TI01351D/06/EN/06.25-00
71726213
2025-12-01



# Technical Information
# **Proline Promass E 100**

Coriolis flowmeter

## The flowmeter with minimum total cost of ownership and an ultra-compact transmitter

### Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Accurate measurement of liquids and gases for a wide range of standard applications

*Device properties*
- Compact dual-tube sensor
- Medium temperature up to +150 °C (+302 °F)
- Process pressure up to 100 bar (1 450 psi)
- Robust, ultra-compact transmitter housing
- Highest degree of protection: IP69
- Local display available

### Your benefits

- Cost-effective – multipurpose device; an alternative to conventional volumetric flowmeters
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in-/outlet run needs
- Space-saving transmitter – full functionality on smallest footprint
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology

Endress+Hauser
People for Process Automation

# Table of contents

# About this document

## Symbols

### Electrical symbols

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

### Symbols for certain types of information

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

### Symbols in graphics

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

# Function and system design

## Measuring principle

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

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

$F_c$ = Coriolis force

$\Delta m$ = moving mass

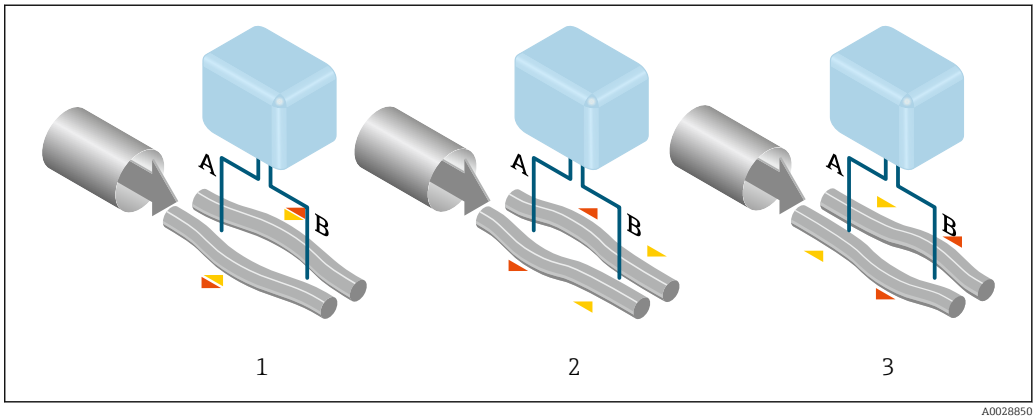
$\omega$ = rotational velocity

$v$ = radial velocity in rotating or oscillating system

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

In the sensor, two parallel measuring tubes containing flowing medium oscillate in antiphase, acting like a vibrating fork. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):

- At zero flow (when the medium 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).




A0028850

The phase shift (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet. System balance is ensured by the antiphase oscillation of 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 medium) results in a corresponding, automatic adjustment in the oscillation frequency. The resonance frequency is thus a function of the medium density. The microprocessor utilizes this relationship to obtain a density signal.

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

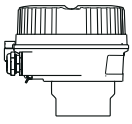
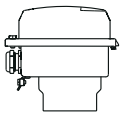
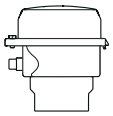
**Temperature measurement**
The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output signal.

## Measuring system

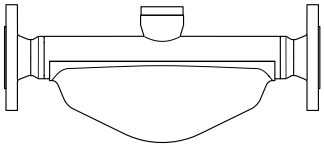
The device consists of a transmitter and a sensor. If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

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

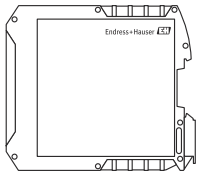
## Transmitter

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

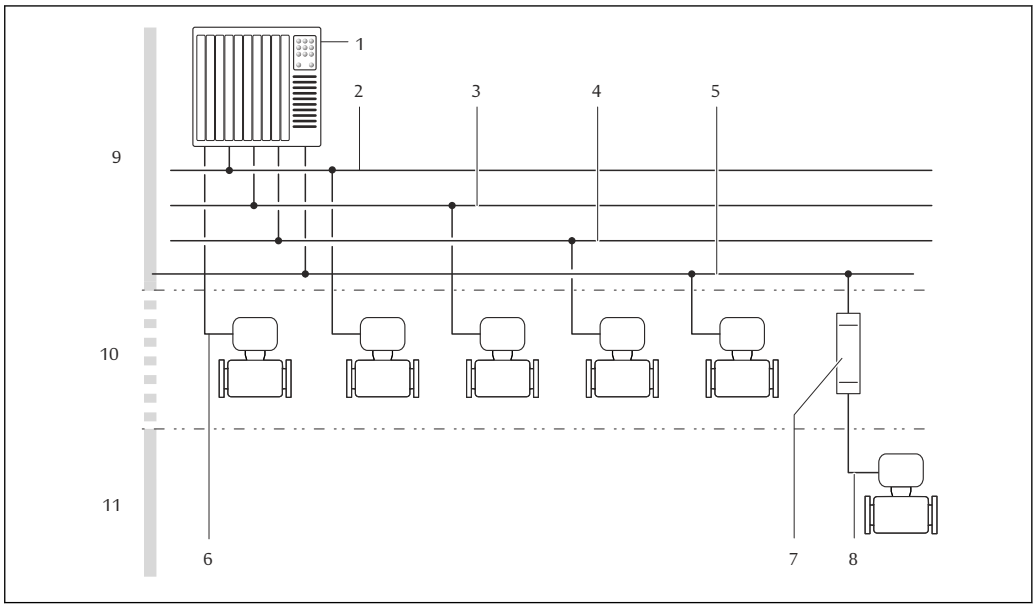
## Sensor

| | |
|---|---|
| **Promass E**<br>  <br>A0030940 | ▪ Bent dual-tube system<br>▪ For standard applications where stable and reliable measurements are required<br>▪ Simultaneous measurement of flow, volume flow, density and temperature (multivariable)<br>▪ Immune to process influences<br>▪ Nominal diameter range: DN 8 to 80 ($^{3}/_{8}$ to 3")<br>▪ Materials:<br>▪ Sensor: stainless steel, 1.4301 (304)<br>▪ Measuring tubes: stainless steel, 1.4539 (904L)<br>▪ Process connections: stainless steel, 1.4404 (316/316L) |

## Safety Barrier Promass 100

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

## Equipment architecture




1 *Possibilities for integrating measuring instruments into a system*

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

## Reliability

### IT security

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

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

# Input

## Measured variable

### Direct measured variables

- Mass flow
- Density
- Temperature

### Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

## Measuring range

### Measuring range for liquids

| DN | | Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$ | |
|---|---|---|---|
| [mm] | [in] | [kg/h] | [lb/min] |
| 8 | ⅜ | 0 to 2 000 | 0 to 73.50 |
| 15 | ½ | 0 to 6 500 | 0 to 238.9 |
| 25 | 1 | 0 to 18 000 | 0 to 661.5 |
| 40 | 1½ | 0 to 45 000 | 0 to 1 654 |
| 50 | 2 | 0 to 70 000 | 0 to 2 573 |
| 80 | 3 | 0 to 180 000 | 0 to 6 615 |

### Measuring range for gases

The full scale value depends on the density and the speed of sound of the gas used. The full scale value can be calculated with the following formulas:

$\dot{m}_{max(G)}$ = minimum of $(\dot{m}_{max(F)} \cdot \rho_G : x)$ and

$(\rho_G \cdot (c_G/2) \cdot d_i^2 \cdot (\pi/4) \cdot 3600 \cdot n)$

| | |
|---|---|
| $\dot{m}_{max(G)}$ | 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 $\dot{m}_{max(F)}$ |
| $\rho_G$ | Gas density in [kg/m³] at operating conditions |
| x | Limitation constant for max. gas flow [kg/m³] |
| $c_G$ | Speed of sound (gas) [m/s] |
| $d_i$ | Measuring tube internal diameter [m] |
| π | Pi |
| n = 2 | Number of measuring tubes |

| DN | | x |
|---|---|---|
| [mm] | [in] | [kg/m³] |
| 8 | ⅜ | 85 |
| 15 | ½ | 110 |
| 25 | 1 | 125 |
| 40 | 1½ | 125 |

| DN | | x |
|---|---|---|
| [mm] | [in] | [kg/m³] |
| 50 | 2 | 125 |
| 80 | 3 | 155 |

To calculate the measuring range, use the *Applicator* sizing tool → 89

If calculating the full scale value using the two formulas:

1. Calculate the full scale value with both formulas.
2. The smaller value is the value that must be used.

**Recommended measuring range**

Flow limit → 52

**Operable flow range**

Over 1000 : 1.

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

**Input signal**

**External measured values**

To increase the measurement accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring instrument:

- Operating pressure to increase measurement accuracy (Endress+Hauser recommends the use of a pressure measuring instrument for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase measurement accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow for gases

Various pressure transmitters and temperature measuring instruments can be ordered from Endress+Hauser: see "Accessories" section → 89

It is recommended to read in external measured values to calculate the following measured variables:

- Mass flow
- Corrected volume flow

*HART protocol*

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

- HART protocol
- Burst mode

*Digital communication*

The measured values can be written by the automation system via:

- PROFIBUS DP
- Modbus RS485
- EtherNet/IP
- PROFINET

# Output

**Output signal**

**HART current output**

| | |
|---|---|
| **Current output** | 4-20 mA HART (active) |
| **Maximum output values** | ▪ DC 24 V (no flow)<br>▪ 22.5 mA |

| | |
|---|---|
| **Load** | 0 to 700 Ω |
| **Resolution** | 0.38 µA |
| **Damping** | Configurable: 0.07 to 999 s |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>The range of options increases if the measuring device has one or more application packages. |

### Pulse/frequency/switch output

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

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

### PROFIBUS DP

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

### Modbus RS485

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

### EtherNet/IP

| | |
|---|---|
| **Standards** | In accordance with IEEE 802.3 |

### PROFINET

| | |
|---|---|
| **Standards** | In accordance with IEEE 802.3 |

## Signal on alarm

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

### Current output

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

### Pulse/frequency/switch output

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

### PROFIBUS DP

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

### Modbus RS485

| | |
|---|---|
| **Failure mode** | Choose from:<br>▪ NaN value instead of current value<br>▪ Last valid value |

### EtherNet/IP

| | |
|---|---|
| **Device diagnostics** | Device condition can be read out in Input Assembly |

### PROFINET

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

### Local display

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

Status signal as per NAMUR recommendation NE 107

### Interface/protocol

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

Additional information on remote operation → 78

### Web browser

| | |
|---|---|
| **Plain text display** | With information on cause and remedial measures |

### LEDs

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

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

## Ex connection data

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

### Safety Barrier Promass 100

*Safety-related values*

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

*Intrinsically safe values*

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

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

### Transmitter

*Intrinsically safe values*

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

## Low flow cut off

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

## Protocol-specific data

### HART

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

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

### PROFIBUS DP

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

| | |
|---|---|
| **Output values**<br>(from measuring instrument to automation system) | **Analog input 1 to 8**<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Target mass flow<br>▪ Carrier mass flow<br>▪ Density<br>▪ Reference density<br>▪ Concentration<br>▪ Temperature<br>▪ Carrier pipe temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency<br>▪ Oscillation amplitude<br>▪ Frequency fluctuation<br>▪ Oscillation damping<br>▪ Tube damping fluctuation<br>▪ Signal asymmetry<br>▪ Exciter current<br>**Digital input 1 to 2**<br>▪ Partially filled pipe detection<br>▪ Low flow cut off<br>**Totalizer 1 to 3**<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow |
| **Input values**<br>(from automation system to measuring instrument) | **Analog output 1 to 3 (fixed assignment)**<br>▪ Pressure<br>▪ Temperature<br>▪ Reference density<br>**Digital output 1 to 3 (fixed assignment)**<br>▪ Digital output 1: switch positive zero return on/off<br>▪ Digital output 2: perform zero adjustment<br>▪ Digital output 3: switch switch output on/off<br>**Totalizer 1 to 3**<br>▪ Totalize<br>▪ Reset and hold<br>▪ Preset and hold<br>▪ Stop<br>▪ Operating mode configuration:<br>  ▪ Net flow total<br>  ▪ Forward flow total<br>  ▪ Reverse flow total |
| **Supported functions** | ▪ Identification & maintenance<br>Straightforward device identification on the part of the control system and nameplate<br>▪ PROFIBUS upload/download<br>Reading and writing parameters is up to ten times faster with PROFIBUS upload/download.<br>▪ Condensed status<br>Straightforward and self-explanatory diagnostic information by categorizing diagnostic messages that occur |
| **Configuration of the device address** | ▪ DIP switches on the I/O electronics module<br>▪ Via operating tools (e.g. FieldCare) |

### Modbus RS485

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

| | |
|---|---|
| **Function codes** | ▪ 03: Read holding register<br>▪ 04: Read input register<br>▪ 06: Write single registers<br>▪ 08: Diagnostics<br>▪ 16: Write multiple registers<br>▪ 23: Read/write multiple registers |
| **Broadcast messages** | Supported by the following function codes:<br>▪ 06: Write single registers<br>▪ 16: Write multiple registers<br>▪ 23: Read/write multiple registers |
| **Supported baud rate** | ▪ 1 200 BAUD<br>▪ 2 400 BAUD<br>▪ 4 800 BAUD<br>▪ 9 600 BAUD<br>▪ 19 200 BAUD<br>▪ 38 400 BAUD<br>▪ 57 600 BAUD<br>▪ 115 200 BAUD |
| **Data transfer mode** | ▪ ASCII<br>▪ RTU |
| **Data access** | Each device parameter can be accessed via Modbus RS485.<br>For Modbus register information, see "Description of device parameters" documentation → 90 |

### EtherNet/IP

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

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

| | |
|---|---|
| **Configurable Input Assembly** | ▪ Current device diagnostics<br>▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Totalizer 1<br>▪ Totalizer 2<br>▪ Totalizer 3<br>The range of options increases if the measuring device has one or more application packages. |
| **Fix output** | |
| **Output Assembly** | ▪ Activation of reset totalizers 1-3<br>▪ Activation of pressure compensation<br>▪ Activation of reference density compensation<br>▪ Activation of temperature compensation<br>▪ Reset totalizers 1-3<br>▪ External pressure value<br>▪ Pressure unit<br>▪ External reference density<br>▪ Reference density unit<br>▪ External temperature<br>▪ Temperature unit |
| **Configuration** | |
| **Configuration Assembly** | Only the most common configurations are listed below.<br>▪ Software write protection<br>▪ Mass flow unit<br>▪ Mass unit<br>▪ Volume flow unit<br>▪ Volume unit<br>▪ Corrected volume flow unit<br>▪ Corrected volume unit<br>▪ Density unit<br>▪ Reference density unit<br>▪ Temperature unit<br>▪ Pressure unit<br>▪ Length<br>▪ Totalizer 1-3:<br>  ▪ Assignment<br>  ▪ Unit<br>  ▪ Mode of operation<br>  ▪ Failure mode<br>▪ Alarm delay |

## PROFINET

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

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

| | |
|---|---|
| **Input values**<br>(from automation system to measuring instrument) | **Analog Output module (fixed assignment)**<br>▪ External pressure (slot 18)<br>▪ External temperature (slot 19)<br>▪ External reference density (slot 20)<br>**Discrete Output module (fixed assignment)**<br>▪ Activate/deactivate positive zero return (slot 21)<br>▪ Perform zero adjustment (slot 22)<br>**Totalizer 1 to 3 (slot 15 to 17)**<br>▪ Totalize<br>▪ Reset and hold<br>▪ Preset and hold<br>▪ Stop<br>▪ Operating mode configuration:<br>  ▪ Net flow total<br>  ▪ Forward flow total<br>  ▪ Reverse flow total<br>**Heartbeat Verification module (fixed assignment)**<br>Start verification (slot 23)<br>The range of options increases if the measuring device has one or more application packages. |
| **Supported functions** | ▪ Identification & maintenance<br>Simple device identification via:<br>  ▪ Control system<br>  ▪ Nameplate<br>▪ Measured value status<br>The process variables are communicated with a measured value status<br>▪ Blinking feature via the local display for simple device identification and assignment |

*Administration of software options*

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

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

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

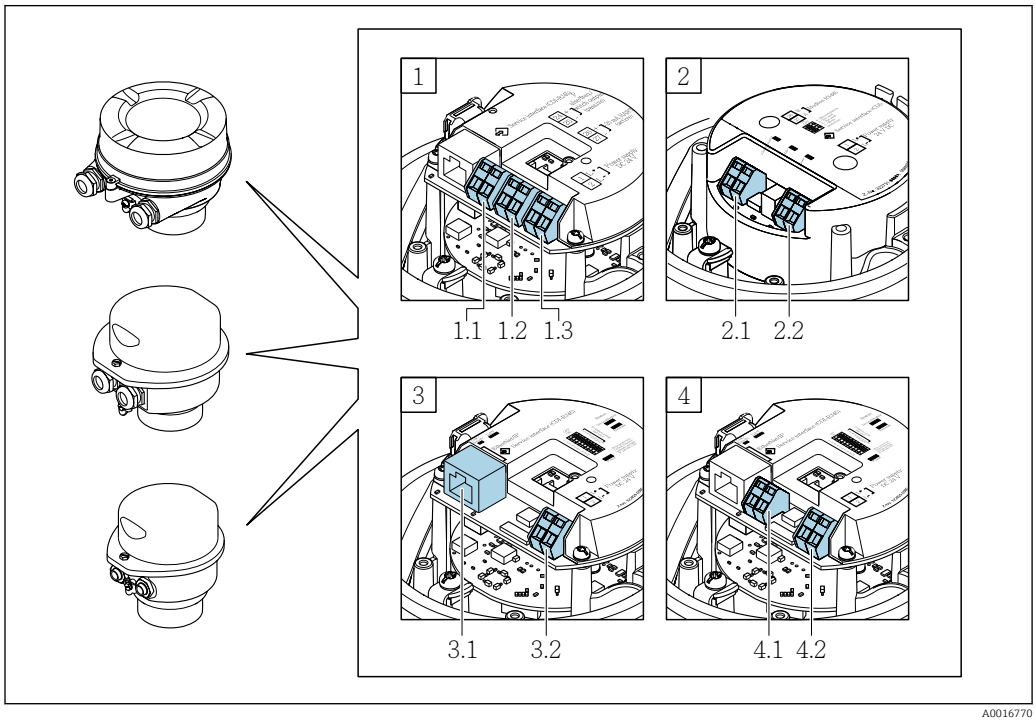
*Startup configuration*

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

# Power supply

## Terminal assignment

### Overview: housing version and connection versions




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

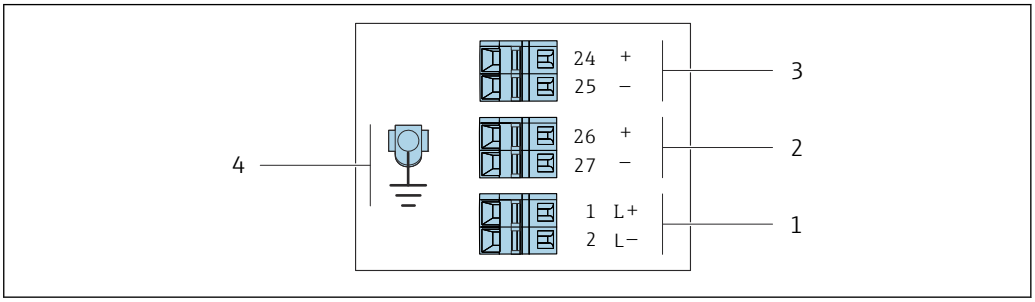
### Transmitter

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

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

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

| Order code for "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|---|
| | Outputs | Power supply | |
| Options **A**, **B** | Terminals | Terminals | ▪ Option **A**: coupling M20x1<br>▪ Option **B**: thread M20x1<br>▪ Option **C**: thread G ½"<br>▪ Option **D**: thread NPT ½" |
| Options **A**, **B** | Device plug → 🖹 32 | Terminals | ▪ Option **L**: plug M12x1 + thread NPT ½"<br>▪ Option **N**: plug M12x1 + coupling M20<br>▪ Option **P**: plug M12x1 + thread G ½"<br>▪ Option **U**: plug M12x1 + thread M20 |
| Options **A**, **B**, **C** | Device plug → 🖹 32 | Device plug → 🖹 32 | Option **Q**: 2 x plug M12x1 |
| Order code for "Housing":<br>▪ Option **A**: compact, coated aluminum<br>▪ Option **B**: compact, hygienic, stainless<br>▪ Option **C**: ultra-compact, hygienic, stainless | | | |




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

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

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

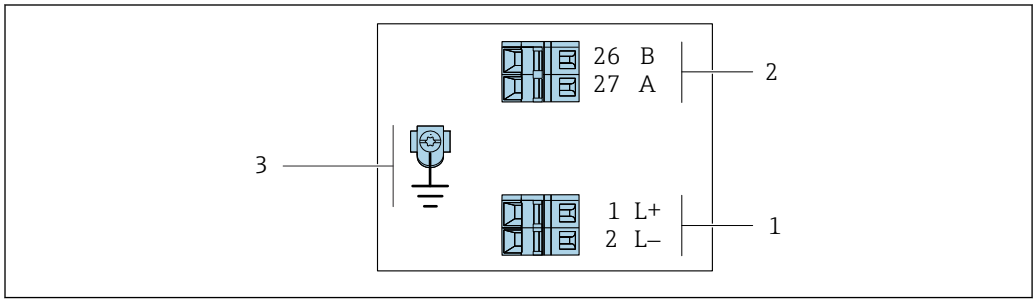
*PROFIBUS DP connection version*

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

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

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

| Order code for "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|---|
| | Output | Power supply | |
| Options **A**, **B** | Terminals | Terminals | ▪ Option **A**: coupling M20x1<br>▪ Option **B**: thread M20x1<br>▪ Option **C**: thread G ½"<br>▪ Option **D**: thread NPT ½" |
| Options **A**, **B** | Device plug → 🖹 32 | Terminals | ▪ Option **L**: plug M12x1 + thread NPT ½"<br>▪ Option **N**: plug M12x1 + coupling M20<br>▪ Option **P**: plug M12x1 + thread G ½"<br>▪ Option **U**: plug M12x1 + thread M20 |
| Options **A**, **B**, **C** | Device plug → 🖹 32 | Device plug → 🖹 32 | Option **Q**: 2 x plug M12x1 |
| Order code for "Housing":<br>▪ Option **A**: compact, coated aluminum<br>▪ Option **B**: compact, hygienic, stainless<br>▪ Option **C**: ultra-compact, hygienic, stainless | | | |




*3 PROFIBUS DP terminal assignment*

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

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

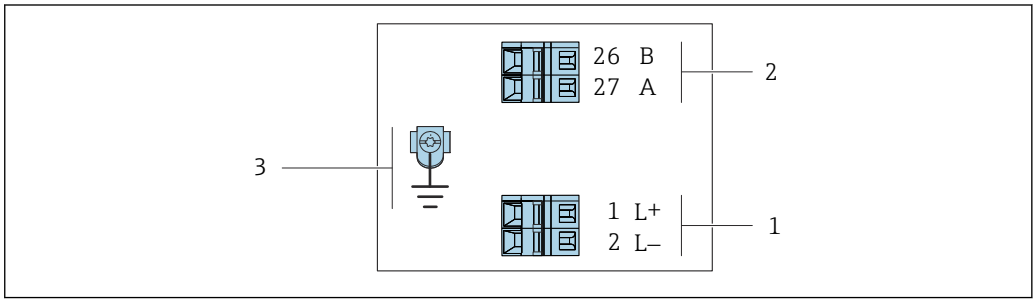
*Modbus RS485 connection version*

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

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

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

| Order code for "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|---|
| | Output | Power supply | |
| Options **A**, **B** | Terminals | Terminals | ▪ Option **A**: coupling M20x1<br>▪ Option **B**: thread M20x1<br>▪ Option **C**: thread G ½"<br>▪ Option **D**: thread NPT ½" |
| Options **A**, **B** | Device plug → 🖹 32 | Terminals | ▪ Option **L**: plug M12x1 + thread NPT ½"<br>▪ Option **N**: plug M12x1 + coupling M20<br>▪ Option **P**: plug M12x1 + thread G ½"<br>▪ Option **U**: plug M12x1 + thread M20 |
| Options **A**, **B**, **C** | Device plug → 🖹 32 | Device plug → 🖹 32 | Option **Q**: 2 x plug M12x1 |
| Order code for "Housing":<br>▪ Option **A**: compact, coated aluminum<br>▪ Option **B**: compact, hygienic, stainless<br>▪ Option **C**: ultra-compact, hygienic, stainless | | | |




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

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

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

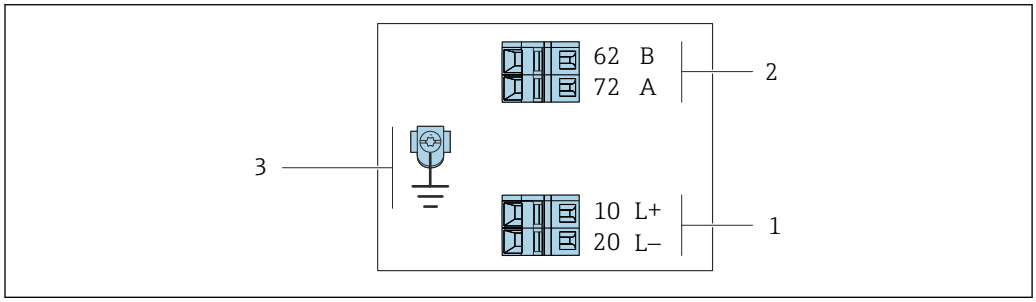
*Modbus RS485 connection version*

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

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

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

| Order code for "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|---|
| | Output | Power supply | |
| Options **A**, **B** | Terminals | Terminals | ▪ Option **A**: coupling M20x1<br>▪ Option **B**: thread M20x1<br>▪ Option **C**: thread G ½"<br>▪ Option **D**: thread NPT ½" |
| **A**, **B**, **C** | Device plug<br>→ 🖹 32 | | Option **I**: plug M12x1 |
| Order code for "Housing":<br>▪ Option **A**: compact, coated aluminum<br>▪ Option **B**: compact, hygienic, stainless<br>▪ Option **C**: ultra-compact, hygienic, stainless | | | |




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

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

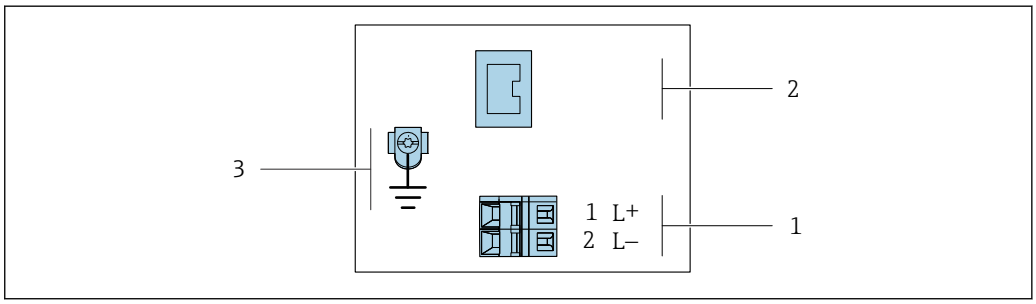
| Order code for "Output" | 10 (L+) | 20 (L-) | 62 (B) | 72 (A) |
|---|---|---|---|---|
| Option **M** | Intrinsically safe supply voltage | | Modbus RS485, intrinsically safe | |
| Order code for "Output":<br>Option **M**: Modbus RS485, for use in the intrinsically safe area (connection via Safety Barrier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

*EtherNet/IP connection version*

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

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

| Order code for "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|---|
| | Output | Power supply | |
| Options **A**, **B** | Device plug → 🖹 33 | Terminals | ▪ Option **L**: plug M12x1 + thread NPT ½"<br>▪ Option **N**: plug M12x1 + coupling M20<br>▪ Option **P**: plug M12x1 + thread G ½"<br>▪ Option **U**: plug M12x1 + thread M20 |
| Options **A**, **B**, **C** | Device plug → 🖹 33 | Device plug → 🖹 33 | Option **Q**: 2 x plug M12x1 |
| Order code for "Housing":<br>▪ Option **A**: compact, coated aluminum<br>▪ Option **B**: compact, hygienic, stainless<br>▪ Option **C**: ultra-compact, hygienic, stainless | | | |




*6 EtherNet/IP terminal assignment*

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

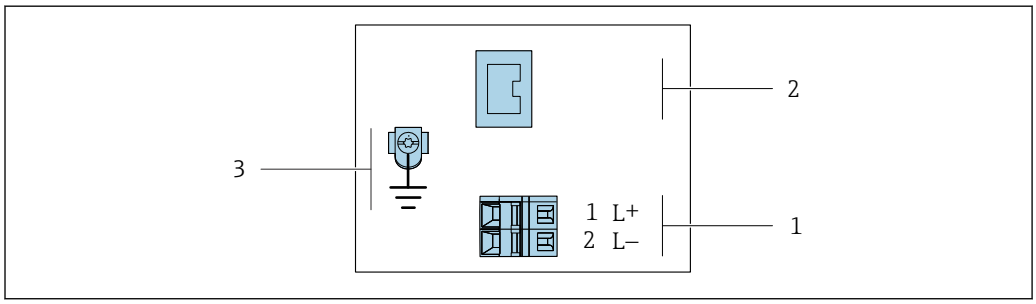
| Order code for "Output" | Terminal number | | |
|---|---|---|---|
| | Power supply | | Output |
| | 2 (L-) | 1 (L+) | Device plug M12x1 |
| Option **N** | DC 24 V | | EtherNet/IP |
| Order code for "Output":<br>Option **N**: EtherNet/IP | | | |

*PROFINET connection version*

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

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

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

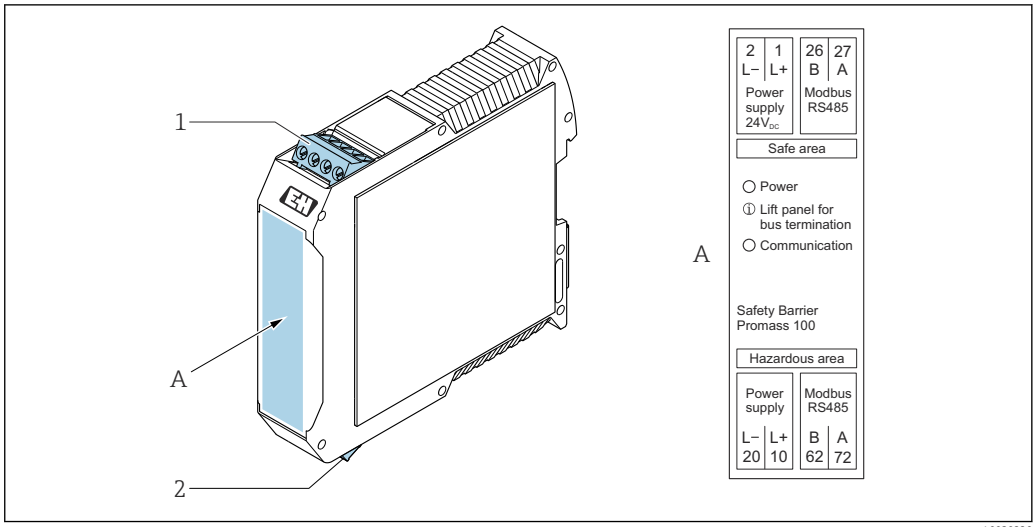



*7 PROFINET terminal assignment*

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

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

### Safety Barrier Promass 100




*8 Safety Barrier Promass 100 with terminals*

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

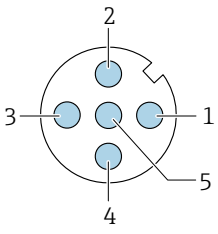
## Pin assignment, device plug

Order codes for the M12x1 plugs, see the "Order code for **electrical connection**" column:
- 4-20 mA HART, pulse/frequency/switch output → 24
- PROFIBUS DP→ 26
- Modbus RS485 → 27
- EtherNet/IP → 29
- PROFINET→ 30

### Supply voltage

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

Device plug MODBUS RS485, intrinsically safe with supply voltage → 32



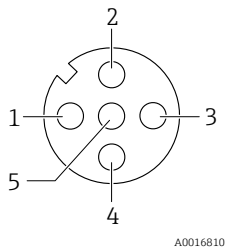

| Pin | | Assignment |
|---|---|---|
| 1 | L+ | DC 24 V |
| 2 | | Not used |
| 3 | | Not used |
| 4 | L- | DC 24 V |
| 5 | | Grounding/shielding [1] |
| **Coding** | | **Plug/socket** |
| A | | Plug |

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

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

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

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




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

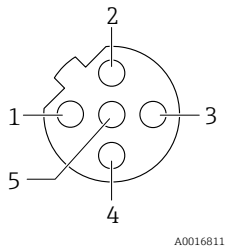
1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".
Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

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

### PROFIBUS DP

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

*Device plug for signal transmission (device side)*



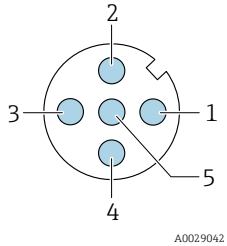

| Pin | | Assignment |
|---|---|---|
| 1 | | Not used |
| 2 | A | PROFIBUS DP |
| 3 | | Not used |
| 4 | B | PROFIBUS DP |
| 5 | | Shielding [1] |
| **Coding** | | **Plug/socket** |
| B | | Socket |

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

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

### MODBUS RS485

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




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

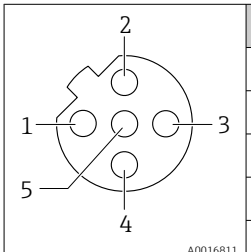
| | Coding | Plug/socket |
|---|---|---|
| | A | Plug |

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

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

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

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



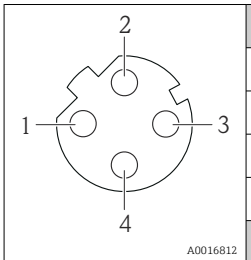

| Pin | | Assignment |
|---|---|---|
| 1 | | Not used |
| 2 | A | Modbus RS485 |
| 3 | | Not used |
| 4 | B | Modbus RS485 |
| 5 | | Shielding [1] |
| **Coding** | | **Plug/socket** |
| B | | Socket |

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

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

### EtherNet/IP

*Device plug for signal transmission (device side)*

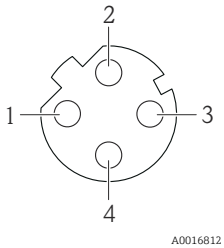



| Pin | | Assignment |
|---|---|---|
| 1 | + | Tx |
| 2 | + | Rx |
| 3 | - | Tx |
| 4 | - | Rx |
| **Coding** | | **Plug/socket** |
| D | | Socket |

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

**PROFINET**

*Device plug for signal transmission (device side)*




| Pin | | Assignment |
|---|---|---|
| 1 | + | TD + |
| 2 | + | RD + |
| 3 | - | TD – |
| 4 | - | RD – |
| **Coding** | | **Plug/socket** |
| D | | Socket |

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

## Supply voltage

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

### Transmitter

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

### Promass 100 safety barrier

DC 20 to 30 V

## Power consumption

### Transmitter

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

*Safety Barrier Promass 100*

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

## Current consumption

### Transmitter

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

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

**Safety Barrier Promass 100**

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

**Device fuse**

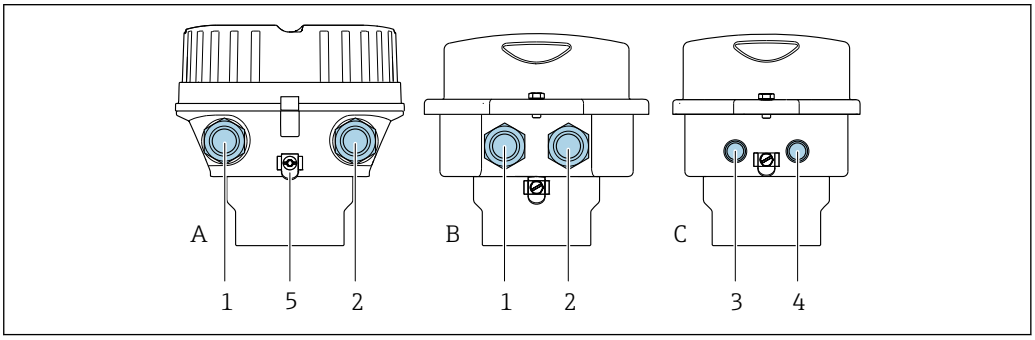
Fine-wire fuse (slow-blow) T2A

**Power supply failure**

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

**Electrical connection**

**Transmitter connection**




A0016924

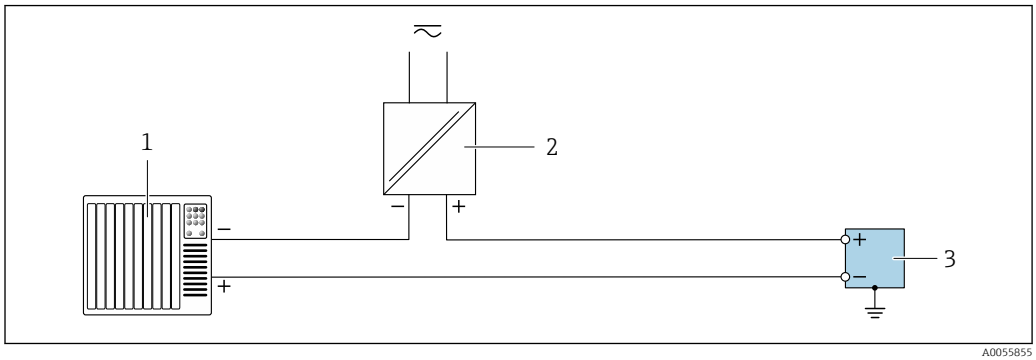
*A Housing version: compact, coated, aluminum*
*B Housing version: compact, hygienic, stainless*
*C Housing version: ultra-compact, hygienic, stainless, M12 device plug*
*1 Cable entry or device plug for signal transmission*
*2 Cable entry or device plug for supply voltage*
*3 Device plug for signal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

- Terminal assignment → 24
- Pin assignment, device plug → 31

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

### Connection examples

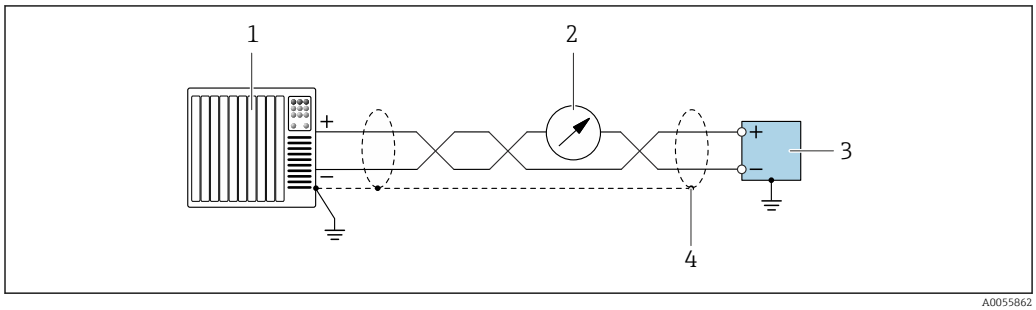
*Pulse output/frequency output/switch output*




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

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

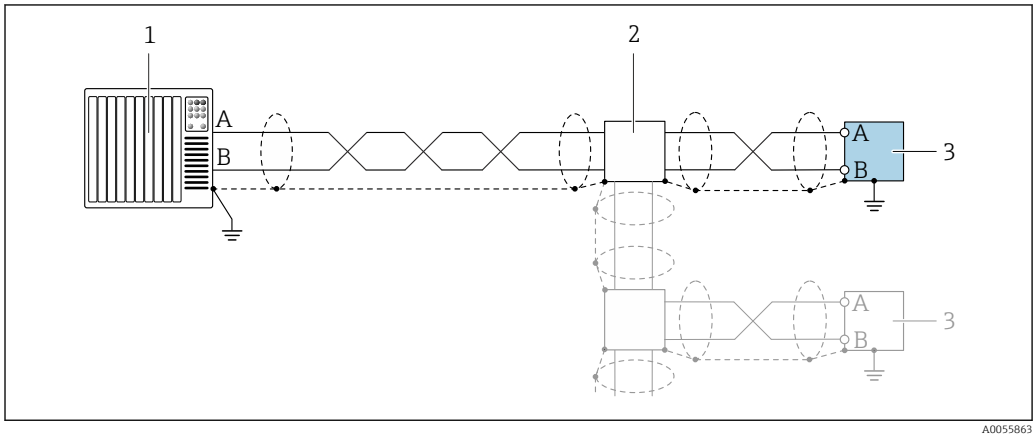
*Current output 4 to 20 mA HART*




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

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

*Modbus RS485*




*11 Connection example for Modbus RS485*

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

*PROFIBUS DP*

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

*PROFINET*

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

*EtherNet/IP*

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

**Potential equalization**

**Requirements**

For potential equalization:
- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electric potential
- Use a ground cable with a minimum cross-section of 6 $mm^2$ (10 AWG) and a cable lug for potential equalization connections

**Terminals**

**Transmitter**
Spring terminals for wire cross-sections0.5 to 2.5 $mm^2$ (20 to 14 AWG)

**Promass 100 safety barrier**
Plug-in screw terminals for wire cross-sections0.5 to 2.5 $mm^2$ (20 to 14 AWG)

**Cable entries**

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

**Cable specification**

**Permitted temperature range**

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

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

Standard installation cable is sufficient.

**Signal cable**

*Pulse/frequency/switch output*

Standard installation cable is sufficient.

*Current output 4 to 20 mA HART*

Shielded twisted-pair cable.

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

*Modbus RS485*

Shielded twisted-pair cable.

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

*PROFIBUS DP*

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

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

*PROFINET*

Only PROFINET cables.

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

*EtherNet/IP*

Twisted-pair Ethernet CAT 5 or better.

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

### Connecting cable between Safety Barrier Promass 100 and measuring device

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

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

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

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

# Performance characteristics

**Reference operating conditions**

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

To obtain measured errors, use the *Applicator* sizing tool → 🖹 89

**Maximum measurement error**

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

### Base accuracy

Design fundamentals → 🖹 41

*Mass flow and volume flow (liquids)*

- ±0.15 % o.r.
  ±0.10 % o.r. (order code for "Calibration flow", option A, B, C, for mass flow)
- ±0.25 % o.r.

*Mass flow (gases)*

±0.50 % o.r.

*Density (liquids)*

| Under reference conditions [g/cm³] | Standard density calibration [g/cm³] |
|---|---|
| ±0.0005 | ±0.002 |

*Temperature*

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

### Zero point stability

| DN | | Zero point stability | |
|---|---|---|---|
| [mm] | [in] | [kg/h] | [lb/min] |
| 8 | ⅜ | 0.20 | 0.007 |
| 15 | ½ | 0.65 | 0.024 |
| 25 | 1 | 1.80 | 0.066 |
| 40 | 1½ | 4.50 | 0.165 |
| 50 | 2 | 7.0 | 0.257 |
| 80 | 3 | 18.0 | 0.6615 |

### Flow values

Flow values as turndown parameters depending on nominal diameter.

*SI units*

| DN [mm] | 1:1 [kg/h] | 1:10 [kg/h] | 1:20 [kg/h] | 1:50 [kg/h] | 1:100 [kg/h] | 1:500 [kg/h] |
|---|---|---|---|---|---|---|
| 8 | 2 000 | 200 | 100 | 40 | 20 | 4 |
| 15 | 6 500 | 650 | 325 | 130 | 65 | 13 |
| 25 | 18 000 | 1 800 | 900 | 360 | 180 | 36 |
| 40 | 45 000 | 4 500 | 2 250 | 900 | 450 | 90 |
| 50 | 70 000 | 7 000 | 3 500 | 1 400 | 700 | 140 |
| 80 | 180 000 | 18 000 | 9 000 | 3 600 | 1 800 | 360 |

*US units*

| DN [inch] | 1:1 [lb/min] | 1:10 [lb/min] | 1:20 [lb/min] | 1:50 [lb/min] | 1:100 [lb/min] | 1:500 [lb/min] |
|---|---|---|---|---|---|---|
| ⅜ | 73.50 | 7.350 | 3.675 | 1.470 | 0.735 | 0.147 |
| ½ | 238.9 | 23.89 | 11.95 | 4.778 | 2.389 | 0.478 |
| 1 | 661.5 | 66.15 | 33.08 | 13.23 | 6.615 | 1.323 |
| 1½ | 1 654 | 165.4 | 82.70 | 33.08 | 16.54 | 3.308 |
| 2 | 2 573 | 257.3 | 128.7 | 51.46 | 25.73 | 5.146 |
| 3 | 6 615 | 661.5 | 330.8 | 132.3 | 66.15 | 13.23 |

### Accuracy of outputs

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

The outputs have the following base accuracy specifications:

*Current output*

| | |
|---|---|
| **Accuracy** | Max. ±5 µA |

*Pulse/frequency output*

o.r. = of reading

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

## Repeatability

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

### Base repeatability

Design fundamentals → 🖹 41

*Mass flow and volume flow (liquids)*

±0.075 % o.r.
±0.05 % o.r. (calibration option, for mass flow)

*Mass flow (gases)*

±0.25 % o.r. (up to a Mach number of 0.2)

*Density (liquids)*

±0.00025 g/cm³

*Temperature*

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

## Response time

The response time depends on the configuration (damping).

## Influence of ambient temperature

### Current output

o.r. = of reading

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

### Pulse/frequency output

| | |
|---|---|
| **Temperature coefficient** | No additional effect. Included in accuracy. |

## Influence of medium temperature

### Mass flow

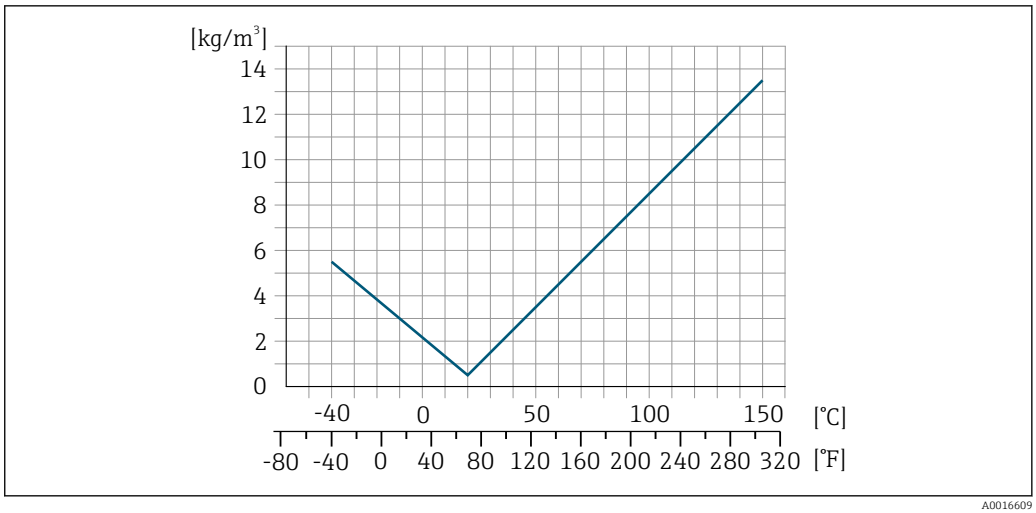
o.f.s. = of full scale value

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

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

### Density

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




12 *Field density adjustment, for example at +20 °C (+68 °F)*

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

**Influence of medium pressure**

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

o.r. = of reading

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

Operating Instructions → 90.

| DN | | [% o.r./bar] | [% o.r./psi] |
|---|---|---|---|
| [mm] | [in] | | |
| 8 | ⅜ | no effect | |
| 15 | ½ | no effect | |
| 25 | 1 | no effect | |
| 40 | 1½ | no effect | |
| 50 | 2 | −0.009 | −0.0006 |
| 80 | 3 | −0.020 | −0.0014 |

**Design fundamentals**

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

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

MeasValue = measured value; ZeroPoint = zero point stability

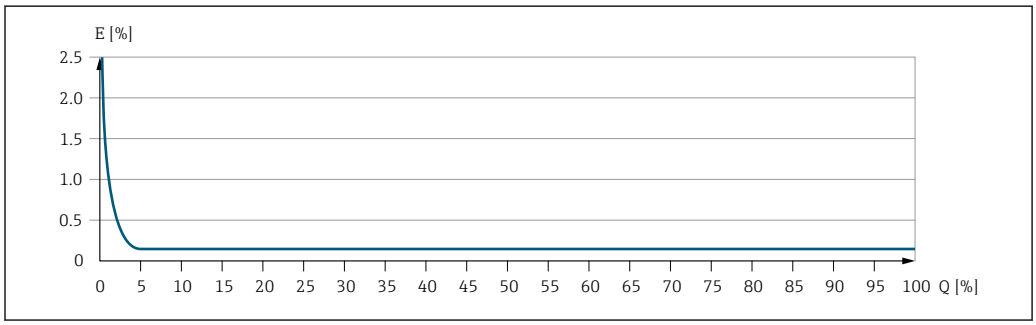
*Calculation of the maximum measured error as a function of the flow rate*

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

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

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

### Example of maximum measurement error

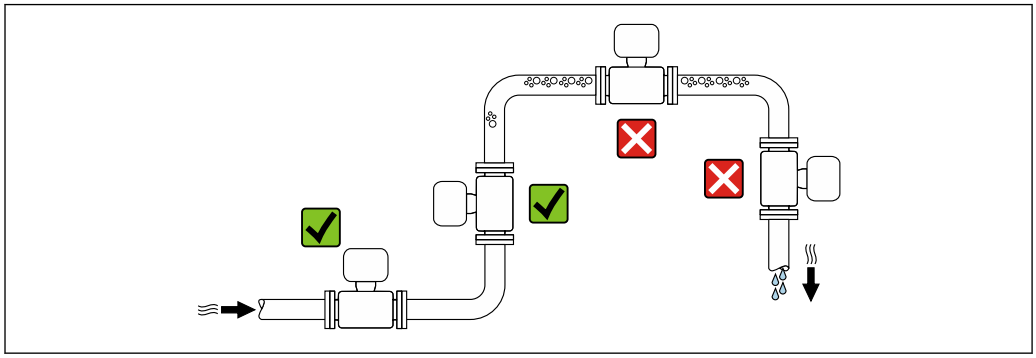



A0030289

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

# Installation

## Mounting location

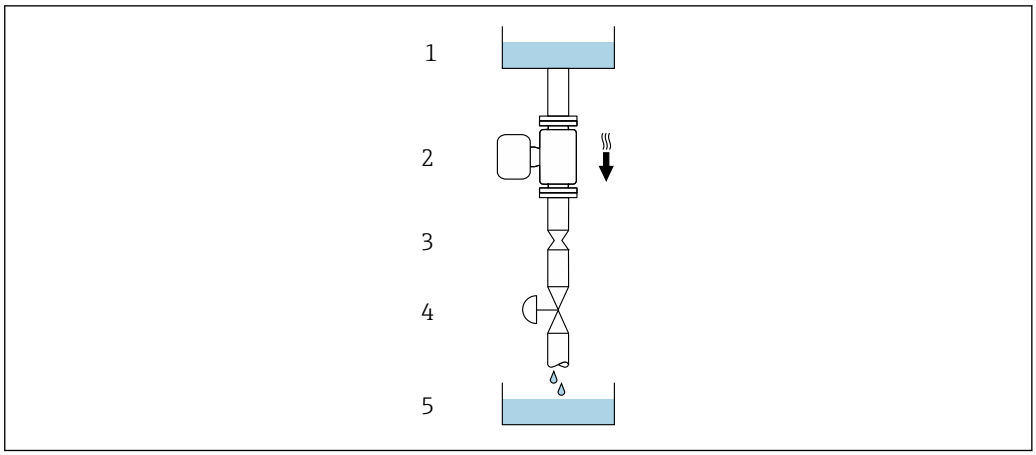


A0028772

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

### Installation in down pipes

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



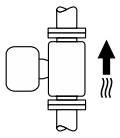
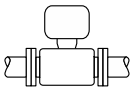
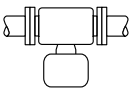

*13 Installation in a down pipe (e.g. for batching applications)*

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

| DN/NPS | | Ø orifice plate, pipe restriction | |
|---|---|---|---|
| [mm] | [in] | [mm] | [in] |
| 8 | ⅜ | 6 | 0.24 |
| 15 | ½ | 10 | 0.40 |
| 25 | 1 | 14 | 0.55 |
| 40 | 1 ½ | 22 | 0.87 |
| 50 | 2 | 28 | 1.10 |
| 80 | 3 | 50 | 1.97 |

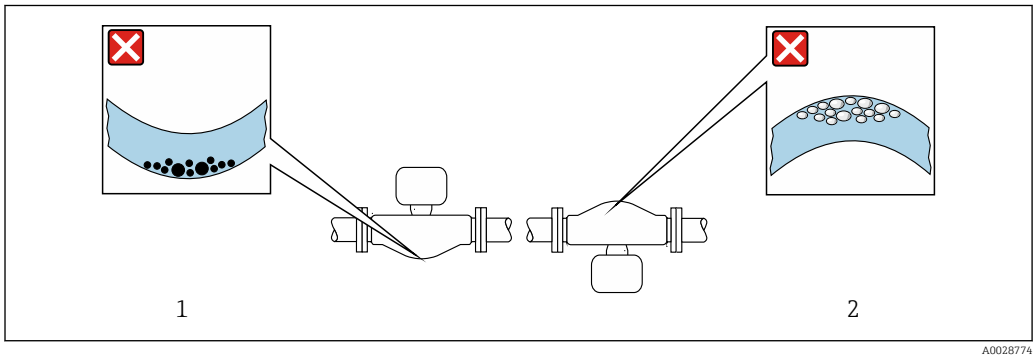
**Orientation**

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

| Orientation | | | Recommendation |
|---|---|---|---|
| **A** | Vertical orientation |  A0015591 | ✓✓ 1) |
| **B** | Horizontal orientation, transmitter at top |  A0015589 | ✓✓ 2) Exception: → 14, 44 |
| **C** | Horizontal orientation, transmitter at bottom |  A0015590 | ✓✓ 3) Exception: → 14, 44 |
| **D** | Horizontal orientation, transmitter at side |  A0015592 | ✗ |

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

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




14 *Orientation of sensor with curved measuring tube*

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

## Inlet and outlet runs

No special precautions need to be taken for fittings that create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 52.

## Special installation instructions

### Drainability

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

### Hygienic compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 84

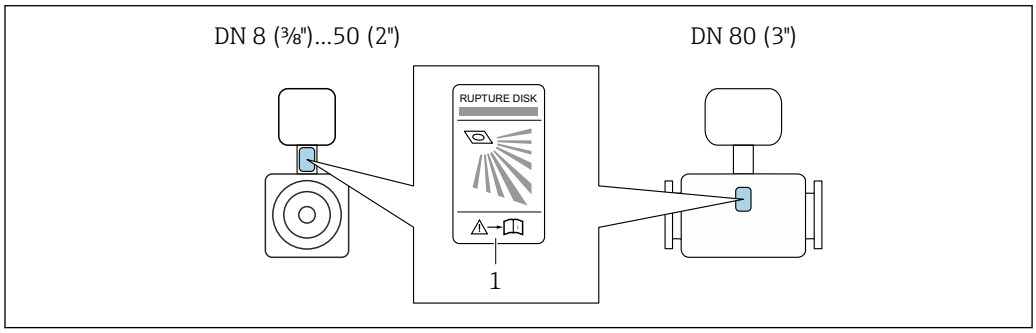
### Rupture disk

Process-related information: → 52.

**WARNING**

**Danger from medium escaping!**
Medium escaping under pressure can cause injury or material damage.
- Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- Observe the information on the rupture disk sticker.
- Make sure that the function and operation of the rupture disk is not impeded through the installation of the device.
- Do not use a heating jacket.
- Do not remove or damage the rupture disk.

The position of the rupture disk is indicated on a sticker applied over it. If the rupture disk is triggered, the sticker is destroyed. The disk can therefore be visually monitored.




1 *Rupture disk label*

**Zero point verification and zero adjustment**

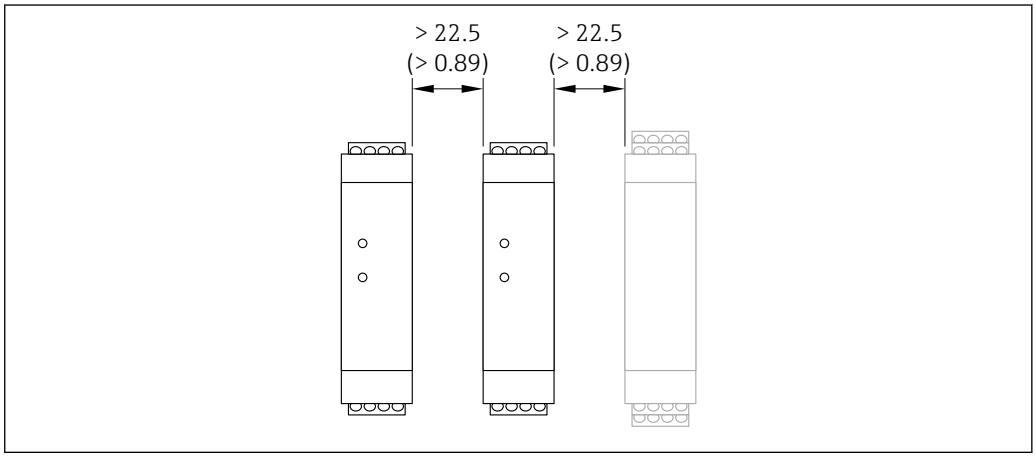
All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 38. Therefore, a zero adjustment in the field is generally not required.

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

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

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

**Installing the Safety Barrier Promass 100**




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

# Environment

**Ambient temperature range**

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

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

**Storage temperature**

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

**Climate class**

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

**Degree of protection**

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

**Safety Barrier Promass 100**
IP20

**Vibration resistance and shock resistance**

**Sinusoidal vibration similar to IEC 60068-2-6**

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

**Broadband random vibration similar to IEC 60068-2-64**

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

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

6 ms 30 g

**Rough handling shocks similar to IEC 60068-2-31**

**Electromagnetic compatibility (EMC)**

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

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

Details are provided in the Declaration of Conformity.

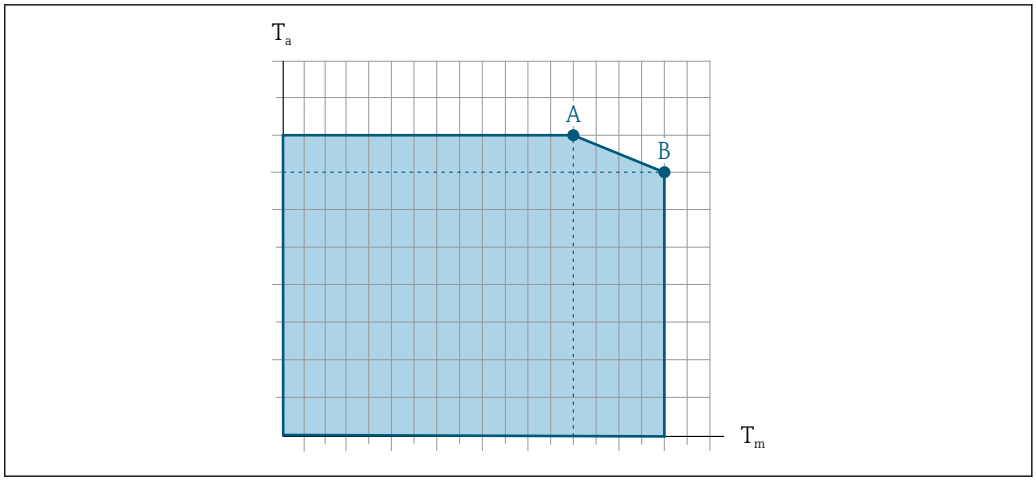
This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

# Process

**Medium temperature range**

−40 to +150 °C (−40 to +302 °F)

**Dependency of ambient temperature on medium temperature**




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

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

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

| Not insulated | | | | Insulated | | | |
|---|---|---|---|---|---|---|---|
| A | | B | | A | | B | |
| $T_a$ | $T_m$ | $T_a$ | $T_m$ | $T_a$ | $T_m$ | $T_a$ | $T_m$ |
| 60 °C (140 °F) | 150 °C (302 °F) | – | – | 60 °C (140 °F) | 110 °C (230 °F) | 55 °C (131 °F) | 150 °C (302 °F) |

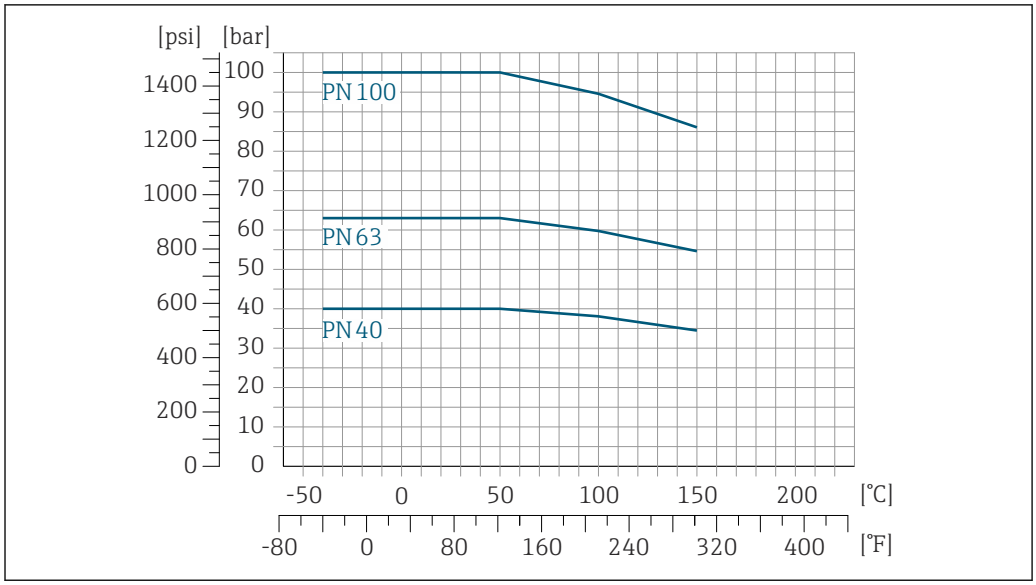
**Medium density**

0 to 5 000 kg/m³ (0 to 312 lb/cf)

**Pressure/temperature ratings**

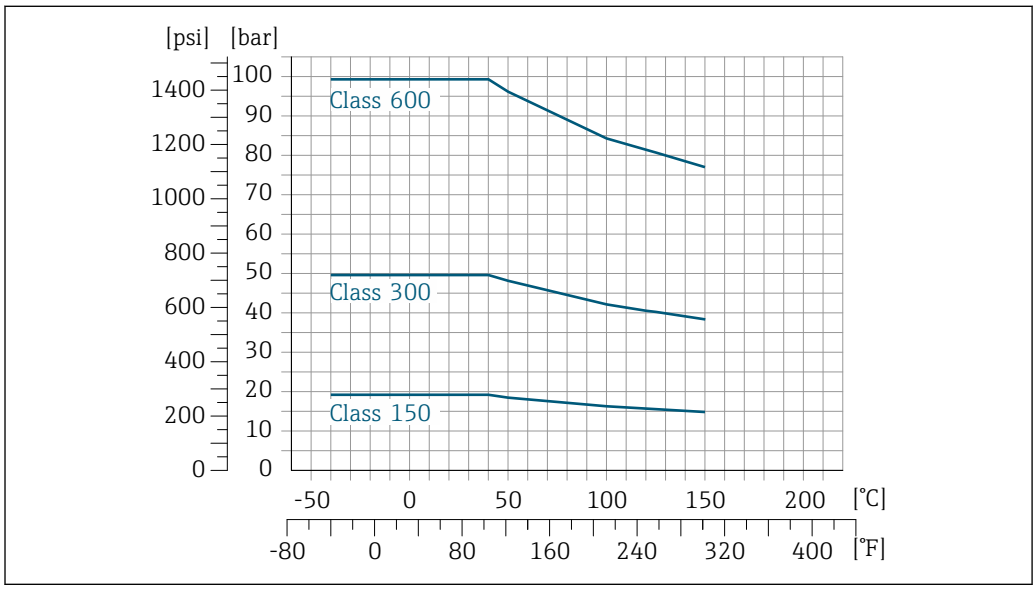
The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

**Flange similar to EN 1092-1 (DIN 2501)**



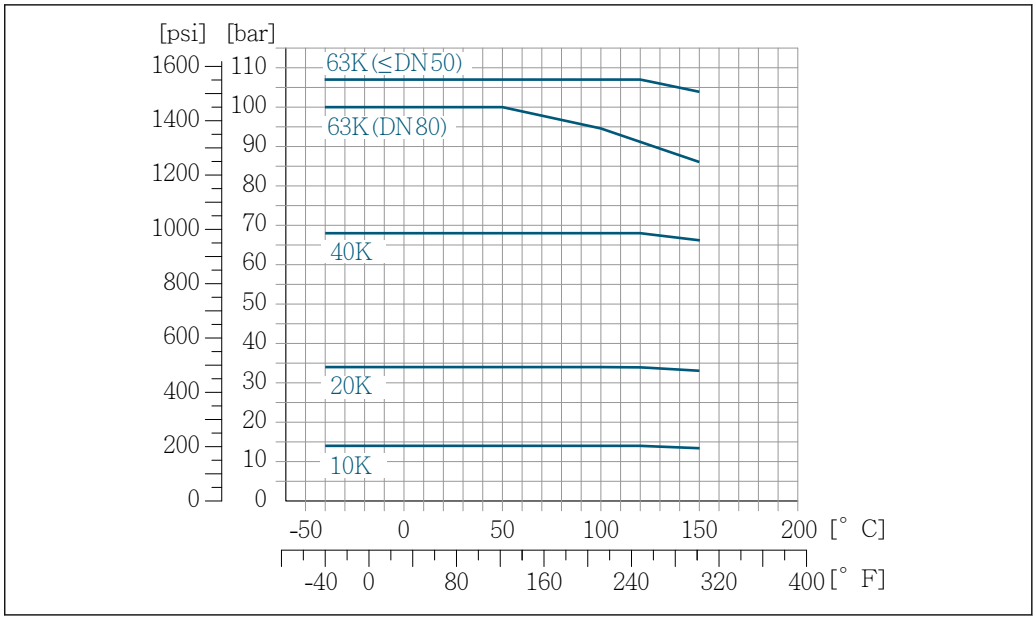

17 *With flange material 1.4404 (F316/F316L)*

**Flange similar to ASME B16.5**



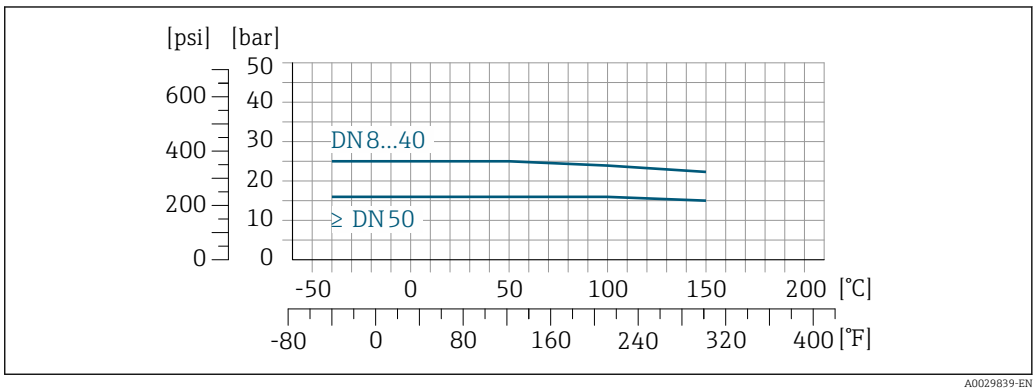

18 *With flange material 1.4404 (F316/F316L)*

### Flange JIS B2220



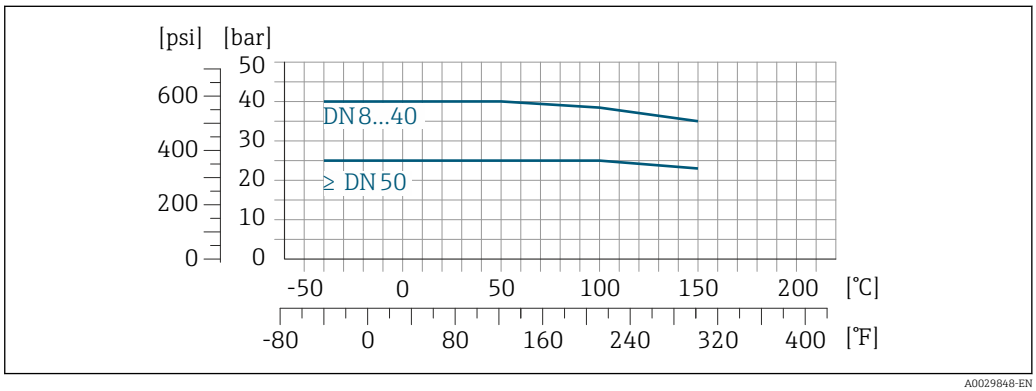

19 *With flange material 1.4404 (F316/F316L)*

### Flange DIN 11864-2 Form A




20 *With flange material 1.4404 (316/316L)*

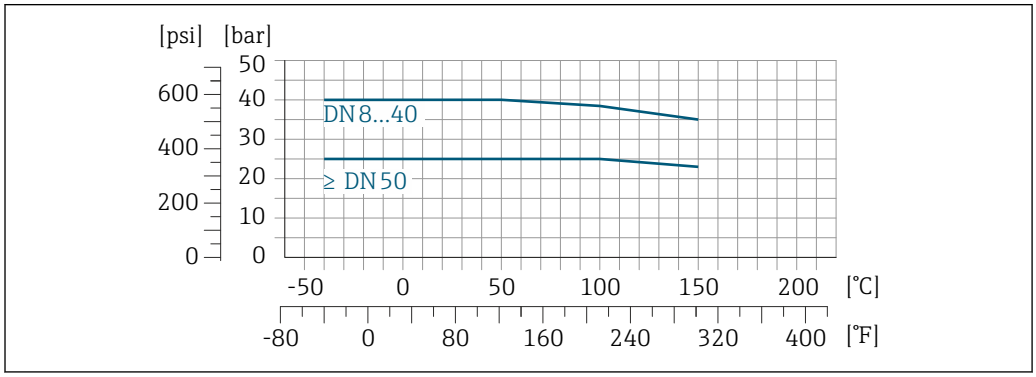
### Threaded adapter DIN 11851




21 *With connection material 1.4404 (316/316L)*

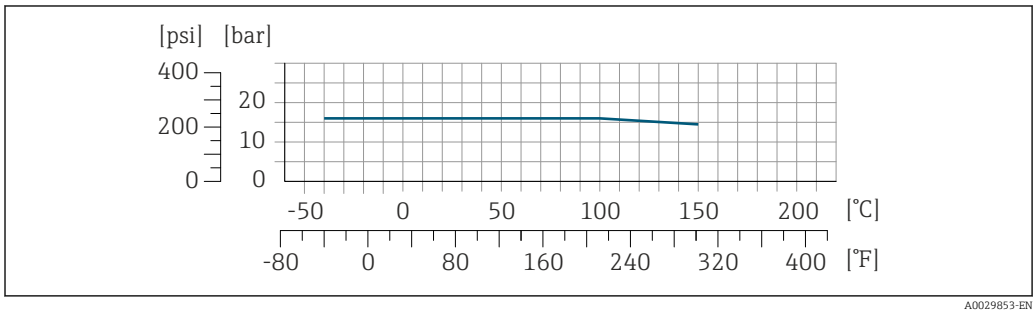
DIN 11851 allows for applications up to +140 °C (+284 °F) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

### Threaded adapter DIN 11864-1 Form A



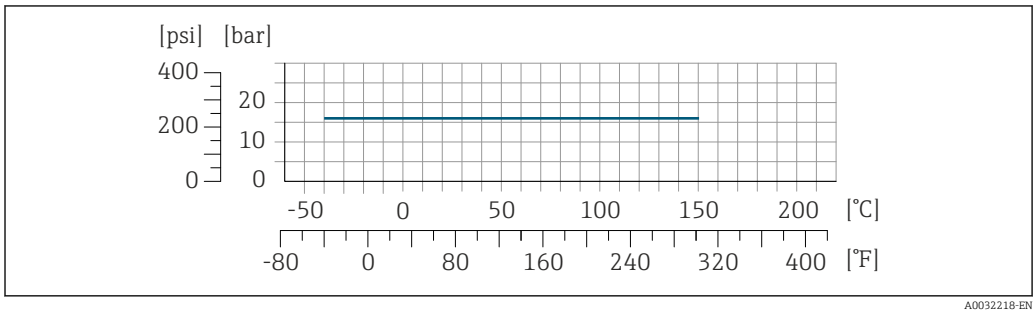

22 *With connection material 1.4404 (316/316L)*

### Threaded adapter ISO 2853



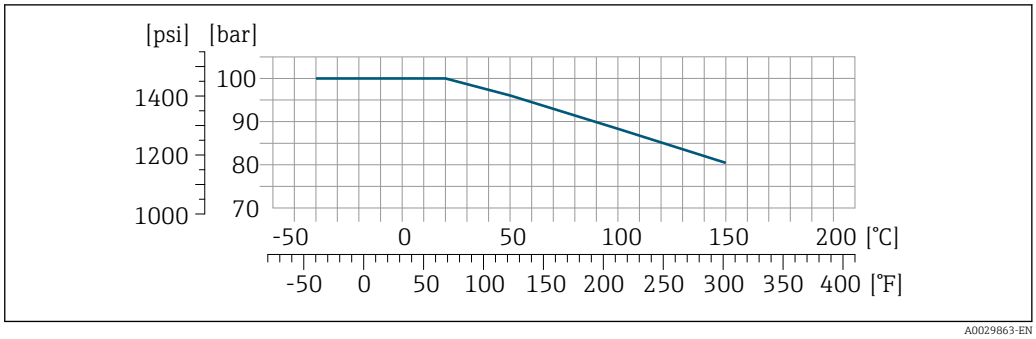

23 *With connection material 1.4404 (316/316L)*

### Threaded adapter SMS 1145



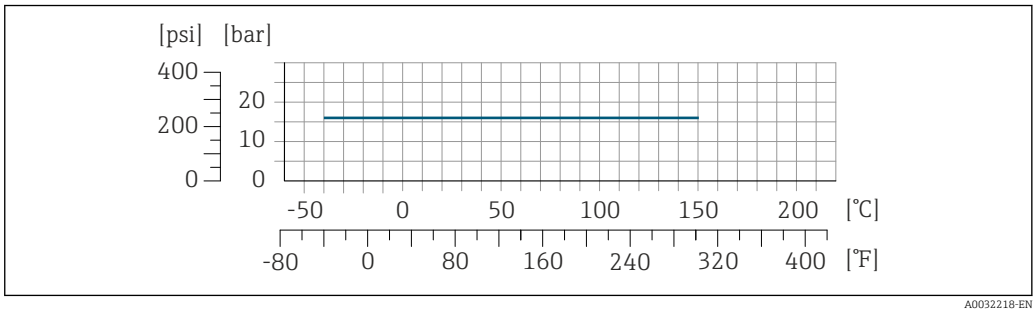

24 *With connection material 1.4404 (316/316L)*

**VCO**




*25 With connection material 1.4404 (316/316L)*

**Tri-Clamp**




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

## Sensor housing

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

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

In the event of a tube failure, the pressure level inside the sensor housing will rise according to the operating process pressure. If the user judges that the sensor housing burst pressure does not provide an adequate safety margin, the device can be fitted with a rupture disk. This prevents excessively high pressure from forming inside the sensor housing. Therefore, the use of a rupture disk is strongly recommended in applications involving high gas pressures, and particularly in applications in which the process pressure is greater than 2/3 of the sensor housing burst pressure.

### Burst pressure of the sensor housing

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

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

| DN | | Sensor housing burst pressure | |
|---|---|---|---|
| [mm] | [in] | [bar] | [psi] |
| 8 | ⅜ | 250 | 3620 |
| 15 | ½ | 250 | 3620 |
| 25 | 1 | 250 | 3620 |
| 40 | 1½ | 200 | 2900 |

| DN | | Sensor housing burst pressure | |
|---|---|---|---|
| [mm] | [in] | [bar] | [psi] |
| 50 | 2 | 180 | 2610 |
| 80 | 3 | 120 | 1740 |

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

**Rupture disk**

To increase the level of safety, a device version with a rupture disk with a trigger pressure of 10 to 15 bar (145 to 217.5 psi) can be used (order code for "Sensor option", option CA "rupture disk").

The use of rupture disks cannot be combined with the separately available heating jacket.

**Internal cleaning**

- CIP cleaning
- SIP cleaning

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

**Flow limit**

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

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

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

To calculate the flow limit, use the *Applicator* sizing tool → 89

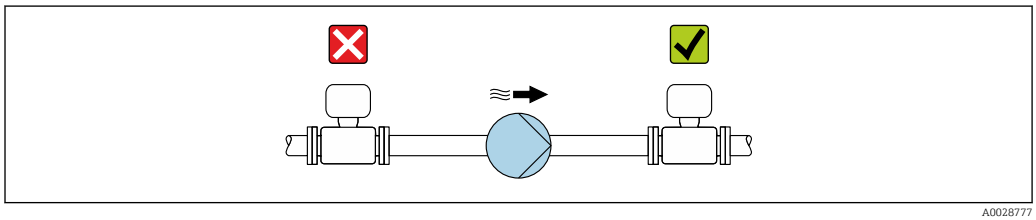
**Pressure loss**

To calculate the pressure loss, use the *Applicator* sizing tool → 89

**Static pressure**

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

For this reason, the following mounting locations are recommended:
- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)



A0028777

**Thermal insulation**

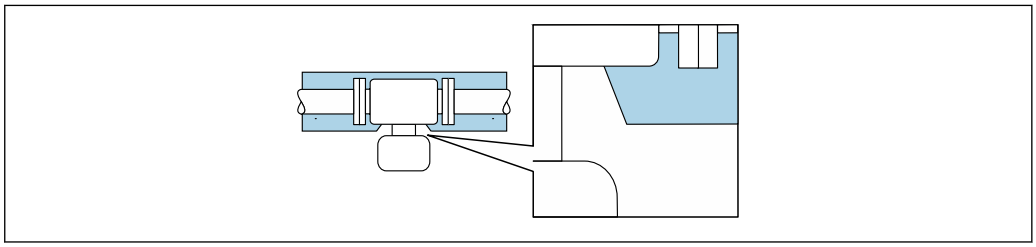
In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

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

NOTICE

**Electronics overheating on account of thermal insulation!**

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



A0034391

*26 Thermal insulation with exposed extension neck*

## Heating

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

**Heating options**

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

Heating jackets for the sensors can be ordered as accessories from Endress+Hauser → 88.

NOTICE

**Danger of overheating when heating**

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

## Vibrations

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

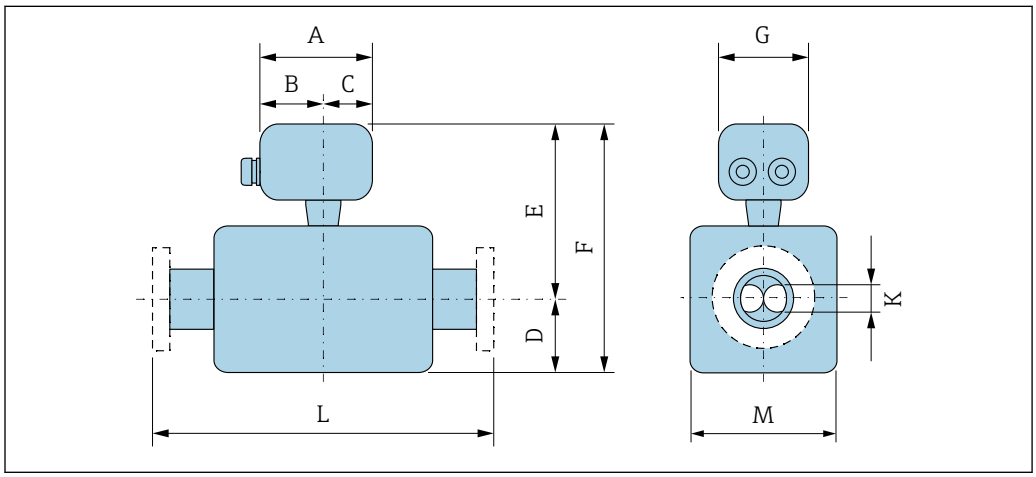
2) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" → 91

# Mechanical construction

**Dimensions in SI units**

## Compact version

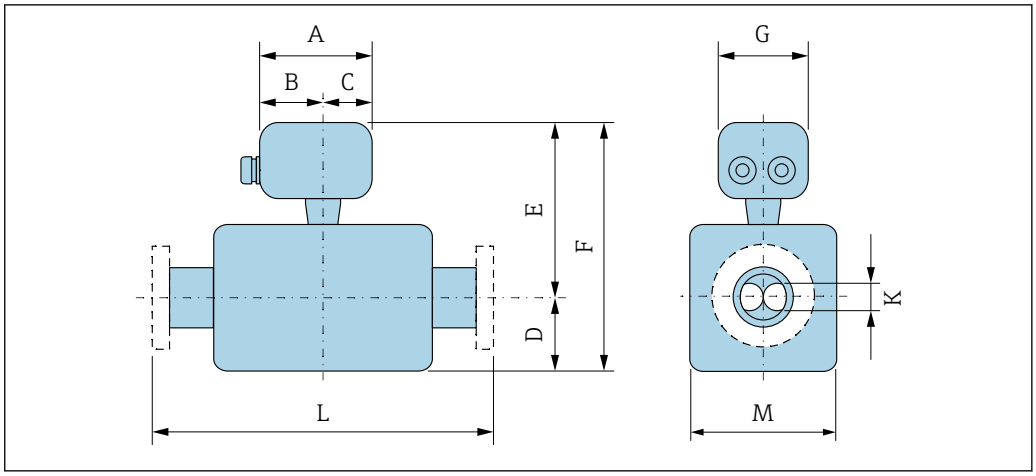
*Order code for "Housing", option A "Compact coated aluminum"*




| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [1] [mm] | F [1] [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 147.5 | 93.5 | 54 | 89.1 | 177.1 | 266.2 | 136 | 5.35 | 2) | 44.9 |
| 15 | 147.5 | 93.5 | 54 | 100.1 | 177.1 | 277.2 | 136 | 8.30 | 2) | 44.9 |
| 25 | 147.5 | 93.5 | 54 | 102.1 | 174.2 | 276.2 | 136 | 12.0 | 2) | 51 |
| 40 | 147.5 | 93.5 | 54 | 120.7 | 180.2 | 300.8 | 136 | 17.6 | 2) | 64.3 |
| 50 | 147.5 | 93.5 | 54 | 175.5 | 194.5 | 369.9 | 136 | 26.0 | 2) | 91.1 |
| 80 | 147.5 | 93.5 | 54 | 205.3 | 210 | 415.3 | 136 | 40.5 | 2) | 127 |

1) If using a display, order code for "Display; operation", option B: values +28 mm
2) Depends on the particular process connection

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

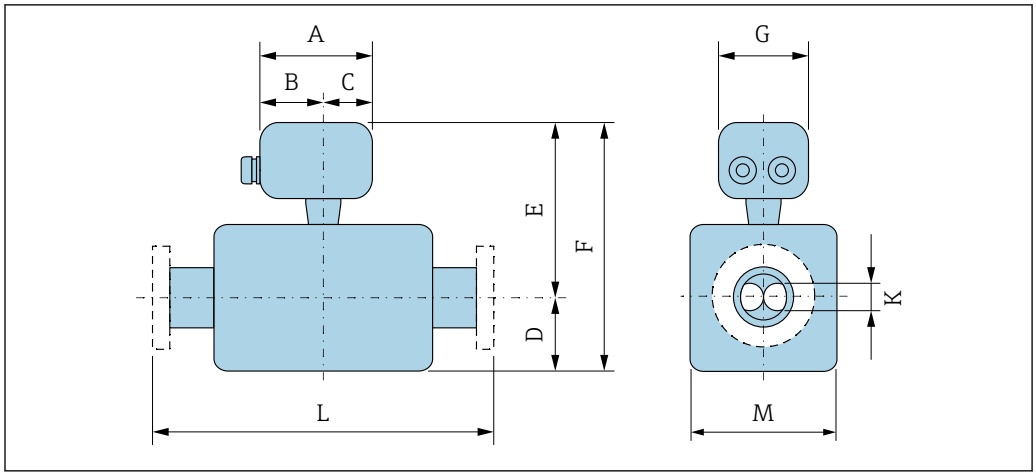



A0033787

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [1] [mm] | F [1] [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 136.8 | 78 | 58.8 | 89.1 | 172.5 | 261.6 | 133.5 | 5.35 | [2] | 44.9 |
| 15 | 136.8 | 78 | 58.8 | 100.1 | 172.5 | 272.6 | 133.5 | 8.30 | [2] | 44.9 |
| 25 | 136.8 | 78 | 58.8 | 102.1 | 169.6 | 271.6 | 133.5 | 12.0 | [2] | 51 |
| 40 | 136.8 | 78 | 58.8 | 120.7 | 175.6 | 296.2 | 133.5 | 17.6 | [2] | 64.3 |
| 50 | 136.8 | 78 | 58.8 | 175.5 | 189.9 | 365.3 | 133.5 | 26.0 | [2] | 91.1 |
| 80 | 136.8 | 78 | 58.8 | 205.3 | 205.4 | 410.8 | 133.5 | 40.5 | [2] | 127 |

1) If using a display, order code for "Display; operation", option B: values +14 mm
2) Depends on the particular process connection

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

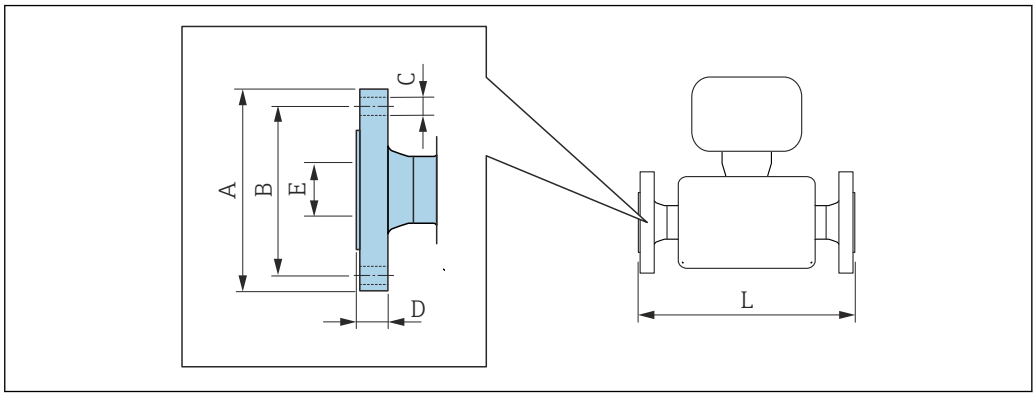



| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [1] [mm] | F [1] [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 123.6 | 67.7 | 55.9 | 89.1 | 172.3 | 261.4 | 111.4 | 5.35 | 2) | 44.9 |
| 15 | 123.6 | 67.7 | 55.9 | 100.1 | 172.3 | 272.4 | 111.4 | 8.30 | 2) | 44.9 |
| 25 | 123.6 | 67.7 | 55.9 | 102.1 | 169.4 | 271.4 | 111.4 | 12.0 | 2) | 51 |
| 40 | 123.6 | 67.7 | 55.9 | 120.7 | 175.4 | 296 | 111.4 | 17.6 | 2) | 64.3 |
| 50 | 123.6 | 67.7 | 55.9 | 175.5 | 189.6 | 365 | 111.4 | 26.0 | 2) | 91.1 |
| 80 | 123.6 | 67.7 | 55.9 | 205.3 | 205.2 | 410.5 | 111.4 | 40.5 | 2) | 127 |

1) If using a display, order code for "Display; operation", option B: values +14 mm
2) Depends on the particular process connection

### Flange connections

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




A0015621

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

**Flange similar to EN 1092-1 (DIN 2501/DIN 2512N), PN 40**
**1.4404 (F316/F316L)**: *order code for "Process connection", option* **D2S**

**Flange with groove similar to EN 1092-1 Form D (DIN 2512N), PN 40**
**1.4404 (F316/F316L)**: *order code for "Process connection", option* **D6S**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 95 | 65 | 4 × Ø14 | 16 | 17.3 | 232/510 [2] |
| 15 | 95 | 65 | 4 × Ø14 | 16 | 17.3 | 279/510 [2] |
| 25 | 115 | 85 | 4 × Ø14 | 18 | 28.5 | 329/600 [2] |
| 40 | 150 | 110 | 4 × Ø18 | 18 | 43.1 | 445 |
| 50 | 165 | 125 | 4 × Ø18 | 20 | 54.5 | 556/715 [2] |
| 80 | 200 | 160 | 8 × Ø18 | 24 | 82.5 | 611/915 [2] |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | |

1) DN 8 with DN 15 flanges as standard
2) Installed length in accordance with NAMUR recommendation NE 132 optionally available (order code for "Process connection", option D2N or D6N (with groove))

**Flange similar to EN 1092-1 (DIN 2501), PN 40 (with DN 25 flanges)**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **R2S**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 | 115 | 85 | 4 × Ø14 | 18 | 28.5 | 329 |
| 15 | 115 | 85 | 4 × Ø14 | 18 | 28.5 | 329 |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | |

**Flange similar to EN 1092-1 (DIN 2501/DIN 2512N), PN 63**
**1.4404 (F316/F316L)**: *order code for "Process connection", option* **D3S**

**Flange with groove similar to EN 1092-1 Form D (DIN 2512N), PN 63**
**1.4404 (F316/F316L)**: *order code for "Process connection", option* **D7S**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 | 180 | 135 | 4 × Ø22 | 26 | 54.5 | 565 |
| 80 | 215 | 170 | 8 × Ø22 | 28 | 81.7 | 646 |

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

**Flange similar to EN 1092-1 (DIN 2501/DIN 2512N), PN 100**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **D4S**

**Flange with groove similar to EN 1092-1 Form D (DIN 2512N) available, PN 100**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **D8S**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 105 | 75 | 4 × Ø14 | 20 | 17.3 | 261 |
| 15 | 105 | 75 | 4 × Ø14 | 20 | 17.3 | 295 |
| 25 | 140 | 100 | 4 × Ø18 | 24 | 28.5 | 360 |
| 40 | 170 | 125 | 4 × Ø22 | 26 | 42.5 | 486 |
| 50 | 195 | 145 | 4 × Ø26 | 28 | 53.9 | 581 |
| 80 | 230 | 180 | 8 × Ø26 | 32 | 80.9 | 656 |

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

1) DN 8 with DN 15 flanges as standard

**Flange similar to ASME B16.5, Class 150**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **AAS**

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

Surface roughness (flange): Ra 3.2 to 6.3 µm

1) DN 8 with DN 15 flanges as standard

**Flange similar to ASME B16.5, Class 300**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **ABS**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 95 | 66.7 | 4 × Ø15.7 | 14.2 | 15.7 | 232 |
| 15 | 95 | 66.7 | 4 × Ø15.7 | 14.2 | 15.7 | 279 |

**Flange similar to ASME B16.5, Class 300**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **ABS**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 125 | 88.9 | 4 × Ø19.0 | 17.5 | 26.7 | 329 |
| 40 | 155 | 114.3 | 4 × Ø22.3 | 20.6 | 40.9 | 445 |
| 50 | 165 | 127 | 8 × Ø19.0 | 22.3 | 52.6 | 556 |
| 80 | 210 | 168.3 | 8 × Ø22.3 | 28.4 | 78.0 | 611 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) DN 8 with DN 15 flanges as standard

**Flange similar to ASME B16.5, Class 600**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **ACS**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1)] | 95 | 66.7 | 4 × Ø15.7 | 20.6 | 13.9 | 261 |
| 15 | 95 | 66.7 | 4 × Ø15.7 | 20.6 | 13.9 | 295 |
| 25 | 125 | 88.9 | 4 × Ø19.1 | 23.9 | 24.3 | 380 |
| 40 | 155 | 114.3 | 4 × Ø22.4 | 28.7 | 38.1 | 496 |
| 50 | 165 | 127 | 8 × Ø19.1 | 31.8 | 49.2 | 583 |
| 80 | 210 | 168.3 | 8 × Ø22.4 | 38.2 | 73.7 | 671 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) DN 8 with DN 15 flanges as standard

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 | 155 | 120 | 4 × Ø19 | 16 | 50 | 556 |
| 80 | 185 | 150 | 8 × Ø19 | 18 | 80 | 603 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1)] | 95 | 70 | 4 × Ø15 | 14 | 15 | 232 |
| 15 | 95 | 70 | 4 × Ø15 | 14 | 15 | 279 |
| 25 | 125 | 90 | 4 × Ø19 | 16 | 25 | 329 |
| 40 | 140 | 105 | 4 × Ø19 | 18 | 40 | 445 |
| 50 | 155 | 120 | 8 × Ø19 | 18 | 50 | 556 |

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 80 | 200 | 160 | 8 × Ø23 | 22 | 80 | 603 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) DN 8 with DN 15 flanges as standard

**Flange JIS B2220, 40K**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **NGS**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1)] | 115 | 80 | 4 × Ø19 | 20 | 15 | 261 |
| 15 | 115 | 80 | 4 × Ø19 | 20 | 15 | 300 |
| 25 | 130 | 95 | 4 × Ø19 | 22 | 25 | 375 |
| 40 | 160 | 120 | 4 × Ø23 | 24 | 38 | 496 |
| 50 | 165 | 130 | 8 × Ø19 | 26 | 50 | 601 |
| 80 | 210 | 170 | 8 × Ø23 | 32 | 75 | 661 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

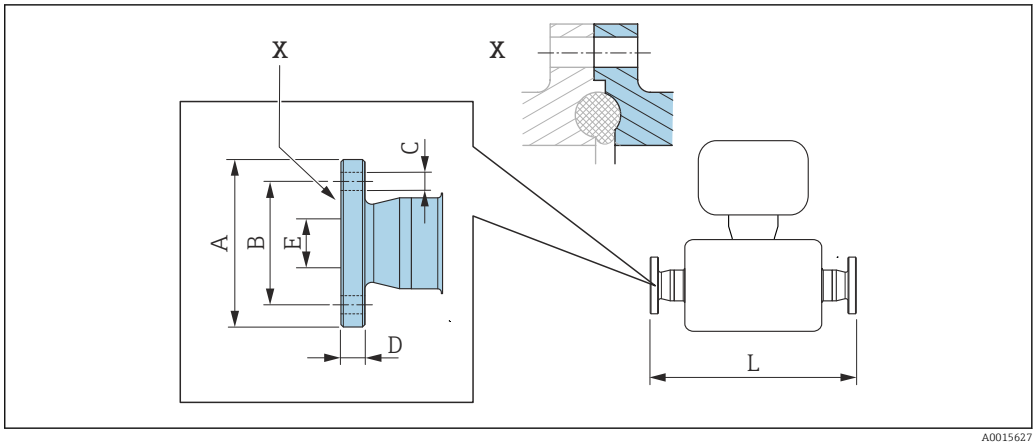
1) DN 8 with DN 15 flanges as standard

**Flange JIS B2220, 63K**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **NHS**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1)] | 120 | 85 | 4 × Ø19 | 23 | 12 | 282 |
| 15 | 120 | 85 | 4 × Ø19 | 23 | 12 | 315 |
| 25 | 140 | 100 | 4 × Ø23 | 27 | 22 | 383 |
| 40 | 175 | 130 | 4 × Ø25 | 32 | 35 | 515 |
| 50 | 185 | 145 | 4 × Ø23 | 34 | 48 | 616 |
| 80 | 230 | 185 | 4 × Ø25 | 40 | 73 | 686 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) DN 8 with DN 15 flanges as standard

*Fixed flange DIN 11864-2*




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

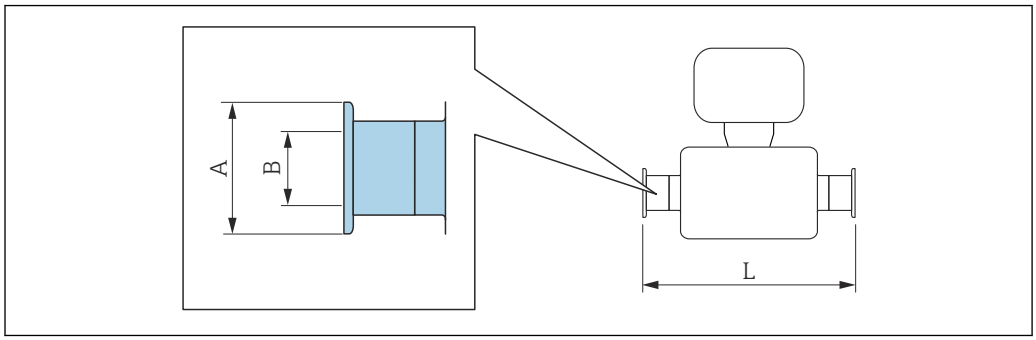
Length tolerance for dimension L in mm:
+1.5/−2.0

| **Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flange with notch**<br>**1.4404 (316/316L)**<br>*Order code for "Process connection", option* **KCS** | | | | | | |
|---|---|---|---|---|---|---|
| **DN [mm]** | **A [mm]** | **B [mm]** | **C [mm]** | **D [mm]** | **E [mm]** | **L [mm]** |
| 8 [1] | 54 | 37 | 4 × Ø9 | 10 | 10 | 249 |
| 15 | 59 | 42 | 4 × Ø9 | 10 | 16 | 293 |
| 25 | 70 | 53 | 4 × Ø9 | 10 | 26 | 344 |
| 40 | 82 | 65 | 4 × Ø9 | 10 | 38 | 456 |
| 50 | 94 | 77 | 4 × Ø9 | 10 | 50 | 562 |
| 80 | 133 | 112 | 8 × Ø11 | 12 | 81 | 671 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK | | | | | | |

1) DN 8 with DN 10 flanges as standard

### Clamp connections

*Tri-Clamp*



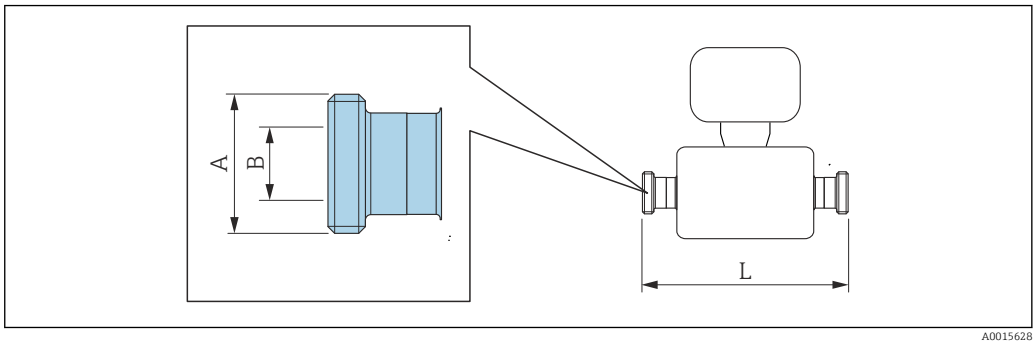

Length tolerance for dimension L in mm:
+1.5/−2.0

| **Tri-Clamp (½"), for pipe according to DIN 11866 series C<br>1.4404 (316/316L)**<br>*Order code for "Process connection", option* **FDW** | | | | |
|---|---|---|---|---|
| **DN<br>[mm]** | **Clamp<br>[in]** | **A<br>[mm]** | **B<br>[mm]** | **L<br>[mm]** |
| 8 | ½ | 25.0 | 9.5 | 229 |
| 15 | ½ | 25.0 | 9.5 | 273 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK | | | | |

| **Tri-Clamp (≥ 1"), for pipe according to DIN 11866 series C<br>1.4404 (316/316L)**<br>*Order code for "Process connection", option* **FTS** | | | | |
|---|---|---|---|---|
| **DN<br>[mm]** | **Clamp<br>[in]** | **A<br>[mm]** | **B<br>[mm]** | **L<br>[mm]** |
| 8 | 1 | 50.4 | 22.1 | 229 |
| 15 | 1 | 50.4 | 22.1 | 273 |
| 25 | 1 | 50.4 | 22.1 | 324 |
| 40 | 1½ | 50.4 | 34.8 | 456 |
| 50 | 2 | 63.9 | 47.5 | 562 |
| 80 | 3 | 90.9 | 72.9 | 671 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK | | | | |

### Threaded couplings

*Threaded adapter DIN 11851, DIN11864-1, SMS 1145*




A0015628

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

**Threaded adapter DIN 11851, for pipe according to DIN11866 series A**
**1.4404 (316/316L)**
*Order code for "Process connection", option* **FMW**

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 8 | Rd 34 × 1/8 | 16 | 229 |
| 15 | Rd 34 × 1/8 | 16 | 273 |
| 25 | Rd 52 × 1/6 | 26 | 324 |
| 40 | Rd 65 × 1/6 | 38 | 456 |
| 50 | Rd 78 × 1/6 | 50 | 562 |
| 80 | Rd 110 × 1/4 | 81 | 671 |

3-A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ
Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK

**Threaded adapter DIN11864-1 Form A, for pipe according to DIN11866 series A**
**1.4404 (316/316L)**
*Order code for "Process connection", option* **FLW**

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 8 | Rd 28 × 1/8 | 10 | 229 |
| 15 | Rd 34 × 1/8 | 16 | 273 |
| 25 | Rd 52 × 1/6 | 26 | 324 |
| 40 | Rd 65 × 1/6 | 38 | 456 |
| 50 | Rd 78 × 1/6 | 50 | 562 |
| 80 | Rd 110 × 1/4 | 81 | 671 |

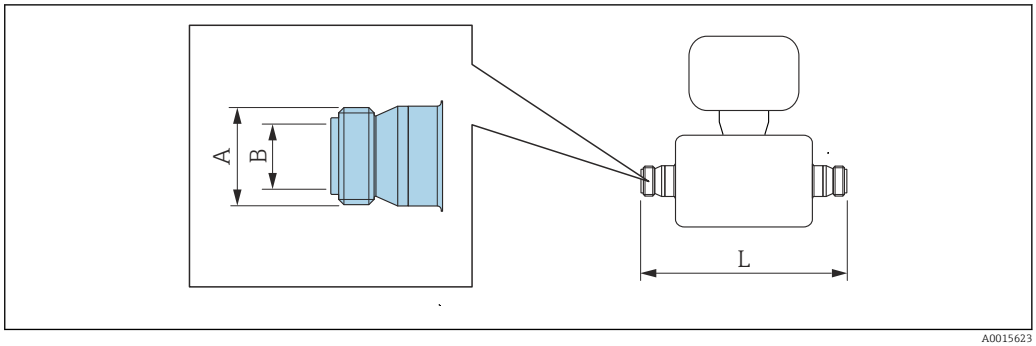
3-A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ
Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK

**Threaded adapter SMS 1145**
**1.4404 (316/316L)**
*Order code for "Process connection", option* **SCS**

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 8 | Rd 40 × ⅙ | 22.5 | 229 |
| 15 | Rd 40 × ⅙ | 22.5 | 273 |
| 25 | Rd 40 × ⅙ | 22.5 | 324 |
| 40 | Rd 60 × ⅙ | 35.5 | 456 |
| 50 | Rd 70 × ⅙ | 48.5 | 562 |
| 80 | Rd 98 × ⅙ | 72.9 | 671 |

3-A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ
Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK

*Threaded adapter ISO 2853*



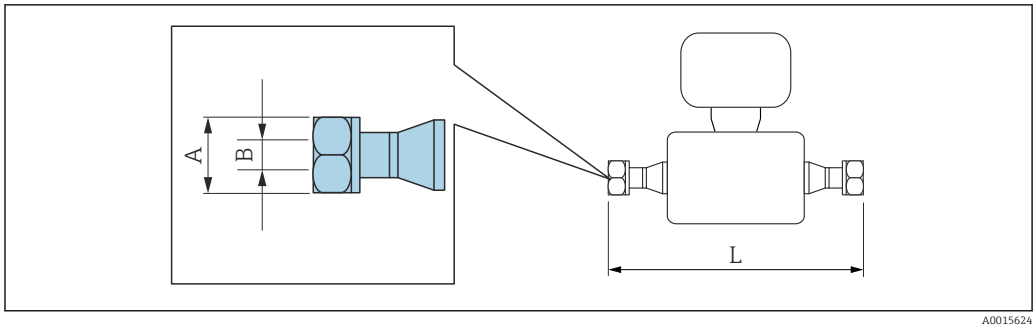

A0015623

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

| **Threaded adapter ISO 2853, for pipe according to ISO 2037**<br>**1.4404 (316/316L)**<br>*Order code for "Process connection", option* **JSF** | | | |
|---|---|---|---|
| **DN**<br>**[mm]** | **A** [1]<br>**[mm]** | **B**<br>**[mm]** | **L**<br>**[mm]** |
| 8 | 37.13 | 22.6 | 229 |
| 15 | 37.13 | 22.6 | 273 |
| 25 | 37.13 | 22.6 | 324 |
| 40 | 50.68 | 35.6 | 456 |
| 50 | 64.16 | 48.6 | 562 |
| 80 | 91.19 | 72.9 | 671 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 0.38 µm: order code for "Measuring tube material", option SC, SK | | | |

1) Max. thread diameter according to ISO 2853 Annex A

*VCO*




A0015624

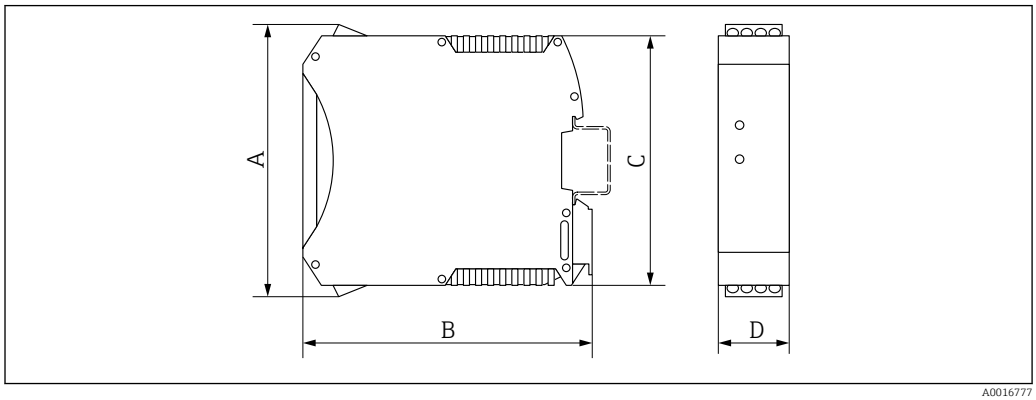
Length tolerance for dimension L in mm:
+1.5/−2.0

| 8-VCO-4 (½")<br>1.4404 (316/316L)<br>*Order code for "Process connection", option* **CVS** | | | |
|---|---|---|---|
| **DN [mm]** | **A [in]** | **B [mm]** | **L [mm]** |
| 8 | AF 1 | 10.2 | 252 |

| 12-VCO-4 (¾")<br>1.4404 (316/316L)<br>*Order code for "Process connection", option* **CWS** | | | |
|---|---|---|---|
| **DN [mm]** | **A [in]** | **B [mm]** | **L [mm]** |
| 15 | AF 1½ | 15.7 | 305 |

### Safety Barrier Promass 100

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



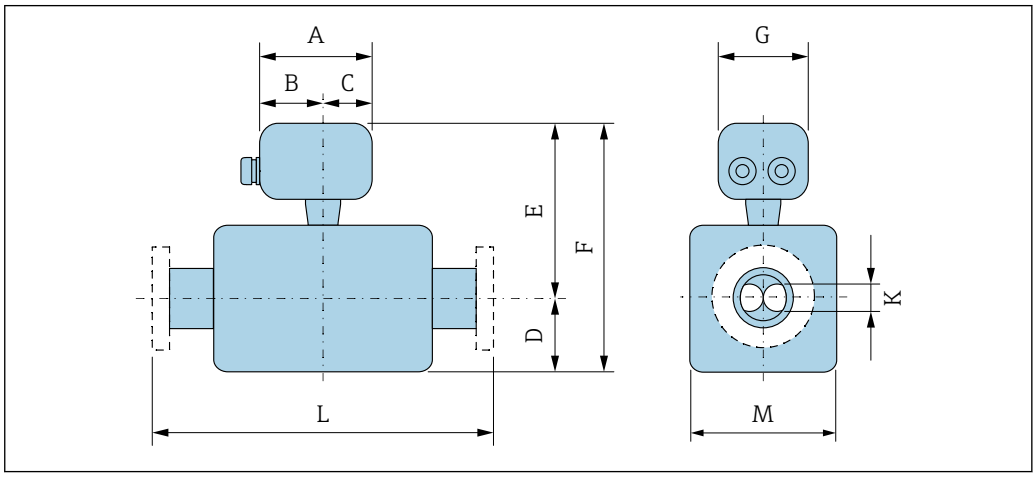

A0016777

| A | B | C | D |
|---|---|---|---|
| **[mm]** | **[mm]** | **[mm]** | **[mm]** |
| 108 | 114.5 | 99 | 22.5 |

## Dimensions in US units

### Compact version

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

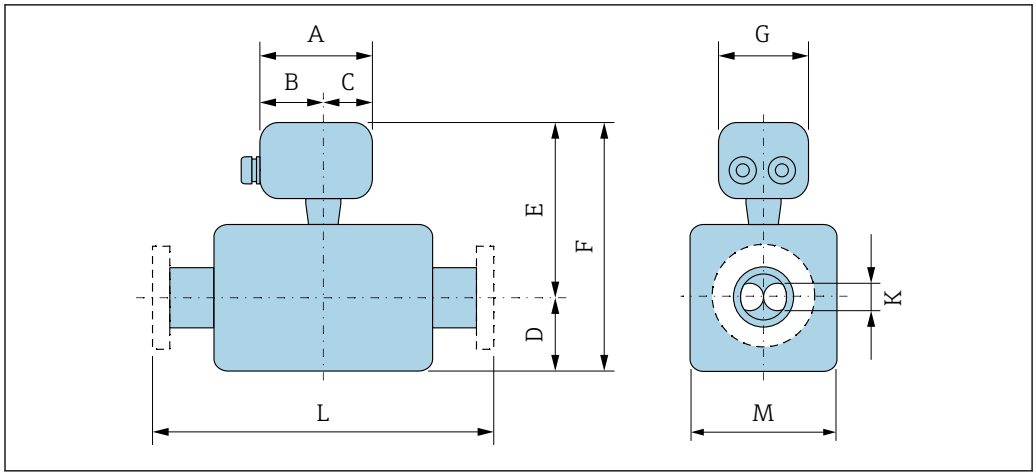



A0033787

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [1] [in] | F [1] [in] | G [in] | K [in] | L [in] | M [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ⅜ | 5.81 | 3.68 | 2.13 | 3.66 | 7.05 | 10.71 | 5.35 | 0.21 | [2] | 1.77 |
| ½ | 5.81 | 3.68 | 2.13 | 4.13 | 7.13 | 11.26 | 5.35 | 0.33 | [2] | 1.77 |
| 1 | 5.81 | 3.68 | 2.13 | 4.17 | 7.32 | 11.5 | 5.35 | 0.47 | [2] | 2.01 |
| 1½ | 5.81 | 3.68 | 2.13 | 4.76 | 7.56 | 12.32 | 5.35 | 0.69 | [2] | 2.53 |
| 2 | 5.81 | 3.68 | 2.13 | 6.67 | 8.19 | 14.86 | 5.35 | 1.02 | [2] | 3.59 |
| 3 | 5.81 | 3.68 | 2.13 | 8.07 | 8.41 | 16.48 | 5.35 | 1.59 | [2] | 5 |

1) If using a display, order code for "Display; operation", option B: values +1.1 in
2) Depends on the particular process connection

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

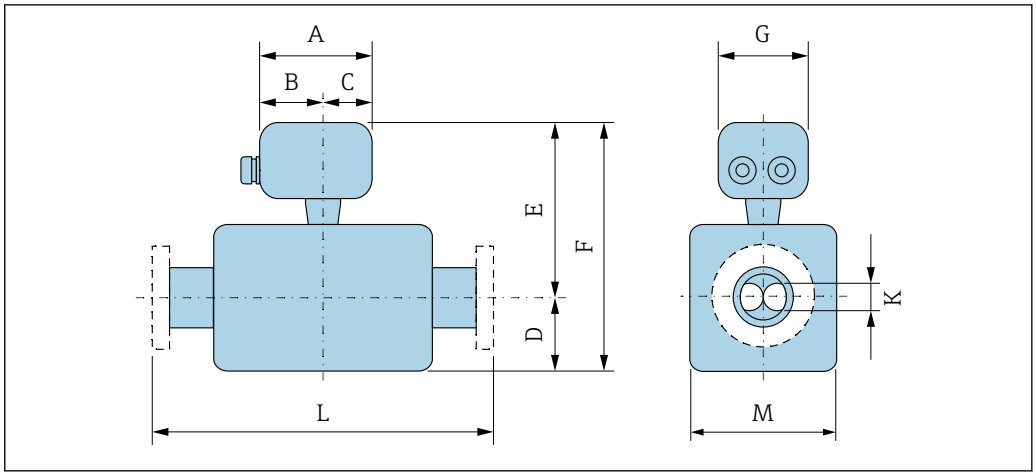



A0033787

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [1] [in] | F [1] [in] | G [in] | K [in] | L [in] | M [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ⅜ | 5.39 | 3.07 | 2.31 | 3.66 | 6.85 | 10.51 | 5.26 | 0.21 | 2) | 1.77 |
| ½ | 5.39 | 3.07 | 2.31 | 4.13 | 6.93 | 11.06 | 5.26 | 0.33 | 2) | 1.77 |
| 1 | 5.39 | 3.07 | 2.31 | 4.17 | 7.13 | 11.3 | 5.26 | 0.47 | 2) | 2.01 |
| 1½ | 5.39 | 3.07 | 2.31 | 4.76 | 7.36 | 12.13 | 5.26 | 0.69 | 2) | 2.53 |
| 2 | 5.39 | 3.07 | 2.31 | 6.67 | 7.99 | 14.67 | 5.26 | 1.02 | 2) | 3.59 |
| 3 | 5.39 | 3.07 | 2.31 | 8.07 | 8.21 | 16.28 | 5.26 | 1.59 | 2) | 5 |

1) If using a display, order code for "Display; operation", option B: values +0.55 in
2) Depends on the particular process connection

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



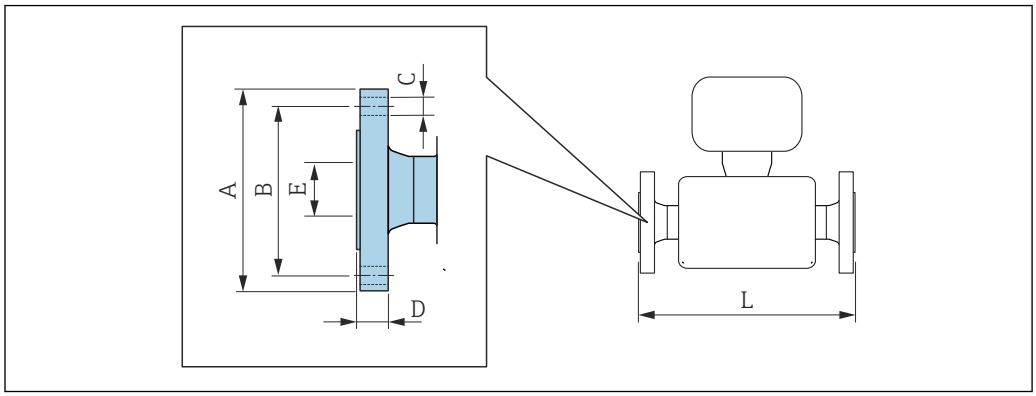

A0033787

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [1] [in] | F [1] [in] | G [in] | K [in] | L [in] | M [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| ⅜ | 4.87 | 2.67 | 2.2 | 3.66 | 6.85 | 10.51 | 4.39 | 0.21 | [2] | 1.77 |
| ½ | 4.87 | 2.67 | 2.2 | 4.13 | 6.93 | 11.06 | 4.39 | 0.33 | [2] | 1.77 |
| 1 | 4.87 | 2.67 | 2.2 | 4.17 | 7.13 | 11.3 | 4.39 | 0.47 | [2] | 2.01 |
| 1½ | 4.87 | 2.67 | 2.2 | 4.76 | 7.36 | 12.13 | 4.39 | 0.69 | [2] | 2.53 |
| 2 | 4.87 | 2.67 | 2.2 | 6.67 | 7.99 | 14.67 | 4.39 | 1.02 | [2] | 3.59 |
| 3 | 4.87 | 2.67 | 2.2 | 8.07 | 8.21 | 16.28 | 4.39 | 1.59 | [2] | 5 |

1) If using a display, order code for "Display; operation", option B: values +0.55 in
2) Depends on the particular process connection

### Flange connections

*Fixed flange ASME B16.5*




A0015621

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

| **Flange similar to ASME B16.5, Cl 150<br>1.4404 (F316/F316L)**<br>*Order code for "Process connection", option* **AAS** | | | | | | |
|---|---|---|---|---|---|---|
| **DN [in]** | **A [in]** | **B [in]** | **C [in]** | **D [in]** | **E [in]** | **L [in]** |
| ⅜ [1] | 3.54 | 2.37 | 4 × Ø0.62 | 0.44 | 0.62 | 9.13 |
| ½ | 3.54 | 2.37 | 4 × Ø0.62 | 0.44 | 0.62 | 10.98 |
| 1 | 4.33 | 3.13 | 4 × Ø0.62 | 0.56 | 1.05 | 12.95 |
| 1½ | 4.92 | 3.87 | 4 × Ø0.62 | 0.69 | 1.61 | 17.52 |
| 2 | 5.91 | 4.75 | 4 × Ø0.75 | 0.75 | 2.07 | 21.89 |
| 3 | 7.48 | 6.00 | 4 × Ø0.75 | 0.94 | 3.07 | 24.06 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

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

| **Flange similar to ASME B16.5, Class 300<br>1.4404 (F316/F316L)**<br>*Order code for "Process connection", option* **ABS** | | | | | | |
|---|---|---|---|---|---|---|
| **DN [in]** | **A [in]** | **B [in]** | **C [in]** | **D [in]** | **E [in]** | **L [in]** |
| ⅜ [1] | 3.74 | 2.63 | 4 × Ø0.62 | 0.56 | 0.62 | 9.13 |
| ½ | 3.74 | 2.63 | 4 × Ø0.62 | 0.56 | 0.62 | 10.98 |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.69 | 1.05 | 12.95 |
| 1½ | 6.10 | 4.50 | 4 × Ø0.88 | 0.81 | 1.61 | 17.52 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 0.88 | 2.07 | 21.89 |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 1.12 | 3.07 | 24.06 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

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

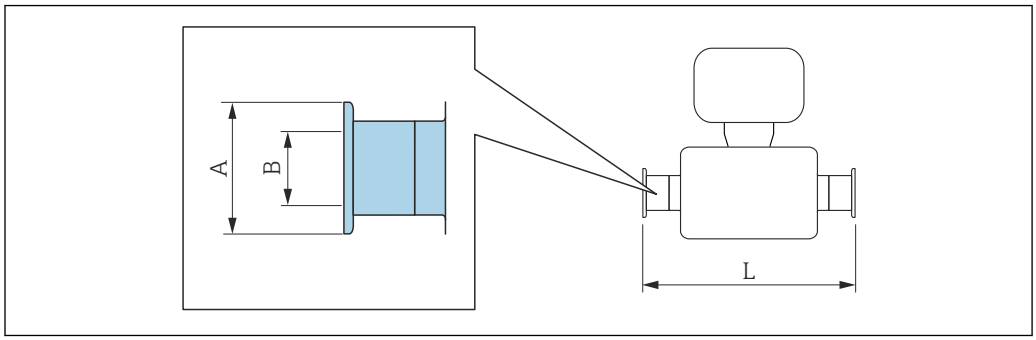
**Flange similar to ASME B16.5, Class 600**
**1.4404 (F316/F316L)**
*Order code for "Process connection", option* **ACS**

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| ⅜ 1) | 3.74 | 2.63 | 4 × Ø0.62 | 0.81 | 0.55 | 10.28 |
| ½ | 3.74 | 2.63 | 4 × Ø0.62 | 0.81 | 0.55 | 11.61 |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.94 | 0.96 | 14.96 |
| 1½ | 6.10 | 4.50 | 4 × Ø0.88 | 1.13 | 1.50 | 19.53 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 1.25 | 1.94 | 22.95 |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 1.50 | 2.9 | 26.42 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

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

### Clamp connections

*Tri-Clamp*



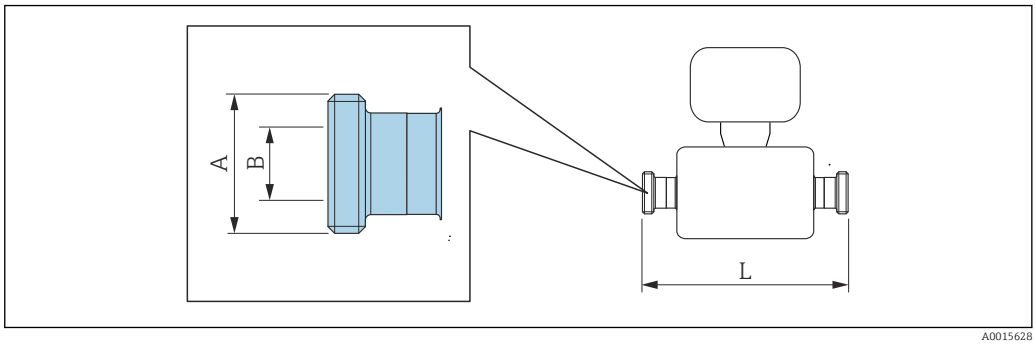

Length tolerance for dimension L in inches:
+0.06/−0.08

| **Tri-Clamp (½"), DIN 11866 series C<br>1.4404 (316/316L)**<br>*Order code for "Process connection", option* **FDW** | | | | |
|---|---|---|---|---|
| **DN<br>[in]** | **Clamp<br>[in]** | **A<br>[in]** | **B<br>[in]** | **L<br>[in]** |
| ⅜ | ½ | 0.98 | 0.37 | 9.02 |
| ½ | ½ | 0.98 | 0.37 | 10.75 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 30 µin: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 15 µin: order code for "Measuring tube material", option SC, SK | | | | |

| **Tri-Clamp (≥ 1"), DIN 11866 series C<br>1.4404 (316/316L)**<br>*Order code for "Process connection", option* **FTS** | | | | |
|---|---|---|---|---|
| **DN<br>[in]** | **Clamp<br>[in]** | **A<br>[in]** | **B<br>[in]** | **L<br>[in]** |
| ⅜ | 1 | 1.98 | 0.87 | 9.02 |
| ½ | 1 | 1.98 | 0.87 | 10.75 |
| 1 | 1 | 1.98 | 0.87 | 12.76 |
| 1½ | 1½ | 1.98 | 1.37 | 17.95 |
| 2 | 2 | 2.52 | 1.87 | 22.13 |
| 3 | 3 | 3.58 | 2.87 | 26.42 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 30 µin: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 15 µin: order code for "Measuring tube material", option SC, SK | | | | |

### Threaded couplings

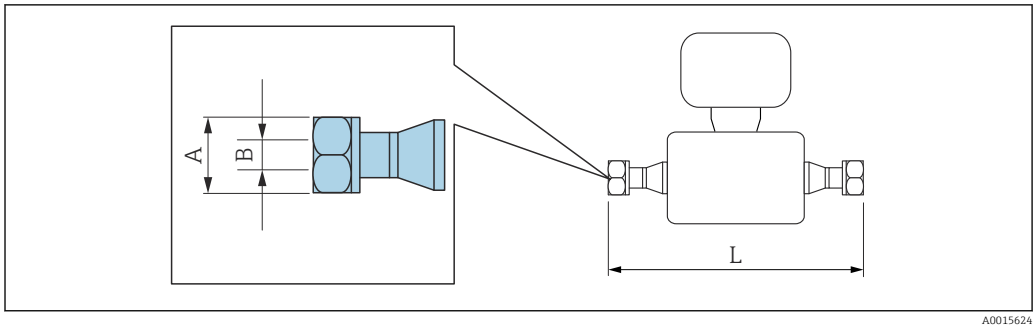
*Threaded adapter SMS 1145*




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

| **Threaded adapter SMS 1145**<br>**1.4404 (316/316L)**<br>*Order code for "Process connection", option* **SCS** | | | |
|---|---|---|---|
| **DN**<br>**[in]** | **A**<br>**[in]** | **B**<br>**[in]** | **L**<br>**[in]** |
| ⅜ | Rd 40 × ⅙ | 0.89 | 9.02 |
| ½ | Rd 40 × ⅙ | 0.89 | 10.75 |
| 1 | Rd 40 × ⅙ | 0.89 | 12.76 |
| 1½ | Rd 60 × ⅙ | 1.40 | 17.95 |
| 2 | Rd 70 × ⅙ | 1.91 | 22.13 |
| 3 | Rd 98 × ⅙ | 2.87 | 26.42 |
| 3-A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 30 µin: order code for "Measuring tube material", option SB, SJ<br>Ra ≤ 15 µin: order code for "Measuring tube material", option SC, SK | | | |

*VCO*




A0015624

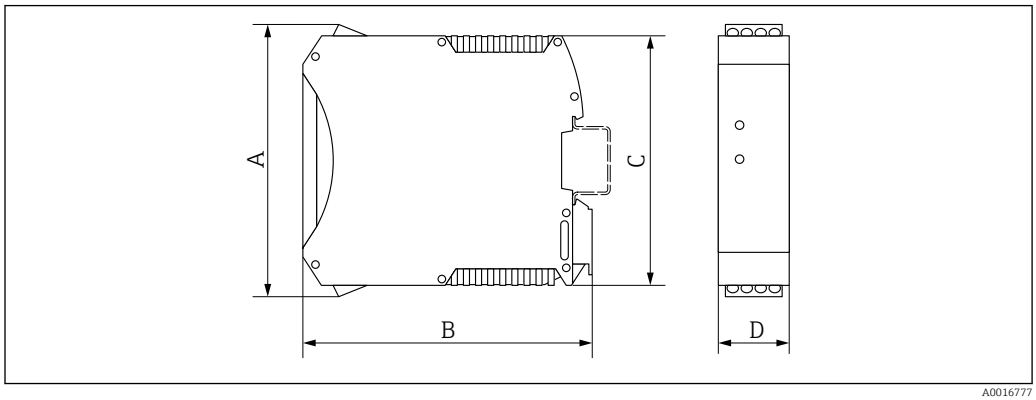
Length tolerance for dimension L in inches:
+0.06/−0.08

| 8-VCO-4 (½")<br>1.4404 (316/316L)<br>*Order code for "Process connection", option* **CVS** | | | |
|---|---|---|---|
| **DN [in]** | **A [in]** | **B [in]** | **L [in]** |
| ⅜ | AF 1 | 0.40 | 9.92 |

| 12-VCO-4 (¾")<br>1.4404 (316/316L)<br>*Order code for "Process connection", option* **CWS** | | | |
|---|---|---|---|
| **DN [in]** | **A [in]** | **B [in]** | **L [in]** |
| ½ | AF 1½ | 0.62 | 12.01 |

### Safety Barrier Promass 100

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




A0016777

| A | B | C | D |
|---|---|---|---|
| **[in]** | **[in]** | **[in]** | **[in]** |
| 4.25 | 4.51 | 3.9 | 0.89 |

## Weight

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

### Weight in SI units

| DN [mm] | Weight [kg] |
|---|---|
| 8 | 4.5 |
| 15 | 4.8 |
| 25 | 6.4 |
| 40 | 10.4 |
| 50 | 15.5 |
| 80 | 29 |

### Weight in US units

| DN [in] | Weight [lbs] |
|---|---|
| 3/8 | 10 |
| ½ | 11 |
| 1 | 14 |
| 1½ | 23 |
| 2 | 34 |
| 3 | 64 |

### Safety Barrier Promass 100

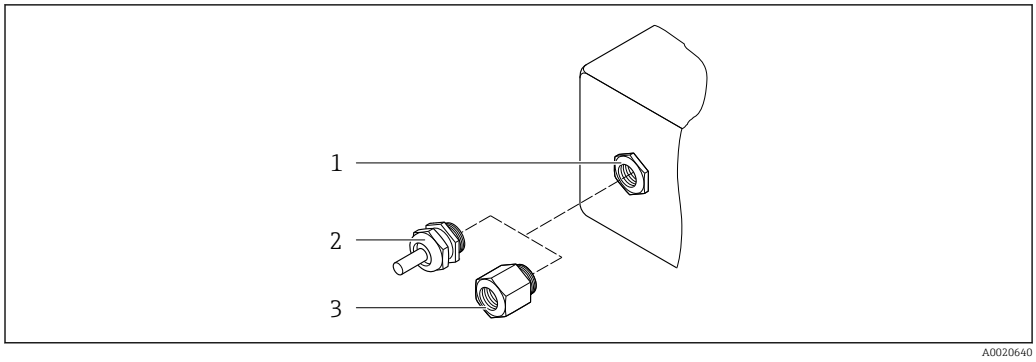
49 g (1.73 ounce)

## Materials

### Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, hygienic, stainless": Hygienic version, stainless steel 1.4301 (304)
- Order code for "Housing", option **C** "Ultra-compact, hygienic, stainless": Hygienic version, stainless steel 1.4301 (304)
- Window material for optional local display (→ 78):
  - For order code for "Housing", option **A**: glass
  - For order code for "Housing", option **B** and **C**: plastic

### Cable entries/cable glands




*28 Possible cable entries/cable glands*

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

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

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

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

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

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

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

### Device plug

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

### Sensor housing

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

### Measuring tubes

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

### Process connections

- Flanges similar to EN 1092-1 (DIN2501) / similar to ASME B 16.5 / as per JIS B2220:
  Stainless steel, 1.4404 (F316/F316L)
- All other process connections:
  Stainless steel, 1.4404 (316/316L)

Available process connections → 77

### Seals

Welded process connections without internal seals

### Accessories

*Safety Barrier Promass 100*

Housing: Polyamide

## Process connections

- Fixed flange connections:
  - EN 1092-1 (DIN 2501) flange
  - EN 1092-1 (DIN 2512N) flange
  - NAMUR lengths in accordance with NE 132
  - ASME B16.5 flange
  - JIS B2220 flange
  - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
- Clamp connections:
  Tri-Clamp (OD tubes), DIN 11866 series C
- Thread:
  - DIN 11851 thread, DIN 11866 series A
  - SMS 1145 thread
  - ISO 2853 thread, ISO 2037
  - DIN 11864-1 Form A thread, DIN 11866 series A
- VCO connections:
  - 8-VCO-4
  - 12-VCO-4

Process connection materials → 75

## Surface roughness

All data relate to parts in contact with medium.

*The following surface roughness categories can be ordered:*

| Category | Method | Option(s)/Order code "Measuring tube mat., wetted surface" |
|---|---|---|
| Not polished | – | SA |
| Ra ≤ 0.76 µm (30 µin) [1] | Mechanically polished [2] | SB |
| Ra ≤ 0.76 µm (30 µin) [1] | Mechanically polished [2], welds in as-welded condition | SJ |
| Ra ≤ 0.38 µm (15 µin) [1] | Mechanically polished [2] | SC |
| Ra ≤ 0.38 µm (15 µin) [1] | Mechanically polished [2], welds in as-welded condition | SK |

1) Ra according to ISO 21920
2) Inaccessible weld seams between pipe and manifold are excluded

# Operability

## Operating concept

**Operator-oriented menu structure for user-specific tasks**
- Commissioning
- Operation
- Diagnostics
- Expert level

**Fast and safe commissioning**
- Individual menus for applications
- Menu guidance with brief descriptions of the individual parameter functions

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

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

## Local display

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

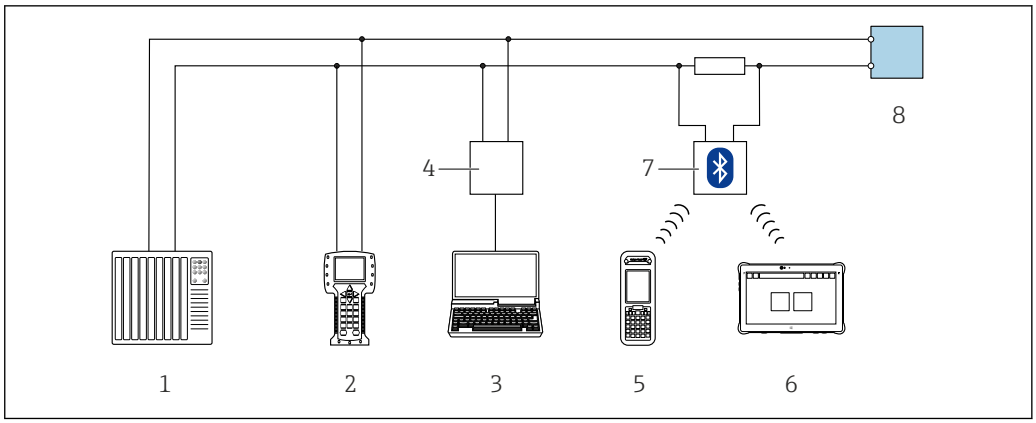
The local display is only available with the following device order code:
Order code for "Display; operation", option **B**: 4-line; illuminated, via communication

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

## Remote operation

**Via HART protocol**

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

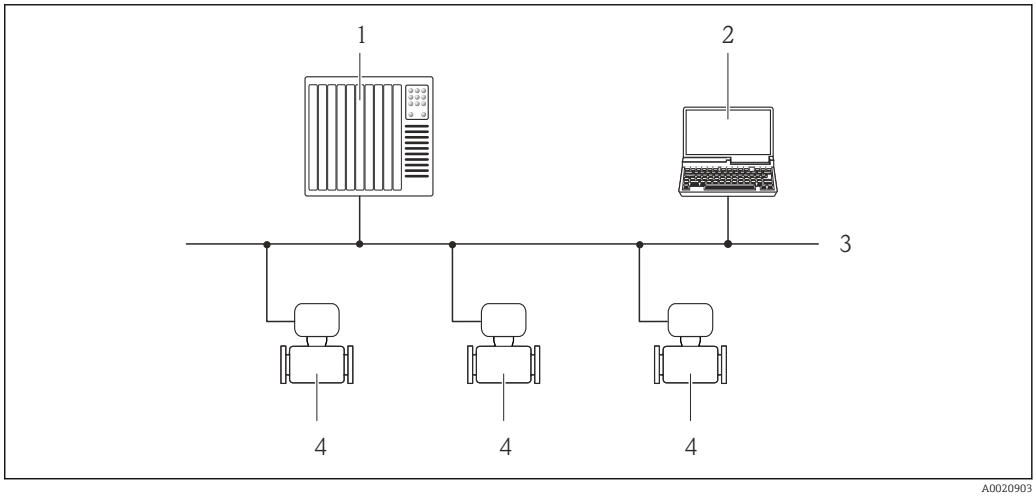



29 *Options for remote operation via HART protocol*

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

### Via PROFIBUS DP network

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



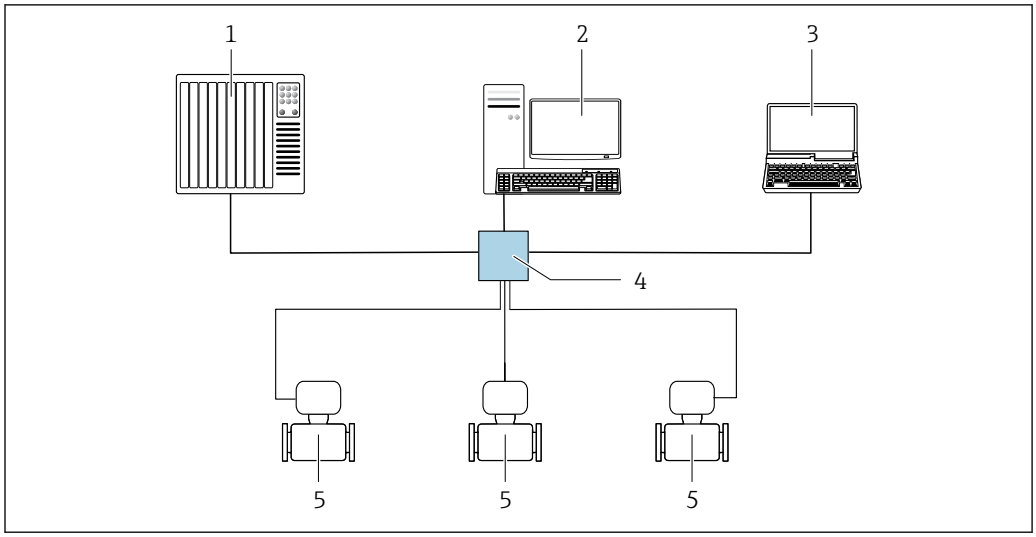

30 *Options for remote operation via PROFIBUS DP network*

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

### Via EtherNet/IP network

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

*Star topology*



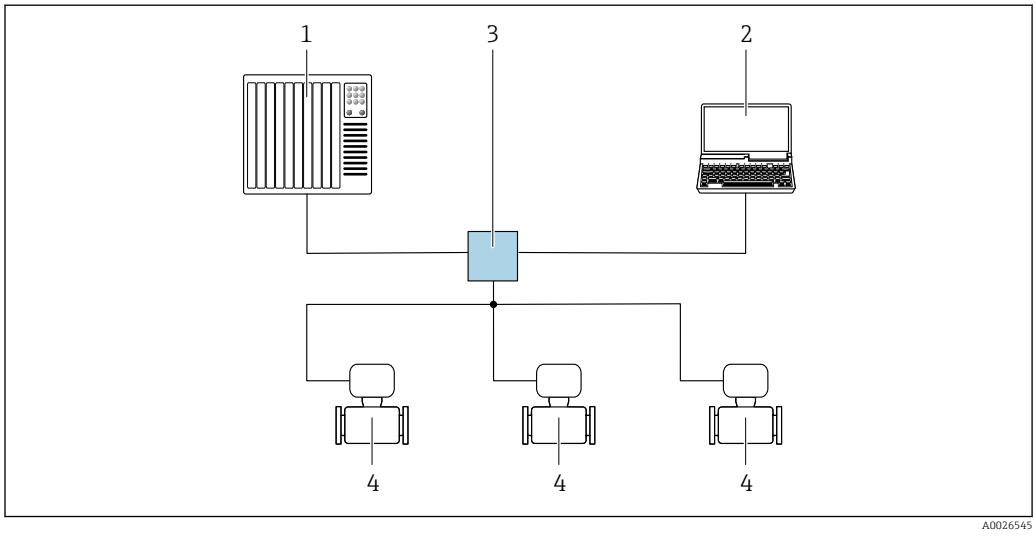

*31 Options for remote operation via Ethernet/IP network: star topology*

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

### Via PROFINET network

This communication interface is available in device versions with PROFINET.

*Star topology*




*32 Options for remote operation via PROFINET network: star topology*

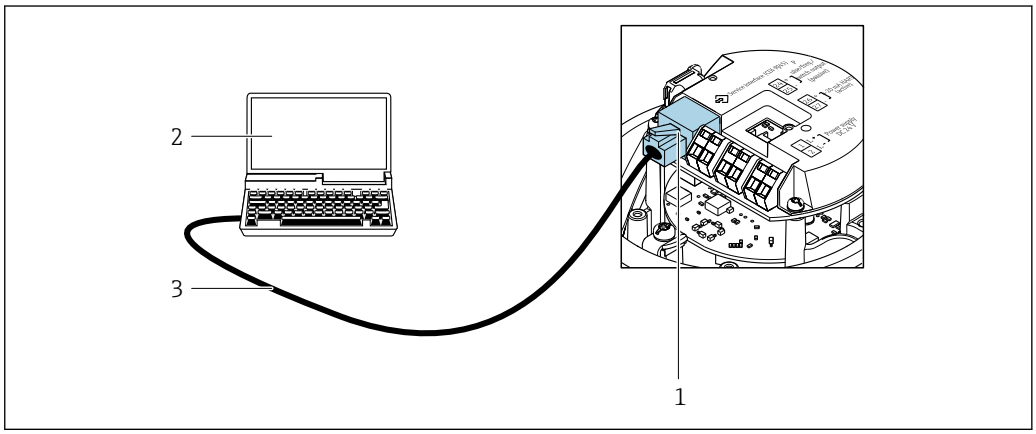
*1 Automation system, e.g. Simatic S7 (Siemens)*
*2 Computer with web browser for accessing integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"*
*3 Standard Ethernet switch, e.g. Scalance X204 (Siemens)*
*4 Measuring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

**Service interface**

**Via service interface (CDI-RJ45)**

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

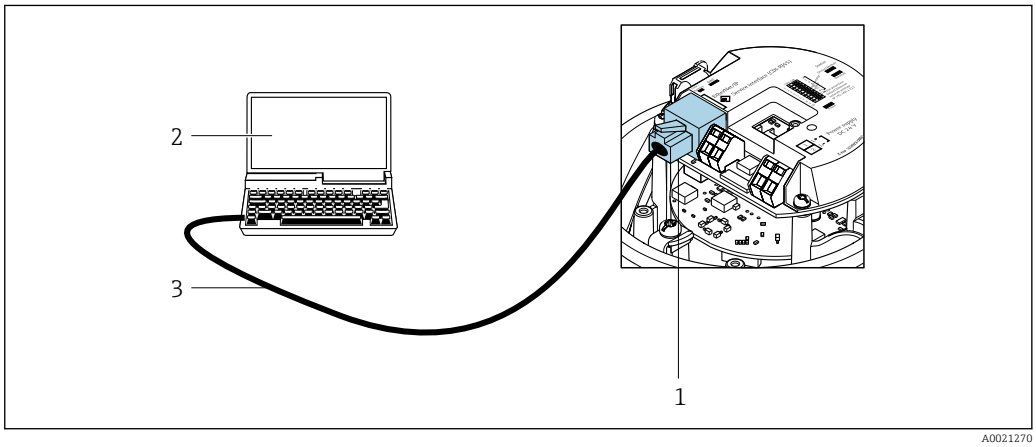
*HART*




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

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

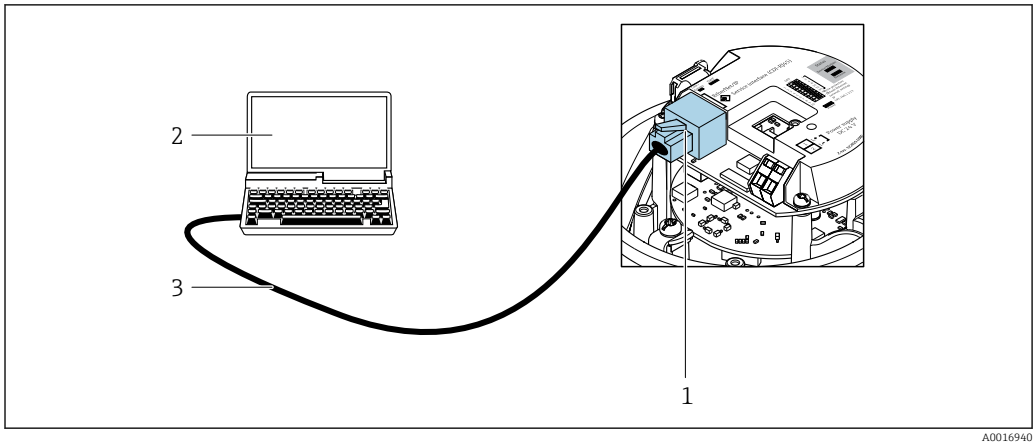
*PROFIBUS DP*




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

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

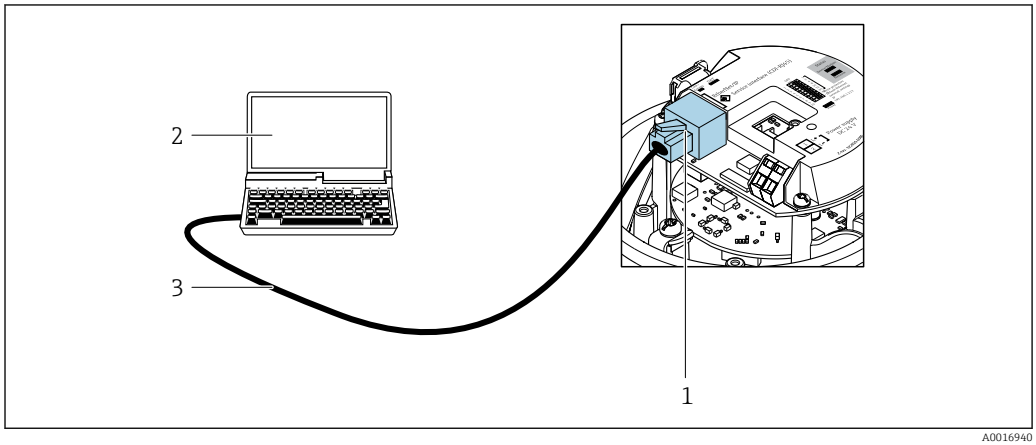
*EtherNet/IP*




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

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

*PROFINET*



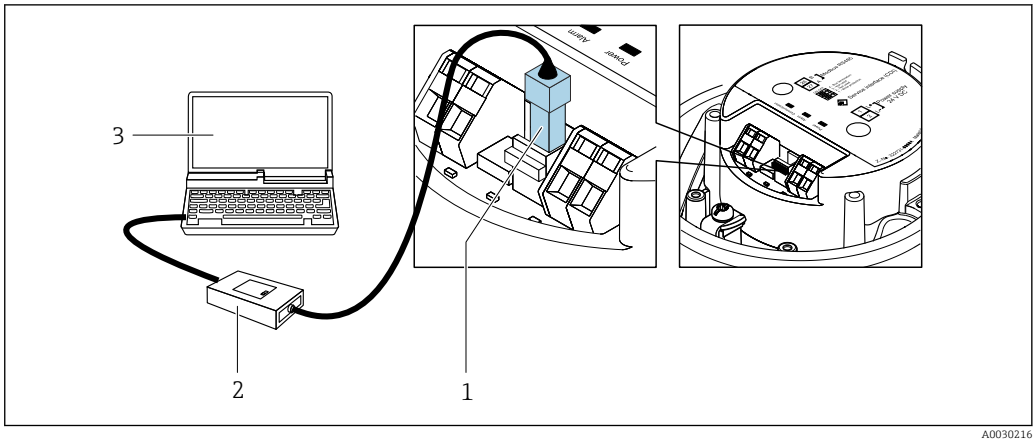

*36 Connection for order code for "Output", option R: PROFINET*

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

### Via service interface (CDI)

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

*Modbus RS485*




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

# Certificates and approvals

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

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

**CE mark**

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

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

**UKCA marking**

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

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

**RCM marking**

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

**Ex approval**

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

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

**Hygienic compatibility**

- 3-A approval
  - Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval.
  - The 3-A approval refers to the measuring instrument.
  - When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument.
    A remote display module must be installed in accordance with the 3-A Standard.
  - Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.
    Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG-tested (Type EL Class I)
  Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.
  To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedg.org).
  To meet the requirements for EHEDG certification, the orientation of the device must ensure drainability.
  Test criteria for cleanability according to EHEDG is a flow velocity of 1.5 m/s in the process line. This speed must be ensured for EHEDG-compliant cleaning.
- FDA CFR 21
- Food Contact Materials Regulation (EC) 1935/2004
- Food Contact Materials Regulation GB 4806
- The requirements of the Food Contact Material regulations must be observed when selecting the material versions.

Observe special installation instructions

**Pharmaceutical compatibility**

- FDA 21 CFR 177
- USP <87>
- USP <88> Class VI 121 °C
- TSE/BSE Certificate of Suitability
- cGMP
  Devices with the order code for "Test, certificate", option JG "Conformity with cGMP-derived requirements, declaration" comply with the requirements of cGMP with regard to the surfaces of parts in contact with the medium, design, FDA 21 CFR material conformity, USP Class VI tests and TSE/BSE conformity.
  A serial number-specific declaration is generated.

**HART certification**

**HART interface**

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

**Certification PROFIBUS**

**PROFIBUS interface**

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

**Certification PROFINET**

**PROFINET interface**

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

**EtherNet/IP certification**

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

**Modbus RS485 certification**

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

**Pressure Equipment Directive**

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

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

**Additional certification**

**CRN approval**

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

**Tests and certificates**

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

**External standards and guidelines**

- EN 60529
  Degrees of protection provided by enclosure (IP code)
- IEC/EN 60068-2-6
  Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
  Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- GB 30439.5
  Safety requirements for industrial automation products - Part 5: Flowmeter safety requirements
- EN 61326-1/-2-3
  EMC requirements for electrical equipment for measurement, control and laboratory use
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment

- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
  The application of the pressure equipment directive to process control devices
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnostics of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications
- NAMUR NE 132
  Coriolis mass meter
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components.
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

# Ordering information

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

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

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

**Product generation index**

| Release date | Product root | Documentation |
|---|---|---|
| 01.10.2017 | 8E1C | TI01351D |

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

# Application packages

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

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

Detailed information on the application packages:
Special Documentation → 90

**Heartbeat Technology**

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

**Heartbeat Verification**
Meets the requirement for traceable verification in accordance with DIN ISO 9001:2015 Clause 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high total test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk evaluation.

**Heartbeat Monitoring**
Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:
- Draw conclusions - using these data and other information - about the impact the process influences (e.g. corrosion, abrasion, deposit buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.g. gas pockets.

Detailed information on Heartbeat Technology:
Special Documentation → 90

**Concentration measurement**

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

Calculation and outputting of fluid concentrations.

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

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

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

**Petroleum & locking function**

Order code for "Application package", option EM "Petroleum & locking function"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package. It is also possible to lock the settings.

- Corrected volume flow and calculated reference density in accordance with the "API Manual of Petroleum Measurement Standards, Chapter 11.1"
- Water content, based on density measurement
- Weighted mean of the density and temperature

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

# Accessories

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

## Device-specific accessories

### For the sensor

| Accessories | Description |
|---|---|
| Heating jacket | Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.<br>If using oil as a heating medium, please consult with Endress+Hauser.<br>Heating jackets cannot be used with sensors fitted with a rupture disk.<br>▪ If ordered together with the measuring device:<br>Order code for "Accessory enclosed"<br>▪ Option RB "Heating jacket, G 1/2" female thread"<br>▪ Option RC "Heating jacket, G 3/4" female thread"<br>▪ Option RD "Heating jacket, NPT 1/2" female thread"<br>▪ Option RE "Heating jacket, NPT 3/4" female thread"<br>▪ If ordered subsequently:<br>Use the order code with the product root DK8003.<br>Special Documentation SD02151D |

## Communication-specific accessories

| Accessories | Description |
|---|---|
| Commubox FXA195 HART | For intrinsically safe HART communication with FieldCare via the USB interface.<br>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.<br>Technical Information TI00405C |
| HART loop converter HMX50 | Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.<br>▪ Technical Information TI00429F<br>▪ Operating Instructions BA00371F |
| Wireless HART adapter SWA70 | Is used for the wireless connection of field devices.<br>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.<br>Operating Instructions BA00061S |
| Fieldgate FXA42 | Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments<br>▪ Technical Information TI01297S<br>▪ Operating Instructions BA01778S<br>▪ Product page: www.endress.com/fxa42 |
| Field Xpert SMT50 | The Field Xpert SMT50 tablet PC for device configuration enables mobile plant asset management in non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.<br>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.<br>▪ Technical Information TI01555S<br>▪ Operating Instructions BA02053S<br>▪ Product page: www.endress.com/smt50 |

| | |
|---|---|
| Field Xpert SMT70 | The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.<br>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.<br>▪ Technical Information TI01342S<br>▪ Operating Instructions BA01709S<br>▪ Product page: www.endress.com/smt70 |
| Field Xpert SMT77 | The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.<br>▪ Technical Information TI01418S<br>▪ Operating Instructions BA01923S<br>▪ Product page: www.endress.com/smt77 |

## Service-specific accessories

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

## System components

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

# Documentation

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

## Standard documentation

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

### Brief Operating Instructions

*Brief Operating Instructions for the sensor*

| Measuring instrument | Documentation code |
|---|---|
| Proline Promass E | KA01260D |

*Brief Operating Instructions for the transmitter*

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

### Operating Instructions

| | Documentation code | | | | |
|---|---|---|---|---|---|
| Measuring device | HART | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Promass E 100 | BA01713D | BA01714D | BA01711D | BA01712D | BA01715D |

### Description of Device Parameters

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

## Supplementary device-dependent documentation

### Safety Instructions

| Content | Documentation code |
|---|---|
| ATEX/IECEx Ex i | XA00159D |
| ATEX/IECEx Ex nA | XA01029D |
| cCSAus IS | XA00160D |
| INMETRO Ex i | XA01219D |
| INMETRO Ex nA | XA01220D |

### Special Documentation

| Contents | Documentation code |
|---|---|
| Information on the Pressure Equipment Directive | SD01614D |
| Concentration measurement Ethernet/IP, HART, Modbus RS485, PROFIBUS DP | SD01152D |
| Concentration measurement PROFINET | SD01503D |

| Contents | Documentation code |
|---|---|
| Heartbeat Technology EtherNet/IP, HART, Modbus RS485, PROFIBUS DP | SD01153D |
| Heartbeat Technology PROFINET | SD01493D |
| Web server HART | SD01820D |
| Web server PROFIBUS DP | SD01821D |
| Web server EtherNet/IP | SD01822D |
| Web server PROFINET | SD01823D |

### Installation Instructions

| Contents | Note |
|---|---|
| Installation instructions for spare part sets and accessories | The corresponding documentation code is listed with the relevant accessory.→ 88. |

## Registered trademarks

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

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

**Modbus®**
Registered trademark of SCHNEIDER AUTOMATION, INC.

**Ethernet/IP™**
Trademark of ODVA, Inc.

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

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


www.addresses.endress.com

Endress+Hauser

People for Process Automation