# Technical Information
# Proline Promass I 100

Coriolis flowmeter



# Combines in-line viscosity and flow measurement with an ultra-compact transmitter

## Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Liquid and gas measurement in applications requiring low pressure loss and sensitive handling of the medium

*Device properties*
- Straight, easy-to-clean single-tube system
- TMB® technology
- Titanium measuring tube
- Robust, ultra-compact transmitter housing
- Highest degree of protection: IP69K
- Local display available

## Your benefits

- Energy-saving – full bore design enables minimal pressure loss
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no inlet/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 **EH**

People for Process Automation

# Table of contents

Document information . . . . . . . . . . . . . . . . . . . . . . . 4
  Symbols used . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 4

Function and system design . . . . . . . . . . . . . . . . . 5
  Measuring principle . . . . . . . . . . . . . . . . . . . . . . . . . . 5
  Measuring system . . . . . . . . . . . . . . . . . . . . . . . . . . . 5
  Equipment architecture . . . . . . . . . . . . . . . . . . . . . . . 7
  Safety . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7

Input . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
  Measured variable . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
  Measuring range . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
  Operable flow range . . . . . . . . . . . . . . . . . . . . . . . . . 9
  Input signal . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9

Output . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10
  Output signal . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10
  Signal on alarm . . . . . . . . . . . . . . . . . . . . . . . . . . . . 11
  Ex connection data . . . . . . . . . . . . . . . . . . . . . . . . . 13
  Low flow cut off . . . . . . . . . . . . . . . . . . . . . . . . . . . . 14
  Galvanic isolation . . . . . . . . . . . . . . . . . . . . . . . . . . 14
  Protocol-specific data . . . . . . . . . . . . . . . . . . . . . . . 14

Power supply . . . . . . . . . . . . . . . . . . . . . . . . . . . . 24
  Terminal assignment . . . . . . . . . . . . . . . . . . . . . . . . 24
  Pin assignment, device plug . . . . . . . . . . . . . . . . . . . 31
  Supply voltage . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 33
  Power consumption . . . . . . . . . . . . . . . . . . . . . . . . . 34
  Current consumption . . . . . . . . . . . . . . . . . . . . . . . . 34
  Power supply failure . . . . . . . . . . . . . . . . . . . . . . . . 34
  Electrical connection . . . . . . . . . . . . . . . . . . . . . . . . 35
  Potential equalization . . . . . . . . . . . . . . . . . . . . . . . 40
  Terminals . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 40
  Cable entries . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 40
  Cable specification . . . . . . . . . . . . . . . . . . . . . . . . . . 40

Performance characteristics . . . . . . . . . . . . . . . . 42
  Reference operating conditions . . . . . . . . . . . . . . . . 42
  Maximum measured error . . . . . . . . . . . . . . . . . . . . 42
  Repeatability . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 44
  Response time . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 44
  Influence of ambient temperature . . . . . . . . . . . . . . 44
  Influence of medium temperature . . . . . . . . . . . . . . 44
  Influence of medium pressure . . . . . . . . . . . . . . . . . 45
  Design fundamentals . . . . . . . . . . . . . . . . . . . . . . . . 45

Installation . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 46
  Mounting location . . . . . . . . . . . . . . . . . . . . . . . . . . 46
  Orientation . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 47
  Inlet and outlet runs . . . . . . . . . . . . . . . . . . . . . . . . 48
  Special mounting instructions . . . . . . . . . . . . . . . . . 48
  Mounting Safety Barrier Promass 100 . . . . . . . . . . . 49

Environment . . . . . . . . . . . . . . . . . . . . . . . . . . . . 49
  Ambient temperature range . . . . . . . . . . . . . . . . . . . 49
  Storage temperature . . . . . . . . . . . . . . . . . . . . . . . . 51
  Climate class . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 51

Degree of protection . . . . . . . . . . . . . . . . . . . . . . . . 51
Vibration resistance . . . . . . . . . . . . . . . . . . . . . . . . . 52
Shock resistance . . . . . . . . . . . . . . . . . . . . . . . . . . . . 52
Shock resistance . . . . . . . . . . . . . . . . . . . . . . . . . . . . 52
Interior cleaning . . . . . . . . . . . . . . . . . . . . . . . . . . . . 52
Electromagnetic compatibility (EMC) . . . . . . . . . . . . . 52

Process . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 52
  Medium temperature range . . . . . . . . . . . . . . . . . . . . 52
  Density . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 52
  Pressure-temperature ratings . . . . . . . . . . . . . . . . . . 52
  Secondary containment pressure rating . . . . . . . . . . . 55
  Flow limit . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 56
  Pressure loss . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 56
  System pressure . . . . . . . . . . . . . . . . . . . . . . . . . . . . 56
  Thermal insulation . . . . . . . . . . . . . . . . . . . . . . . . . . 57
  Heating . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 58
  Vibrations . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 58

Mechanical construction . . . . . . . . . . . . . . . . . . . 59
  Dimensions in SI units . . . . . . . . . . . . . . . . . . . . . . . 59
  Dimensions in US units . . . . . . . . . . . . . . . . . . . . . . . 72
  Weight . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 79
  Materials . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 80
  Process connections . . . . . . . . . . . . . . . . . . . . . . . . . 82
  Surface roughness . . . . . . . . . . . . . . . . . . . . . . . . . . . 82

Operability . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 82
  Operating concept . . . . . . . . . . . . . . . . . . . . . . . . . . . 82
  Local display . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 82
  Remote operation . . . . . . . . . . . . . . . . . . . . . . . . . . . 83
  Service interface . . . . . . . . . . . . . . . . . . . . . . . . . . . . 84

Certificates and approvals . . . . . . . . . . . . . . . . . . 87
  CE mark . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 87
  C-Tick symbol . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 87
  Ex approval . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 87
  Sanitary compatibility . . . . . . . . . . . . . . . . . . . . . . . . 88
  HART certification . . . . . . . . . . . . . . . . . . . . . . . . . . 88
  Certification PROFIBUS . . . . . . . . . . . . . . . . . . . . . . 88
  Certification PROFINET . . . . . . . . . . . . . . . . . . . . . . 88
  EtherNet/IP certification . . . . . . . . . . . . . . . . . . . . . . 88
  Modbus RS485 certification . . . . . . . . . . . . . . . . . . . 88
  Pressure Equipment Directive . . . . . . . . . . . . . . . . . . 88
  Other standards and guidelines . . . . . . . . . . . . . . . . . 89

Ordering information . . . . . . . . . . . . . . . . . . . . . . 89

Application packages . . . . . . . . . . . . . . . . . . . . . . 89
  Heartbeat Technology . . . . . . . . . . . . . . . . . . . . . . . . 90
  Concentration . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 90
  Viscosity . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 90

Accessories . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 91
  Device-specific accessories . . . . . . . . . . . . . . . . . . . . 91
  Communication-specific accessories . . . . . . . . . . . . . 91
  Service-specific accessories . . . . . . . . . . . . . . . . . . . . 92

# Document information

| Symbols used | **Electrical symbols** |

| Symbol | Meaning | Symbol | Meaning |
|---|---|---|---|
| --- | Direct current | $\sim$ | Alternating current |
| ⎓ | Direct current and alternating current | ⏚ | **Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
| ⏚ | **Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections. | ▽ | **Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice. |

**Symbols for certain types of information**

| Symbol | Meaning |
|---|---|
| ✓ | **Permitted** Procedures, processes or actions that are permitted. |
| ✓✓ | **Preferred** Procedures, processes or actions that are preferred. |
| ✗ | **Forbidden** Procedures, processes or actions that are forbidden. |
| 🛈 | **Tip** Indicates additional information. |
| 📖 | Reference to documentation |
| 📄 | Reference to page |
| 🖼 | Reference to graphic |
| 👁 | Visual inspection |

**Symbols in graphics**

| Symbol | Meaning | Symbol | Meaning |
|---|---|---|---|
| 1, 2, 3,... | Item numbers | 1., 2., 3. ... | Series of steps |
| A, B, C, ... | Views | A-A, B-B, C-C, ... | Sections |
| ⚠EX | 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 $\Delta m$, its velocity $v$ in the system and thus on the mass flow. Instead of a constant rotational velocity $\omega$, the sensor uses oscillation.

In the sensor, an oscillation is produced in the measuring tube. The Coriolis forces produced at the measuring tube cause a phase shift in the tube oscillations (see illustration):
- If there is zero flow (i.e. when the fluid stands still), the oscillation measured at points A and B has the same phase (no phase difference).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).



A0016772
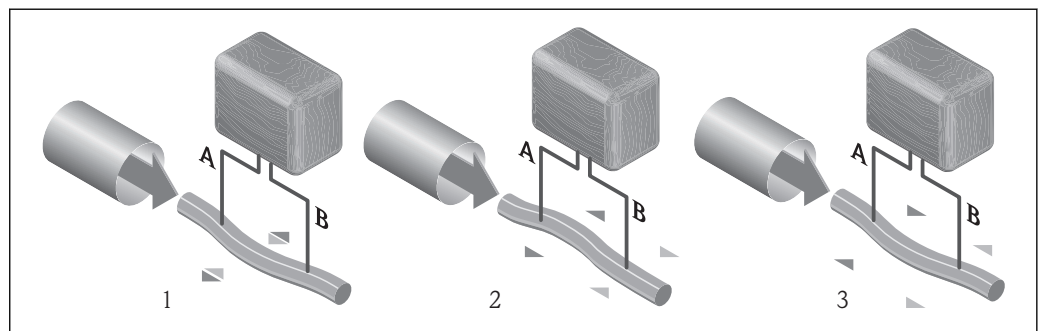
The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet. System balance is created by exciting an eccentrically arranged swinging mass to antiphase oscillation. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

**Density measurement**
The measuring tube is continuously excited at its resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tube and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency is thus a function of 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.
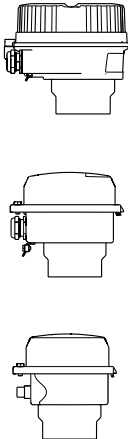
**Measuring system**
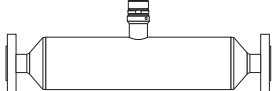
The device consists of a transmitter and a sensor. If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

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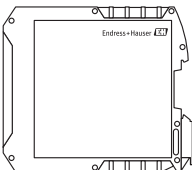
Transmitter

| Promass 100 | Device versions and materials: |
|---|---|
| A0016693 A0016694 A0016695 | • 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)<br>• Additionally for device version with local display:<br>  Via Web browser (e.g. Microsoft Internet Explorer)<br>• Also for device version with 4-20 mA HART, pulse/frequency/switch output:<br>  Via Web browser (e.g. Microsoft Internet Explorer)<br>• Also for device version with EtherNet/IP output:<br>  – Via Web browser (e.g. Microsoft Internet Explorer)<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 (e.g. Microsoft Internet Explorer)<br>  – Via device master file (GSD) |

Sensor

| Promass I | |
|---|---|
| A0016508 | • Sensitive fluid handling thanks to straight single-tube system<br>• Simultaneous measurement of viscosity, 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, 1.4301/1.4307 (304L)<br>  – Measuring tubes: titanium Grade 9<br>  – Process connections: stainless steel, 1.4301 (304), wetted parts: titanium Grade 2 |

Safety Barrier Promass 100

| | |
|---|---|
| Endress+Hauser 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**
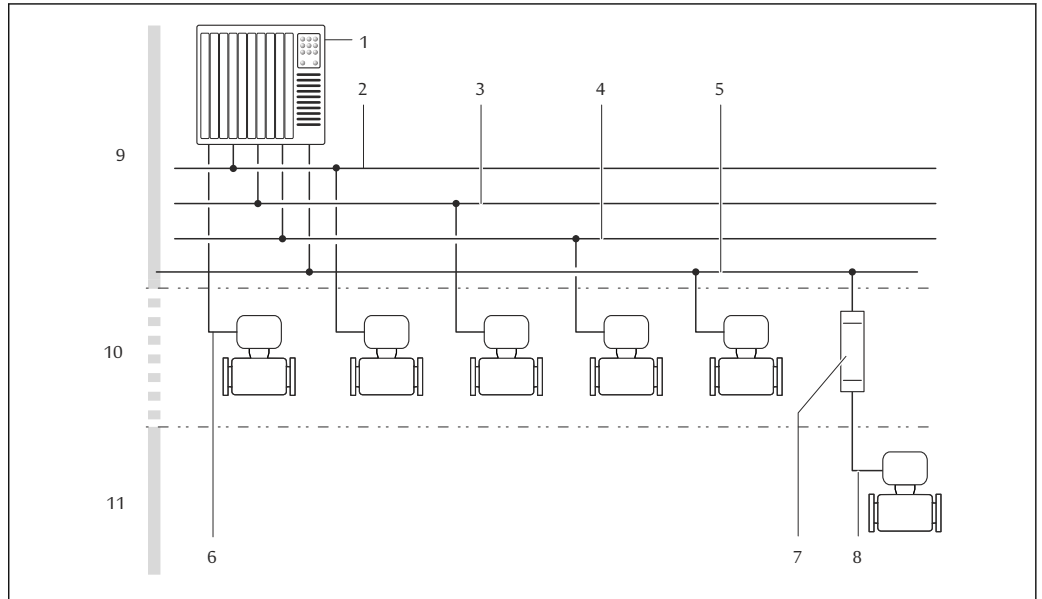


⊡ *1    Possibilities for integrating measuring devices into a system*

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

**Safety**

**IT security**

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

# Input

| | |
|---|---|
| Measured variable | **Direct measured variables**<br><br>• Mass flow<br>• Density<br>• Temperature<br>• Viscosity<br><br>**Calculated measured variables**<br><br>• Volume flow<br>• Corrected volume flow<br>• Reference density |

| | |
|---|---|
| Measuring range | **Measuring ranges for liquids** |

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

**Measuring ranges for gases**

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

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

| DN | | x |
|---|---|---|
| [mm] | [in] | [kg/m³] |
| 8 | ³⁄₈ | 60 |
| 15 | ½ | 80 |
| 15 FB | ½ FB | 90 |
| 25 | 1 | 90 |
| 25 FB | 1 FB | 90 |
| 40 | 1½ | 90 |
| 40 FB | 1½ FB | 90 |

| DN | | x |
|---|---|---|
| [mm] | [in] | [kg/m³] |
| 50 | 2 | 90 |
| 50 FB | 2 FB | 110 |
| 80 | 3 | 110 |
| FB = Full bore | | |

To calculate the measuring range, use the *Applicator* sizing tool → 🖺 92

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

Maximum possible full scale value:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_G : x = 70\,000$ kg/h · 60.3 kg/m³ : 90 kg/m³ = 46 900 kg/h

**Recommended measuring range**

"Flow limit" section → 🖺 56

| | |
|---|---|
| **Operable flow range** | Over 1000 : 1. |

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

| | |
|---|---|
| **Input signal** | **External measured values** |

To increase the accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring device:
- Operating pressure to increase accuracy (Endress+Hauser recommends the use of a pressure measuring device for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow for gases

Various pressure transmitters and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 🖺 92

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 from the automation system to the measuring via:
- PROFIBUS DP
- Modbus RS485
- EtherNet/IP
- PROFINET

# Output

| Output signal | 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 | Adjustable: 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><br>ℹ 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 | Adjustable: 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 | Adjustable: 0 to 10 000 Hz |
| Damping | Adjustable: 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><br>ℹ 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 | Adjustable: 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><br>ℹ 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 |

**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**

*4-20 mA*

| Failure mode | Choose from:<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>• Freely definable value between: 3.59 to 22.5 mA<br>• Actual value<br>• Last valid value |
|---|---|

*HART*

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

**Pulse/frequency/switch output**

| Pulse output | |
|---|---|
| **Failure mode** | Choose from:<br>• Actual value<br>• No pulses |
| **Frequency output** | |
| **Failure mode** | Choose from:<br>• Actual value<br>• 0 Hz<br>• Defined value: 0 to 12 500 Hz |
| **Switch output** | |
| **Failure mode** | Choose from:<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** | In accordance with "Application Layer protocol for decentral device periphery and distributed automation", 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

**Operating tool**

• Via digital communication:
  – HART protocol
  – PROFIBUS DP
  – Modbus RS485
  – EtherNet/IP
  – PROFINET
• Via service interface
• Via Web server

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

ℹ️ Additional information on remote operation → 🔖 83

**Web browser**

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

**Light emitting diodes (LED)**

| Status information | Status indicated by various light emitting diodes |
|---|---|
| | The following information is displayed depending on the device version:<br>• Supply voltage active<br>• Data transmission active<br>• Device alarm/error has occurred<br>• EtherNet/IP network available<br>• EtherNet/IP connection established<br>• PROFINET network available<br>• PROFINET connection established<br>• PROFINET blinking feature |

**Ex connection data**

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

**Safety Barrier Promass 100**

*Safety-related values*

| Terminal numbers | | | |
|---|---|---|---|
| Supply voltage | | Signal transmission | |
| 2 (L-) | 1 (L+) | 26 (A) | 27 (B) |
| $U_{nom}$ = DC 24 V<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 (A) | 72 (B) |
| $U_o$ = 16.24 V<br>$I_o$ = 623 mA<br>$P_o$ = 2.45 W<br>With IIC [1]: $L_o$ = 92.8 µH, $C_o$ = 0.433 µF, $L_o/R_o$ = 14.6 µH/Ω<br>With 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 (A) | 72 (B) |
| • 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.

**Galvanic isolation**

The following connections are galvanically isolated from each other:
• Outputs
• Power supply

**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>• Sensor integrity<br>• Carrier pipe temperature<br>• Frequency fluctuation 1<br>• Oscillation amplitude 1<br>• Tube damping fluctuation 1<br>• Exciter current 1 |
|---|---|
| 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>• 9 = dynamic viscosity<br>• 10 = kinematic viscosity<br>• 11 = temp. compensated dynamic viscosity<br>• 12 = temp. compensated kinematic viscosity<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 under:<br>• www.endress.com<br>  On the product page for the device: Documents/Software → Device drivers<br>• www.profibus.org |

| Output values (from measuring device 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>• Dynamic viscosity<br>• Kinematic viscosity<br>• Temp. compensated dynamic viscosity<br>• Temp. compensated kinematic viscosity<br>• Temperature<br>• Carrier pipe temperature<br>• Electronic temperature<br>• Oscillation frequency<br>• Oscillation amplitude<br>• Frequency fluctuation<br>• Oscillation damping<br>• Tube damping fluctuation<br>• Signal asymmetry<br>• Exciter current<br><br>**Digital input 1 to 2**<br>• Partially filled pipe detection<br>• Low flow cut off<br><br>**Totalizer 1 to 3**<br>• Mass flow<br>• Volume flow<br>• Corrected volume flow |
|---|---|
| **Input values** (from automation system to measuring device) | **Analog output 1 to 3 (fixed assignment)**<br>• Pressure<br>• Temperature<br>• Reference density<br><br>**Digital output 1 to 3 (fixed assignment)**<br>• Digital output 1: switch positive zero return on/off<br>• Digital output 2: perform zero point adjustment<br>• Digital output 3: switch switch output on/off<br><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>  Simplest 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>  Simplest 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 |

Endress+Hauser

| 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><br>📖 For Modbus register information |

**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 device | • 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 device |
| 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><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><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>  – Measuring mode<br>  – Failsafe 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 MBit/s |
| Device profile | Application interface identifier 0xF600<br>Generic device |
| Manufacturer ID | 0x11 |
| Device type ID | 0x844A |
| Device description files (GSD, DTM) | Information and files under:<br>• www.endress.com<br>  On the product page for the device: Documents/Software → Device drivers<br>• www.profibus.org |
| Baud rates | Automatic 100 Mbit/s with full-duplex detection |

| | |
|---|---|
| **Cycle times** | 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 device** | • 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 device |
| **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 device 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>• Dynamic viscosity<br>• Kinematic viscosity<br>• Temp. compensated dynamic viscosity<br>• Temp. compensated kinematic viscosity<br>• Temperature<br>• Carrier pipe temperature<br>• Electronic temperature<br>• Oscillation frequency<br>• Oscillation amplitude<br>• Frequency fluctuation<br>• Oscillation damping<br>• Tube damping fluctuation<br>• Signal asymmetry<br>• Exciter current<br><br>**Discrete Input module (slot 1 to 14)**<br>• Empty pipe detection<br>• Low flow cut off<br><br>**Diagnostics Input module (slot 1 to 14)**<br>• Last diagnostics<br>• Current diagnosis<br><br>**Totalizer 1 to 3 (slot 15 to 17)**<br>• Mass flow<br>• Volume flow<br>• Corrected volume flow<br><br>**Heartbeat Verification module (fixed assignment)**<br>Verification status (slot 23)<br><br>The range of options increases if the measuring device has one or more application packages. |

| Input values (from automation system to measuring device) | **Analog Output module (fixed assignment)**<br>• External pressure (slot 18)<br>• External temperature (slot 19)<br>• External reference density (slot 20) |
|---|---|
| | **Discrete Output module (fixed assignment)**<br>• Activate/deactivate positive zero return (slot 21)<br>• Perform zero point adjustment (slot 22) |
| | **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 |
| | **Heartbeat Verification module (fixed assignment)**<br>Start verification (slot 23)<br><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 onsite 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 | | |
| | Electronic 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 | Dynamic viscosity | Viscosity [2] | 1...14 |

| Input/output value | Process variable | Category | Slot |
|---|---|---|---|
| | Kinematic viscosity | | |
| | Temp. compensated dynamic viscosity | | |
| | Temp. compensated kinematic viscosity | | |
| Output value | Carrier pipe temperature | Heartbeat [3] | 1…14 |
| | Oscillation damping 1 | | |
| | Oscillation frequency 1 | | |
| | Oscillation amplitude 0 | | |
| | Oscillation amplitude 1 | | |
| | Frequency fluctuation 1 | | |
| | Tube damping fluctuation 1 | | |
| | Exciter current 1 | | |
| | Sensor integrity | | |
| Input value | External density | Process monitoring | 18 |
| | External temperature | | 19 |
| | External reference density | | 20 |
| | Flow override | | 21 |
| | Zero point adjustment | | 22 |
| | Verification status | Heartbeat Verification | 23 |

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

*Startup configuration*

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

# Power supply

| | |
|---|---|
| Terminal assignment | Overview: housing version and connection versions |
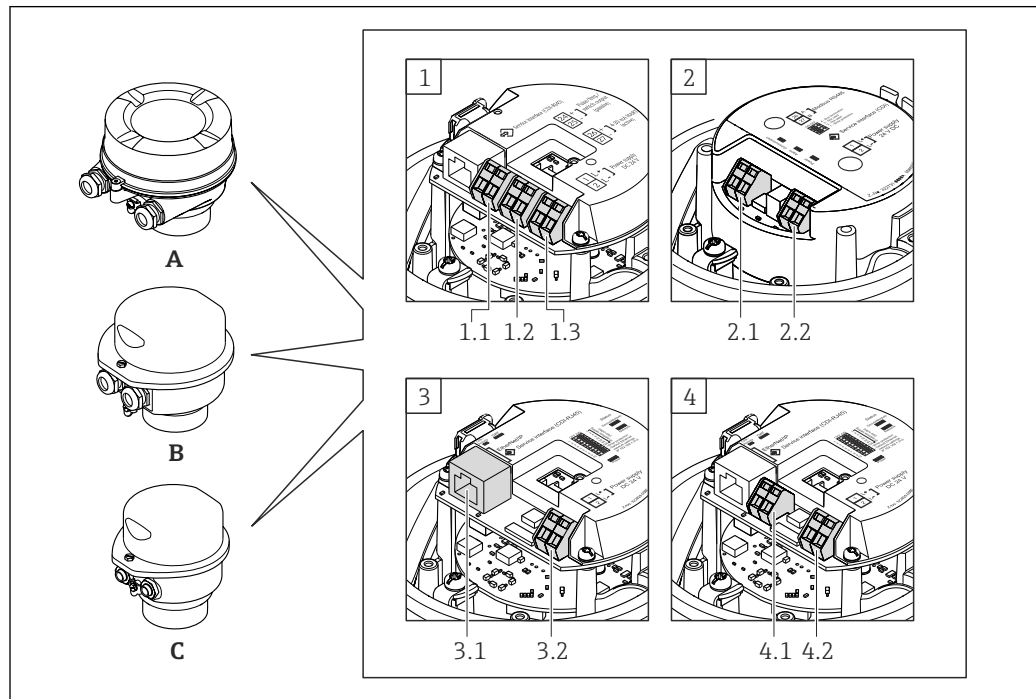


A0016770

*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 plugs → 🖻 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 plugs → 🖻 31 | Device plugs → 🖻 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 | | | |



🖻 *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)*

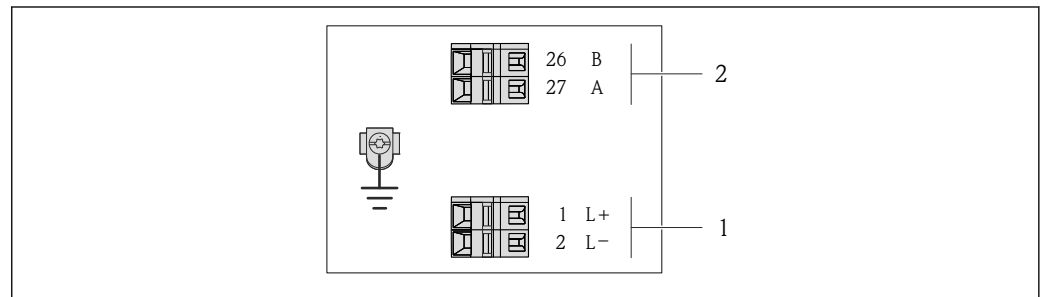| Order code for "Output" | Terminal number | | | | | |
|---|---|---|---|---|---|---|
| | Power supply | | Output 1 | | Output 2 | |
| | 2 (L-) | 1 (L+) | 27 (−) | 26 (+) | 25 (−) | 24 (+) |
| Option **B** | DC 24 V | | 4-20 mA HART (active) | | Pulse/frequency/switch output (passive) | |
| Order code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

*PROFIBUS DP connection version*

ℹ️ 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 plugs → 🖹 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 plugs → 🖹 31 | Device plugs → 🖹 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 | | | |



A0022716

🔲 *3   PROFIBUS DP terminal assignment*

*1   Power supply: DC 24 V*
*2   PROFIBUS DP*

| 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*

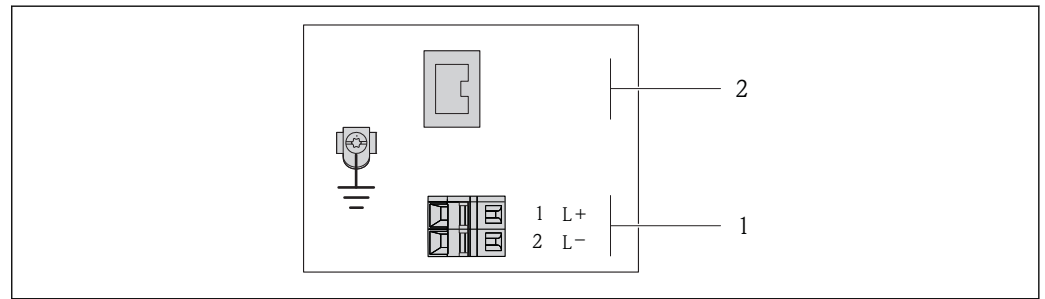ℹ For use in the non-hazardous area and Zone 2/Div. 2.

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 plugs → 🕮 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 plugs → 🕮 31 | Device plugs → 🕮 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 | | | |



🔲 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*

| Order code for "Output" | Terminal number | | | |
|---|---|---|---|---|
| | Power supply | | Output | |
| | 2 (L-) | 1 (L+) | 27 (B) | 26 (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*

ℹ️ 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 plugs<br>→ 🔲 31 | | 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 | | | |



A0017053

🔲 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*

| Order code for "Output" | 20 (L-) | 10 (L+) | 72 (B) | 62 (A) |
|---|---|---|---|---|
| Option **M** | Intrinsically safe supply voltage | | Modbus RS485 intrinsically safe | |
| Order code for "Output":<br>Option **M**: Modbus RS485, for use in intrinsically safe areas (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 plugs → 🖹 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 plugs → 🖹 31 | Device plugs → 🖹 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 | | | |



A0017054

🖻 *6    EtherNet/IP terminal assignment*

*1    Power supply: DC 24 V*
*2    EtherNet/IP*

| 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 plugs → 🗐 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 plugs → 🗐 31 | Device plugs → 🗐 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*

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

**Safety Barrier Promass 100**
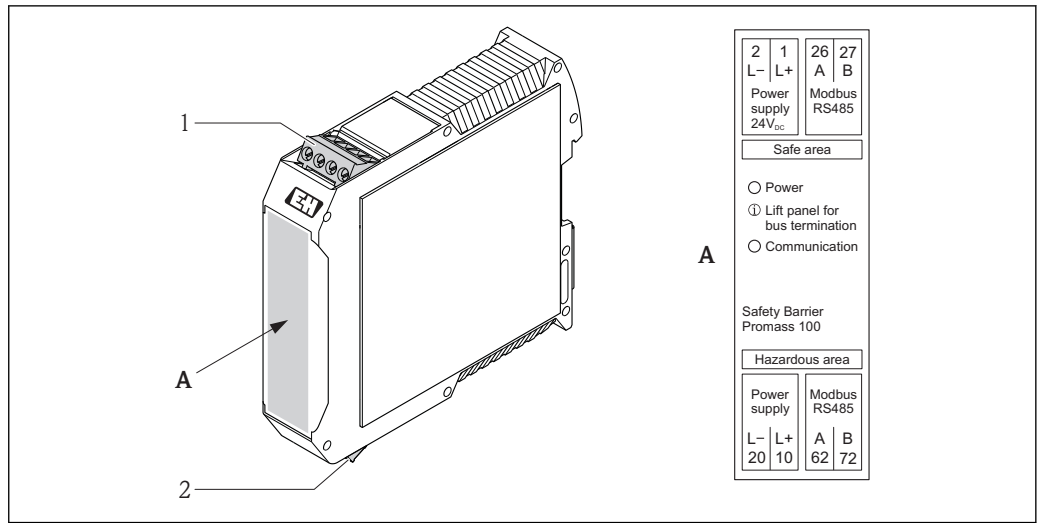


🔲 *8    Safety Barrier Promass 100 with terminals*

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

**Pin assignment, device plug**

ℹ️ Order codes for the M12x1 connectors, see the "Order code for **electrical connection**" column:
- 4-20 mA HART, pulse/frequency/switch output → 🔲 25
  - PROFIBUS DP→ 🔲 26
  - Modbus RS485 → 🔲 27
  - EtherNet/IP → 🔲 29
  - PROFINET→ 🔲 30

**Supply voltage**

*For all connection versions except MODBUS RS485 intrinsically safe (device side)*
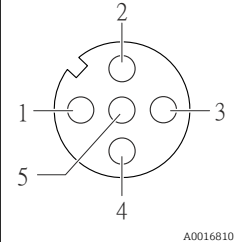
ℹ️ Device plug MODBUS RS485 intrinsically safe with supply voltage → 🔲 32

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

ℹ️ The following is recommended as a socket:
- Binder, series 763, part no. 79 3440 35 05
  - Alternatively: Phoenix part no. 1669767 SAC-5P-M12MS
    – 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)*
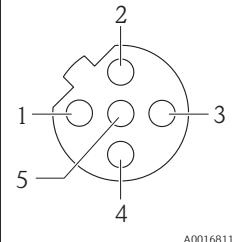
| Pin | | Assignment |
|---|---|---|
| 1 | + | 4-20 mA HART (active) |
| 2 | - | 4-20 mA HART (active) |
| 3 | + | Pulse/frequency/switch output (passive) |
| 4 | - | Pulse/frequency/switch output (passive) |
| 5 | | Grounding/shielding |
| **Coding** | | **Plug/socket** |
| A | | Socket |

• 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.
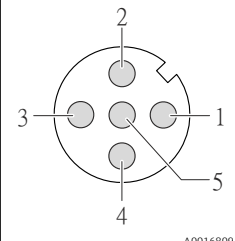
*Device plug for signal transmission (device side)*

| Pin | | Assignment |
|---|---|---|
| 1 | | Not assigned |
| 2 | A | PROFIBUS DP |
| 3 | | Not assigned |
| 4 | B | PROFIBUS DP |
| 5 | | Grounding/shielding |
| **Coding** | | **Plug/socket** |
| B | | Socket |

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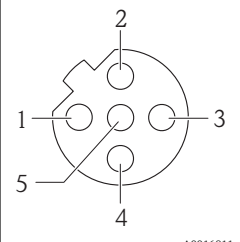
*Device plug for signal transmission with supply voltage (device side), MODBUS RS485 (intrinsically safe)*

| 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 |
| **Coding** | | **Plug/socket** |
| A | | Plug |

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

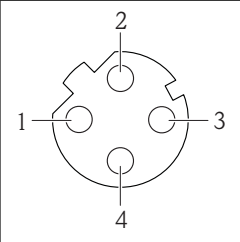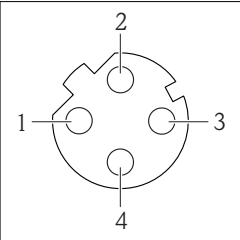*Device plug for signal transmission (device side), MODBUS RS485 (not intrinsically safe)*

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

| Pin | | Assignment |
|---|---|---|
| 1 | | Not assigned |
| 2 | A | Modbus RS485 |
| 3 | | Not assigned |
| 4 | B | Modbus RS485 |
| 5 | | Grounding/shielding |
| **Coding** | | **Plug/socket** |
| B | | Socket |

A0016811

- 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 |

A0016812

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 |

A0016812

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

**Safety Barrier Promass 100**

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) |
| 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) |

| Power supply failure | - Totalizers stop at the last value measured. |
|---|---|

- 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).
- Configuration is retained in the plug-in memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

**Electrical connection**

**Connecting the transmitter**
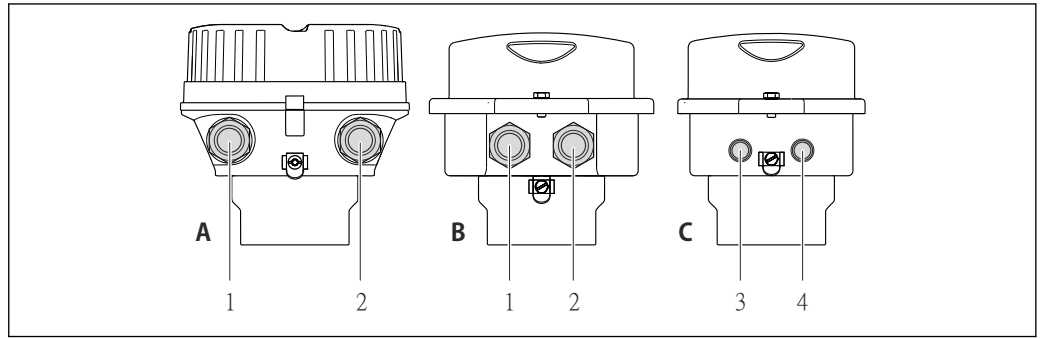


A0016924

*A    Housing version: compact, aluminum coated*
*B    Housing version: compact hygienic, stainless*
*1    Cable entry or device plug for signal transmission*
*2    Cable entry or device plug for supply voltage*
*C    Housing version: ultra-compact, hygienic, stainless, M12 device plug*
*3    Device plug for signal transmission*
*4    Device plug for supply voltage*

- 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**

*Current output 4-20 mA HART*



A0016800
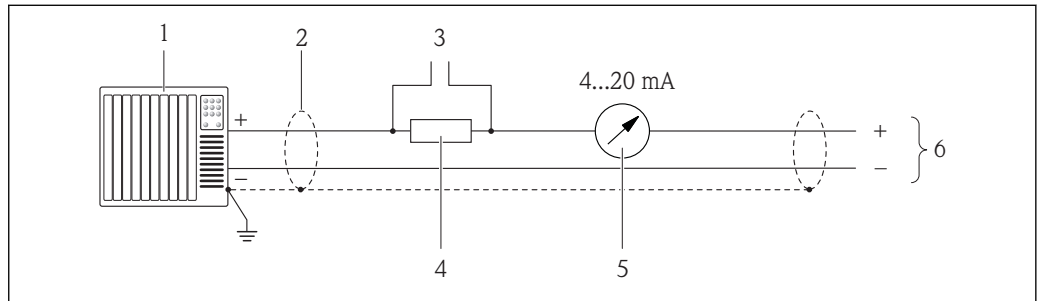
⊞ *9    Connection example for 4-20 mA HART current output (active)*

*1    Automation system with current input (e.g. PLC)*
*2    Cable shield, observe cable specifications*
*3    Connection for HART operating devices*
*4    Resistor for HART communication (≥ 250 Ω): observe maximum load*
*5    Analog display unit: observe maximum load*
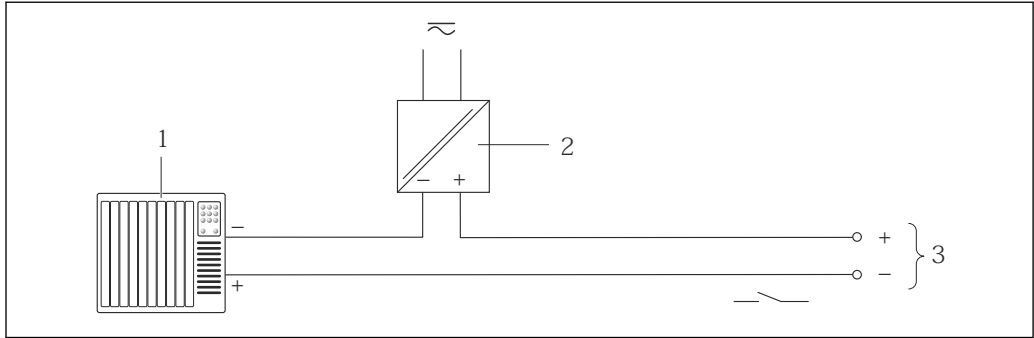*6    Transmitter*

*Pulse/frequency output*
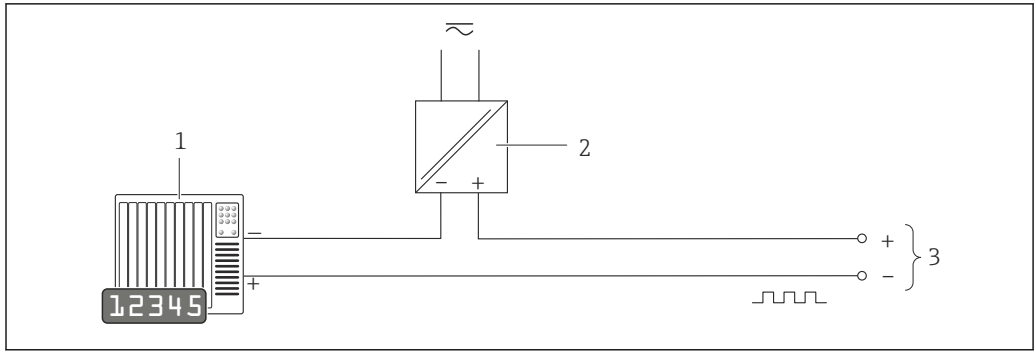


🔲 *10    Connection example for pulse/frequency output (passive)*

*1    Automation system with pulse/frequency input (e.g. PLC)*
*2    Power supply*
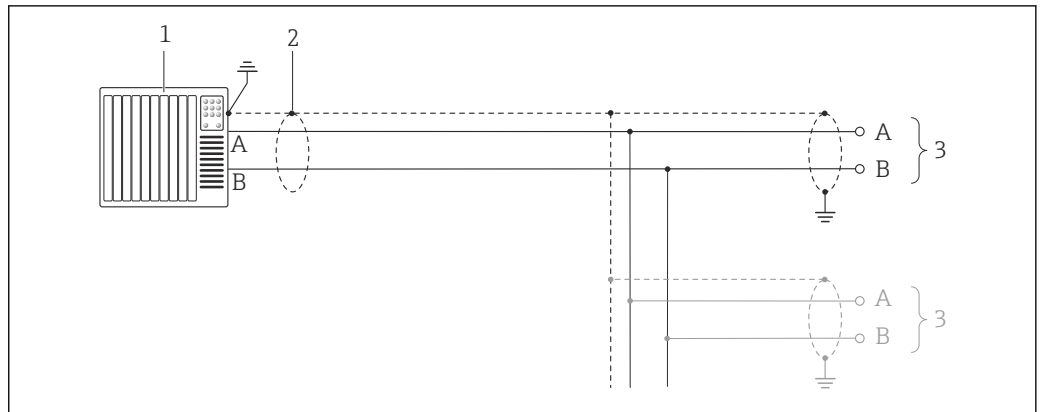*3    Transmitter: observe input values → 🔖 10*

*Switch output*



🔲 *11    Connection example for switch output (passive)*

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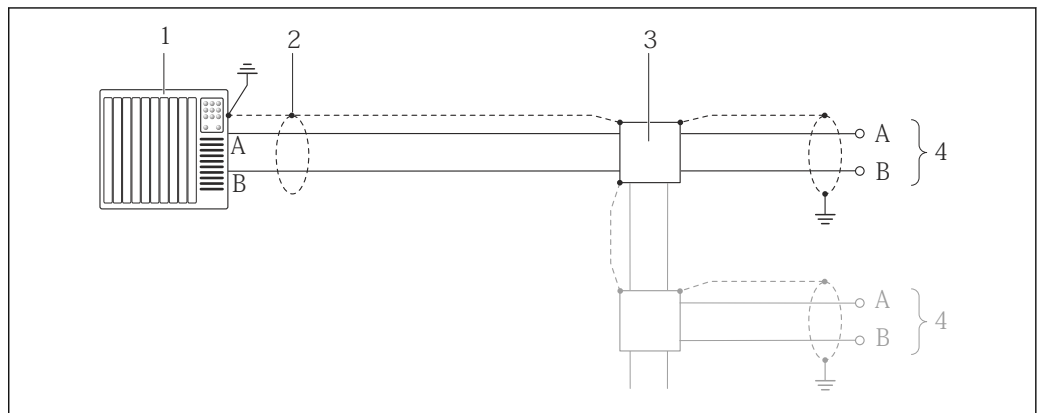*3    Transmitter: observe input values*

*PROFIBUS DP*



A0021429

⊡ *12    Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2*

*1    Control system (e.g. PLC)*
*2    Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
*3    Transmitter*

> 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.

*Modbus RS485*

*Modbus RS485, non-hazardous area and Zone 2/Div. 2*



A0016803

⊡ *13    Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2*

*1    Control system (e.g. PLC)*
*2    Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
*3    Distribution box*
*4    Transmitter*
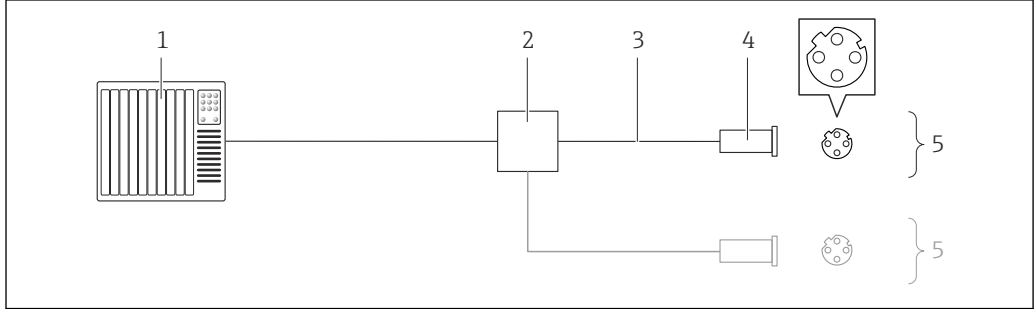
*Modbus RS485 intrinsically safe*
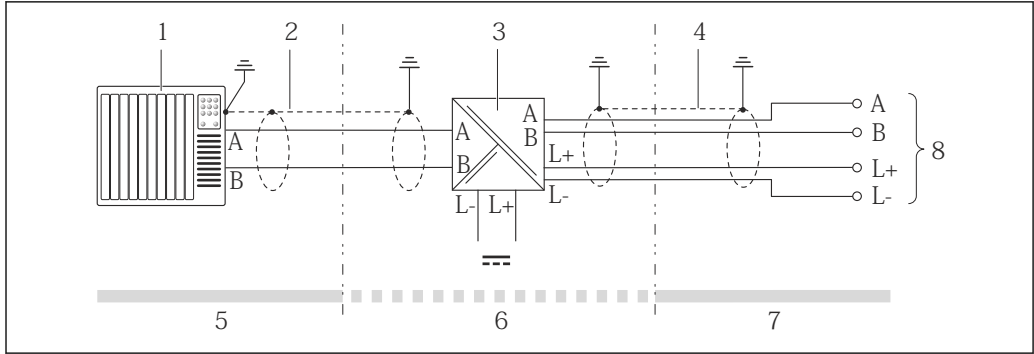


A0016804

⊡ *14    Connection example for Modbus RS485 intrinsically safe*

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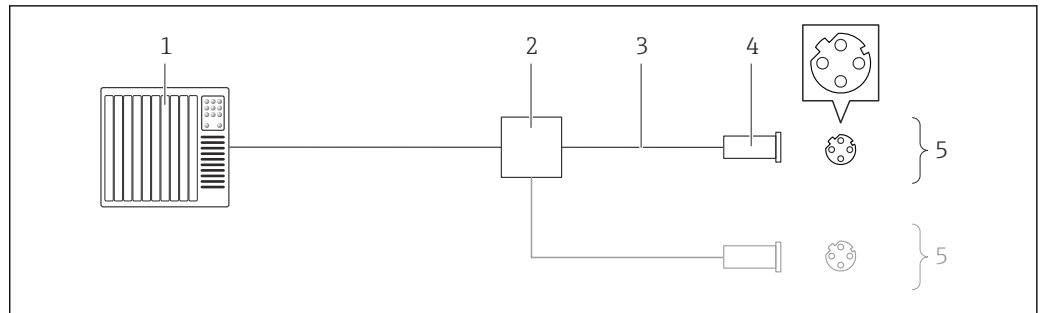*7    Intrinsically safe area*
*8    Transmitter*

*EtherNet/IP*



A0016805

⊡ *15    Connection example for EtherNet/IP*

*1    Control system (e.g. PLC)*
*2    Ethernet switch*
*3    Observe cable specifications*
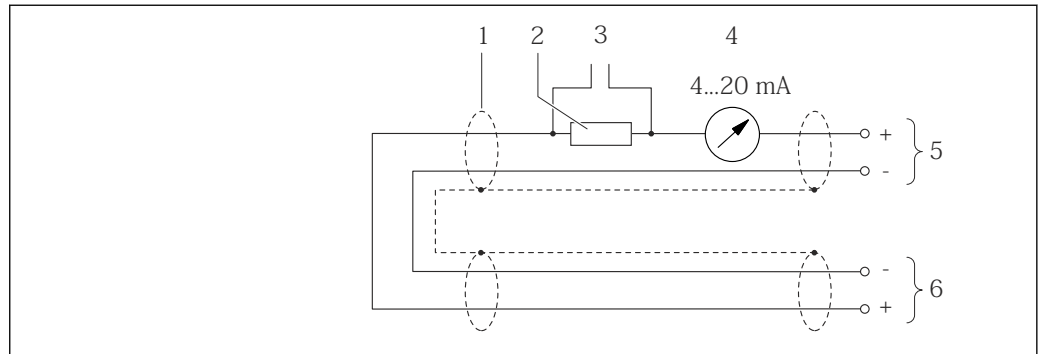*4    Device plug*
*5    Transmitter*

*PROFINET*



⊠ *16      Connecting cable for PROFINET*

*1      Control system (e.g. PLC)*
*2      Ethernet switch*
*3      Observe cable specifications*
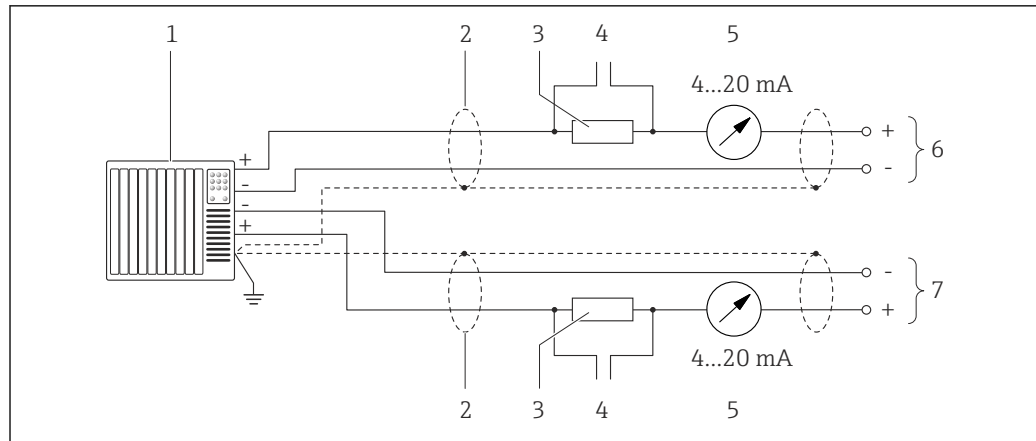*4      Connector*
*5      Transmitter*

*HART input*



⊠ *17      Connection example for HART input (burst mode) via current output (active)*

*1      Cable shield, observe cable specifications*
*2      Resistor for HART communication (≥ 250 Ω): observe maximum load*
*3      Connection for HART operating devices*
*4      Analog display unit*
*5      Transmitter*
*6      Sensor for external measured variable*

*⊡ 18    Connection example for HART input (master mode) via current output (active)*

*1    Automation system with current input (e.g. PLC).*
     *Prerequisite: automation system with HART version 6, HART commands 113 and 114 can be processed.*
*2    Cable shield, observe cable specifications*
*3    Resistor for HART communication (≥ 250 Ω): observe maximum load*
*4    Connection for HART operating devices*
*5    Analog display unit*
*6    Transmitter*
*7    Sensor for external measured variable*

| | |
|---|---|
| **Potential equalization** | **Requirements** |

No special measures for potential equalization are required.

Please consider the following to ensure correct measurement:
- Same electrical potential for the fluid and sensor
- Company-internal grounding concepts

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

| | |
|---|---|
| **Terminals** | **Transmitter** |

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

**Safety Barrier Promass 100**
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 $\phi$6 to 12 mm (0.24 to 0.47 in) |

- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20

| | |
|---|---|
| **Cable specification** | **Permitted temperature range** |

- −40 ℃ (−40 ℉) to +80 ℃ (+176 ℉)
- Minimum requirement: cable temperature range ≥ ambient temperature +20 K

**Power supply cable**

Standard installation cable is sufficient.

**Signal cable**

*Current output*

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

*Pulse/frequency/switch output*

Standard installation cable is sufficient.

*PROFIBUS DP*

The IEC 61158 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

| Cable type | A |
|---|---|
| Characteristic impedance | 135 to 165 Ω at a measuring frequency of 3 to 20 MHz |
| Cable capacitance | <30 pF/m |
| Wire cross-section | >0.34 mm$^2$ (22 AWG) |
| Cable type | Twisted pairs |
| Loop resistance | ≤110 Ω/km |
| Signal damping | Max. 9 dB over the entire length of the cable cross-section |
| Shield | Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant. |

*Modbus RS485*

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

| Cable type | A |
|---|---|
| Characteristic impedance | 135 to 165 Ω at a measuring frequency of 3 to 20 MHz |
| Cable capacitance | <30 pF/m |
| Wire cross-section | >0.34 mm$^2$ (22 AWG) |
| Cable type | Twisted pairs |
| Loop resistance | ≤110 Ω/km |
| Signal damping | Max. 9 dB over the entire length of the cable cross-section |
| Shield | Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant. |

*EtherNet/IP*

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

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

*PROFINET*

Standard IEC 61156-6 specifies CAT 5 as the minimum category for a cable used for PROFINET. CAT 5e and CAT 6 are recommended.

For more information on planning and installing PROFINET networks, see: "PROFINET Cabling and Interconnection Technology", Guideline for PROFINET

**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 with +15 to +45 ℃ (+59 to +113 ℉) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.

To obtain measured errors, use the *Applicator* sizing tool → 🖴 92

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

### Base accuracy

Design fundamentals → 🖴 45

*Mass flow and volume flow (liquids)*

±0.10 % o.r.

*Mass flow (gases)*

±0.50 % o.r.

*Density (liquids)*

| Under reference operating conditions | | Standard density calibration [1] | | Wide-range density specification [2] [3] | |
|---|---|---|---|---|---|
| [g/cm³] | [lbs/in³] | [g/cm³] | [lbs/in³] | [g/cm³] | [lbs/in³] |
| ±0.0005 | ±0.00097 | ±0.02 | ±0.039 | ±0.004 | ±0.0078 |

1) Valid over the entire temperature and density range
2) Valid range for special density calibration: 0 to 2 g/cm³, +5 to +80 ℃ (+41 to +176 ℉)
3) Order code for "Application package", option EF "Special density and concentration " or EH "Special density and viscosity"

*Temperature*

±0.5 ℃ ± 0.005 · T ℃ (±0.9 ℉ ± 0.003 · (T − 32) ℉)

**Zero point stability**

| DN | | Zero point stability | |
|---|---|---|---|
| [mm] | [in] | [kg/h] | [lb/min] |
| 8 | ⅜ | 0.150 | 0.0055 |
| 15 | ½ | 0.488 | 0.0179 |
| 15 FB | ½ FB | 1.350 | 0.0496 |
| 25 | 1 | 1.350 | 0.0496 |
| 25 FB | 1 FB | 3.375 | 0.124 |
| 40 | 1½ | 3.375 | 0.124 |
| 40 FB | 1 ½ FB | 5.25 | 0.193 |
| 50 | 2 | 5.25 | 0.193 |
| 50 FB | 2 FB | 13.5 | 0.496 |
| 80 | 3 | 13.5 | 0.496 |
| FB = Full bore | | | |

**Flow values**

Flow values as turndown parameter depending on nominal diameter.

*SI units*

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

*US units*

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

| DN | 1:1 | 1:10 | 1:20 | 1:50 | 1:100 | 1:500 |
|----|-----|------|------|------|-------|-------|
| [inch] | [lb/min] | [lb/min] | [lb/min] | [lb/min] | [lb/min] | [lb/min] |
| 2 | 2 573 | 257.3 | 128.7 | 51.46 | 25.73 | 5.146 |
| 2 FB | 6 615 | 661.5 | 330.8 | 132.3 | 66.15 | 13.23 |
| 3 | 6 615 | 661.5 | 330.8 | 132.3 | 66.15 | 13.23 |
| FB = Full bore | | | | | | |

### Accuracy of outputs

ℹ️ In the case of analog outputs, the output accuracy must also be considered for the measured error; in contrast, this need not be considered in the case of 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. (across the entire ambient temperature range) |
|----------|----------------------------------------------------------------|

**Repeatability**

o.r. = of reading; 1 g/cm$^3$ = 1 kg/l; T = medium temperature

**Base repeatability**

**Mass flow and volume flow (liquids)**
±0.05 % o.r.

**Mass flow (gases)**
±0.25 % o.r.

ℹ️ Design fundamentals → 🖺 45

**Density (liquids)**
±0.00025 g/cm$^3$

**Temperature**
±0.25 ℃ ± 0.0025 · T ℃ (±0.45 ℉ ± 0.0015 · (T−32) ℉)

**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./℃ |
|-------------------------|---------------------|

**Pulse/frequency output**

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

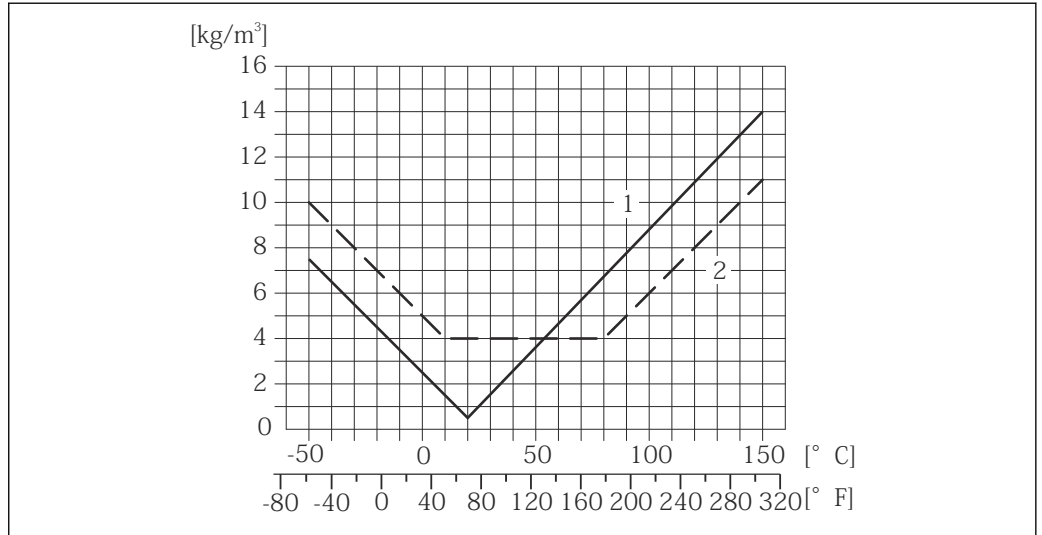**Influence of medium temperature**

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

**Density**

When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is $\pm0.0001$ g/cm³ /℃ ($\pm0.00005$ g/cm³ /℉). Field density calibration is possible.

**Wide-range density specification (special density calibration)**

If the process temperature is outside the valid range ($\rightarrow$ 🖺 42) the measured error is $\pm0.0001$ g/cm³ /℃ ($\pm0.00005$ g/cm³ /℉)

*1    Field density calibration, for example at +20 ℃ (+68 ℉)*
*2    Special density calibration*

**Temperature**

$\pm0.005 \cdot T$ ℃ ($\pm 0.005 \cdot (T - 32)$ ℉)

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

o.r. = of reading

| DN | | [% o.r./bar] | [% o.r./psi] |
|---|---|---|---|
| [mm] | [in] | | |
| 8 | ⅜ | No effect | No effect |
| 15 | ½ | No effect | No effect |
| 15 FB | ½ FB | +0.003 | +0.0002 |
| 25 | 1 | +0.003 | +0.0002 |
| 25 FB | 1 FB | No effect | No effect |
| 40 | 1½ | No effect | No effect |
| 40 FB | 1½ FB | No effect | No effect |
| 50 | 2 | No effect | No effect |
| 50 FB | 2 FB | No effect | No effect |
| 80 | 3 | No effect | No effect |
| FB = Full bore | | | |

| 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

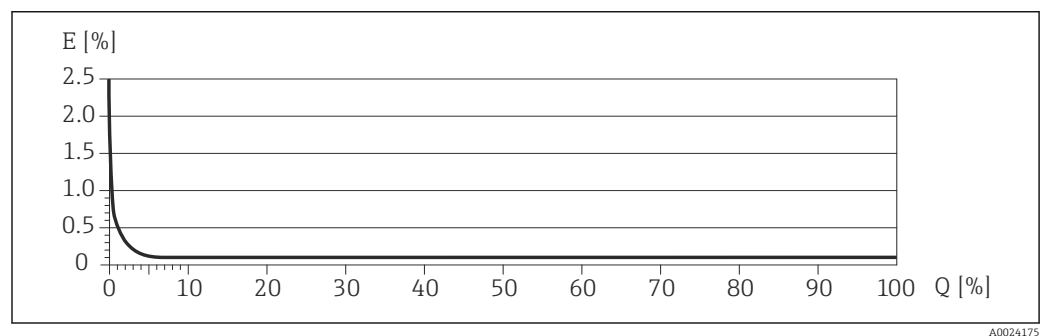*Calculation of the maximum measured error as a function of the flow rate*

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

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

| Flow rate | Maximum repeatability in % o.r. |
|---|---|
| $\geq \dfrac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$ <br> A0021335 | $\pm$ BaseRepeat <br> A0021340 |
| $< \dfrac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$ <br> A0021336 | $\pm \frac{1}{2} \cdot \dfrac{ZeroPoint}{MeasValue} \cdot 100$ <br> A0021337 |

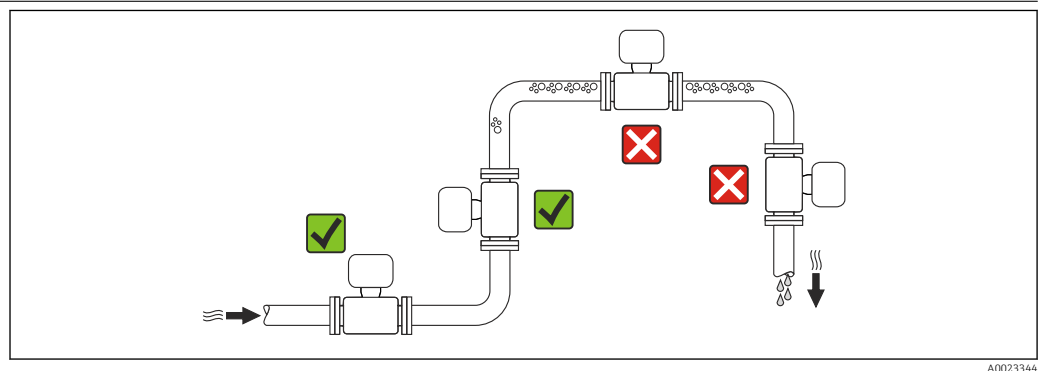**Example for max. measured error**



A0024175

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

# Installation

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

**Mounting location**



A0023344

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

### Installation in down pipes

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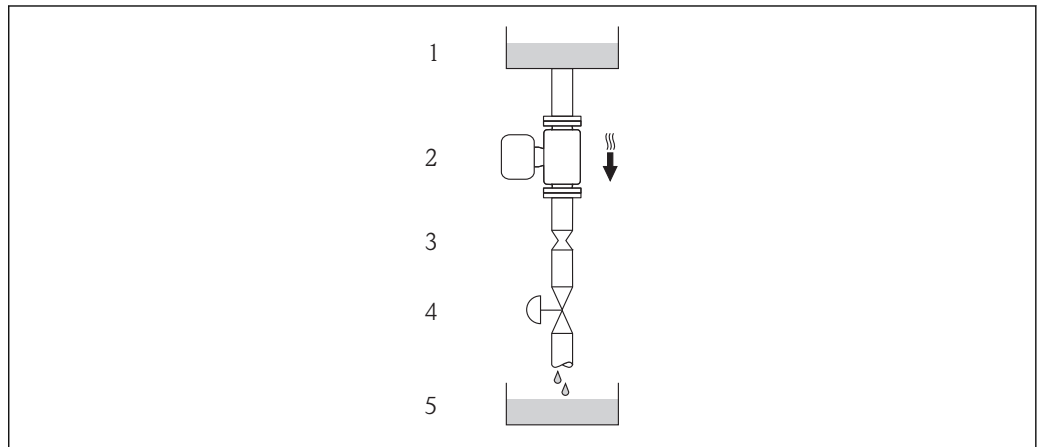


A0015596

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

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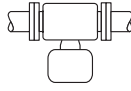*4   Valve*
*5   Batching tank*

| DN | | Ø orifice plate, pipe restriction | |
|---|---|---|---|
| [mm] | [in] | [mm] | [in] |
| 8 | ⅜ | 6 | 0.24 |
| 15 | ½ | 10 | 0.40 |
| 15 FB | ½ FB | 15 | 0.60 |
| 25 | 1 | 14 | 0.55 |
| 25 FB | 1 FB | 24 | 0.95 |
| 40 | 1½ | 22 | 0.87 |
| 40 FB | 1½ FB | 35 | 1.38 |
| 50 | 2 | 28 | 1.10 |
| 50 FB | 2 FB | 54 | 2.13 |
| 80 | 3 | 50 | 1.97 |
| FB = Full bore | | | |

**Orientation**

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

| | Orientation | | Recommendation |
|---|---|---|---|
| A | Vertical orientation | A0015591 | ☑☑ |
| B | Horizontal orientation, transmitter head up | A0015589 | ☑☑ [1]<br>Exceptions: |

| | Orientation | | Recommendation |
|---|---|---|---|
| C | Horizontal orientation, transmitter head down | A0015590 | ☑☑ [2] Exceptions: |
| D | Horizontal orientation, transmitter head at side | A0015592 | ☑☑ |

1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

**Inlet and outlet runs**

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 📖 56.

**Special mounting instructions**

### Complete drainability guaranteed

When the sensor is installed in a horizontal line, eccentric clamps can be used to ensure complete drainability. When the system is pitched in a specific direction and at a specific slope, gravity can be used to achieve complete drainability. The sensor must be mounted in the correct position to ensure full drainability in the horizontal position. Markings on the sensor show the correct mounting position to optimize drainability.



A0016585
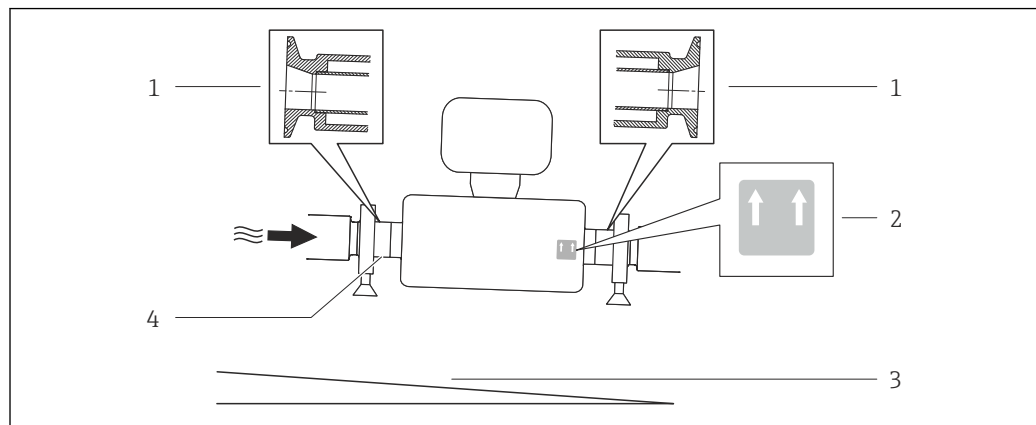
*1 Eccentric clamp connection*
*2 "This side up" label indicates which side is up*
*3 Slope the device in accordance with the hygiene guidelines. Slope: approx. 2 % or 21 mm/m (0.24 in/feet)*
*4 Line on the underside indicates the lowest point of the eccentric process connection.*

### Securing with mounting clamp in the case of hygiene connections

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

Use mounting clamp with lining between clamp and measuring instrument.



A0016588
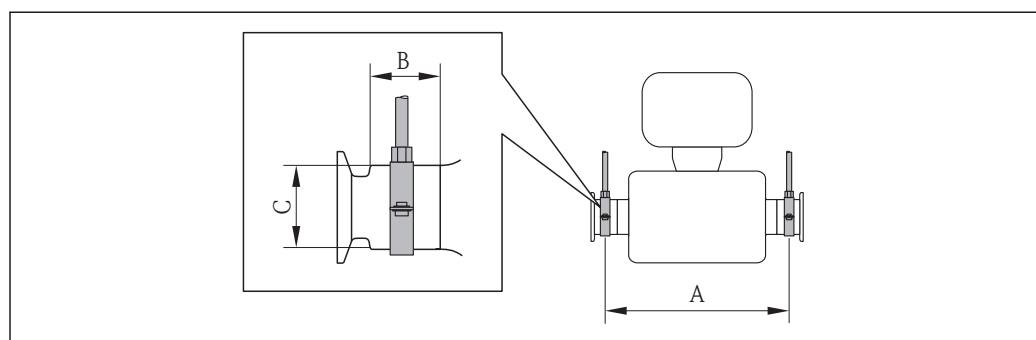
| DN | | A | | B | | C | |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [in] | [mm] | [in] | [mm] | [in] |
| 8 | 8 | 373 | 14.69 | 20 | 0.79 | 40 | 1.57 |
| 15 | 15 | 409 | 16.1 | 20 | 0.79 | 40 | 1.57 |
| 15 FB | 15 FB | 539 | 21.22 | 30 | 1.18 | 44.5 | 1.75 |
| 25 | 25 | 539 | 21.22 | 30 | 1.18 | 44.5 | 1.75 |
| 25 FB | 25 FB | 668 | 26.3 | 28 | 1.1 | 60 | 2.36 |
| 40 | 40 | 668 | 26.3 | 28 | 1.1 | 60 | 2.36 |
| 40 FB | 40 FB | 780 | 30.71 | 35 | 1.38 | 80 | 3.15 |
| 50 | 50 | 780 | 30.71 | 35 | 1.38 | 80 | 3.15 |
| 50 FB | 50 FB | 1 152 | 45.35 | 57 | 2.24 | 90 | 3.54 |
| 80 | 80 | 1 152 | 45.35 | 57 | 2.24 | 90 | 3.54 |

**Zero point adjustment**

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions →  42. Therefore, a zero point adjustment in the field is generally not required.

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

**Mounting Safety Barrier Promass 100**
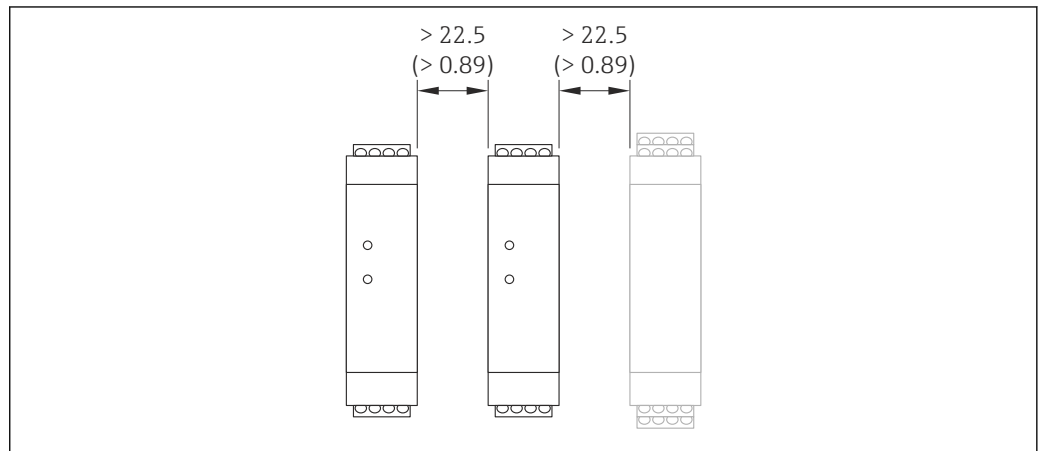


 *20   Minimum distance between additional Safety Barrier Promass 100 or other modules.Engineering unit mm (in)*

# Environment

**Ambient temperature range**

| Measuring device | Non-Ex | −40 to +60 ℃ (−40 to +140 ℉) |
|---|---|---|
| | Ex na, NI version | −40 to +60 ℃ (−40 to +140 ℉) |
| | Ex ia, IS version | • −40 to +60 ℃ (−40 to +140 ℉)<br>• −50 to +60 ℃ (−58 to +140 ℉) (order code for "Test, certificate", option JM)) |

| Readability of the local display | −20 to +60 ℃ (−4 to +140 ℉)<br>The readability of the display may be impaired at temperatures outside the temperature range. |
|---|---|
| Safety Barrier Promass 100 | −40 to +60 ℃ (−40 to +140 ℉) |

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

ℹ️ Weather protection covers can be ordered from Endress+Hauser: see "Accessories" section

**Temperature tables**

In the following tables, the following interdependencies between the maximum medium temperature $T_m$ for T6 to T1 and the maximum ambient temperature $T_a$ apply when operating the device in hazardous areas.

**Ex ia, $_c$CSA$_{US}$ IS**

*SI units*

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

*US units*

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

**Ex nA, $_c$CSA$_{US}$ NI**

*SI units*

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

*US units*

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

*Explosion hazards arising from gas and dust*

**Determining the temperature class and surface temperature with the temperature table**
- In the case of gas: Determine the temperature class as a function of the ambient temperature $T_a$ and the medium temperature $T_m$.
- In the case of dust: Determine the maximum surface temperature as a function of the maximum ambient temperature $T_a$ and the maximum medium temperature $T_m$.

**Example**

- Measured maximum ambient temperature: $T_{ma}$ = 47 °C
- Measured maximum medium temperature: $T_{mm}$ = 108 °C



🖾 *21   Procedure for determining the maximum surface temperature*

1. Select device (optional).

2. In the column for the maximum ambient temperature $T_a$ select the temperature that is immediately greater than or equal to the measured maximum ambient temperature $T_{ma}$ that is present.
   ↳ $T_a$ = 50 °C.
      The row showing the maximum medium temperature is determined.

3. Select the maximum medium temperature $T_m$ of this row, which is larger or equal to the measured maximum medium temperature $T_{mm}$.
   ↳ The column with the temperature class for gas is determined: 108 °C ≤ 120°C → T4.

4. The maximum temperature of the temperature class determined corresponds to the maximum surface temperature for dust: T4 = 135 °C

| **Storage temperature** | –40 to +80 °C (–40 to +176 °F), preferably at +20 °C (+68 °F) (standard version) |
|---|---|
| | –50 to +80 °C (–58 to +176 °F) (Order code for *"Test, certificate"*, option JM) |

| **Climate class** | DIN EN 60068-2-38 (test Z/AD) |
|---|---|

**Degree of protection**

**Transmitter and sensor**
- As standard: IP66/67, type 4X enclosure
- With the order code for "Sensor options", option **CM**: IP69K can also be ordered
- When housing is open: IP20, type 1 enclosure
- Display module: IP20, type 1 enclosure

Safety Barrier Promass 100
IP20

| | |
|---|---|
| **Vibration resistance** | **Compact version**<br>• Vibration, sinusoidal according to IEC 60068-2-6<br>  – 2 to 8.4 Hz, 3.5 mm peak<br>  – 8.4 to 2 000 Hz, 1 g peak<br>• Vibration broad-band random, according to IEC 60068-2-64<br>  – 10 to 200 Hz, 0.003 $g^2$/Hz<br>  – 200 to 2 000 Hz, 0.001 $g^2$/Hz<br>  – Total: 1.54 g rms |
| **Shock resistance** | **Compact version**<br>Shock, half-sine according to IEC 60068-2-27<br>6 ms 30 g |
| **Shock resistance** | **Compact version**<br>Rough handling shocks according to IEC 60068-2-31 |
| **Interior cleaning** | • Cleaning in place (CIP)<br>• Sterilization in place (SIP)<br>• Cleaning with pigs<br><br>**Options**<br>Oil- and grease-free version for wetted parts, without inspection certificate<br>Order code for "Service", option **HA** |
| **Electromagnetic compatibility (EMC)** | • Depends on the communication protocol:<br>  – HART, PROFIBUS DP, Modbus RS485, EtherNet/IP:<br>    As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)<br>  – PROFINET: as per IEC/EN 61326<br>• Complies with emission limits for industry as per EN 55011 (Class A)<br>• Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784<br><br>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.<br><br>For details, refer to the Declaration of Conformity. |

# Process

| | |
|---|---|
| **Medium temperature range** | **Sensor**<br>–50 to +150 °C (–58 to +302 °F)<br><br>**Seals**<br>No internal seals |
| **Density** | 0 to 5 000 kg/m³ (0 to 312 lb/cf) |
| **Pressure-temperature ratings** | The following pressure-temperature ratings refer to the entire device and not just the process connection. |

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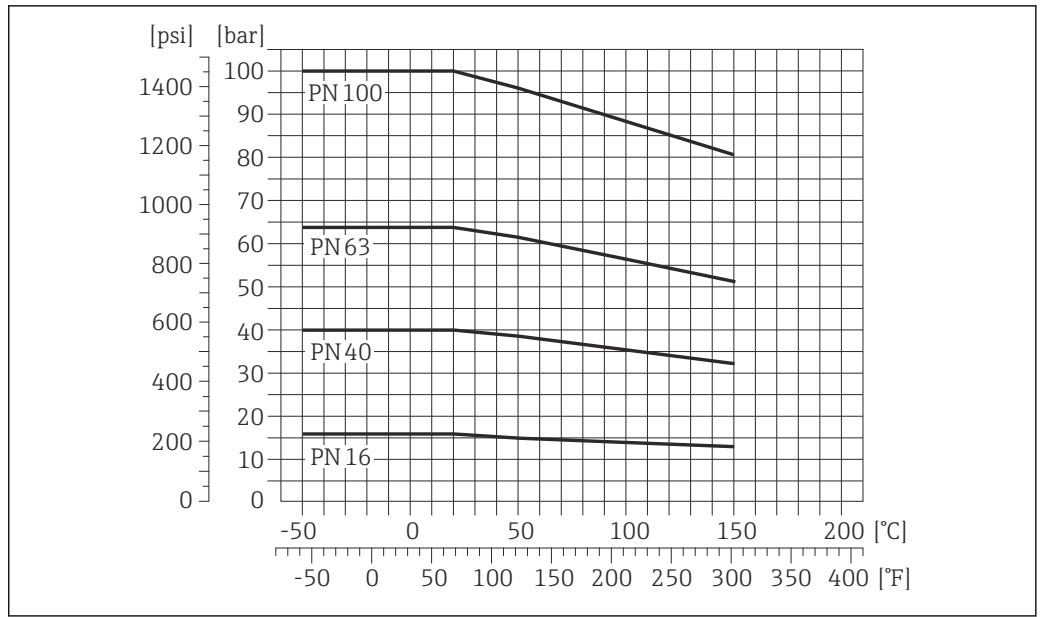


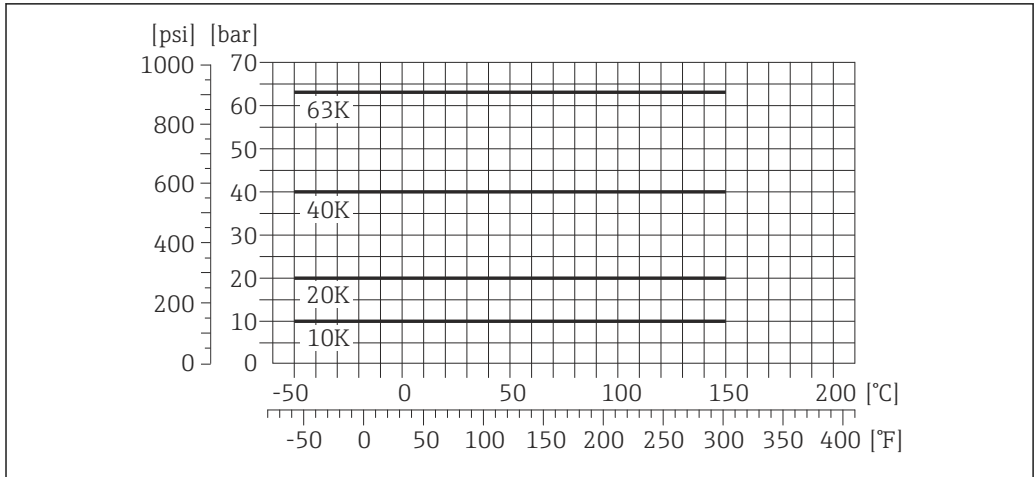*⊠ 22    With flange material 1.4301 (304); wetted parts: titanium*
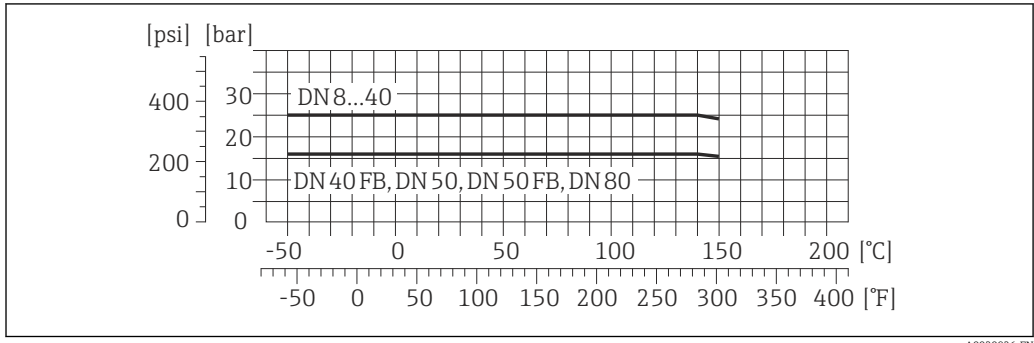
**Flange according to ASME B16.5**
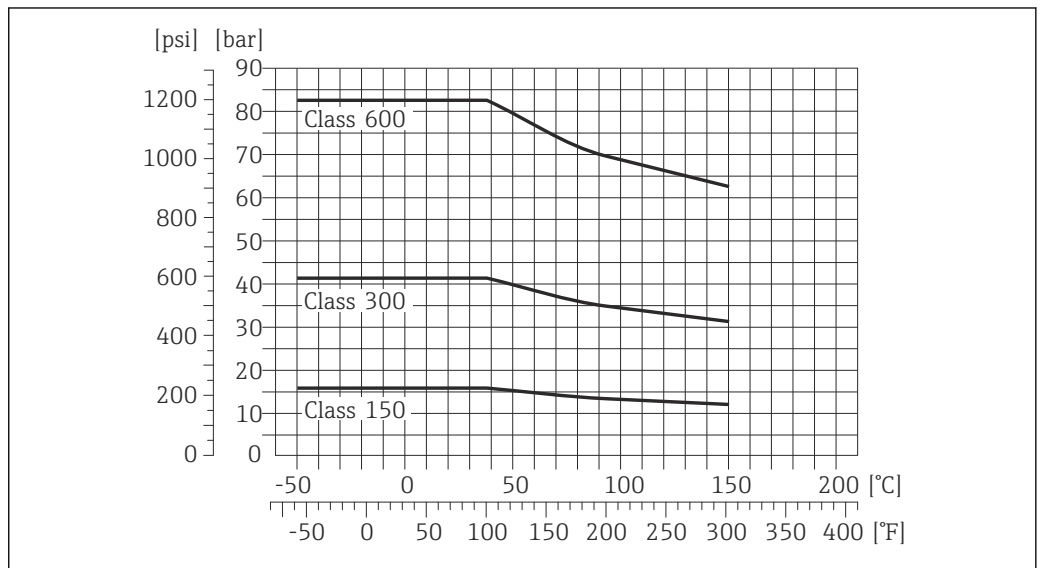


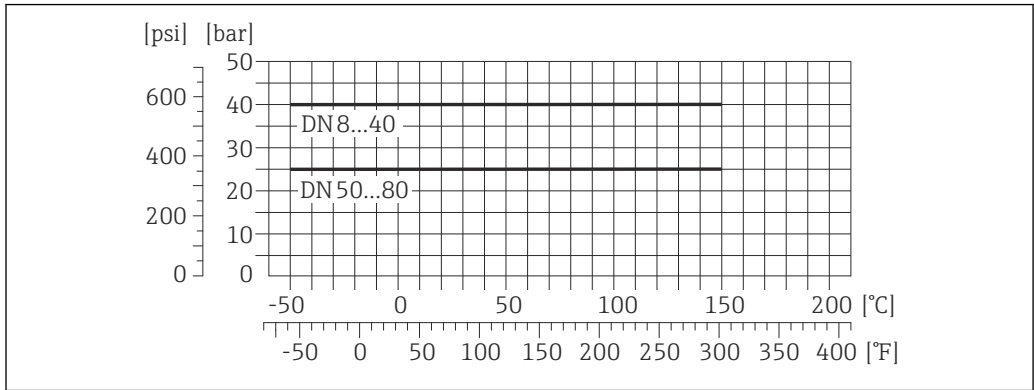*⊠ 23    With flange material 1.4301 (304); wetted parts: titanium*

**Flange JIS B2220**



▣ *24    With flange material 1.4301 (304). Wetted parts: titanium.*

**Flange DIN 11864-2 Form A**
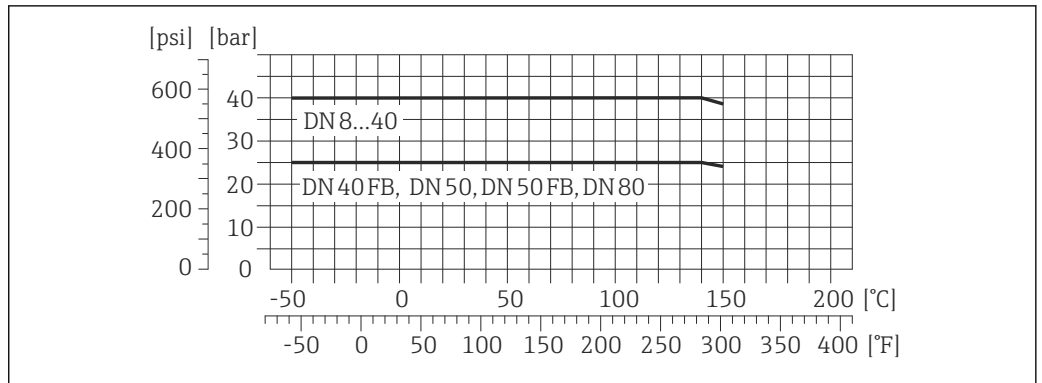


▣ *25    With titanium flange material*

**Threaded hygienic connection DIN 11851**
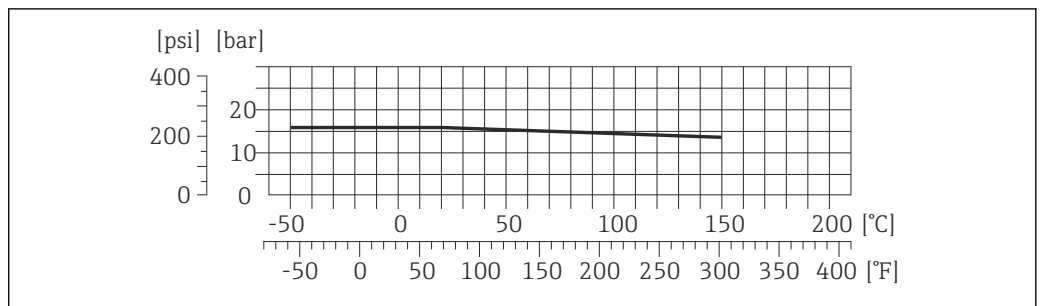


▣ *26    With titanium connection material*

DIN 11851 allows for applications up to +140 ℃ (+284 ℉) 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 hygienic connection DIN 11864-1 Form A**



⊡ *27    With titanium connection material*

**Threaded hygienic connection ISO 2853**



⊡ *28    With titanium connection material*

**Threaded hygienic connection SMS 1145**
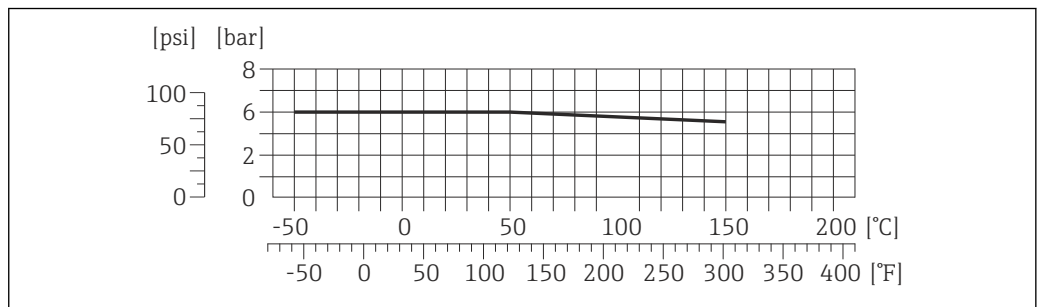


⊡ *29    With connection material 1.4404 (316L)*

SMS 1145 allows for applications up to 6 bar (87 psi) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

**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.

**Secondary containment pressure rating**

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

The following secondary containment pressure rating is only valid for a fully welded sensor housing and/or a device equipped with closed purge connections (never opened/as delivered).

| DN | | Secondary containment pressure rating (designed with a safety factor ≥ 4) | | Secondary containment burst pressure | |
|---|---|---|---|---|---|
| [mm] | [in] | [bar] | [psi] | [bar] | [psi] |
| 8 | ⅜ | 40 | 580 | 220 | 3190 |
| 15 | ½ | 40 | 580 | 220 | 3190 |
| 15 FB | ½ FB | 40 | 580 | 235 | 3405 |
| 25 | 1 | 40 | 580 | 235 | 3405 |
| 25 FB | 1 FB | 40 | 580 | 220 | 3190 |
| 40 | 1½ | 40 | 580 | 220 | 3190 |
| 40 FB | 1 ½ FB | 40 | 580 | 235 | 3405 |
| 50 | 2 | 40 | 580 | 235 | 3405 |
| 50 FB | 2 FB | 40 | 580 | 460 | 6670 |
| 80 | 3 | 40 | 580 | 460 | 6670 |
| FB = Full bore | | | | | |

If there is a risk of measuring tube failure due to process characteristics, e.g. with corrosive fluids, we recommend the use of sensors whose secondary containment is equipped with special pressure monitoring connections (order code for "Sensor option", option CH "Purge connection").

With the help of these connections, the fluid collected in the secondary containment can be bled off in the event of tube failure. This is especially important in high-pressure gas applications. These connections can also be used for gas purging (gas detection).

Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar (72.5 psi).

If a device fitted with purge connections is connected to the purge system, the maximum nominal pressure is determined by the purge system itself or by the device, depending on which component has the lower nominal pressure.

Dimensions:

**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

• The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
• In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
• 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 sound velocity (0.5 Mach)
  – The maximum mass flow depends on the density of the gas: formula

**Pressure loss**

To calculate the pressure loss, use the *Applicator* sizing tool → 🖹 92

**System pressure**

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

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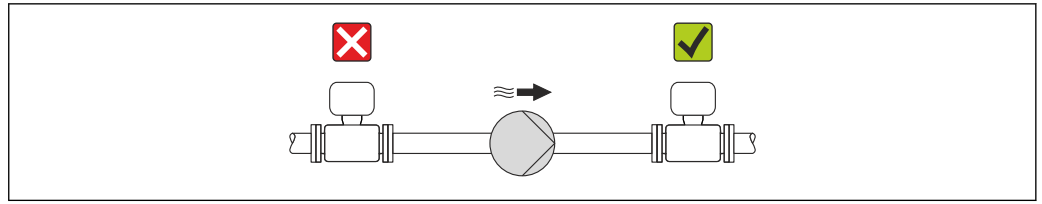
Thermal insulation

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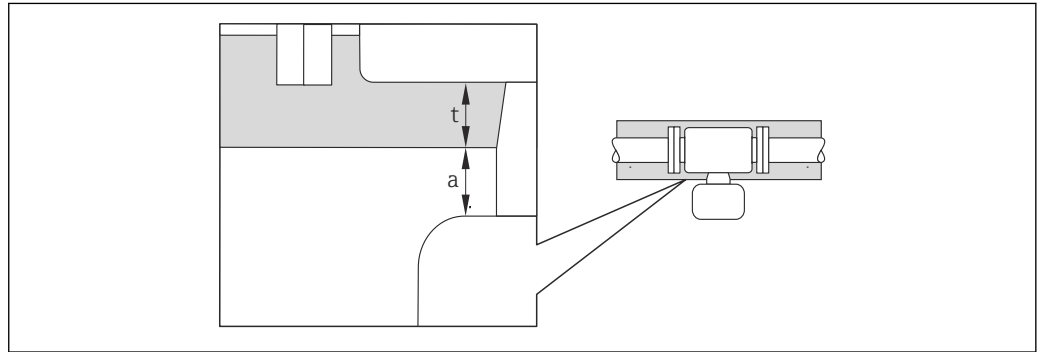


*a*    *Minimum distance to insulation*
*t*    *maximum Insulation thickness*

The minimum distance between the transmitter housing and the insulation is 10 mm (0.39 in) so that the transmitter head remains completely exposed.

**Maximum recommended insulation thickness**
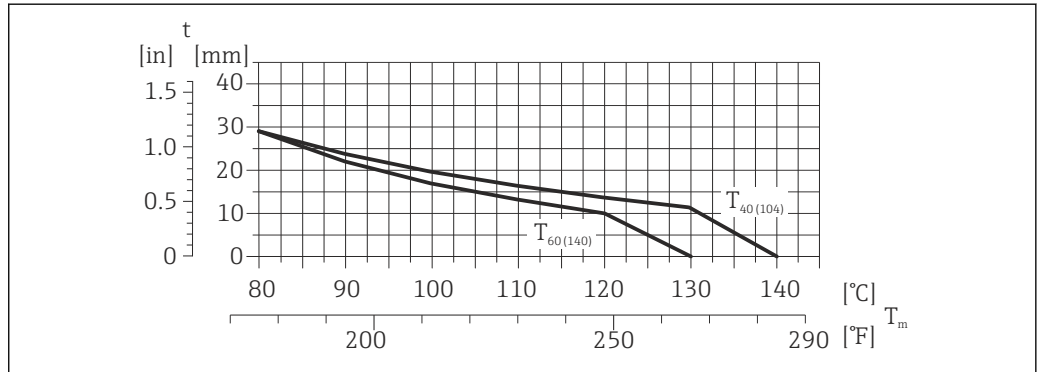


 *30*    *Maximum recommended insulation thickness depending on the temperature of the medium and the ambient temperature*

| | |
|---|---|
| t | Insulation thickness |
| $T_m$ | Medium temperature |
| $T_{40(104)}$ | Maximum recommended insulation thickness at an ambient temperature of $T_a$ = 40 ℃ (104 ℉) |
| $T_{60(140)}$ | Maximum recommended insulation thickness at an ambient temperature of $T_a$ = 60 ℃ (140 ℉) |

**Maximum recommended insulation thickness for the extended temperature range and insulation**
For the extension neck for insulation version, order code for "Sensor option", option CG:

*31   Maximum recommended insulation thickness depending on the temperature of the medium and the ambient temperature*

| t | Insulation thickness |
| $T_m$ | Medium temperature |
| $T_{40(104)}$ | Maximum recommended insulation thickness at an ambient temperature of $T_a$ = 40 ℃ (104 ℉) |
| $T_{60(140)}$ | Maximum recommended insulation thickness at an ambient temperature of $T_a$ = 60 ℃ (140 ℉) |

> **NOTICE**
> **Danger of overheating with insulation**
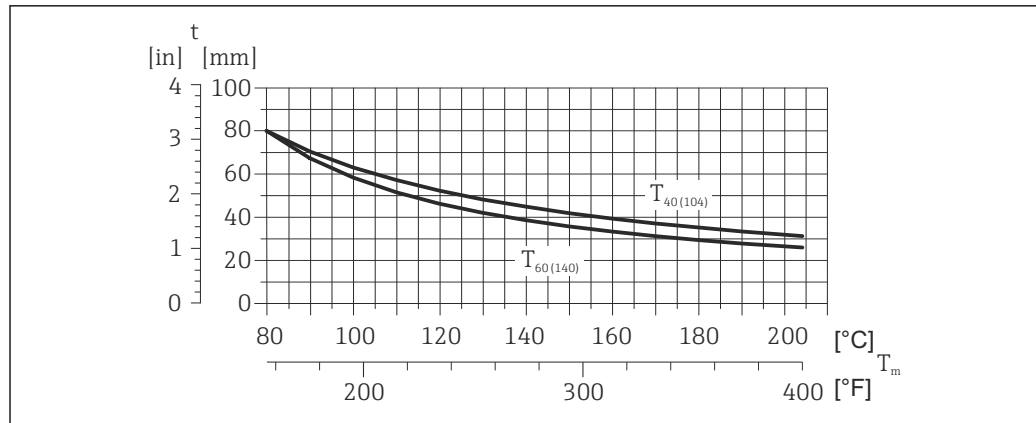> ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 ℃ (176 ℉)

> **NOTICE**
> **The insulation can also be thicker than the maximum recommended insulation thickness.**
> Prerequisite:
> ▶ Ensure that convection takes place on a sufficiently large scale at the transmitter neck.
> ▶ Ensure that a sufficiently large area of the housing support remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.

**Heating**

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

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

ℹ️ Heating jackets for the sensors can be ordered as accessories from Endress+Hauser → 🖺 91.

> **NOTICE**
> **Danger of overheating when heating**
> ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 ℃ (176 ℉).
> ▶ Ensure that convection takes place on a sufficiently large scale at the transmitter neck.
> ▶ Ensure that a sufficiently large area of the housing support remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.

**Vibrations**

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

# Mechanical construction

**Dimensions in SI units**

**Compact version**

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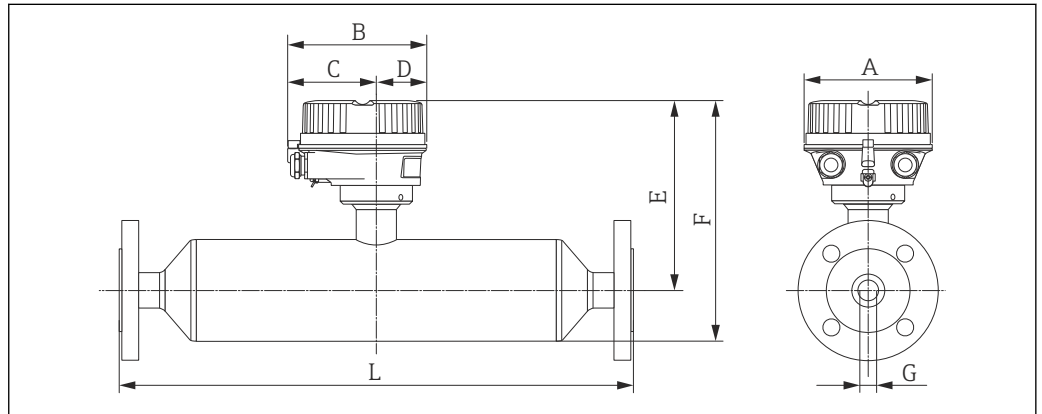


A0016456

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [1) 2)] [mm] | F [1) 2)] [mm] | G [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| 8 | 136 | 147.5 | 93.5 | 54 | 207.2 | 264.4 | 8.55 | 3) |
| 15 | 136 | 147.5 | 93.5 | 54 | 207.2 | 264.4 | 11.38 | 3) |
| 15 FB | 136 | 147.5 | 93.5 | 54 | 207.2 | 264.4 | 17.07 | 3) |
| 25 | 136 | 147.5 | 93.5 | 54 | 216.9 | 274.1 | 17.07 | 3) |
| 25 FB | 136 | 147.5 | 93.5 | 54 | 216.9 | 287.6 | 26.40 | 3) |
| 40 | 136 | 147.5 | 93.5 | 54 | 231.2 | 301.9 | 26.40 | 3) |
| 40 FB | 136 | 147.5 | 93.5 | 54 | 231.2 | 315.4 | 35.62 | 3) |
| 50 | 136 | 147.5 | 93.5 | 54 | 256.6 | 340.8 | 35.62 | 3) |
| 50 FB | 136 | 147.5 | 93.5 | 54 | 256.6 | 366.2 | 54.8 | 3) |
| 80 | 136 | 147.5 | 93.5 | 54 | 256.6 | 366.2 | 54.8 | 3) |
| FB = Full bore | | | | | | | | |

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

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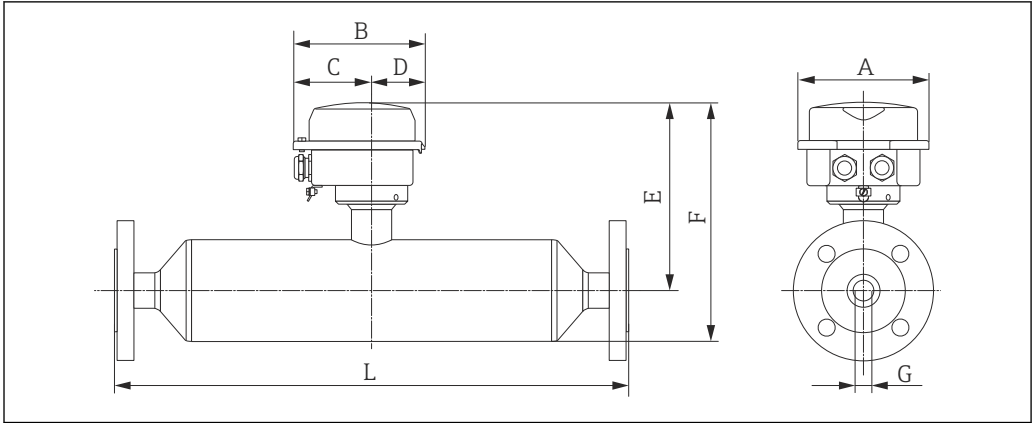


A0016522

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [2) [mm] | F [1) 2) [mm] | G [mm] | L [mm] |
|---------|--------|--------|--------|--------|-----------|--------------|--------|--------|
| 8 | 133.5 | 136.8 | 78 | 58.8 | 202.2 | 264.4 | 8.55 | 3) |
| 15 | 133.5 | 136.8 | 78 | 58.8 | 202.2 | 264.4 | 11.38 | 3) |
| 15 FB | 133.5 | 136.8 | 78 | 58.8 | 202.2 | 264.4 | 17.07 | 3) |
| 25 | 133.5 | 136.8 | 78 | 58.8 | 211.9 | 274.1 | 17.07 | 3) |
| 25 FB | 133.5 | 136.8 | 78 | 58.8 | 211.9 | 287.6 | 26.40 | 3) |
| 40 | 133.5 | 136.8 | 78 | 58.8 | 226.2 | 301.9 | 26.40 | 3) |
| 40 FB | 133.5 | 136.8 | 78 | 58.8 | 226.2 | 315.4 | 35.62 | 3) |
| 50 | 133.5 | 136.8 | 78 | 58.8 | 251.6 | 340.8 | 35.62 | 3) |
| 50 FB | 133.5 | 136.8 | 78 | 58.8 | 251.6 | 366.2 | 54.8 | 3) |
| 80 | 133.5 | 136.8 | 78 | 58.8 | 251.6 | 366.2 | 54.8 | 3) |
| FB = Full bore | | | | | | | | |

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

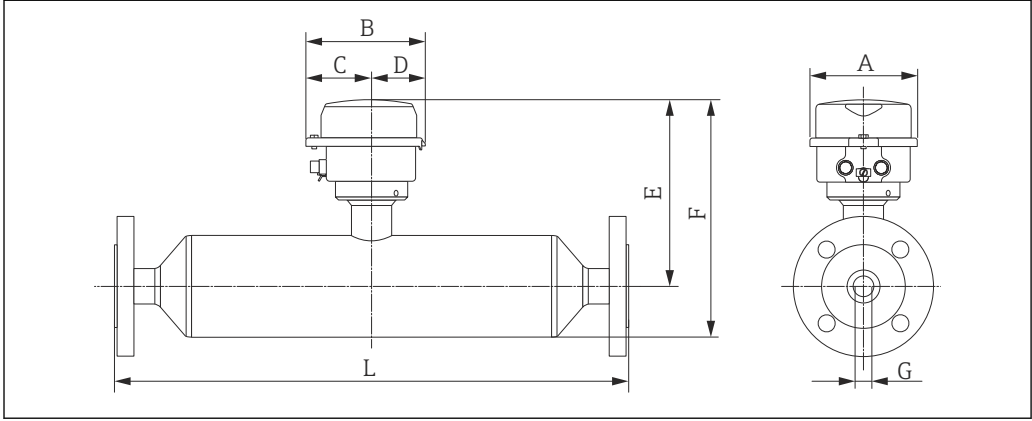*Order code for "Housing", option C "Ultra-compact hygienic, stainless"*
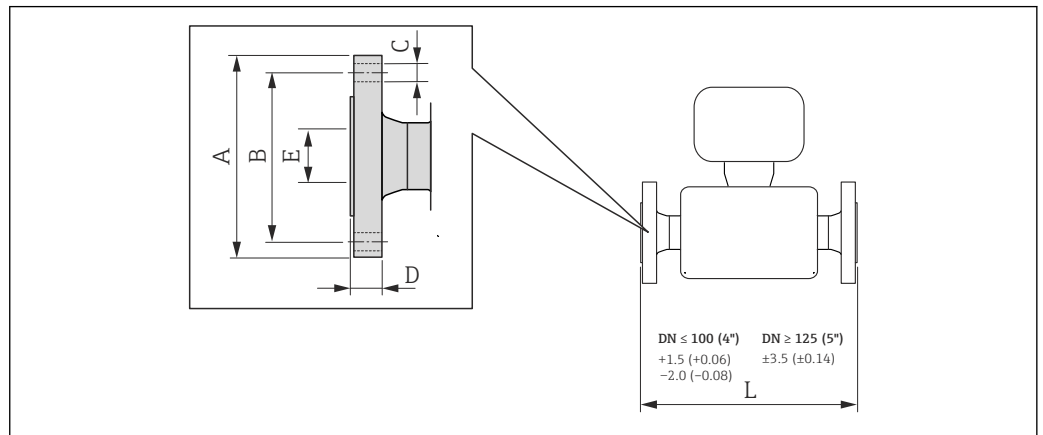


A0016521

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [2) ] [mm] | F [1) 2) ] [mm] | G [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| 8 | 111.4 | 123.6 | 67.7 | 55.9 | 202.2 | 264.4 | 8.56 | 3) |
| 15 | 111.4 | 123.6 | 67.7 | 55.9 | 202.2 | 264.4 | 11.38 | 3) |
| 15 FB | 111.4 | 123.6 | 67.7 | 55.9 | 202.2 | 264.4 | 17.07 | 3) |
| 25 | 111.4 | 123.6 | 67.7 | 55.9 | 211.9 | 274.1 | 17.07 | 3) |
| 25 FB | 111.4 | 123.6 | 67.7 | 55.9 | 211.9 | 287.6 | 26.37 | 3) |
| 40 | 111.4 | 123.6 | 67.7 | 55.9 | 226.2 | 301.9 | 26.37 | 3) |
| 40 FB | 111.4 | 123.6 | 67.7 | 55.9 | 226.2 | 315.4 | 35.62 | 3) |
| 50 | 111.4 | 123.6 | 67.7 | 55.9 | 251.6 | 340.8 | 35.62 | 3) |
| 50 FB | 111.4 | 123.6 | 67.7 | 55.9 | 251.6 | 366.2 | 54.76 | 3) |
| 80 | 111.4 | 123.6 | 67.7 | 55.9 | 251.6 | 366.2 | 54.76 | 3) |
| FB = Full bore | | | | | | | | |

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

**Flange connections**

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



🔲 *32    Engineering unit mm (in)*

**Flange according to EN 1092-1 (DIN 2501) Form B1 (DIN 2526 Form C): PN 40**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option D2W*

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1)] | 95 | 65 | 4 × Ø14 | 16 | 17.30 | 402 |
| 15 | 95 | 65 | 4 × Ø14 | 16 | 17.30 | 438 |
| 15 FB | 95 | 65 | 4 × Ø14 | 15 | 17.07 | 572 |
| 25 | 115 | 85 | 4 × Ø14 | 19 | 28.50 | 578 |
| 25 FB | 115 | 85 | 4 × Ø14 | 18 | 25.60 | 700 |
| 40 | 150 | 110 | 4 × Ø18 | 22 | 43.10 | 708 |
| 40 FB | 150 | 110 | 4 × Ø18 | 20 | 35.62 | 819 |
| 50 | 165 | 125 | 4 × Ø18 | 24 | 54.50 | 827 |

**Flange according to EN 1092-1 (DIN 2501) Form B1 (DIN 2526 Form C): PN 40**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **D2W**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 FB | 165 | 125 | 4 × Ø18 | 36 | 54.8 | 1210 |
| 80 | 200 | 160 | 8 × Ø18 | 33 | 82.5 | 1210 |
| FB = Full bore <br> Surface roughness: Ra 3.2 to 12.5 µm | | | | | | |

1)    DN 8 with DN 15 flanges as standard

**Flange according to EN 1092-1 (DIN 2501) Form B2 (DIN 2526 Form E): PN 63**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **D3W**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 | 180 | 135 | 4 × Ø22 | 34 | 54.5 | 832 |
| 50 FB | 180 | 135 | 4 × Ø22 | 45 | 54.8 | 1210 |
| 80 | 215 | 170 | 8 × Ø22 | 41 | 81.7 | 1210 |
| FB = Full bore <br> Surface roughness (flange): Ra 0.8 to 3.2 µm | | | | | | |

**Flange according to EN 1092-1 (DIN 2501) Form B2 (DIN 2526 Form E): PN 100**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **D4W**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 105 | 75 | 4 × Ø14 | 25 | 17.30 | 402 |
| 15 | 105 | 75 | 4 × Ø14 | 25 | 17.30 | 438 |
| 15 FB | 105 | 75 | 4 × Ø14 | 26 | 17.07 | 578 |
| 25 | 140 | 100 | 4 × Ø18 | 29 | 28.50 | 578 |
| 25 FB | 140 | 100 | 4 × Ø18 | 31 | 25.60 | 706 |
| 40 | 170 | 125 | 4 × Ø22 | 32 | 42.50 | 708 |
| 40 FB | 170 | 125 | 4 × Ø22 | 33 | 35.62 | 825 |
| 50 | 195 | 145 | 4 × Ø26 | 36 | 53.90 | 832 |
| 50 FB | 195 | 145 | 4 × Ø26 | 48 | 54.8 | 1210 |
| 80 | 230 | 180 | 8 × Ø26 | 58 | 80.9 | 1236 |
| FB = Full bore <br> Surface roughness (flange): Ra 0.8 to 3.2 µm | | | | | | |

1)    DN 8 with DN 15 flanges as standard

**Flange according to ASME B16.5: Class 150**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **AAW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 90 | 60.3 | 4 × Ø15.7 | 20 | 15.70 | 402 |
| 15 | 90 | 60.3 | 4 × Ø15.7 | 20 | 15.70 | 438 |

**Flange according to ASME B16.5: Class 150**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **AAW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 15 FB | 90 | 60.3 | 4 × Ø15.7 | 19 | 17.07 | 572 |
| 25 | 110 | 79.4 | 4 × Ø15.7 | 23 | 26.70 | 578 |
| 25 FB | 110 | 79.4 | 4 × Ø15.7 | 22 | 25.60 | 700 |
| 40 | 125 | 98.4 | 4 × Ø15.7 | 26 | 40.90 | 708 |
| 40 FB | 125 | 98.4 | 4 × Ø15.7 | 24 | 35.62 | 819 |
| 50 | 150 | 120.7 | 4 × Ø19.1 | 28 | 52.60 | 827 |
| 50 FB | 150 | 120.7 | 4 × Ø19.1 | 40 | 54.8 | 1 210 |
| 80 | 190 | 152.4 | 4 × Ø19.1 | 37 | 78 | 1 210 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 µm

1)  DN 8 with DN 15 flanges as standard

**Flange according to ASME B16.5: Class 300**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **ABW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 95 | 66.7 | 4 × Ø15.7 | 20 | 15.70 | 402 |
| 15 | 95 | 66.7 | 4 × Ø15.7 | 20 | 15.70 | 438 |
| 15 FB | 95 | 66.7 | 4 × Ø15.7 | 19 | 17.07 | 572 |
| 25 | 125 | 88.9 | 4 × Ø19.1 | 23 | 26.70 | 578 |
| 25 FB | 125 | 88.9 | 4 × Ø19.1 | 22 | 25.60 | 700 |
| 40 | 155 | 114.3 | 4 × Ø22.4 | 26 | 40.90 | 708 |
| 40 FB | 155 | 114.3 | 4 × Ø22.4 | 24 | 35.62 | 819 |
| 50 | 165 | 127.0 | 8 × Ø19.1 | 28 | 52.60 | 827 |
| 50 FB | 165 | 127.0 | 8 × Ø19.1 | 43 | 54.8 | 1 210 |
| 80 | 210 | 168.3 | 8 × Ø22.3 | 42 | 78 | 1 210 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 µm

1)  DN 8 with DN 15 flanges as standard

**Flange according to ASME B16.5: Class 600**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **ACW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 95 | 66.7 | 4 × Ø15.7 | 20 | 13.80 | 402 |
| 15 | 95 | 66.7 | 4 × Ø15.7 | 20 | 13.80 | 438 |
| 15 FB | 95 | 66.7 | 4 × Ø15.7 | 22 | 17.07 | 578 |
| 25 | 125 | 88.9 | 4 × Ø19.1 | 23 | 24.40 | 578 |
| 25 FB | 125 | 88.9 | 4 × Ø19.1 | 25 | 25.60 | 706 |
| 40 | 155 | 114.3 | 4 × Ø22.4 | 28 | 38.10 | 708 |

**Flange according to ASME B16.5: Class 600**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **ACW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 40 FB | 155 | 114.3 | 4 × Ø22.4 | 29 | 35.62 | 825 |
| 50 | 165 | 127.0 | 8 × Ø19.1 | 33 | 49.30 | 832 |
| 50 FB | 165 | 127.0 | 8 × Ø19.1 | 46 | 54.8 | 1210 |
| 80 | 210 | 168.3 | 8 × Ø22.3 | 53 | 73.7 | 1222 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 μm

1) DN 8 with DN 15 flanges as standard

**Flange JIS B2220: 10K**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **NDW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 | 155 | 120 | 4 × Ø19 | 28 | 50 | 827 |
| 50 FB | 195 | 145 | 4 × Ø26 | 48 | 54.8 | 1210 |
| 80 | 200 | 160 | 8 × Ø18 | 37 | 82.5 | 1210 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 μm

**Flange JIS B2220: 20K**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **NEW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 95 | 70 | 4 × Ø15 | 20 | 15.00 | 402 |
| 15 | 95 | 70 | 4 × Ø15 | 20 | 15.00 | 438 |
| 15 FB | 95 | 70 | 4 × Ø15 | 19 | 17.07 | 572 |
| 25 | 125 | 90 | 4 × Ø19 | 23 | 25.00 | 578 |
| 25 FB | 125 | 90 | 4 × Ø19 | 22 | 25.60 | 700 |
| 40 | 140 | 105 | 4 × Ø19 | 26 | 40.00 | 708 |
| 40 FB | 140 | 105 | 4 × Ø19 | 24 | 35.62 | 819 |
| 50 | 155 | 120 | 8 × Ø19 | 28 | 50.00 | 827 |
| 50 FB | 155 | 120 | 8 × Ø19 | 42 | 54.8 | 1210 |
| 80 | 200 | 160 | 8 × Ø23 | 36 | 80 | 1210 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 μm

1) DN 8 with DN 15 flanges as standard

**Flange JIS B2220: 40K**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **NFW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 115 | 80 | 4 × Ø19 | 25 | 15.00 | 402 |
| 15 | 115 | 80 | 4 × Ø19 | 25 | 15.00 | 438 |
| 15 FB | 115 | 80 | 4 × Ø19 | 26 | 17.07 | 578 |
| 25 | 130 | 95 | 4 × Ø19 | 27 | 25.00 | 578 |
| 25 FB | 130 | 95 | 4 × Ø19 | 29 | 25.60 | 706 |
| 40 | 160 | 120 | 4 × Ø23 | 30 | 38.00 | 708 |
| 40 FB | 160 | 120 | 4 × Ø23 | 31 | 35.62 | 825 |
| 50 | 165 | 130 | 8 × Ø19 | 32 | 50.00 | 827 |
| 50 FB | 165 | 130 | 8 × Ø19 | 43 | 54.8 | 1210 |
| 80 | 210 | 170 | 8 × Ø23 | 46 | 75 | 1210 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 µm

1)     DN 8 with DN 15 flanges as standard

**Flange JIS B2220: 63K**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **NHW**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 8 [1] | 120 | 85 | 4 × Ø19 | 28 | 12.00 | 402 |
| 15 | 120 | 85 | 4 × Ø19 | 28 | 12.80 | 438 |
| 15 FB | 120 | 85 | 4 × Ø19 | 29 | 17.07 | 578 |
| 25 | 140 | 100 | 4 × Ø23 | 30 | 22.00 | 578 |
| 25 FB | 140 | 100 | 4 × Ø23 | 32 | 25.60 | 706 |
| 40 | 175 | 130 | 4 × Ø25 | 36 | 35.00 | 708 |
| 40 FB | 175 | 130 | 4 × Ø25 | 37 | 35.62 | 825 |
| 50 | 185 | 145 | 8 × Ø23 | 40 | 48.00 | 832 |
| 50 FB | 185 | 145 | 8 × Ø23 | 47 | 54.8 | 1210 |
| 80 | 230 | 185 | 8 × Ø25 | 55 | 73 | 1226 |

FB = Full bore
Surface roughness (flange): Ra 3.2 to 6.3 µm

1)     DN 8 with DN 15 flanges as standard

*Fixed flange DIN 11864-2*
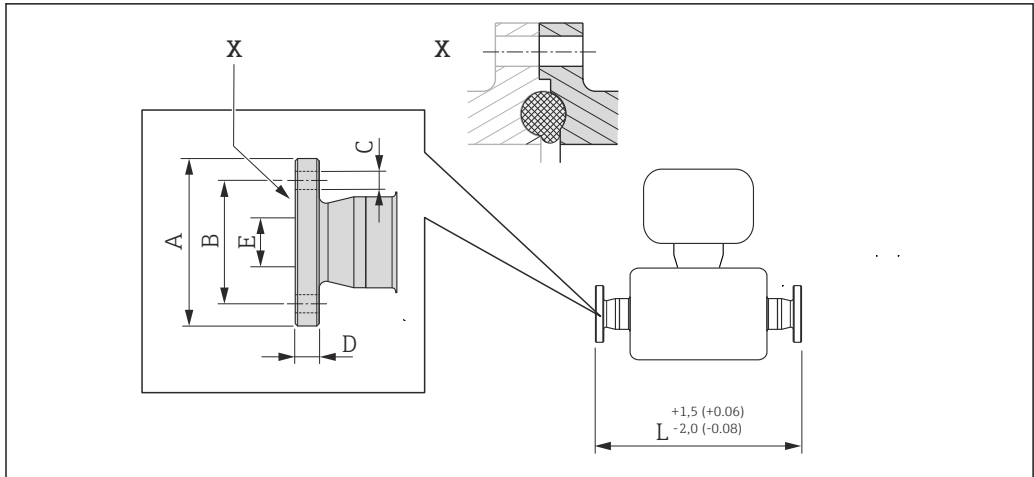


⊠ *33 Detail X: Asymmetrical process connection; the part shown in gray is provided by the supplier. Engineering unit mm (in).*
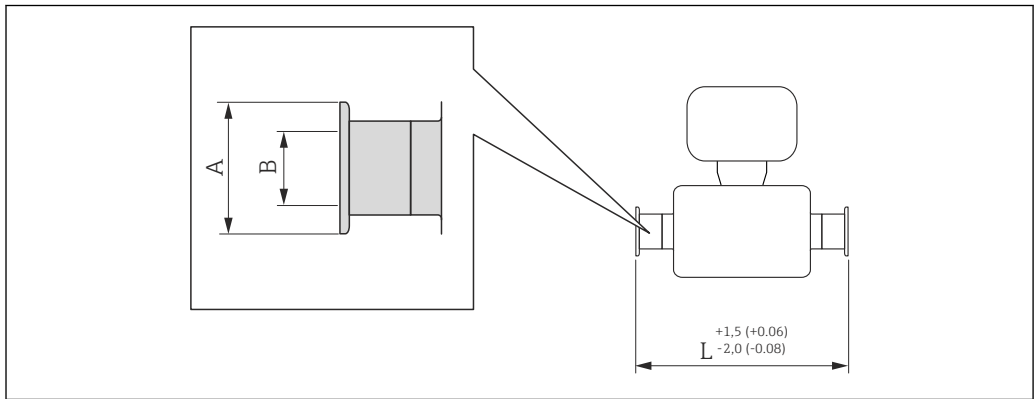
A0015627

| Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flat flange Titanium *Order code for "Process connection", option* **KFW** | | | | | | |
|---|---|---|---|---|---|---|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 [1] | 54 | 37 | 4 × Ø9 | 10 | 10 | 449 |
| 15 | 59 | 42 | 4 × Ø9 | 10 | 16 | 485 |
| 25 | 70 | 53 | 4 × Ø9 | 10 | 26 | 625 |
| 40 | 82 | 65 | 4 × Ø9 | 10 | 38 | 753 |
| 50 | 94 | 77 | 4 × Ø9 | 10 | 50 | 874 |
| 80 | 133 | 112 | 8 × Ø11 | 12 | 81 | 1268 |
| FB = Full bore 3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.8 μm: order code for "Measuring tube material", option CB or Ra ≤ 0.4 μm: order code for "Measuring tube material", option CD | | | | | | |

1) DN 8 with DN 15 flanges as standard

**Clamp connections**

*Tri-Clamp*



⊠ *34 Engineering unit mm (in)*

A0015625

**Tri-Clamp ( ≥ 1"), DIN 11866 series C**
**Titanium**
*Order code for "Process connection", option* **FTW**

| DN [mm] | Clamp [in] | A [mm] | B [mm] | L [mm] |
|---|---|---|---|---|
| 8 | 1 | 50.4 | 22.1 | 427 |
| 15 | 1 | 50.4 | 22.1 | 463 |
| 15 FB | see ¾" Tri-Clamp connection | | | |
| 25 | 1 | 50.4 | 22.1 | 603 |
| 25 FB | 1 | 50.4 | 22.1 | 730 |
| 40 | 1 ½ | 50.4 | 34.8 | 731 |
| 40 FB | 1 ½ | 50.4 | 34.8 | 849 |
| 50 | 2 | 63.9 | 47.5 | 850 |
| 50 FB [1] | 2 ½ | 77.4 | 60.3 | 1268 |
| 80 | 3 | 90.9 | 72.9 | 1268 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.8 µm: order code for "Measuring tube material", option CB or
Ra ≤ 0.4 µm: order code for "Measuring tube material", option CD

1)    Order code for "Process connection", option FRW

**¾" Tri-Clamp, DIN 11866 series C**
**Titanium**
*Order code for "Process connection", option* **FEW**

| DN [mm] | Clamp [in] | A [mm] | B [mm] | L [mm] |
|---|---|---|---|---|
| 8 | ¾ | 25.0 | 16.0 | 426 |
| 15 | ¾ | 25.0 | 16.0 | 462 |
| 15 FB | ¾ | 25.0 | 16.0 | 602 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.8 µm: order code for "Measuring tube material", option CB or
Ra ≤ 0.4 µm: order code for "Measuring tube material", option CD

**½" Tri-Clamp, DIN 11866 series C**
**Titanium**
*Order code for "Process connection", option* **FBW**

| DN [mm] | Clamp [in] | A [mm] | B [mm] | L [mm] |
|---|---|---|---|---|
| 8 | ½ | 25.0 | 9.5 | 426 |
| 15 | ½ | 25.0 | 9.5 | 462 |

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.8 µm: order code for "Measuring tube material", option CB or
Ra ≤ 0.4 µm: order code for "Measuring tube material", option CD

| Eccentric Tri-Clamp, DIN 11866 series C Titanium | | | | | |
|---|---|---|---|---|---|
| DN [mm] | Order Code for "Process connection", Option | Clamp [in] | A [mm] | B [mm] | L [mm] |
| 8 | FEA | ½ | 25 | 9.5 | 427 |
| 15 | FEC | ¾ | 25 | 15.75 | 463 |
| 15 FB | FEE | 1 | 50.5 | 22.1 | 603 |
| 25 | FEE | 1 | 50.5 | 22.1 | 603 |
| 25 FB | FEG | 1½ | 50.5 | 34.8 | 730 |
| 40 | FEG | 1½ | 50.5 | 34.8 | 730 |
| 40 FB | FEJ | 2 | 64 | 47.5 | 849 |
| 50 | FEJ | 2 | 64 | 47.5 | 849 |
| 50 FB | FEL | 2 ½ | 77.5 | 60.3 | 1268 |
| 50 FB | FEM | 3 | 91 | 72.9 | 1268 |
| 80 | FEL | 2 ½ | 77.5 | 60.3 | 1268 |
| 80 | FEM | 3 | 91 | 72.9 | 1268 |
| FB = Full bore<br>3A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.8 µm: order code for "Measuring tube material", option CB or<br>Ra ≤ 0.4 µm: order code for "Measuring tube material", option CD<br>Additional information on "Eccentric clamps | | | | | |

**Cable glands**

*Threaded hygienic connection DIN 11851*
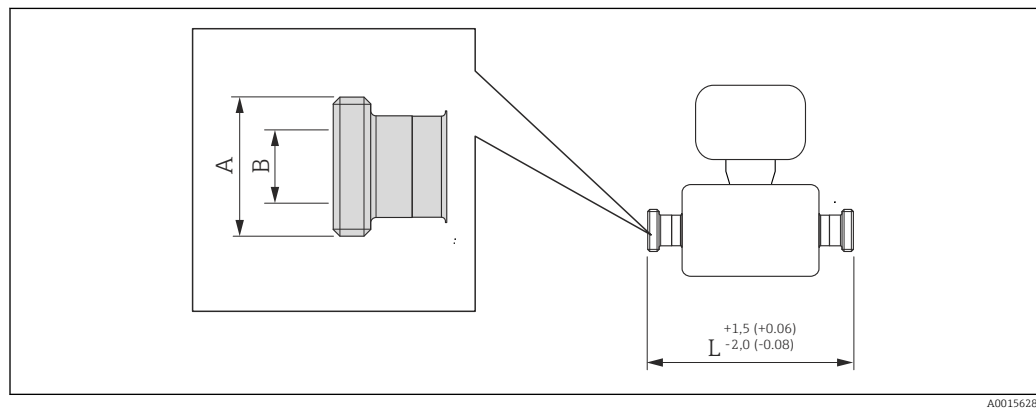
⊞ *35    Engineering unit mm (in)*

| Threaded hygienic connection DIN 11851, for pipe according to DIN11866 series A Titanium<br>*Order code for "Process connection", option* **KCW** | | | |
|---|---|---|---|
| DN [mm] | A [in] | B [mm] | L [mm] |
| 8 | Rd 34 × 1/8 | 16 | 427 |
| 15 | Rd 34 × 1/8 | 16 | 463 |
| 15 FB | Rd 34 × 1/8 | 16 | 602 |
| 25 | Rd 52 × 1/6 | 26 | 603 |
| 25 FB | Rd 52 × 1/6 | 26 | 736 |

**Threaded hygienic connection DIN 11851, for pipe according to DIN11866 series A**
**Titanium**
*Order code for "Process connection", option* **KCW**

| DN<br>[mm] | A<br>[in] | B<br>[mm] | L<br>[mm] |
|---|---|---|---|
| 40 | Rd 65 × 1/6 | 38 | 731 |
| 40 FB | Rd 65 × 1/6 | 38 | 855 |
| 50 | Rd 78 × 1/6 | 50 | 856 |
| 50 FB | Rd 78 × 1/6 | 50 | 1268 |
| 80 | Rd 110 × 1/4 | 81 | 1268 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.8 µm: order code for "Measuring tube material", option CB

**Threaded hygienic connection Rd 28 × 1/8" DIN 11851, for pipe according to DIN11866 series A**
**Titanium**
*Order code for "Process connection", option* **KAW**

| DN<br>[mm] | A<br>[in] | B<br>[mm] | L<br>[mm] |
|---|---|---|---|
| 8 | Rd 28 × 1/8 | 10 | 426 |
| 15 | Rd 28 × 1/8 | 10 | 462 |

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.8 µm: order code for "Measuring tube material", option CB

**Threaded hygienic connection DIN11864-1 Form A, for pipe according to DIN11866 series A**
**Titanium**
*Order code for "Process connection", option* **KEW**

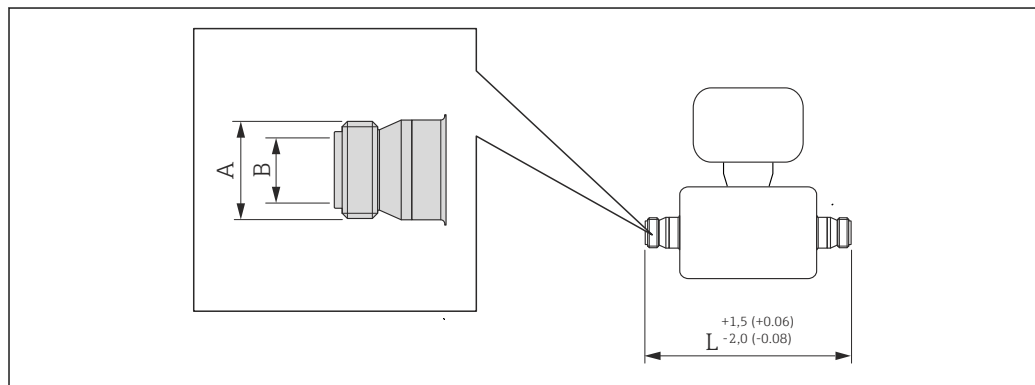| DN<br>[mm] | A<br>[in] | B<br>[mm] | L<br>[mm] |
|---|---|---|---|
| 8 [1] | Rd 28 × 1/8 | 10 | 428 |
| 15 | Rd 34 × 1/8 | 16 | 463 |
| 15 FB | Rd 34 × 1/8 | 16 | 602 |
| 25 | Rd 52 × 1/6 | 26 | 603 |
| 25 FB | Rd 52 × 1/6 | 26 | 734 |
| 40 | Rd 65 × 1/6 | 38 | 731 |
| 40 FB | Rd 65 × 1/6 | 38 | 855 |
| 50 | Rd 78 × 1/6 | 50 | 856 |
| 50 FB | Rd 78 × 1/6 | 50 | 1268 |
| 80 | Rd 110 × 1/4 | 81 | 1268 |

FB = Full bore
3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 µm, Ra ≤ 0.4 µm (order code for "Measuring tube material", option CB, CD)

1)     DN 8 with DN 10 threaded hygienic connection as standard

**Threaded hygienic connection SMS 1145**
**Titanium**
*Order code for "Process connection", option* **SCS**

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 8 | Rd 40 × 1/6 | 22.5 | 427 |
| 15 | Rd 40 × 1/6 | 22.5 | 463 |
| 25 | Rd 40 × 1/6 | 22.5 | 603 |
| 25 FB | Rd 40 × 1/6 | 22.5 | 736 |
| 40 | Rd 60 × 1/6 | 35.5 | 738 |
| 40 FB | Rd 60 × 1/6 | 35.5 | 857 |
| 50 | Rd 70 × 1/6 | 48.5 | 858 |
| 50 FB | Rd 70 × 1/6 | 48.5 | 1258 |
| 80 | Rd 98 × 1/6 | 72 | 1268 |

FB = Full bore
3A version available (Ra ≤ 0.8 μm) (order code for "Additional approval", option LP)

*Threaded hygienic connection ISO 2853*



🔲 *36   Engineering unit mm (in)*

**Threaded hygienic connection ISO 2853, for pipe according to ISO 2037**
**Titanium**
*Order code for "Process connection", option* **JSE**

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 8 [1] | 37.13 | 22.6 | 435 |
| 15 | 37.13 | 22.6 | 471 |
| 15 FB | 37.13 | 22.6 | 610 |
| 25 FB | 37.13 | 22.6 | 744 |
| 40 | 50.65 | 35.6 | 737 |
| 40 FB | 50.65 | 35.6 | 859 |
| 50 | 64.16 | 48.6 | 856 |
| 50 FB | 64.1 | 48.6 | 1268 |

| Threaded hygienic connection ISO 2853, for pipe according to ISO 2037 Titanium | | | |
|---|---|---|---|
| Order code for "Process connection", option **JSE** | | | |
| DN [mm] | A [in] | B [mm] | L [mm] |
| 80 | 91.19 | 72.9 | 1268 |
| FB = Full bore 3A version available (order code for "Additional approval", option LP) in combination with Ra ≤ 0.8 μm, Ra ≤ 0.4 μm (order code for "Measuring tube material", option CB, CD) | | | |

1)     DN 8 with DN 15 threaded hygienic connection as standard

**Safety Barrier Promass 100**
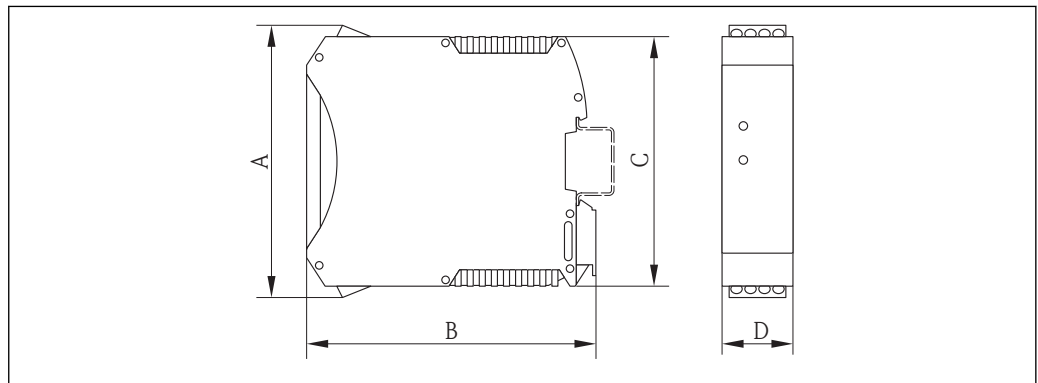
Top-hat rail EN 60715:
• TH 35 x 7.5
• TH 35 x 15

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

**Accessories**

*Purge connections / secondary containment monitoring*

Order code for "Sensor options", option CH
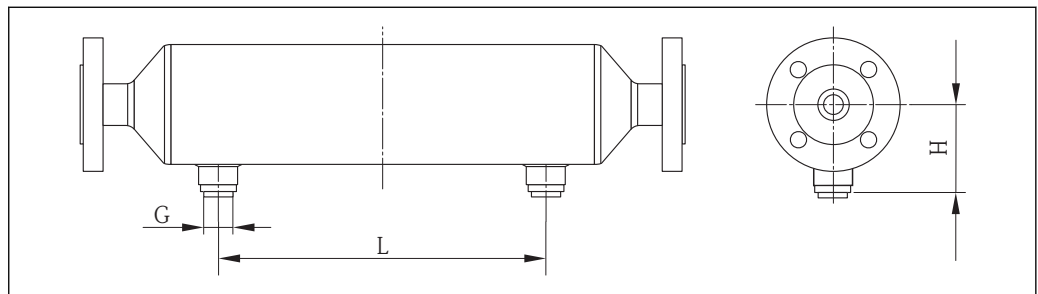
| DN | G | H | L |
|---|---|---|---|
| [mm] | [in] | [mm] | [mm] |
| 8 | ½-NPT | 90.65 | 122 |
| 15 | ½-NPT | 90.65 | 158 |

| DN | G | H | L |
|---|---|---|---|
| [mm] | [in] | [mm] | [mm] |
| 15 FB | ½-NPT | 90.65 | 158 |
| 25 | ½-NPT | 90.65 | 296 |
| 25 FB | ½-NPT | 90.65 | 296 |
| 40 | ½-NPT | 103.35 | 392 |
| 40 FB | ½-NPT | 103.35 | 392 |
| 50 | ½-NPT | 117.75 | 488 |
| 50 FB | ½-NPT | 145.5 | 814 |
| 80 | ½-NPT | 145.5 | 814 |

**Dimensions in US units**       **Compact version**

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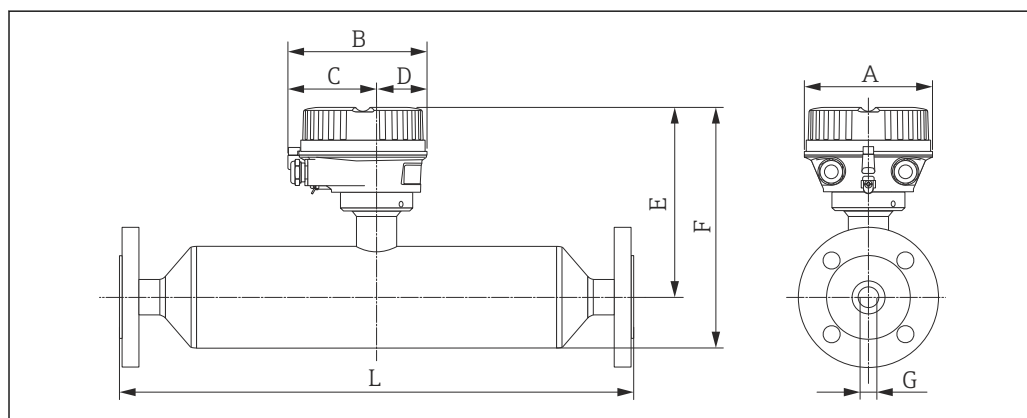


A0016456

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [2] [in] | F [1] [2] [in] | G [in] | L [in] |
|---|---|---|---|---|---|---|---|---|
| ⅜ | 5.35 | 5.81 | 3.68 | 2.13 | 8.16 | 10.41 | 0.34 | [3] |
| ½ | 5.35 | 5.81 | 3.68 | 2.13 | 8.16 | 10.41 | 0.45 | [3] |
| ½ FB | 5.35 | 5.81 | 3.68 | 2.13 | 8.16 | 10.41 | 0.67 | [3] |
| 1 | 5.35 | 5.81 | 3.68 | 2.13 | 8.54 | 10.79 | 0.67 | [3] |
| 1 FB | 5.35 | 5.81 | 3.68 | 2.13 | 8.54 | 11.32 | 1.01 | [3] |
| 1½ | 5.35 | 5.81 | 3.68 | 2.13 | 9.1 | 11.89 | 1.01 | [3] |
| 1½ FB | 5.35 | 5.81 | 3.68 | 2.13 | 9.1 | 12.42 | 1.40 | [3] |
| 2 | 5.35 | 5.81 | 3.68 | 2.13 | 10.1 | 13.42 | 1.40 | [3] |
| 2 FB | 5.35 | 5.81 | 3.68 | 2.13 | 10.1 | 14.42 | 2.16 | [3] |
| 3 | 5.35 | 5.81 | 3.68 | 2.13 | 10.1 | 14.42 | 2.16 | [3] |
| FB = Full bore | | | | | | | | |

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

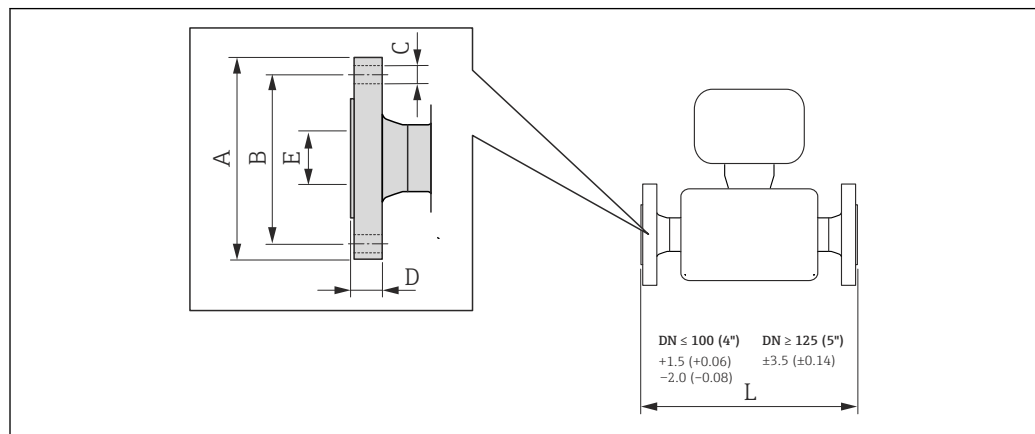*Order code for "Housing", option B "Compact hygienic, stainless"*
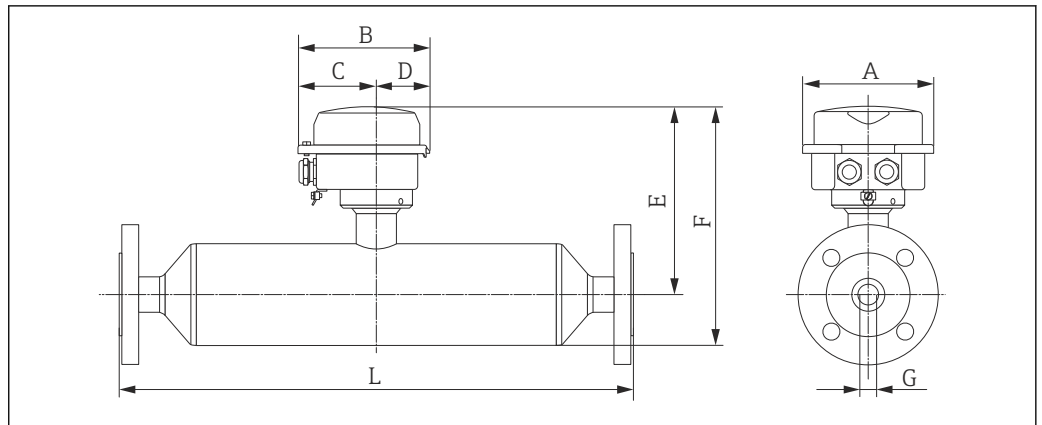


A0016522

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [2] [in] | F [1] [2] [in] | G [in] | L [in] |
|---|---|---|---|---|---|---|---|---|
| ⅜ | 5.26 | 5.39 | 3.07 | 2.31 | 7.96 | 10.41 | 0.34 | [3] |
| ½ | 5.26 | 5.39 | 3.07 | 2.31 | 7.96 | 10.41 | 0.45 | [3] |
| ½ FB | 5.26 | 5.39 | 3.07 | 2.31 | 7.96 | 10.41 | 0.67 | [3] |
| 1 | 5.26 | 5.39 | 3.07 | 2.31 | 8.34 | 10.79 | 0.67 | [3] |
| 1 FB | 5.26 | 5.39 | 3.07 | 2.31 | 8.34 | 11.32 | 1.01 | [3] |
| 1½ | 5.26 | 5.39 | 3.07 | 2.31 | 8.91 | 11.89 | 1.01 | [3] |
| 1½ FB | 5.26 | 5.39 | 3.07 | 2.31 | 8.91 | 12.42 | 1.40 | [3] |
| 2 | 5.26 | 5.39 | 3.07 | 2.31 | 9.91 | 13.42 | 1.40 | [3] |
| 2 FB | 5.26 | 5.39 | 3.07 | 2.31 | 9.91 | 14.42 | 2.16 | [3] |
| 3 | 5.26 | 5.39 | 3.07 | 2.31 | 9.91 | 14.42 | 2.16 | [3] |
| FB = Full bore | | | | | | | | |

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

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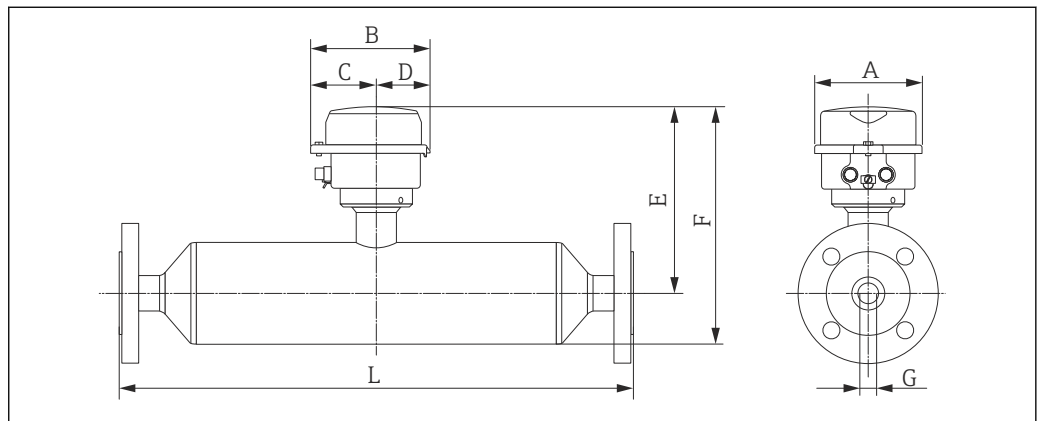


A0016521

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [2] [in] | F [1] [2] [in] | G [in] | L [in] |
|---|---|---|---|---|---|---|---|---|
| ⅜ | 4.39 | 4.87 | 2.67 | 2.2 | 7.96 | 10.41 | 0.337 | [3] |
| ½ | 4.39 | 4.87 | 2.67 | 2.2 | 7.96 | 10.41 | 0.448 | [3] |
| ½ FB | 4.39 | 4.87 | 2.67 | 2.2 | 7.96 | 10.41 | 0.672 | [3] |
| 1 | 4.39 | 4.87 | 2.67 | 2.2 | 8.34 | 10.79 | 0.672 | [3] |
| 1 FB | 4.39 | 4.87 | 2.67 | 2.2 | 8.34 | 11.32 | 1.038 | [3] |
| 1½ | 4.39 | 4.87 | 2.67 | 2.2 | 8.91 | 11.89 | 1.038 | [3] |
| 1½ FB | 4.39 | 4.87 | 2.67 | 2.2 | 8.91 | 12.42 | 1.402 | [3] |
| 2 | 4.39 | 4.87 | 2.67 | 2.2 | 9.91 | 13.42 | 1.402 | [3] |
| 2 FB | 4.39 | 4.87 | 2.67 | 2.2 | 9.91 | 14.42 | 2.156 | [3] |
| 3 | 4.39 | 4.87 | 2.67 | 2.2 | 9.91 | 14.42 | 2.156 | [3] |
| FB = Full bore | | | | | | | | |

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

**Flange connections**

*Fixed flange ASME B16.5*



🔲 *37*  *Engineering unit mm (in)*

| Flange according to ASME B16.5: Class 150 1.4301 (304), wetted parts: titanium *Order code for "Process connection", option* **AAW** | | | | | | |
|---|---|---|---|---|---|---|
| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
| ⅜ [1] | 3.54 | 2.37 | 4 × Ø0.62 | 0.79 | 0.62 | 15.83 |
| ½ | 3.54 | 2.37 | 4 × Ø0.62 | 0.79 | 0.62 | 17.24 |
| ½ FB | 3.54 | 2.37 | 4 × Ø0.62 | 0.75 | 0.67 | 22.52 |
| 1 | 4.33 | 3.13 | 4 × Ø0.62 | 0.91 | 1.05 | 22.76 |
| 1 FB | 4.33 | 3.13 | 4 × Ø0.62 | 0.87 | 1.01 | 27.56 |
| 1½ | 4.92 | 3.87 | 4 × Ø0.62 | 1.02 | 1.61 | 27.87 |
| 1½ FB | 4.92 | 3.87 | 4 × Ø0.62 | 0.94 | 1.4 | 32.24 |
| 2 | 5.91 | 4.75 | 4 × Ø0.75 | 1.1 | 2.07 | 32.56 |

**Flange according to ASME B16.5: Class 150**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **AAW**

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| 2 FB | 5.91 | 4.75 | 4 × Ø0.75 | 1.57 | 2.16 | 47.64 |
| 3 | 7.48 | 6.00 | 4 × Ø0.75 | 1.46 | 3.07 | 47.64 |

FB = Full bore
Surface roughness (flange): Ra 125 to 248 µin

1) DN 3/8" with DN ½" flanges as standard;

**Flange according to ASME B16.5: Class 300**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **ABW**

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| ⅜ 1) | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.62 | 15.83 |
| ½ | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.62 | 17.24 |
| ½ FB | 3.74 | 2.63 | 4 × Ø0.62 | 0.75 | 0.67 | 22.52 |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.91 | 1.05 | 22.76 |
| 1 FB | 4.92 | 3.50 | 4 × Ø0.75 | 0.87 | 1.01 | 27.56 |
| 1½ | 6.10 | 4.50 | 4 × Ø0.88 | 1.02 | 1.61 | 27.87 |
| 1½ FB | 6.10 | 4.50 | 4 × Ø0.88 | 0.94 | 1.4 | 32.24 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 1.1 | 2.07 | 32.56 |
| 2 FB | 6.50 | 5.00 | 8 × Ø0.75 | 1.69 | 2.16 | 47.64 |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 1.65 | 3.07 | 47.64 |

FB = Full bore
Surface roughness (flange): Ra 125 to 248 µin

1) DN 3/8" with DN ½" flanges as standard;

**Flange according to ASME B16.5: Class 600**
**1.4301 (304), wetted parts: titanium**
*Order code for "Process connection", option* **ACW**

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| ⅜ 1) | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.54 | 15.83 |
| ½ | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.54 | 17.24 |
| ½ FB | 3.74 | 2.63 | 4 × Ø0.62 | 0.87 | 0.67 | 22.76 |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.91 | 0.96 | 22.76 |
| 1 FB | 4.92 | 3.50 | 4 × Ø0.75 | 0.98 | 1.01 | 27.8 |
| 1½ | 6.10 | 4.50 | 4 × Ø0.88 | 1.1 | 1.5 | 27.87 |
| 1½ FB | 6.10 | 4.50 | 4 × Ø0.88 | 1.14 | 1.4 | 32.48 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 1.3 | 1.94 | 32.76 |
| 2 FB | 6.50 | 5.00 | 8 × Ø0.75 | 1.81 | 2.16 | 47.64 |

| Flange according to ASME B16.5: Class 600 1.4301 (304), wetted parts: titanium *Order code for "Process connection", option* **ACW** | | | | | | |
|---|---|---|---|---|---|---|
| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 2.09 | 2.9 | 48.11 |
| FB = Full bore Surface roughness (flange): Ra 125 to 248 µin | | | | | | |

1)    DN 3/8" with DN ½" flanges as standard;
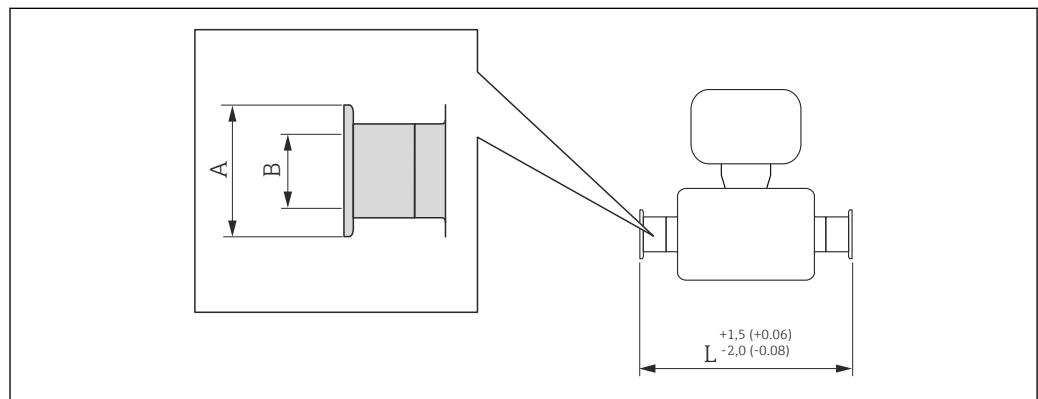
### Clamp connections

*Tri-Clamp*



🔲 *38    Engineering unit mm (in)*

| Tri-Clamp ( ≥ 1"), DIN 11866 series C Titanium *Order code for "Process connection", option* **FTW** | | | | |
|---|---|---|---|---|
| DN [in] | Clamp [in] | A [in] | B [in] | L [in] |
| ³⁄₈ | 1 | 1.98 | 0.87 | 16.81 |
| ½ | 1 | 1.98 | 0.87 | 18.23 |
| ½ FB | see ¾" Tri-Clamp connection | | | |
| 1 | 1 | 1.98 | 0.87 | 23.74 |
| 1 FB | 1 | 1.98 | 0.87 | 28.74 |
| 1½ | 1 ½ | 1.98 | 1.37 | 28.78 |
| 1½ FB | 1 ½ | 1.98 | 1.37 | 33.43 |
| 2 | 2 | 2.52 | 1.87 | 33.46 |
| 2 FB [1] | 2 ½ | 3.05 | 2.37 | 49.92 |
| 3 | 3 | 3.58 | 2.87 | 49.92 |
| FB = Full bore 3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 32 µin: order code for "Measuring tube material", option CB or Ra ≤ 16 µin: order code for "Measuring tube material", option CD | | | | |

1)    Order code for "Process connection", option FRW

**¾" Tri-Clamp, DIN 11866 series C**
**Titanium**
*Order code for "Process connection", option* **FEW**

| DN [in] | Clamp [in] | A [in] | B [in] | L [in] |
|---|---|---|---|---|
| ⅜ | ¾ | 0.98 | 0.63 | 16.77 |
| ½ | ¾ | 0.98 | 0.63 | 18.19 |
| ½ FB | ¾ | 0.98 | 0.63 | 23.7 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 32 µin: order code for "Measuring tube material", option CB or
Ra ≤ 16 µin: order code for "Measuring tube material", option CD

**½" Tri-Clamp, DIN 11866 series C**
**Titanium**
*Order code for "Process connection", option* **FBW**

| DN [in] | Clamp [in] | A [in] | B [in] | L [in] |
|---|---|---|---|---|
| ⅜ | ½ | 0.98 | 0.37 | 16.77 |
| ½ | ½ | 0.98 | 0.37 | 18.19 |

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 32 µin: order code for "Measuring tube material", option CB or
Ra ≤ 16 µin: order code for "Measuring tube material", option CD

**Eccentric Tri-Clamp, DIN 11866 series C**
**Titanium**

| DN [in] | Order Code for "Process connection", Option | Clamp [in] | A [in] | B [in] | L [in] |
|---|---|---|---|---|---|
| ⅜ | FEA | ½ | 0.98 | 0.37 | 16.81 |
| ½ | FEC | ¾ | 0.98 | 0.62 | 18.23 |
| ½ FB | FEE | 1 | 1.99 | 0.87 | 23.74 |
| 1 | FEE | 1 | 1.99 | 0.87 | 23.74 |
| 1 FB | FEG | 1½ | 1.99 | 1.37 | 28.74 |
| 1½ | FEG | 1½ | 1.99 | 1.37 | 28.74 |
| 1½ FB | FEJ | 2 | 2.52 | 1.87 | 33.43 |
| 2 | FEJ | 2 | 2.52 | 1.87 | 33.43 |
| 2 FB | FEL | 2 ½ | 3.05 | 2.37 | 49.92 |
| 2 FB | FEM | 3 | 3.58 | 2.87 | 49.92 |
| 3 | FEL | 2 ½ | 3.05 | 2.37 | 49.92 |
| 3 | FEM | 3 | 3.58 | 2.87 | 49.92 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 32 µin: order code for "Measuring tube material", option CB or
Ra ≤ 16 µin: order code for "Measuring tube material", option CD
Additional information on "Eccentric clamps

**Cable glands**

*Threaded hygienic connection SMS 1145*
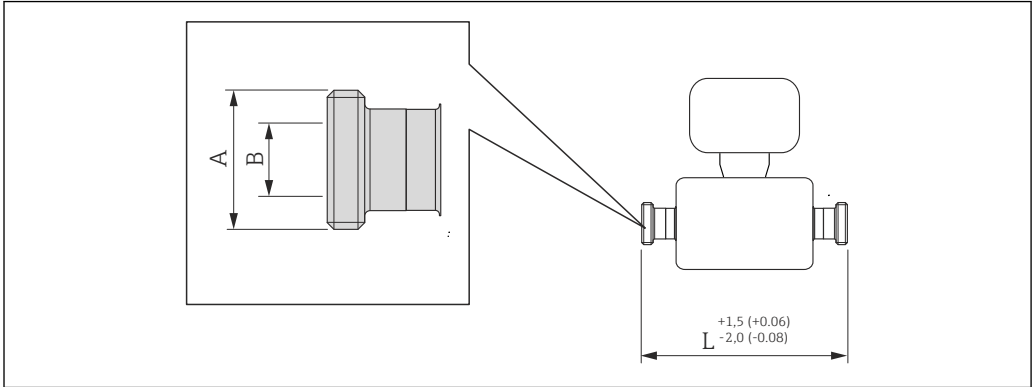


⊠ *39    Engineering unit mm (in)*

| Threaded hygienic connection SMS 1145 Titanium *Order code for "Process connection", option* **SCS** | | | |
|---|---|---|---|
| DN [in] | A [in] | B [in] | L [in] |
| ³⁄₈ | Rd 40 × 1/6 | 0.89 | 16.81 |
| ½ | Rd 40 × 1/6 | 0.89 | 18.23 |
| 1 | Rd 40 × 1/6 | 0.89 | 23.74 |
| 1 FB | Rd 40 × 1/6 | 0.89 | 28.98 |
| 1½ | Rd 60 × 1/6 | 1.4 | 29.06 |
| 1½ FB | Rd 60 × 1/6 | 1.4 | 33.74 |
| 2 | Rd 70 × 1/6 | 1.91 | 33.78 |
| 2 FB | Rd 70 × 1/6 | 1.91 | 49.53 |
| 3 | Rd 98 × 1/6 | 2.83 | 49.92 |
| FB = Full bore Ra ≤ 32 µin: order code for "Measuring tube material", option CB or | | | |

**Safety Barrier Promass 100**
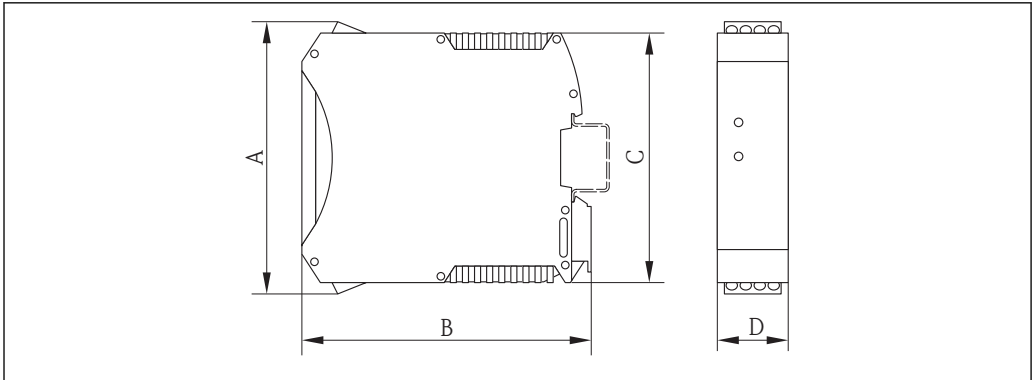
Top-hat rail EN 60715:
• TH 35 x 7.5
• TH 35 x 15

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

**Accessories**

*Purge connections / secondary containment monitoring*

Order code for "Sensor options", option CH
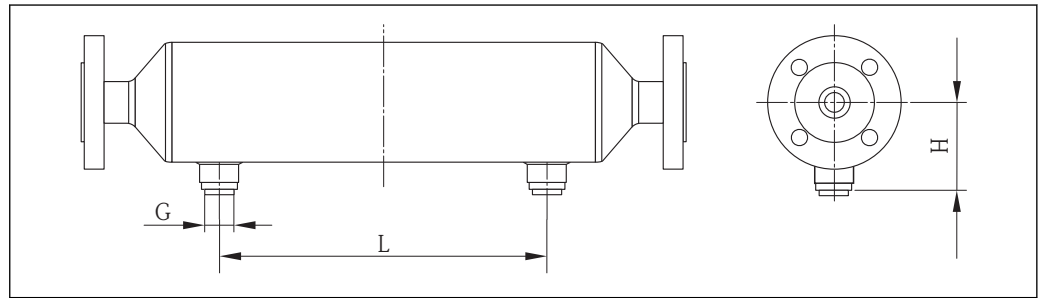


A0003321

| DN | G | H | L |
|---|---|---|---|
| [in] | [in] | [in] | [in] |
| $\frac{3}{8}$ | ½-NPT | 3.57 | 4.80 |
| ½ | ½-NPT | 3.57 | 6.22 |
| ½ FB | ½-NPT | 3.57 | 6.22 |
| 1 | ½-NPT | 3.57 | 11.66 |
| 1 FB | ½-NPT | 3.57 | 11.66 |
| 1½ | ½-NPT | 4.07 | 15.44 |
| 1½ FB | ½-NPT | 4.07 | 15.44 |
| 2 | ½-NPT | 4.64 | 19.22 |
| 2 FB | ½-NPT | 5.73 | 32.40 |
| 3 | ½-NPT | 5.73 | 32.40 |

| Weight | **Compact version** |
|---|---|

*Weight in SI units*

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

| DN<br>[mm] | Weight [kg] |
|---|---|
| 8 | 11 |
| 15 | 13 |
| 15 FB | 19 |
| 25 | 20 |
| 25 FB | 39 |
| 40 | 40 |
| 40 FB | 65 |
| 50 | 67 |
| 50 FB | 118 |

| DN<br>[mm] | Weight [kg] |
|---|---|
| 80 | 122 |
| FB = Full bore | |

*Weight in US units*

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

| DN<br>[in] | Weight [lbs] |
|---|---|
| 3/8 | 24 |
| ½ | 29 |
| ½ FB | 42 |
| 1 | 44 |
| 1 FB | 86 |
| 1½ | 88 |
| 1½ FB | 143 |
| 2 | 148 |
| 2 FB | 260 |
| 3 | 269 |
| FB = Full bore | |

### 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 (→ 🕮 82):
  - For order code for "Housing", option **A**: glass
  - For order code for "Housing", option **B** and **C**: plastic

**Cable entries/cable glands**
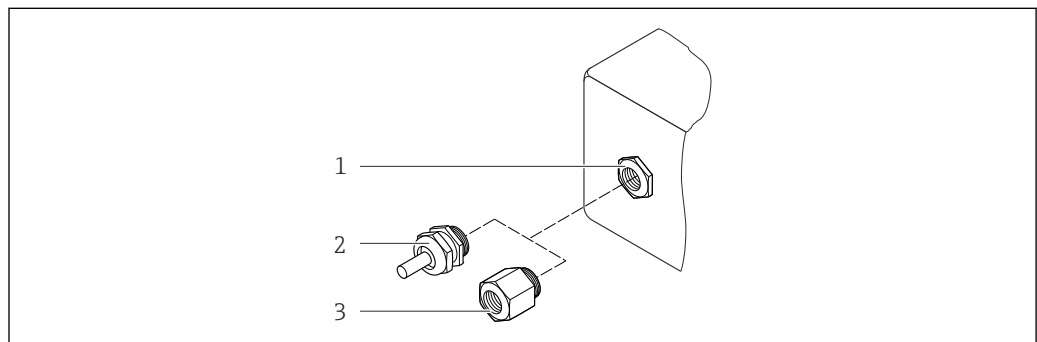


🖻 *40    Possible cable entries/cable glands*

*1    Cable entry in transmitter housing with internal thread M20 x 1.5*
*2    Cable gland M20 x 1.5*
*3    Adapter for cable entry with internal thread G ½" or NPT ½"*

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

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 internal thread G ½" | |
| Adapter for cable entry with internal 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 internal thread G ½" | |
| Adapter for cable entry with internal 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**

Grade 9 titanium

**Process connections**

- Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5/ according to JIS:
  – Stainless steel 1.4301 (304)
  – Wetted parts: Grade 2 titanium
- All other process connections:
  Grade 2 titanium

List of all available process connections →  82

**Seals**

Welded process connections without internal seals

**Safety Barrier Promass 100**

Housing: Polyamide

| | |
|---|---|
| **Process connections** | • Fixed flange connections:<br>  – EN 1092-1 (DIN 2501) flange<br>  – EN 1092-1 (DIN 2512N) flange<br>  – ASME B16.5 flange<br>  – JIS B2220 flange<br>  – DIN 11864-2 Form A flange, DIN11866 series A, flat flange<br>• Clamp connections<br>  Tri-Clamp (OD tubes), DIN 11866 series C<br>• Excentric clamp connection:<br>  Excen. Tri-Clamp, DIN 11866 series C<br>• Threaded hygienic connection:<br>  – DIN 11851 threaded hygienic connection, DIN11866 series A<br>  – SMS 1145 threaded hygienic connection<br>  – ISO 2853 threaded hygienic connection, ISO2037<br>  – DIN 11864-1 Form A threaded hygienic connection, DIN11866 series A<br><br>For information on the different materials used in the process connections → 🖹 80 |
| **Surface roughness** | All data relate to parts in contact with fluid.<br>• Not polished<br>• $Ra_{max}$ = 0.8 μm (32 μin)<br>• $Ra_{max}$ = 0.4 μm (16 μin) |

# Operability

| | |
|---|---|
| **Operating concept** | **Operator-oriented menu structure for user-specific tasks**<br>• Commissioning<br>• Operation<br>• Diagnostics<br>• Expert level<br><br>**Quick and safe commissioning**<br>• Individual menus for applications<br>• Menu guidance with brief explanations of the individual parameter functions<br><br>**Reliable operation**<br>• Operation in the following languages:<br>  – Via "FieldCare" operating tool:<br>    English, German, French, Spanish, Italian, Chinese, Japanese<br>  – Via integrated Web browser (only available for device versions with HART, PROFIBUS DP, PROFINET and EtherNet/IP):<br>    English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish, Korean<br>• Uniform operating philosophy applied to operating tools and Web browser<br>• If replacing the electronic module, transfer the device configuration via the plug-in memory (HistoROM DAT) which contains the process and measuring device data and the event logbook. No need to reconfigure.<br>  For devices with Modbus RS485, the data recovery function is implemented without the plug-in memory (HistoROM DAT).<br><br>**Efficient diagnostics increase measurement availability**<br>• Troubleshooting measures can be called up via the operating tools and Web browser<br>• Diverse simulation options<br>• 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<br><br>The local display is only available with the following device order code:<br>Order code for "Display; Operation", option **B**: 4-line; lit; 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.
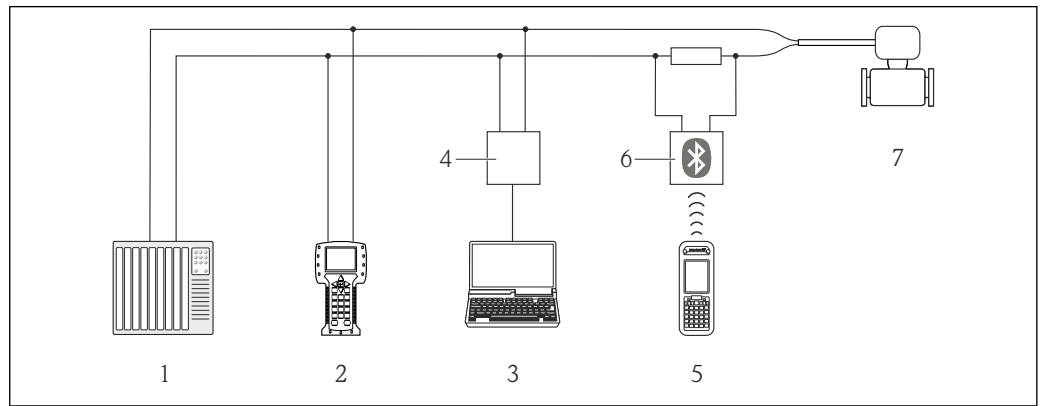


*🖪 41   Options for remote operation via HART protocol*

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

**Via PROFIBUS DP network**

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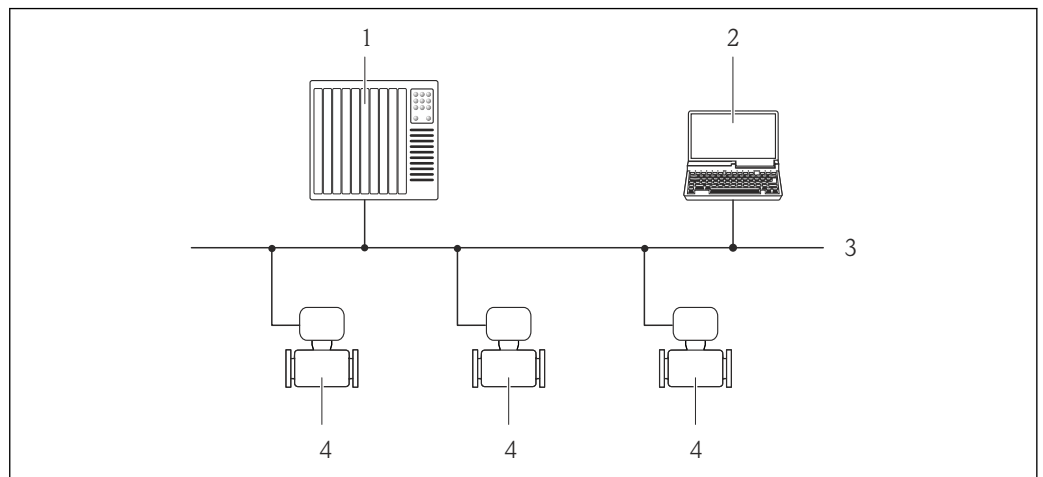


*🖪 42   Options for remote operation via PROFIBUS DP network*

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

**Via Ethernet-based fieldbus**

This communication interface is available in device versions with EtherNet/IP.
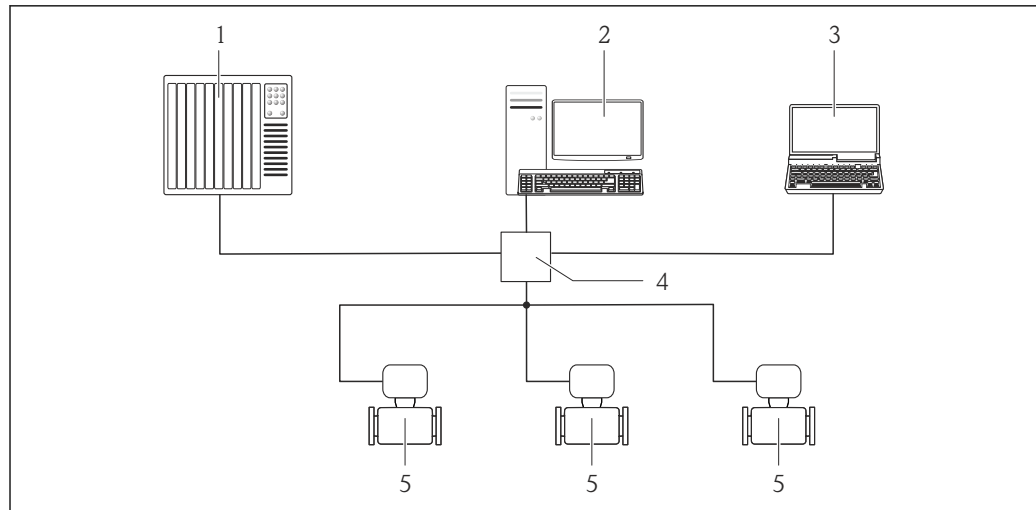
*□ 43    Options for remote operation via Ethernet-based fieldbus*

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

### Via PROFINET network

This communication interface is available in device versions with PROFINET.
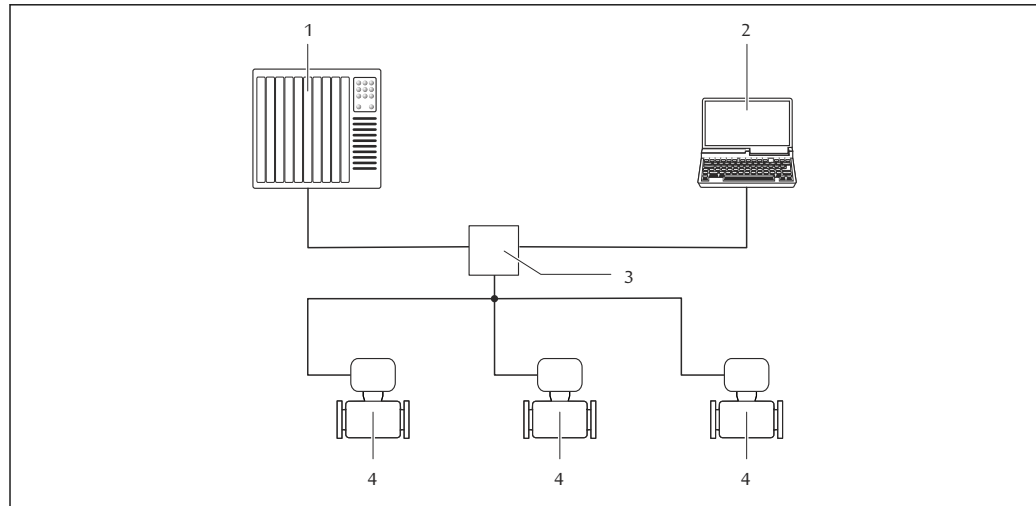


*□ 44    Options for remote operation via PROFINET network*

*1    Automation system, e.g. Simatic S7 (Siemens)*
*2    Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"*
*3    Switch, e.g. Scalance X204 (Siemens)*
*4    Measuring device*

| 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*
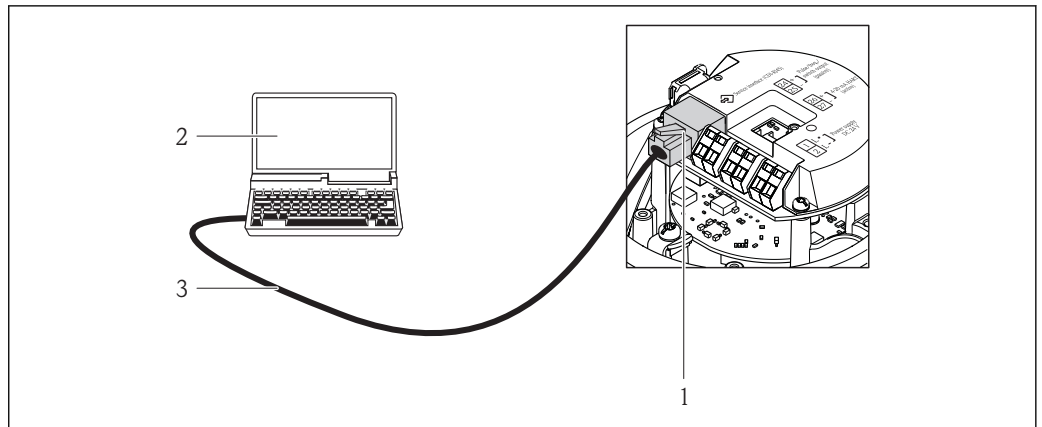


A0016926

⊡ *45*     *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 device with access to the integrated Web server*
*2*     *Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"*
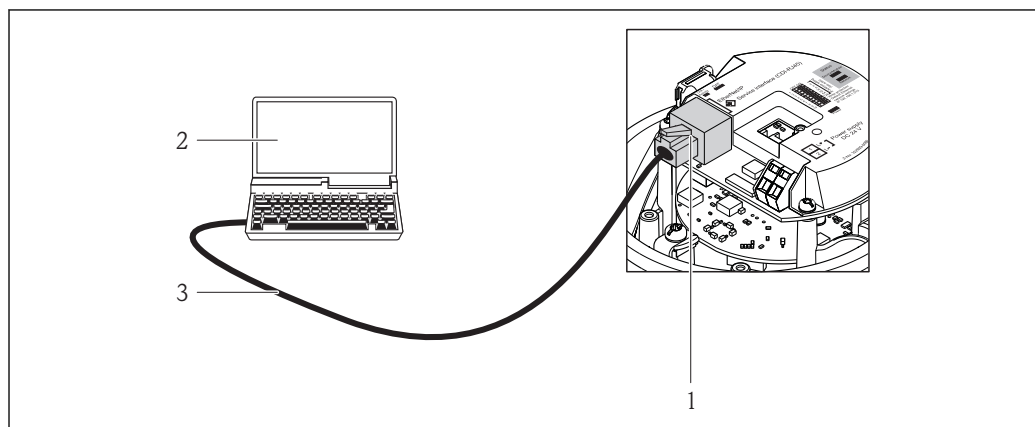*3*     *Standard Ethernet connecting cable with RJ45 plug*

*PROFIBUS DP*
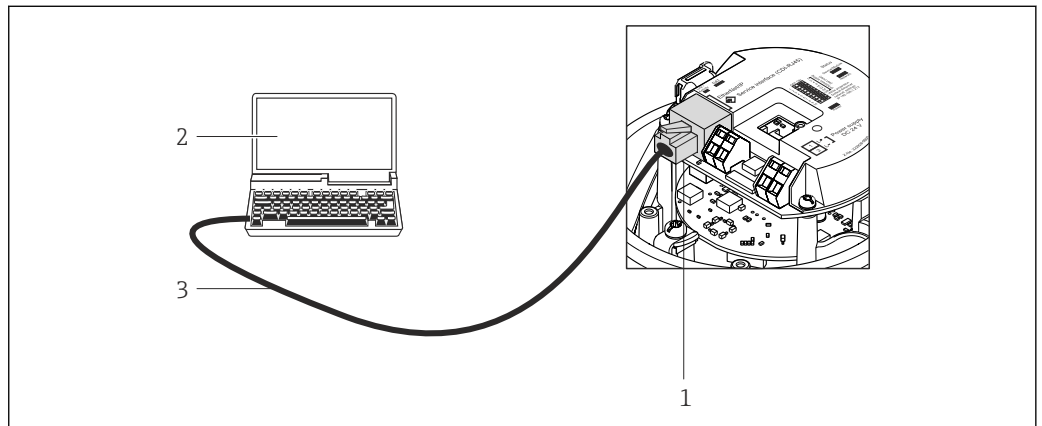


A0021270

⊡ *46*     *Connection for order code for "Output", option L: PROFIBUS DP*

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

*EtherNet/IP*
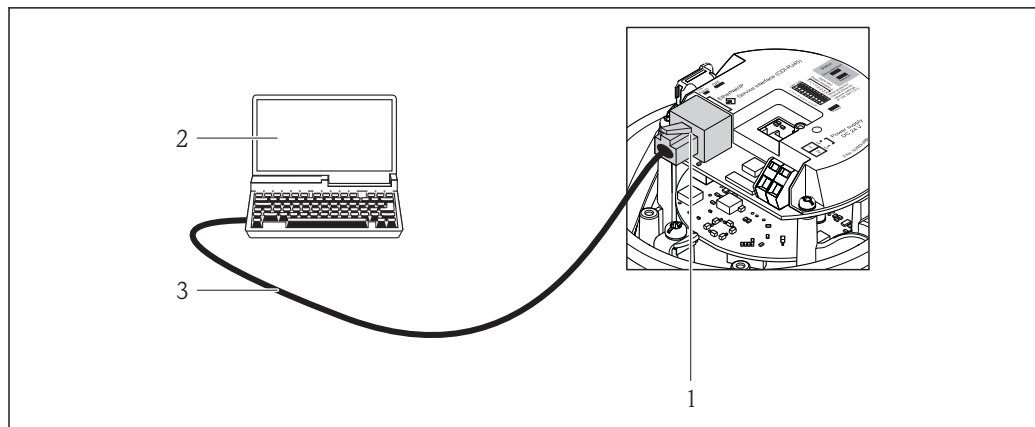


A0016940

⊠ *47    Connection for order code for "Output", option N: EtherNet/IP*

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

*PROFINET*



A0016940

⊠ *48    Connection for order code for "Output", option R: PROFINET*

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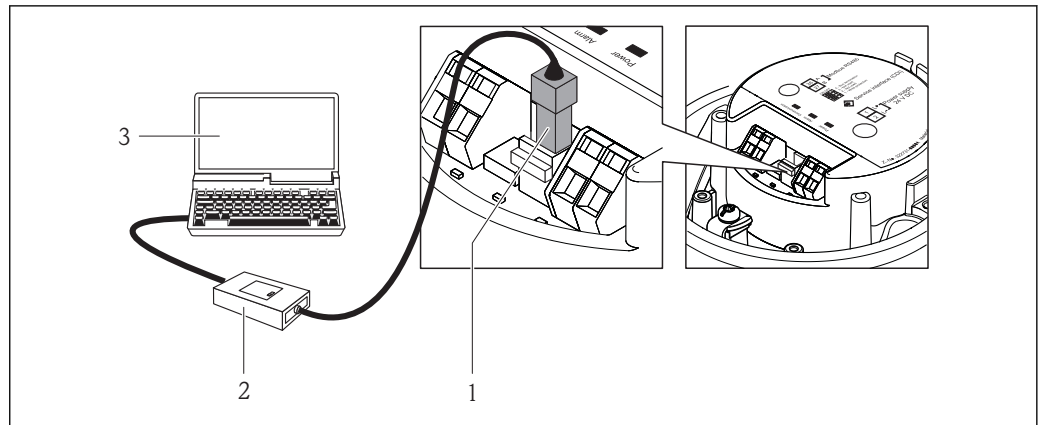


A0016925

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

# Certificates and approvals

**CE mark**

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

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

**C-Tick symbol**

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

**Ex approval**

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

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

**ATEX/IECEx**

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

*Ex ia*

| Category (ATEX) | Type of protection |
|---|---|
| II2G | Ex ia IIC T6...T1 Gb |
| II2G | Ex ia IIC T6...T1 Gb or Ex ia IIB T6...T1 Gb |
| II1/2G, II2D | Ex ia IIC T6...T1 Ga/Gb or Ex ia IIB T6...T1 Ga/Gb<br>Ex tb IIIC Txx °C Db |
| II2G, II2D | Ex ia IIC T6...T1 Gb or Ex ia IIB T6...T1 Gb<br>Ex tb IIIC Txx °C Db |

*Ex nA*

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

$_c$**CSA**$_{US}$

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

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

*NI (Ex nA)*
Class I Division 2 Groups ABCD

| | |
|---|---|
| **Sanitary compatibility** | • 3-A approval<br>• EHEDG-tested |
| **HART certification** | **HART interface**<br><br>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:<br>• Certified according to HART 7<br>• The device can also be operated with certified devices of other manufacturers (interoperability) |
| **Certification PROFIBUS** | **PROFIBUS interface**<br><br>The measuring device is certified and registered by the PROFIBUS User Organization (PNO). The measuring system meets all the requirements of the following specifications:<br>• Certified in accordance with PROFIBUS PA Profile 3.02<br>• The device can also be operated with certified devices of other manufacturers (interoperability) |
| **Certification PROFINET** | **PROFINET interface**<br><br>The measuring device is certified and registered by the PNO (PROFIBUS User Organization ). The measuring system meets all the requirements of the following specifications:<br>• Certified according to:<br>  – Test specification for PROFINET devices<br>  – PROFINET Security Level 1 – Net load test<br>• The device can also be operated with certified devices of other manufacturers (interoperability) |
| **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:<br>• Certified in accordance with the ODVA Conformance Test<br>• EtherNet/IP Performance Test<br>• EtherNet/IP PlugFest compliance<br>• The device can also be operated with certified devices of other manufacturers (interoperability) |
| **Modbus RS485 certification** | The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan. |
| **Pressure Equipment Directive** | The devices can be ordered with or without a PED approval. If a device with a PED approval is required, this must be explicitly stated in the order. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary.<br><br>• With the PED/G1/x (x = category) marking on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" specified in Annex I of the Pressure Equipment Directive 97/23/EC.<br>• Devices bearing this marking (PED) are suitable for the following types of medium:<br>  – Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)<br>  – Unstable gases<br>• Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art.3 Section 3 of the Pressure Equipment Directive 97/23/EC. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive. |

| Other standards and guidelines | • EN 60529<br>Degrees of protection provided by enclosures (IP code)<br>• IEC/EN 60068-2-6<br>Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).<br>• IEC/EN 60068-2-31<br>Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.<br>• EN 61010-1<br>Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements<br>• IEC/EN 61326<br>Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).<br>• NAMUR NE 21<br>Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment<br>• NAMUR NE 32<br>Data retention in the event of a power failure in field and control instruments with microprocessors<br>• NAMUR NE 43<br>Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.<br>• NAMUR NE 53<br>Software of field devices and signal-processing devices with digital electronics<br>• NAMUR NE 80<br>The application of the pressure equipment directive to process control devices<br>• NAMUR NE 105<br>Specifications for integrating fieldbus devices in engineering tools for field devices<br>• NAMUR NE 107<br>Self-monitoring and diagnosis of field devices<br>• NAMUR NE 131<br>Requirements for field devices for standard applications<br>• NAMUR NE 132<br>Coriolis mass meter |
|---|---|

# Ordering information

Detailed ordering information is available from the following sources:
• In the Product Configurator on the Endress+Hauser website: www.endress.com → Select your country → Products → Select measuring technology, software or components → Select the product (picklists: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product opens.
• From your Endress+Hauser Sales Center: www.addresses.endress.com

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

# 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 for the device
- Special Documentation for the device

**Heartbeat Technology**

| Package | Description |
|---|---|
| Heartbeat Verification +Monitoring | **Heartbeat Monitoring**<br>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:<br>• Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time.<br>• Schedule servicing in time.<br>• Monitor the process or product quality, e.g. gas pockets.<br><br>**Heartbeat Verification**<br>Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".<br>• Functional testing in the installed state without interrupting the process.<br>• Traceable verification results on request, including a report.<br>• Simple testing process via local operation or other operating interfaces.<br>• Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.<br>• Extension of calibration intervals according to operator's risk assessment. |

**Concentration**

| Package | Description |
|---|---|
| Concentration measurement and special density | **Calculation and outputting of fluid concentrations**<br>Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.<br>The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.<br><br>With the help of the "Concentration Measurement" application package, the measured density is used to calculate other process parameters:<br>• Temperature-compensated density (reference density).<br>• Percentage mass of the individual substances in a two-phase fluid. (Concentration in %).<br>• Fluid concentration is output with special units (°Brix, °Baumé, °API, etc.) for standard applications.<br><br>The measured values are output via the digital and analog outputs of the device. |

**Viscosity**

| Package | Description |
|---|---|
| Viscosity measurement | **In-line and real-time viscosity measurement**<br>Promass I with the "Viscosity" application package also measures the real-time viscosity of the fluid directly in the process, in addition to measuring the mass flow/volume flow/ temperature and density.<br><br>The following viscosity measurements are performed on liquids:<br>• Dynamic viscosity<br>• Kinematic viscosity<br>• Temperature-compensated viscosity (kinematic and dynamic) in relation to the reference temperature<br><br>Viscosity measurement can be used for Newtonian and non-Newtonian applications and supplies accurate measured data irrespective of the flow, even under difficult conditions. |

# Accessories

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

**Device-specific accessories**

**For the sensor**

| Accessories | Description |
|---|---|
| Heating jacket | Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids. If using oil as a heating medium, please consult with Endress+Hauser. 📖 For details, see Operating Instructions BA00099D |

**Communication-specific accessories**

| Accessories | Description |
|---|---|
| Commubox FXA195 HART | For intrinsically safe HART communication with FieldCare via the USB interface. 📖 For details, see "Technical Information" TI00404F |
| Commubox FXA291 | Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. 📖 For details, see the "Technical Information" document TI405C/07 |
| HART Loop Converter HMX50 | Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. 📖 For details, see "Technical Information" TI00429F and Operating Instructions BA00371F |
| Wireless HART adapter SWA70 | Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. 📖 For details, see Operating Instructions BA00061S |
| Fieldgate FXA320 | Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser. 📖 For details, see "Technical Information" TI00025S and Operating Instructions BA00053S |
| Fieldgate FXA520 | Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser. 📖 For details, see "Technical Information" TI00025S and Operating Instructions BA00051S |
| Field Xpert SFX350 | Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area**. 📖 For details, see Operating Instructions BA01202S |
| Field Xpert SFX370 | Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area** and the **Ex area**. 📖 For details, see Operating Instructions BA01202S |

**Service-specific accessories**

| Accessories | Description |
|---|---|
| Applicator | Software for selecting and sizing Endress+Hauser measuring devices:<br>• Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections.<br>• Graphic illustration of the calculation results<br><br>Administration, documentation and access to all project-related data and parameters throughout the entire life cycle of a project.<br><br>Applicator is available:<br>• Via the Internet: https://wapps.endress.com/applicator<br>• On CD-ROM for local PC installation. |
| W@M | Life cycle management for your plant<br>W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.<br>The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.<br><br>W@M is available:<br>• Via the Internet: www.endress.com/lifecyclemanagement<br>• On CD-ROM for local PC installation. |
| FieldCare | FDT-based plant asset management tool from Endress+Hauser.<br>It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.<br><br>For details, see Operating Instructions BA00027S and BA00059S |
| DeviceCare | Tool for connecting and configuring Endress+Hauser field devices.<br><br>For details, see Innovation brochure IN01047S |
| 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><br>For details, see "Technical Information" TI00405C |

**System components**

| Accessories | Description |
|---|---|
| Memograph M graphic display recorder | The Memograph M graphic display recorder provides information on all 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><br>For details, see "Technical Information" TI00133R and 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 fluid temperature.<br><br>For details, see "Fields of Activity", FA00006T |

# Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
• The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
• The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

Standard documentation

### Brief Operating Instructions

Brief Operating Instructions containing the most important information for standard commissioning are supplied with the device.

### Operating Instructions

| Measuring device | Documentation code | | | | |
|---|---|---|---|---|---|
| | HART | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Promass I 100 | BA01190D | BA01251D | BA01058D | BA01066D | BA01429D |

### Description of device parameters

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

Supplementary device-dependent documentation

### Safety Instructions

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

### Special Documentation

| Content | Documentation code |
|---|---|
| Information on the Pressure Equipment Directive | SD00142D |
| Modbus RS485 Register Information | SD00154D |
| Concentration Measurement | SD01152D |
| Viscosity Measurement | SD01151D |
| Heartbeat Technology | SD01153D |

### Installation Instructions

| Contents | Documentation code |
|---|---|
| Installation Instructions for spare part sets | Specified for each individual accessory |

# Registered trademarks

HART®
Registered trademark of the HART Communication Foundation, Austin, USA

PROFIBUS®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

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

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

**PROFINET®**
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

**Microsoft®**
Registered trademark of the Microsoft Corporation, Redmond, Washington, USA

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

**Applicator®, FieldCare®, DeviceCare ®, Field Xpert™, HistoROM®, TMB®, Heartbeat Technology™**
Registered or registration-pending trademarks of the Endress+Hauser Group

www.addresses.endress.com

Endress+Hauser [EH]

People for Process Automation