4	Rd 132 × 1/6	3.904	45.12
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm(order code for "Measuring tube material", option SB, SE)			

Safety Barrier Promass 100

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



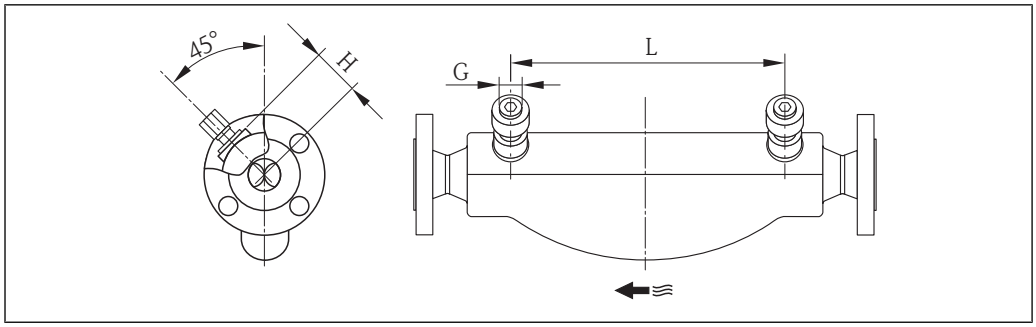
A0016777

A		B		C		D	
[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
108	4.25	114.5	4.51	99	3.9	22.5	0.89

Accessories

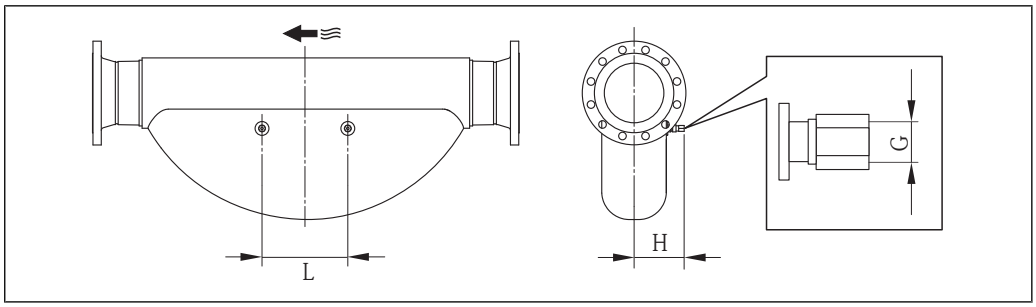
Purge connections/ secondary containment monitoring

Order code for "Sensor options", option CH



A0002537

DN		G	H		L	
[mm]	[in]	[in]	[mm]	[in]	[mm]	[in]
8	3/8	½-NPT	62	2.44	216	8.50
15	1/2	½-NPT	62	2.44	220	8.66
25	1	½-NPT	62	2.44	260	10.24
40	1½	½-NPT	67	2.64	310	12.20
50	2	½-NPT	79	3.11	452	17.78
80	3	½-NPT	101	3.98	560	22.0
100	4	½-NPT	120	4.72	684	27.0
150	6	½-NPT	141	5.55	880	34.6



A0009734

DN		G	H		L	
[mm]	[in]	[in]	[mm]	[in]	[mm]	[in]
250	10	½-NPT	182	7.17	380	14.96

Weight

Compact version

Weight in SI units

All values (weight) refer to devices with EN/DIN PN 40 flanges. Weight information in [kg]

DN [mm]	Weight [kg]
8	9
15	10
25	12
40	17
50	28
80	53
100	94
150	152
250	398

Weight in US units

All values (weight) refer to devices with EN/DIN PN 40 flanges. Weight information in [lbs]

DN [in]	Weight [lbs]
3/8	20
½	22
1	26
1½	37
2	62
3	117
4	207
6	335
10	878

Safety Barrier Promass 100

49 g (25 ounce)

Materials

Transmitter housing

- Order code for "Housing", option **A**: aluminum coating AlSi10Mg
- Order code for "Housing", option **B**, **C**:
  - Hygienic version, stainless steel 1.4301/304
  - Hygienic version, stainless steel 1.4404/316L

Transmitter cable entries

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

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

Electrical connection	Material
Cable gland M20 × 1.5	Nickel-plated brass
Thread G ½" via adapter	
Thread NPT ½" via adapter	

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

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

Electrical connection	Material
Cable gland M20 × 1.5	Stainless steel 1.4404/316L
Thread G ½" via adapter	
Thread NPT ½" via adapter	

Device plug

Order code for "Housing", option A "Compact coated alu", option B "Compact hygienic, stainless", option C "Ultra compact hygienic, stainless, M12 device plug"

Electrical connection	Material
Connector M12x1	■ Connector: Stainless steel 1.4404/316L ■ Contact housing: Polyamide ■ Contacts: Gold-plated brass

Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301/1.4307/304L/304

Measuring tubes

- DN 8 to 100 (3/8 to 4"): Stainless steel 1.4539/904L; manifold: 1.4404/316L
- DN 150 (6"): Stainless steel 1.4404/316L
- DN 250 (10"): Stainless steel 1.4404/316L; manifold: CF3M
- DN 8 to 150 (3/8 to 6"): Alloy 2.4602/N 06022

Surface quality:

- Ra_{max} = 0.8 µm (32 µin)
- Ra_{max} = 0.4 µm (16 µin)

Process connections

- Flanges based on EN 1092-1 (DIN2501)/ based on ASME B 16.5:
  - Stainless steel 1.4404/316L
  - Alloy 2.4602/N 06022
- Flanges as per JIS B2220:
  - Stainless steel SUS 316L
  - Alloy 2.4602/N 06022
- All other process connections:
  Stainless steel 1.4404/316L

List of all available process connections (→ 61)

Seals

Welded process connections without internal seals

Safety Barrier Promass 100

Housing: Polyamide

Process connections

- Flanges:
  - EN 1092-1 (DIN 2501)
  - ASME B16.5
  - JIS B2220
- VCO connections
- Tri-Clamp (OD tubes)
- Threaded hygienic connection:
  - DIN 11851
  - SMS 1145
  - ISO 2853
  - DIN 11864-1 Form A
- Flange with notch
  DIN 11864-2 Form A

For information on the materials of the process connections (→ 61)

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Rapid and safe commissioning

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

Reliable operation

- Operation in the following languages:
  - Via "FieldCare" operating tool:
    English, German, French, Spanish, Italian, Dutch, Japanese
  - Via Web browser:
    English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech
- 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 device data and the event logbook. No need to reconfigure. This function does not apply to the device version with Modbus RS485.

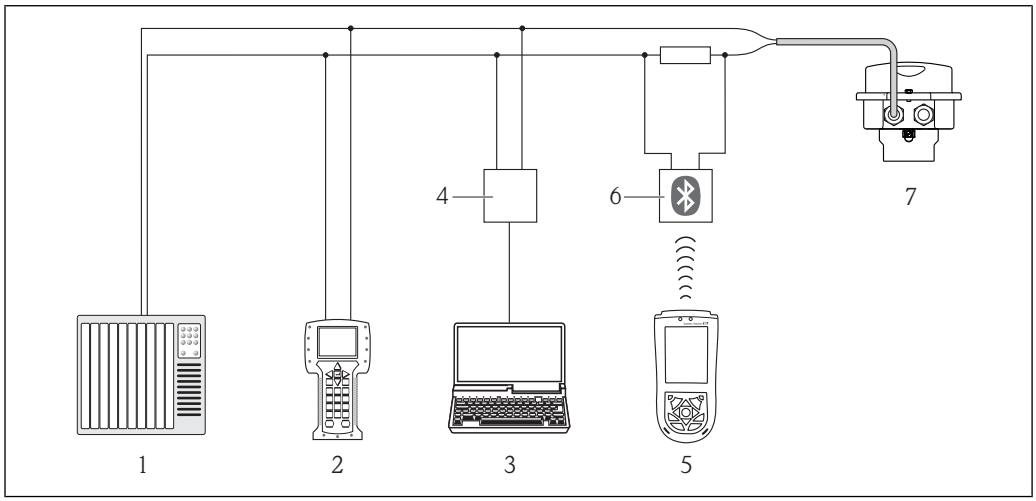
Efficient diagnostics increase measurement availability

- Troubleshooting measures 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

Remote operation

Via HART protocol

This communication interface is present in the following device version:
Order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output

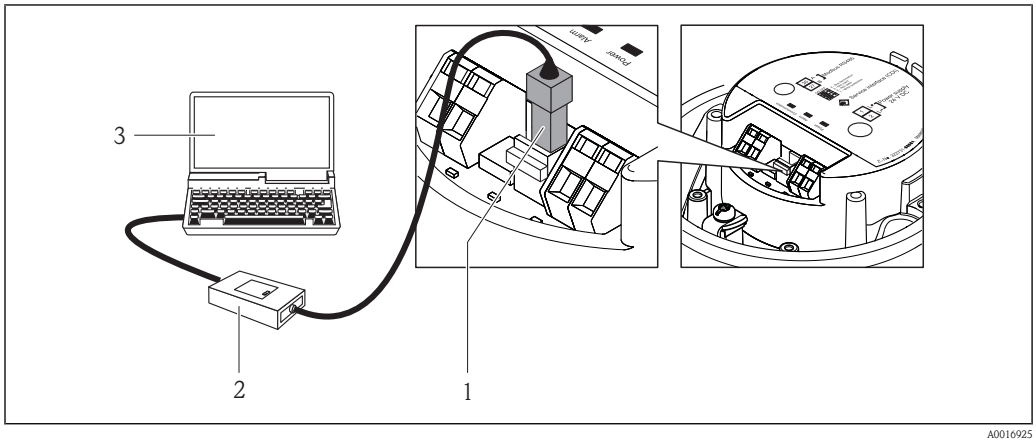


24 Options for remote operation via HART protocol

1 Control 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 SFX100
6 VIATOR Bluetooth modem with connecting cable
7 Transmitter

Via service interface (CDI)

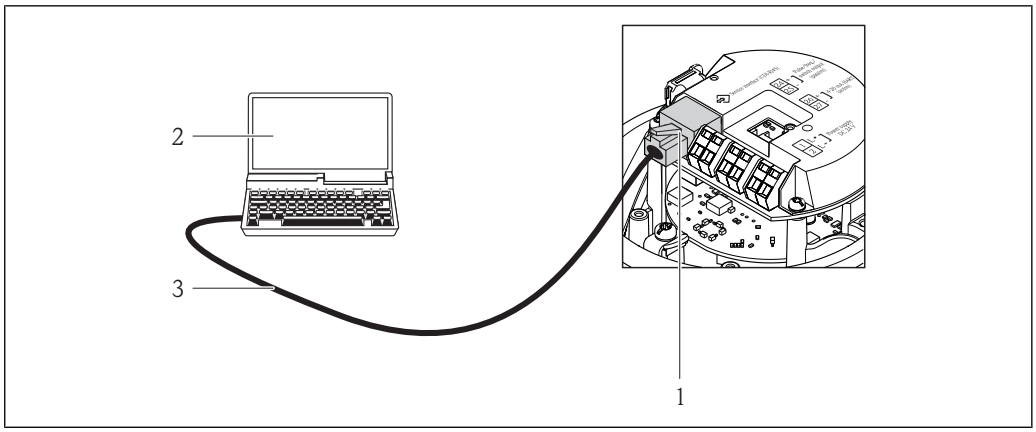
This communication interface is present in the following device version:
Order code for "Output", option **M**: Modbus RS485



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

Via service interface (CDI-RJ45)

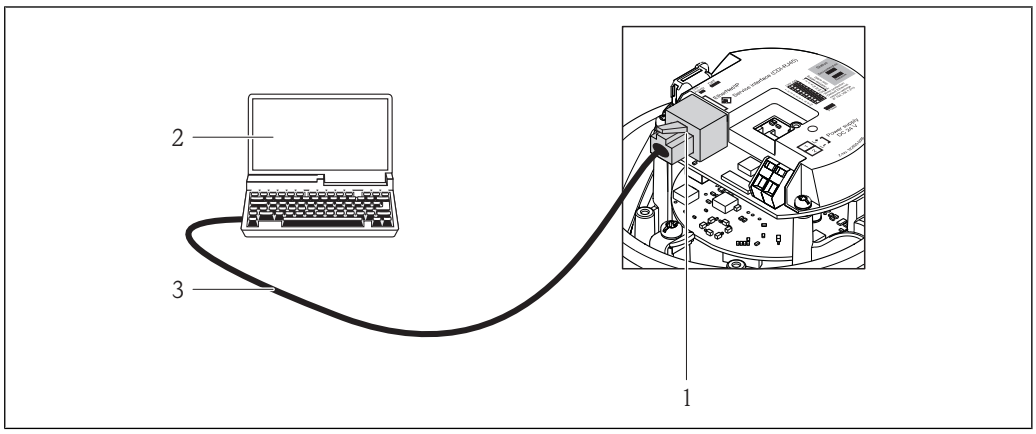
This communication interface is present in the following device version:
Order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output



A0016926

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

This communication interface (CDI = Endress+Hauser Common Data Interface) is present in the following device version:
Order code for "Output", option **N**: EtherNet/IP

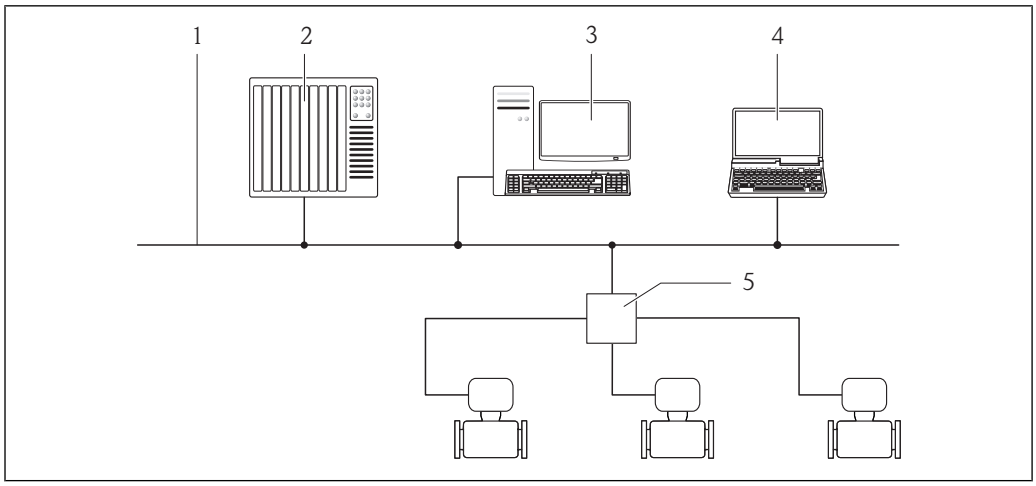


A0016940

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

Via Ethernet network

This communication interface is present in the following device version:
Order code for "Output", option **N**: EtherNet/IP



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

Certificates and approvals

CE mark

The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.

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

C-Tick symbol

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.

ATEX/IECEx

Currently, the following versions for use in hazardous areas are available:

Ex ia

Category (ATEX)	Type of protection
II1/2G	Ex ia IIC T6-T1 Ga/Gb or Ex ia IIB T6-T1 Ga/Gb
II2G	Ex ia IIC T6-T1 Gb or Ex ia IIB T6-T1 Gb
II1/2G, II2D	Ex ia IIC T6-T1 Ga/Gb or Ex ia IIB T6-T1 Ga/Gb Ex tb IIIC T* Db
II2G, II2D	Ex ia IIC T6-T1 Gb or Ex ia IIB T6-T1 Gb Ex tb IIIC T* Db

Ex ia

Category (ATEX)	Type of protection
II2G	Ex ia IIC T6-T1 Gb or Ex ia IIB T6-T1 Gb
II1/2G, II2D	Ex ia IIC T6-T1 Ga/Gb or Ex ia IIB T6-T1 Ga/Gb Ex tb IIIC T* Db
II2G, II2D	Ex ia IIC T6-T1 Gb or Ex ia IIB T6-T1 Gb Ex tb IIIC T* Db

Ex nA

Category (ATEX)	Type of protection
II3G	Ex nA IIC T6-T1 Gc or Ex nA IIC T5-T1 Gc

$_{C}CSA_{US}$

Currently, the following versions for use in hazardous areas are available:

NI (Ex nA, Ex nL)
Class I Division 2 Groups ABCD

IS (Ex i)
- Class I Division 1 Groups ABCD
- Class II Division 1 Groups EFG and Class III

Hygienic compatibility

- 3A approval
- EHEDG-tested

Pressure Equipment Directive

The devices can be ordered with or without a PED approval. If a device with a PED approval is required, this must be explicitly stated in the order. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary.

- With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Basic Safety Requirements" specified of Appendix I of the Pressure Equipment Directive 97/23/EC.
- Devices bearing this marking (PED) 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 (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art.3 Section 3 of the Pressure Equipment Directive 97/23/EC. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive.

Other standards and guidelines

- EN 60529
  Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
  Environmental influences: Test procedure – Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
  Environmental influences: Test procedure – Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.
- IEC/EN 61326
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements)
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 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
  Status classification as per NE107
- NAMUR NE 131
  Requirements for field devices for standard applications
- NAMUR NE 132
  Coriolis mass meter

Ordering information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as 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

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. Heating jackets cannot be used with sensors fitted with a rupture disk. For details, see Operating Instructions BA00132D

Communication-specific accessories

Accessories	Description
Commubox FXA191 HART	For intrinsically safe HART communication with FieldCare via the RS232C interface. For details, see "Technical Information" TI00237F
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. For details, see "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. For details, see "Technical Information" TI00405C
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. For details, see "Technical Information" TI00429F and Operating Instructions BA00371F

WirelessHART adapter	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. For details, see Operating Instructions BA00061S
Fieldgate FXA320	Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser. For details, see "Technical Information" TI00025S and Operating Instructions BA00053S
Fieldgate FXA520	Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser. For details, see "Technical Information" TI00025S and Operating Instructions BA00051S
Field Xpert SFX100	Compact, flexible and robust industry handheld terminal for remote configuration and for obtaining measured values via the HART current output (4-20 mA). For details, see Operating Instructions BA00060S

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ■ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections. ■ Graphic illustration of the calculation results 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://wapps.endress.com/applicator ■ On CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: ■ Via the Internet: www.endress.com/lifecyclemanagement ■ On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details, see Operating Instructions BA00027S and BA00059S

System components

Accessories	Description
Memograph M graphic display recorder	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. For details, see "Technical Information" TI00133R and Operating Instructions BA00247R

Cerabar M	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value via Modbus RS485 or EtherNet/IP. For details, see "Technical Information" TI00426P, TI00436P and Operating Instructions BA00200P, BA00382P
Cerabar S	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value via Modbus RS485 or EtherNet/IP. For details, see "Technical Information" TI00383P and Operating Instructions BA00271P
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 fluid temperature via analog or digital communication. For details, see "Fields of Activity", FA00006T

Documentation

The following document types are available:
- On the CD-ROM supplied with the device
- In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

Standard documentation

*Device type: 8F1B**-*

Communication	Document type	Documentation code
- - - -	Brief Operating Instructions	KA01116D
EtherNet/IP	Operating Instructions	BA01065D
Modbus RS485	Operating Instructions	BA01057D
	Special documentation	SD00154D

Supplementary device-dependent documentation

*Device type: 8*1B**-*

Document type	Approval	Documentation code
Safety Instructions	ATEX/IECEx Ex i	XA00159D
	ATEX/IECEx Ex nA	XA01029D
	cCSAus IS	XA00160D
Information on the Pressure Equipment Directive		SD00142D
Installation Instructions		Specified for each individual accessory (→ 66)

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