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# Technical Information
# **Proline Promass Q 500**

Coriolis flowmeter


## Innovative specialist for challenging applications, as remote version with up to 4 I/Os

### Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Highest measurement performance for custody transfer, density and under tough process conditions

*Device properties*

- Mass/volume flow: measurement error ±0.05 %
- Density: measurement error ±0.1 kg/m$^3$
- High turndown due to low pressure loss/zero point
- Remote version with up to 4 I/Os
- Backlit display with touch control and WLAN access
- Standard cable between sensor and transmitter

### Your benefits

- Secured measuring quality – unmatched accuracy of mass flow, volume flow and density
- Optimized performance for liquids with entrained gas – MFT (Multi-Frequency Technology)
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in-/outlet run needs
- Full access to process and diagnostic information – numerous, freely combinable I/Os and Ethernet
- Reduced complexity and variety – freely configurable I/O functionality
- Integrated verification – Heartbeat Technology

Endress+Hauser
People for Process Automation

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# About this document

## Symbols

### Electrical symbols

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

### Communication-specific symbols

| Symbol | Meaning |
|---|---|
|  | **Wireless Local Area Network (WLAN)**<br>Communication via a wireless, local network. |

### Symbols for certain types of information

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

### Symbols in graphics

| Symbol | Meaning |
|---|---|
| 1, 2, 3, ... | Item numbers |
| 1., 2., 3., ... | Series of steps |
| A, B, C, ... | Views |
| A-A, B-B, C-C, ... | Sections |

| Symbol | Meaning |
|---|---|
|  | Hazardous area |
|  | Safe area (non-hazardous area) |
|  | Flow direction |

# Function and system design

## Measuring principle

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

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

$F_c$ = Coriolis force

$\Delta m$ = moving mass

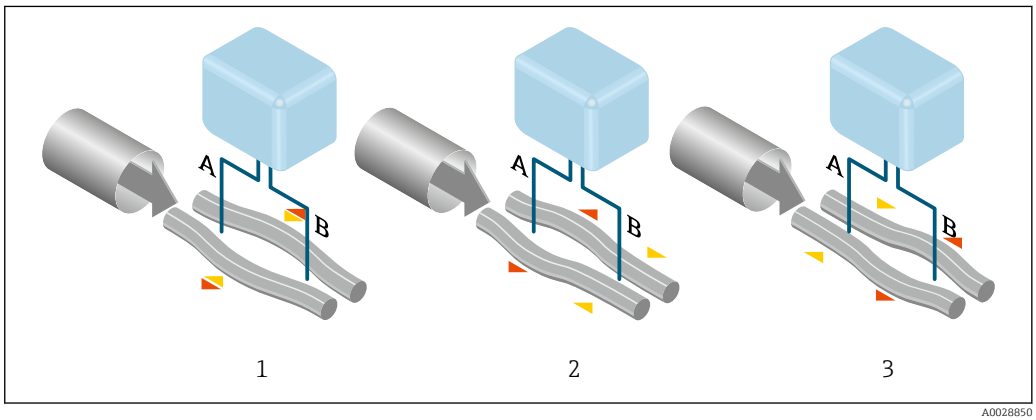
$\omega$ = rotational velocity

$v$ = radial velocity in rotating or oscillating system

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

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

- At zero flow (when the fluid is at a standstill) the two tubes oscillate in phase (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).

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

**Density measurement**

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

**Volume measurement**

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

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

**Multi-frequency technology (MFT)**
Highly accurate measurement of two-phase flow (gaseous medium with suspended bubbles or micro bubbles) using active compensation. Here, the two measuring tubes are excited simultaneously at different resonance frequencies. By analyzing the resonance characteristics of both oscillations in relation to the medium, measuring errors can be actively compensated.

**Gas Fraction Handler (GFH)**
The Gas Fraction Handler is a Promass software function that improves measurement stability and repeatability. The function continuously checks for the presence of disturbances in single-phase flow, i.e. gas bubbles in liquids or droplets in gas. In the presence of the second phase, flow and density become increasingly unstable. The Gas Fraction Handler function improves measurement stability with respect to the severity of the disturbances, without any effect under single-phase flow conditions.

The Gas Fraction Handler is only available in device versions with HART, Modbus RS485, PROFINET and PROFINET with Ethernet-APL.

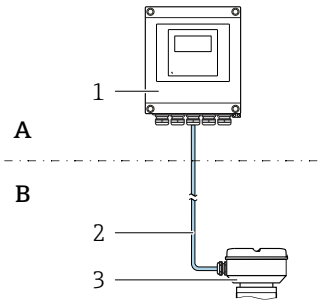
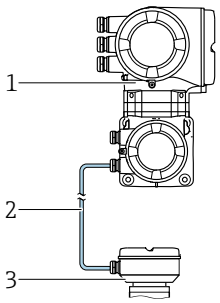
For detailed information on the Gas Fraction Handler, see the Special Documentation for "Gas Fraction Handler" → 🖹 130

## Measuring system

The measuring system consists of a transmitter and a sensor. The transmitter and sensor are mounted in physically separate locations. They are interconnected by connecting cables.

### Transmitter

Two versions of the transmitter are available.

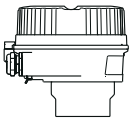
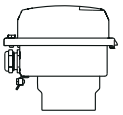
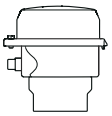
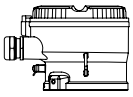
| Proline 500 – digital [1] | Proline 500 |
|---|---|
| For use in applications not required to meet special requirements due to ambient or operating conditions. | For use in applications required to meet special requirements due to ambient or operating conditions. |
|  |  |
| *A Non-hazardous area or Zone 2; Class I, Division 2*<br>*B Non-hazardous area or Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1*<br>*1 Transmitter*<br>*2 Connecting cable: cable, separate, standard*<br>*3 Sensor connection housing with integrated ISEM* | *Non-hazardous area or Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1*<br>*1 Transmitter with integrated ISEM*<br>*2 Connecting cable: cable, separate*<br>*3 Sensor connection housing* |
| ▪ Flexible and cost-effective separate installation.<br>▪ A standard cable can be used as the connecting cable. | Application examples for sensors without electronics:<br>Strong vibrations at the sensor. |
| ▪ Electronics in the transmitter housing, ISEM (intelligent sensor electronics module) in the sensor connection housing<br>▪ Signal transmission: digital<br>Order code for "Integrated ISEM electronics", option **A** "Sensor" | ▪ Electronics and ISEM (intelligent sensor electronics module) in the transmitter housing<br>▪ Signal transmission: analog<br>Order code for "Integrated ISEM electronics", option **B** "Transmitter" |
| **Connecting cable** (can be ordered in various lengths → 🖹 126 ) | |
| ▪ Length:<br>  ▪ Zone 2; Class I, Division 2: max. 300 m (1000 ft)<br>  ▪ Zone 1; Class I, Division 1: max. 150 m (500 ft)<br>▪ Standard cable with common shield (pair-stranded) | ▪ Length: max. 20 m (65 ft)<br>▪ Cable with a common shield and individual shielded cores (3 pairs)<br>▪ DN 150 to 250 (6 to 10 "): Two cables with common shield and individual shielded cores (3 pairs) |

| Proline 500 – digital [1] | Proline 500 |
|---|---|
| **Hazardous area** | |
| Use in: Zone 2; Class I, Division 2<br>Mixed installation is possible:<br>▪ Sensor: Zone 1; Class I, Division 1<br>▪ Transmitter: Zone 2; Class I, Division 2 | Use in: Zone 1; Class I, Division 1 or Zone 2; Class I, Division 2 |
| **Housing versions and materials** | |
| ▪ Transmitter housing<br>  ▪ Aluminum, coated: aluminum, AlSi10Mg, coated<br>  ▪ Material: polycarbonate<br>▪ Material of window in transmitter housing<br>  ▪ Aluminum, coated: glass<br>  ▪ Polycarbonate: plastic | ▪ Transmitter housing<br>  ▪ Aluminum, coated: aluminum, AlSi10Mg, coated<br>  ▪ Cast, stainless: cast, stainless steel, 1.4409 (CF3M) similar to 316L<br>▪ Window material: glass |
| **Configuration** | |
| ▪ External operation via 4-line, illuminated graphic local display (LCD) with touch control and guided menus ("Make-it-run" wizards) for application-specific commissioning.<br>▪ Via service interface or WLAN interface:<br>  ▪ Operating tools (e.g. FieldCare, DeviceCare)<br>  ▪ Web server (access via Web browser, e.g. Microsoft Internet Explorer, Microsoft Edge) | |

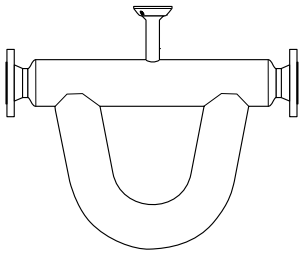
1) Not available for devices with DN 150, 200, 250 (6", 8", 10")

### Sensor connection housing

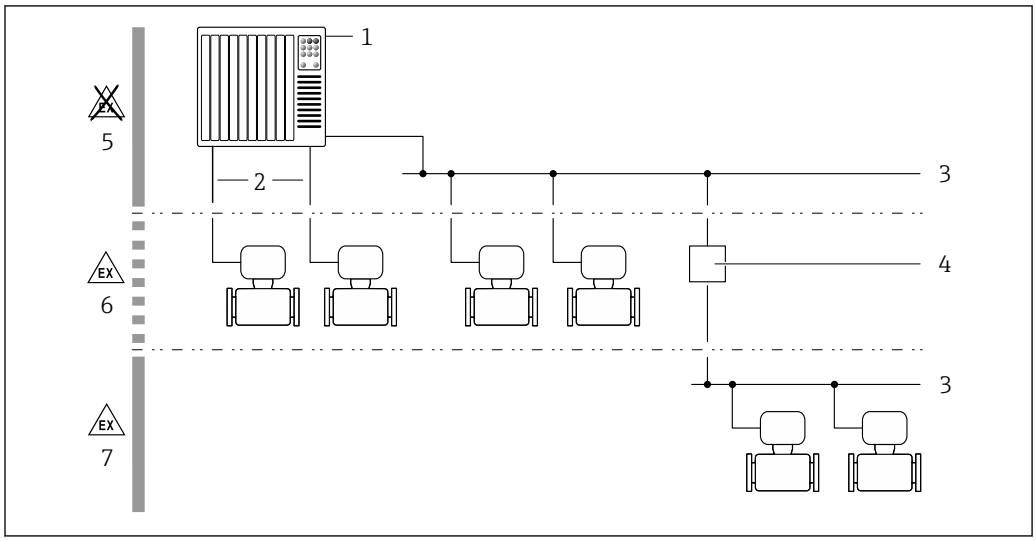
Different versions of the connection housing are available.

| | |
|---|---|
|  | Order code for "Sensor connection housing", option A, "Aluminum, coated": Aluminum, AlSi10Mg, coated<br>This device version is only available in conjunction with the Proline 500 – digital transmitter. |
|  | Order code for "Sensor connection housing", option B, "Stainless":<br>▪ Hygienic version, stainless steel 1.4301 (304)<br>▪ Optional: order code for "Sensor feature", option CC "Hygienic version, for maximum corrosion resistance": stainless steel 1.4404 (316L) |
|  | Order code for "Sensor connection housing", option C, "Ultra-compact hygienic, stainless":<br>Hygienic version, stainless steel 1.4301 (304)<br>This device version is only available in conjunction with the Proline 500 – digital transmitter. |
|  | Order code for "Sensor connection housing", option L, "Cast, stainless":<br>1.4409 (CF3M) similar to 316L |

### Sensor

| | |
|---|---|
| **Promass Q**<br>  <br>A0030075 | ▪ Nominal diameter range: DN 25 to 250 (1 to 10 ")<br>  ▪ Bent dual-tube system: DN 25 to 100 (1 to 4 ")<br>  ▪ Four-tube system: DN 150 to 250 (6 to 10 ")<br>▪ Excellent performance across a wide range of applications<br>▪ Simultaneous measurement of flow, volume flow, density and temperature (multivariable)<br>▪ Immune to process influences<br>▪ Materials:<br>  ▪ Sensor: stainless steel, 1.4404 (316L)<br>  ▪ Measuring tubes: stainless steel, 1.4404 (316/316L)<br>  ▪ Process connections: stainless steel, 1.4404 (316/316L) |

## Equipment architecture




*1 Possibilities for integrating measuring devices into a system*

1 *Control system (e.g. PLC)*
2 *Connecting cable (0/4 to 20 mA HART etc.)*
3 *Fieldbus*
4 *Coupler*
5 *Non-hazardous area*
6 *Hazardous area: Zone 2; Class I, Division 2*
7 *Hazardous area: Zone 1; Class I, Division 1*

## Reliability

### IT security

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

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

#### Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. The following list provides an overview of the most important functions:

| Function/interface | Factory setting | Recommendation |
|---|---|---|
| Write protection via hardware write protection switch → 🖹 9 | Not enabled | On an individual basis following risk assessment |
| Access code (also applies to web server login or FieldCare connection) → 🖹 9 | Not enabled (0000) | Assign a customized access code during commissioning |
| WLAN (order option in display module) | Enabled | On an individual basis following risk assessment |
| WLAN security mode | Enabled (WPA2-PSK) | Do not change |
| WLAN passphrase (Password) → 🖹 9 | Serial number | Assign an individual WLAN passphrase during commissioning |
| WLAN mode | Access point | On an individual basis following risk assessment |
| Web server → 🖹 9 | Enabled | On an individual basis following risk assessment |
| Service interface CDI-RJ45 → 🖹 10 | – | On an individual basis following risk assessment |

*Protecting access via hardware write protection*

Write access to the parameters of the device via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be disabled via a write protection switch (DIP switch on the main electronics module). When hardware write protection is enabled, only read access to the parameters is possible.

Hardware write protection is disabled when the device is delivered.

*Protecting access via a password*

Different passwords are available to protect write access to the device parameters or access to the device via the WLAN interface.

- User-specific access code
  Protect write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.
- WLAN passphrase
  The network key protects a connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface which can be ordered as an option.
- Infrastructure mode
  When the device is operated in infrastructure mode, the WLAN passphrase corresponds to the WLAN passphrase configured on the operator side.

*User-specific access code*

Write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code.

*WLAN passphrase: Operation as WLAN access point*

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface, which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter.

*Infrastructure mode*

A connection between the device and WLAN access point is protected by means of an SSID and passphrase on the system side. Please contact the relevant system administrator for access.

*General notes on the use of passwords*

- The access code and network key supplied with the device should be changed during commissioning for safety reasons.
- Follow the general rules for generating a secure password when defining and managing the access code and network key.
- The user is responsible for the management and careful handling of the access code and network key.

*Access via web server*

The device can be operated and configured via a web browser with the integrated web server. The connection is established via the service interface (CDI-RJ45) or the WLAN interface. For device versions with the EtherNet/IP and PROFINET communication protocols, the connection can also be established via the terminal connection for signal transmission with EtherNet/IP, PROFINET (RJ45 plug) or PROFINET with Ethernet-APL (two-wire).

The web server is enabled when the device is delivered. The web server can be disabled via the **Web server functionality** parameter if necessary (e.g., after commissioning).

The device and status information can be hidden on the login page. This prevents unauthorized access to the information.

Detailed information on the device parameters:
"Description of device parameters" document .

*Access via OPC-UA*

The "OPC UA Server" application package is available in the device version with the HART communication protocol → 125.

The device can communicate with OPC UA clients using the "OPC UA Server" application package.

The OPC UA server integrated in the device can be accessed via the WLAN access point using the WLAN interface - which can be ordered as an optional extra - or the service interface (CDI- RJ45) via Ethernet network. Access rights and authorization as per separate configuration.

The following Security Modes are supported as per the OPC UA Specification (IEC 62541):
- None
- Basic128Rsa15 – signed
- Basic128Rsa15 – signed and encrypted

*Access via service interface (CDI-RJ45)*

The device can be connected to a network via the service interface (CDI-RJ45). Device-specific functions guarantee the secure operation of the device in a network.

The use of relevant industrial standards and guidelines that have been defined by national and international safety committees, such as IEC/ISA62443 or the IEEE, is recommended. This includes organizational security measures such as the assignment of access authorization as well as technical measures such as network segmentation.

Transmitters with an Ex de approval may not be connected via the service interface (CDI-RJ45)!

Order code for "Approval transmitter + sensor", options (Ex de): BA, BB, C1, C2, GA, GB, MA, MB, NA, NB BB, C2, GB, MB, NB

The device can be integrated into a ring topology. The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45) → 111.

# Input

## Measured variable

### Direct measured variables

- Mass flow
- Density
- Temperature

### Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

## Measuring range

### Measuring range for liquids

| DN Measuring instrument | | DN Compatible pipe diameter | | Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$ | |
|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [in] | [kg/h] | [lb/min] |
| 25 | 1 | 25/40 | 1/1½ | 0 to 20 000 | 0 to 735 |
| 50 | 2 | 50/80 | 2/3 | 0 to 80 000 | 0 to 2 940 |
| 80 | 3 | 80/100 | 3/4 | 0 to 200 000 | 0 to 7 350 |
| 100 | 4 | 100/150 | 4/6 | 0 to 550 000 | 0 to 20 210 |
| 150 | 6 | 150/200 | 6/8 | 0 to 850 000 | 0 to 31 240 |
| 200 | 8 | 200/250 | 8/10 | 0 to 1 500 000 | 0 to 55 130 |
| 250 | 10 | 250/300 | 10/12 | 0 to 2 400 000 | 0 to 88 200 |

### Measuring range for gases

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

$\dot{m}_{max(G)} = (\rho_G \cdot (c_G/m) \cdot d_i^2 \cdot (\pi/4) \cdot 3600 \cdot n)$

| | |
|---|---|
| $\dot{m}_{max(G)}$ | Maximum full scale value for gas [kg/h] |
| $\rho_G$ | Gas density in [kg/m³] at operating conditions |
| $c_G$ | Sound velocity (gas) [m/s] |
| $d_i$ | Measuring tube internal diameter [m] |
| $\pi$ | Pi |
| **n = 2** | Number of measuring tubes for DN 25 to 100 (1 to 4 ") |
| **n = 4** | Number of measuring tubes for DN 150 to 250 (6 to 10 ") |
| **m = 2** | For all gases except pure H2 and He gas |
| **m = 3** | For pure H2 and He gas |

To calculate the measuring range, use the *Applicator* sizing tool → 128

### Recommended measuring range

Flow limit → 74

## Operable flow range

Over 1000 : 1.

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

## Input signal

### Output and input variants

→ 🖹 13

### External measured values

Various pressure and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 🖹 128

It is recommended to read in external measured values to calculate the 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

*Current input*

The measured values are written from the automation system to the measuring device via the current input → 🖹 12.

*Digital communication*

The measured values can be written by the automation system via:
- FOUNDATION Fieldbus
- PROFIBUS DP
- PROFIBUS PA
- Modbus RS485
- Modbus TCP over Ethernet-APL
- Ethernet/IP
- PROFINET
- PROFINET over Ethernet-APL

### Current input 0/4 to 20 mA

| | |
|---|---|
| **Current input** | 0/4 to 20 mA (active/passive) |
| **Current span** | ▪ 4 to 20 mA (active)<br>▪ 0/4 to 20 mA (passive) |
| **Resolution** | 1 µA |
| **Voltage drop** | Typically: 0.6 to 2 V for 3.6 to 22 mA (passive) |
| **Maximum input voltage** | ≤ 30 V (passive) |
| **Open-circuit voltage** | ≤ 28.8 V (active) |
| **Possible input variables** | ▪ Pressure<br>▪ Temperature<br>▪ Density |

### Status input

| | |
|---|---|
| **Maximum input values** | ▪ DC −3 to 30 V<br>▪ If status input is active (ON): $R_i$ >3 kΩ |
| **Response time** | Configurable: 5 to 200 ms |
| **Input signal level** | ▪ Low signal: DC −3 to +5 V<br>▪ High signal: DC 12 to 30 V |
| **Assignable functions** | ▪ Off<br>▪ Reset the individual totalizers separately<br>▪ Reset all totalizers<br>▪ Flow override |

# Output

**Output and input variants**

Depending on the option selected for output/input 1, different options are available for the other outputs and inputs. Only one option can be selected for each output/input 1 to 4. The following tables must be read vertically (↓).

Example: If the option BA "4–20 mA HART" was selected for output/input 1, one of the options A, B, D, E, F, H, I or J is available for output 2 and one of the options A, B, D, E, F, H, I or J is available for output 3 and 4.

### Output/input 1 and options for output/input 2

Options for output/input 3 and 4 → 14

| Order code for "Output; input 1" (020) → | Possible options | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current output 4 to 20 mA HART | **BA** | | | | | | | | | | | | |
| Current output 4 to 20 mA HART Ex i passive | ↓ | **CA** | | | | | | | | | | | |
| Current output 4 to 20 mA HART Ex i active | | ↓ | **CC** | | | | | | | | | | |
| FOUNDATION Fieldbus | | | ↓ | **SA** | | | | | | | | | |
| FOUNDATION Fieldbus Ex i | | | | ↓ | **TA** | | | | | | | | |
| PROFIBUS DP | | | | | ↓ | **LA** | | | | | | | |
| PROFIBUS PA | | | | | | ↓ | **GA** | | | | | | |
| PROFIBUS PA Ex i | | | | | | | ↓ | **HA** | | | | | |
| Modbus RS485 | | | | | | | | ↓ | **MA** | | | | |
| EtherNet/IP 2-port switch integrated | | | | | | | | | ↓ | **NA** | | | |
| PROFINET 2-port switch integrated | | | | | | | | | | ↓ | **RA** | | |
| PROFINET over Ethernet-APL | | | | | | | | | | | ↓ | **RB** | |
| PROFINET over Ethernet-APL Ex i | | | | | | | | | | | | ↓ | **RC** |
| **Order code for "Output; input 2" (021) →** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Not used | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** |
| Current output 4 to 20 mA | **B** | | | **B** | | **B** | **B** | | **B** | **B** | **B** | **B** | |
| Current output 4 to 20 mA Ex i passive | | **C** | **C** | | **C** | | | **C** | | | | | **C** |
| User-configurable input/output [1] | **D** | | | **D** | | **D** | **D** | | **D** | **D** | **D** | **D** | |
| Pulse/frequency/switch output | **E** | | | **E** | | **E** | **E** | | **E** | **E** | **E** | **E** | |
| Double pulse output [2] | **F** | | | | | | | | **F** | | | | |
| Pulse/frequency/switch output Ex i passive | | **G** | **G** | | **G** | | | **G** | | | | | **G** |
| Relay output | **H** | | | **H** | | **H** | **H** | | **H** | **H** | **H** | **H** | |
| Current input 0/4 to 20 mA | **I** | | | **I** | | **I** | **I** | | **I** | **I** | **I** | **I** | |
| Status input | **J** | | | **J** | | **J** | **J** | | **J** | **J** | **J** | **J** | |

1) A specific input or output can be assigned → 21 to a user-configurable input/output.
2) If double pulse output (F) is selected for output/input 2 (021), only the double pulse output (F) option is available for selection for output/input 3 (022).

### Output/input 1 and options for output/input 3 and 4

Options for output/input 2 → 13

| Order code for "Output; input 1" (020) → | Possible options | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current output 4 to 20 mA HART | **BA** | | | | | | | | | | | | |
| Current output 4 to 20 mA HART Ex i passive | ↓ | **CA** | | | | | | | | | | | |
| Current output 4 to 20 mA HART Ex i active | | ↓ | **CC** | | | | | | | | | | |
| FOUNDATION Fieldbus | | | ↓ | **SA** | | | | | | | | | |
| FOUNDATION Fieldbus Ex i | | | | ↓ | **TA** | | | | | | | | |
| PROFIBUS DP | | | | | ↓ | **LA** | | | | | | | |
| PROFIBUS PA | | | | | | ↓ | **GA** | | | | | | |
| PROFIBUS PA Ex i | | | | | | | ↓ | **HA** | | | | | |
| Modbus RS485 | | | | | | | | ↓ | **MA** | | | | |
| EtherNet/IP 2-port switch integrated | | | | | | | | | ↓ | **NA** | | | |
| PROFINET 2-port switch integrated | | | | | | | | | | ↓ | **RA** | | |
| PROFINET over Ethernet-APL/SPE, 10 Mbit/s, 2-wire | | | | | | | | | | | ↓ | **RB** | |
| PROFINET over Ethernet-APL Ex i, 10 Mbit/s, 2-wire | | | | | | | | | | | | ↓ | **RC** |
| **Order code for "Output; input 3" (022), "Output; input 4" (023)** [1] → | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Not used | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** | **A** |
| Current output 4 to 20 mA | **B** | | | | | **B** | | | **B** | **B** | **B** | **B** | |
| Current output 4 to 20 mA Ex i passive [2] | | **C** | **C** | | | | | | | | | | |
| User-configurable input/output | **D** | | | | | **D** | | | **D** | **D** | **D** | **D** | |
| Pulse/frequency/switch output | **E** | | | | | **E** | | | **E** | **E** | **E** | **E** | |
| Double pulse output (slave) [3] | **F** | | | | | | | | **F** | | | | |
| Pulse/frequency/switch output Ex i passive [4] | | **G** | **G** | | | | | | | | | | |
| Relay output | **H** | | | | | **H** | | | **H** | **H** | **H** | **H** | |
| Current input 0/4 to 20 mA | **I** | | | | | **I** | | | **I** | **I** | **I** | **I** | |
| Status input | **J** | | | | | **J** | | | **J** | **J** | **J** | **J** | |

1) The order code for "Output; input 4" (023) is only available for the Proline 500-digital transmitter, order code for "Integrated ISEM electronics", option A.
2) The current output 4 to 20 mA Ex i passive (C) option is not available for input/output 4.
3) The double pulse output (F) option is not available for input/output 4.
4) The pulse/frequency/switch output Ex i passive (G) option is not available for input/output 4.

## Output signal

### Current output 4 to 20 mA HART

| | |
|---|---|
| **Order code** | "Output; input 1" (20):<br>Option BA: current output 4 to 20 mA HART |
| **Signal mode** | Can be set to:<br>▪ Active<br>▪ Passive |
| **Current range** | Can be set to:<br>▪ 4 to 20 mA NAMUR<br>▪ 4 to 20 mA US<br>▪ 4 to 20 mA<br>▪ 0 to 20 mA (only if the signal mode is active)<br>▪ Fixed current |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Maximum input voltage** | DC 30 V (passive) |
| **Load** | 250 to 700 Ω |
| **Resolution** | 0.38 µA |
| **Damping** | Configurable: 0 to 999.9 s |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation damping 0<br>▪ Signal asymmetry<br>▪ Exciter current 0<br>The range of options increases if the measuring device has one or more application packages. |

### Current output 4 to 20 mA HART Ex i

| | |
|---|---|
| **Order code** | "Output; input 1" (20) choose from:<br>▪ Option CA: current output 4 to 20 mA HART Ex i passive<br>▪ Option CC: current output 4 to 20 mA HART Ex i active |
| **Signal mode** | Depends on the selected order version. |
| **Current range** | Can be set to:<br>▪ 4 to 20 mA NAMUR<br>▪ 4 to 20 mA US<br>▪ 4 to 20 mA<br>▪ 0 to 20 mA (only if the signal mode is active)<br>▪ Fixed current |
| **Open-circuit voltage** | DC 21.8 V (active) |
| **Maximum input voltage** | DC 30 V (passive) |
| **Load** | ▪ 250 to 400 Ω (active)<br>▪ 250 to 700 Ω (passive) |
| **Resolution** | 0.38 µA |

| | |
|---|---|
| **Damping** | Configurable: 0 to 999.9 s |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation damping 0<br>▪ Signal asymmetry<br>▪ Exciter current 0<br>The range of options increases if the measuring device has one or more application packages. |

### FOUNDATION Fieldbus

| | |
|---|---|
| **FOUNDATION Fieldbus** | H1, IEC 61158-2, galvanically isolated |
| **Data transfer** | 31.25 kbit/s |
| **Current consumption** | 10 mA |
| **Permitted supply voltage** | 9 to 32 V |
| **Bus connection** | With integrated reverse polarity protection |

### PROFIBUS DP

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

### PROFIBUS PA

| | |
|---|---|
| **PROFIBUS PA** | In accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated |
| **Data transmission** | 31.25 kbit/s |
| **Current consumption** | 10 mA |
| **Permitted supply voltage** | 9 to 32 V |
| **Bus connection** | With integrated reverse polarity protection |

### Modbus RS485

| | |
|---|---|
| **Physical interface** | RS485 in accordance with EIA/TIA-485 standard |
| **Terminating resistor** | Integrated, can be activated via DIP switches |

### EtherNet/IP

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

### PROFINET

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

### PROFINET with Ethernet-APL

| | |
|---|---|
| **Device use** | **Device connection to an APL field switch**<br>The device may only be operated according to the following APL port classifications:<br>▪ If used in hazardous areas: SLAA or SLAC [1)]<br>▪ If used in non-hazardous areas: SLAX<br>Connection values of APL field switch (corresponds to APL port classification SPCC or SPAA, for instance):<br>▪ Maximum input voltage: 15 $V_{DC}$<br>▪ Minimum output values: 0.54 W<br>**Device connection to an SPE switch**<br>▪ In non-hazardous areas, the device can be used with an appropriate SPE switch: The device can be connected to an SPE switch with a maximum voltage of 30 $V_{DC}$ and a minimum output power of 1.85 W connected.<br>▪ The SPE switch must support the 10BASE-T1L standard and PoDL power classes 10, 11 or 12 and have a function to disable power class detection. |
| **PROFINET** | According to IEC 61158 and IEC 61784 |
| **Ethernet-APL** | According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated |
| **Data transmission** | 10 Mbit/s |
| **Current consumption** | **Transmitter**<br>▪ Max. 400 mA(24 V)<br>▪ Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz) |
| **Permitted supply voltage** | 9 to 30 V |
| **Network connection** | With integrated reverse polarity protection |

1) For more information on using the device in the hazardous area, see the Ex-specific Safety Instructions

### Current output 4 to 20 mA

| | |
|---|---|
| **Order code** | "Output; input 2" (21), "Output; input 3" (022) or "Output; input 4" (023):<br>Option B: current output 4 to 20 mA |
| **Signal mode** | Can be set to:<br>▪ Active<br>▪ Passive |
| **Current range** | Can be set to:<br>▪ 4 to 20 mA NAMUR<br>▪ 4 to 20 mA US<br>▪ 4 to 20 mA<br>▪ 0 to 20 mA (only if the signal mode is active)<br>▪ Fixed current |
| **Maximum output values** | 22.5 mA |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Maximum input voltage** | DC 30 V (passive) |
| **Load** | 0 to 700 Ω |
| **Resolution** | 0.38 µA |

| | |
|---|---|
| **Damping** | Configurable: 0 to 999.9 s |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation damping 0<br>▪ Signal asymmetry<br>▪ Exciter current 0<br>The range of options increases if the measuring device has one or more application packages. |

### Current output 4 to 20 mA Ex i passive

| | |
|---|---|
| **Order code** | "Output; input 2" (21), "Output; input 3" (022):<br>Option C: current output 4 to 20 mA Ex i passive |
| **Signal mode** | Passive |
| **Current range** | Can be set to:<br>▪ 4 to 20 mA NAMUR<br>▪ 4 to 20 mA US<br>▪ 4 to 20 mA<br>▪ Fixed current |
| **Maximum output values** | 22.5 mA |
| **Maximum input voltage** | DC 30 V |
| **Load** | 0 to 700 Ω |
| **Resolution** | 0.38 µA |
| **Damping** | Configurable: 0 to 999 s |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation damping 0<br>▪ Signal asymmetry<br>▪ Exciter current 0<br>The range of options increases if the measuring device has one or more application packages. |

### Pulse/frequency/switch output

| | |
|---|---|
| **Function** | Can be configured as pulse, frequency or switch output |
| **Version** | Open collector<br>Can be set to:<br>▪ Active<br>▪ Passive<br>▪ Passive NAMUR<br>Ex-i, passive |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Voltage drop** | For 22.5 mA: ≤ DC 2 V |

| | |
|---|---|
| **Pulse output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Maximum output current** | 22.5 mA (active) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Pulse width** | Configurable: 0.05 to 2 000 ms |
| **Maximum pulse rate** | 10 000 Impulse/s |
| **Pulse value** | Configurable |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>The range of options increases if the measuring device has one or more application packages. |
| **Frequency output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Maximum output current** | 22.5 mA (active) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Output frequency** | Configurable: end value frequency 2 to 10 000 Hz($f_{max}$ = 12 500 Hz) |
| **Damping** | Configurable: 0 to 999.9 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>▪ Electronics temperature<br>▪ Oscillation frequency 0<br>▪ Oscillation damping 0<br>▪ Signal asymmetry<br>▪ Exciter current 0<br>The range of options increases if the measuring device has one or more application packages. |
| **Switch output** | |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Switching behavior** | Binary, conductive or non-conductive |
| **Switching delay** | Configurable: 0 to 100 s |

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

### Double pulse output

| | |
|---|---|
| **Function** | Double pulse |
| **Version** | Open collector<br>Can be set to:<br>▪ Active<br>▪ Passive<br>▪ Passive NAMUR |
| **Maximum input values** | DC 30 V, 250 mA (passive) |
| **Open-circuit voltage** | DC 28.8 V (active) |
| **Voltage drop** | For 22.5 mA: ≤ DC 2 V |
| **Output frequency** | Configurable: 0 to 1000 Hz |
| **Damping** | Configurable: 0 to 999 s |
| **Pulse/pause ratio** | 1:1 |
| **Assignable measured variables** | ▪ Mass flow<br>▪ Volume flow<br>▪ Corrected volume flow<br>▪ Density<br>▪ Reference density<br>▪ Temperature<br>The range of options increases if the measuring device has one or more application packages. |

### Relay output

| | |
|---|---|
| **Function** | Switch output |
| **Version** | Relay output, galvanically isolated |
| **Switching behavior** | Can be set to:<br>▪ NO (normally open), factory setting<br>▪ NC (normally closed) |

| | |
|---|---|
| **Maximum switching capacity (passive)** | ▪ DC 30 V, 0.1 A<br>▪ AC 30 V, 0.5 A |
| **Assignable functions** | ▪ Disable<br>▪ On<br>▪ Diagnostic behavior<br>▪ Limit<br>  ▪ Mass flow<br>  ▪ Volume flow<br>  ▪ Corrected volume flow<br>  ▪ Density<br>  ▪ Reference density<br>  ▪ Temperature<br>  ▪ Totalizer 1-3<br>▪ Flow direction monitoring<br>▪ Status<br>  ▪ Partially filled pipe detection<br>  ▪ Low flow cut off<br>The range of options increases if the measuring device has one or more application packages. |

#### User-configurable input/output

**One** specific input or output is assigned to a user-configurable input/output (configurable I/O) during device commissioning.

The following inputs and outputs are available for assignment:
- Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Pulse/frequency/switch output
- Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Status input

The technical values correspond to those of the inputs and outputs described in this section.

## Signal on alarm

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

#### HART current output

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

#### PROFIBUS PA

| | |
|---|---|
| **Status and alarm messages** | Diagnostics in accordance with PROFIBUS PA Profile 3.02 |
| **Failure current FDE (Fault Disconnection Electronic)** | 0 mA |

#### PROFIBUS DP

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

#### EtherNet/IP

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

#### PROFINET

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

### PROFINET with Ethernet-APL

| | |
|---|---|
| **Device diagnostics** | Diagnostics according to PROFINET PA Profile 4 |

### FOUNDATION Fieldbus

| | |
|---|---|
| **Status and alarm messages** | Diagnostics in accordance with FF-891 |
| **Failure current FDE (Fault Disconnection Electronic)** | 0 mA |

### Modbus RS485

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

### Modbus TCP-APL

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

### Current output 0/4 to 20 mA

*4 to 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>▪ Definable value between: 3.59 to 22.5 mA<br>▪ Actual value<br>▪ Last valid value |

*0 to 20 mA*

| | |
|---|---|
| **Failure mode** | Choose from:<br>▪ Maximum alarm: 22 mA<br>▪ Definable value between: 0 to 20.5 mA |

### Pulse/frequency/switch output

| | |
|---|---|
| **Pulse output** | |
| **Fault mode** | Choose from:<br>▪ Actual value<br>▪ No pulses |
| **Frequency output** | |
| **Fault mode** | Choose from:<br>▪ Actual value<br>▪ 0 Hz<br>▪ Definable value between: 2 to 12 500 Hz |

| Switch output | |
|---|---|
| **Fault mode** | Choose from:<br>▪ Current status<br>▪ Open<br>▪ Closed |

### Relay output

| | |
|---|---|
| **Failure mode** | Choose from:<br>▪ Current status<br>▪ Open<br>▪ Closed |

### Local display

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

Status signal as per NAMUR recommendation NE 107

### Interface/protocol

- Via digital communication:
  - HART protocol
  - FOUNDATION Fieldbus
  - PROFIBUS PA
  - PROFIBUS DP
  - Modbus RS485
  - Modbus TCP with Ethernet-APL
  - EtherNet/IP
  - PROFINET
  - PROFINET with Ethernet-APL
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

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

Additional information on remote operation → 📄 105

### 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<br>The following information is displayed depending on the device version:<br>▪ Supply voltage active<br>▪ Data transmission active<br>▪ Device alarm/error has occurred<br>▪ EtherNet/IP network available<br>▪ EtherNet/IP connection established<br>▪ PROFINET network available<br>▪ PROFINET connection established<br>▪ PROFINET blinking feature |

**Load**

Output signal → 15

**Ex connection data**

**Safety-related values**

| Order code "Output; input 1" | Output type | Safety-related values "Output; input 1" | |
|---|---|---|---|
| | | 26 (+) | 27 (–) |
| Option **BA** | Current output 4 to 20 mA HART | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **GA** | PROFIBUS PA | $U_N$ = 32 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **LA** | PROFIBUS DP | $U_N$ = 32 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **MA** | Modbus RS485 | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **MB** | Modbus TCP with Ethernet-APL | APL port profile SLAX<br>SPE PoDL classes 10, 11, 12<br>$U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **SA** | FOUNDATION Fieldbus | $U_N$ = 32 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **NA** | EtherNet/IP | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **RA** | PROFINET | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **RB** | PROFINET with Ethernet-APL | APL port profile SLAX<br>SPE PoDL classes 10, 11, 12<br>$U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |

| Order code "Output; input 2"; "Output; input 3" "Output; input 4" | Output type | Safety-related values | | | | | |
|---|---|---|---|---|---|---|---|
| | | Output; input 2 | | Output; input 3 | | Output; input 4 [1] | |
| | | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| Option **B** | Current output 4 to 20 mA | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |
| Option **D** | User-configurable input/ output | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |
| Option **E** | Pulse/frequency/switch output | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |
| Option **F** | Double pulse output | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |
| Option **H** | Relay output | $U_N$ = 30 $V_{DC}$<br>$I_N$ =100 $mA_{DC}$/500 $mA_{AC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |
| Option **I** | Current input 4 to 20 mA | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |
| Option **J** | Status input | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | | | | | |

1) The order code "Output; input 4" is only available for the Proline 500 – digital transmitter.

**Intrinsically safe values**

| Order code "Output; input 1" | Output type | Intrinsically safe values "Output; input 1" | |
|---|---|---|---|
| | | 26 (+) | 27 (–) |
| Option **CA** | Current output<br>4 to 20 mA HART Ex i passive | $U_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1.25 W<br>$L_i$ = 0 µH<br>$C_i$ = 6 nF | |
| Option **CC** | Current output<br>4 to 20 mA HART Ex i active | **Ex ia** [1]<br>$U_0$ = 21.8 V<br>$I_0$ = 90 mA<br>$P_0$ = 491 mW<br>$L_0$ = 4.1 mH (IIC)/15 mH (IIB)<br>$C_0$ = 160 nF (IIC)/ 1 160 nF (IIB)<br><br>$U_i$ = 30 V<br>$I_i$ = 10 mA<br>$P_i$ = 0.3 W<br>$L_i$ = 5 µH<br>$C_i$ = 6 nF | **Ex ic** [2]<br>$U_0$ = 21.8 V<br>$I_0$ = 90 mA<br>$P_0$ = 491 mW<br>$L_0$ = 9 mH (IIC)/39 mH (IIB)<br>$C_0$ = 600 nF (IIC)/ 4 000 nF (IIB) |
| Option **HA** | PROFIBUS PA Ex i (FISCO Field Device) | **Ex ia** [1]<br>$U_i$ = 30 V<br>$I_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF | **Ex ic** [2]<br>$U_i$ = 32 V<br>$I_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF |
| Option **TA** | FOUNDATION Fieldbus Ex i | **Ex ia** [1]<br>$U_i$ = 30 V<br>$I_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF | **Ex ic** [2]<br>$U_i$ = 32 V<br>$I_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF |
| Option **RC** | PROFINET with Ethernet-APL Ex i | **Ex ia** [1]<br>2-WISE power load APL port profile SLAA | **Ex ic** [2]<br>2-WISE power load APL port profile SLAC |

1) Only available for Proline 500 transmitter Zone 1; Class I, Division 1.
2) Only available for transmitter Zone 2; Class I, Division 2 and only for Proline 500 – digital transmitter

| Order code "Output; input 2"; "Output; input 3"; "Output; input 4" | Output type | Intrinsically safe values or NIFW values | | | | | |
|---|---|---|---|---|---|---|---|
| | | Output; input 2 | | Output; input 3 | | Output; input 4 [1] | |
| | | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| Option C | Current output<br>4 to 20 mA Ex i passive | $U_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1.25 W<br>$L_i$ = 0<br>$C_i$ = 0 | | | | | |
| Option G | Pulse/frequency/switch output Ex-i passive | $U_i$ = 30 V<br>$I_i$ = 100 mA<br>$P_i$ = 1.25 W<br>$L_i$ = 0<br>$C_i$ = 0 | | | | | |

1) The order code "Output; input 4" is only available for the Proline 500 – digital transmitter.

**Low flow cut off**

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

**Galvanic isolation**

The outputs are galvanically isolated:
- from the power supply
- from one another
- from the potential equalization (PE) terminal

**Protocol-specific data**

HART

| | |
|---|---|
| **Manufacturer ID** | 0x11 |
| **Device type ID** | 0x3B |
| **HART protocol revision** | 7 |
| **Device description files (DTM, DD)** | Information and files under:<br>www.endress.com |
| **HART load** | Min. 250 Ω |
| **System integration** | Information on system integration: Operating Instructions → 🖹 129.<br>▪ Measured variables via HART protocol<br>▪ Burst Mode functionality |

FOUNDATION Fieldbus

| | |
|---|---|
| **Manufacturer ID** | 0x452B48 (hex) |
| **Ident number** | 0x103B (hex) |
| **Device revision** | 1 |
| **DD revision** | Information and files under:<br>▪ www.endress.com<br>▪ www.fieldcommgroup.org |
| **CFF revision** | |
| **Interoperability Test Kit (ITK)** | Version 6.2.0 |
| **ITK Test Campaign Number** | Information:<br>▪ www.endress.com<br>▪ www.fieldcommgroup.org |
| **Link Master capability (LAS)** | Yes |
| **Choice of "Link Master" and "Basic Device"** | Yes<br>Factory setting: Basic Device |
| **Node address** | Factory setting: 247 (0xF7) |
| **Supported functions** | The following methods are supported:<br>▪ Restart<br>▪ ENP Restart<br>▪ Diagnostic<br>▪ Set to OOS<br>▪ Set to AUTO<br>▪ Read trend data<br>▪ Read event logbook |
| **Virtual Communication Relationships (VCRs)** | |
| **Number of VCRs** | 44 |
| **Number of link objects in VFD** | 50 |
| **Permanent entries** | 1 |
| **Client VCRs** | 0 |
| **Server VCRs** | 10 |
| **Source VCRs** | 43 |
| **Sink VCRs** | 0 |
| **Subscriber VCRs** | 43 |
| **Publisher VCRs** | 43 |

| Device Link Capabilities | |
|---|---|
| **Slot time** | 4 |
| **Min. delay between PDU** | 8 |
| **Max. response delay** | 16 |
| **System integration** | Information regarding system integration: Operating Instructions → 129.<br>▪ Cyclic data transmission<br>▪ Description of the modules<br>▪ Execution times<br>▪ Methods |

### PROFIBUS DP

| | |
|---|---|
| **Manufacturer ID** | 0x11 |
| **Ident number** | 0x156F |
| **Profile version** | 3.02 |
| **Device description files (GSD, DTM, DD)** | Information and files under:<br>▪ https://www.endress.com/download<br>On the device product page: PRODUCTS → Product Finder → Links<br>▪ https://www.profibus.com |
| **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) |
| **Compatibility with earlier model** | If the device is replaced, the measuring device Promass 500 supports the compatibility of the cyclic data with previous models. It is not necessary to adjust the engineering parameters of the PROFIBUS network with the Promass 500 GSD file.<br>Previous model:<br>Promass 83 PROFIBUS DP<br>▪ ID No.: 1529 (hex)<br>▪ Extended GSD file: EH3x1529.gsd<br>▪ Standard GSD file: EH3_1529.gsd<br>Description of the function scope of compatibility: Operating Instructions → 129. |
| **System integration** | Information regarding system integration: Operating Instructions → 129.<br>▪ Cyclic data transmission<br>▪ Block model<br>▪ Description of the modules |

### PROFIBUS PA

| | |
|---|---|
| **Manufacturer ID** | 0x11 |
| **Ident number** | 0x156D |
| **Profile version** | 3.02 |
| **Device description files (GSD, DTM, DD)** | Information and files under:<br>▪ https://www.endress.com/download<br>On the device product page: PRODUCTS → Product Finder → Links<br>▪ https://www.profibus.com |

| | |
|---|---|
| **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>▪ Local display<br>▪ Via operating tools (e.g. FieldCare) |
| **Compatibility with earlier model** | If the device is replaced, the measuring device Promass 500 supports the compatibility of the cyclic data with previous models. It is not necessary to adjust the engineering parameters of the PROFIBUS network with the Promass 500 GSD file.<br>Earlier models:<br>▪ Promass 80 PROFIBUS PA<br>▪ ID No.: 1528 (hex)<br>▪ Extended GSD file: EH3x1528.gsd<br>▪ Standard GSD file: EH3_1528.gsd<br>▪ Promass 83 PROFIBUS PA<br>▪ ID No.: 152A (hex)<br>▪ Extended GSD file: EH3x152A.gsd<br>▪ Standard GSD file: EH3_152A.gsd<br>Description of the function scope of compatibility: Operating Instructions → 129. |
| **System integration** | Information regarding system integration: Operating Instructions → 129.<br>▪ Cyclic data transmission<br>▪ Block model<br>▪ Description of the modules |

### Modbus RS485

| | |
|---|---|
| **Protocol** | Modbus Applications Protocol Specification V1.1 |
| **Response times** | ▪ Direct data access: typically 25 to 50 ms<br>▪ Auto-scan buffer (data range): typically 3 to 5 ms |
| **Device type** | Slave |
| **Slave address range** | 1 to 247 |
| **Broadcast address range** | 0 |
| **Function codes** | ▪ 03: Read holding register<br>▪ 04: Read input register<br>▪ 06: Write single registers<br>▪ 08: Diagnostics<br>▪ 16: Write multiple registers<br>▪ 23: Read/write multiple registers |
| **Broadcast messages** | Supported by the following function codes:<br>▪ 06: Write single registers<br>▪ 16: Write multiple registers<br>▪ 23: Read/write multiple registers |
| **Supported baud rate** | ▪ 1200 BAUD<br>▪ 2400 BAUD<br>▪ 4800 BAUD<br>▪ 9600 BAUD<br>▪ 19200 BAUD<br>▪ 38400 BAUD<br>▪ 57600 BAUD<br>▪ 115200 BAUD |
| **Data transmission mode** | ▪ ASCII<br>▪ RTU |

| | |
|---|---|
| **Data access** | Each device parameter can be accessed via Modbus RS485.<br>For Modbus register information |
| **Compatibility with earlier model** | If the device is replaced, the measuring device Promass 500 supports the compatibility of the Modbus registers for the process variables and the diagnostic information with the previous model Promass 83. It is not necessary to change the engineering parameters in the automation system.<br>Description of the function scope of compatibility: Operating Instructions → 129. |
| **System integration** | Information regarding system integration: Operating Instructions → 129.<br>▪ Modbus RS485 information<br>▪ Function codes<br>▪ Register information<br>▪ Response time<br>▪ Modbus data map |

### 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** | 0x000049E |
| **Device type ID** | 0x103B |
| **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)** | Yes |
| **System integration** | Information regarding system integration: Operating Instructions → 129.<br>▪ Cyclic data transmission<br>▪ Block model<br>▪ Input and output groups |

### PROFINET

| | |
|---|---|
| **Protocol** | Application layer protocol for decentral device periphery and distributed automation, Version 2.3 |
| **Communication type** | 100 MBit/s |

| | |
|---|---|
| **Conformance Class** | Conformance Class B |
| **Netload Class** | Netload Class 2 0 Mbps |
| **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 |
| **Media Redundancy Protocol (MRP)** | Yes |
| **System redundancy support** | System redundancy S2 (2 AR with 1 NAP) |
| **Device profile** | Application interface identifier 0xF600<br>Generic device |
| **Manufacturer ID** | 0x11 |
| **Device type ID** | 0x843B |
| **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.com |
| **Supported connections** | ▪ 2 x AR (IO Controller AR)<br>▪ 1 x AR (IO-Supervisor Device AR connection allowed)<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>▪ Asset management software (FieldCare, DeviceCare, Field Xpert)<br>▪ Integrated Web server via Web browser and IP address<br>▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device.<br>▪ Onsite operation |
| **Configuration of the device name** | ▪ DIP switches on the electronics module, for device name assignment (last part)<br>▪ DCP protocol<br>▪ Asset management software (FieldCare, DeviceCare, Field Xpert)<br>▪ Integrated Web server |
| **Supported functions** | ▪ Identification & Maintenance, simple device identifier via:<br>▪ Control system<br>▪ Nameplate<br>▪ Measured value status<br>The process variables are communicated with a measured value status<br>▪ Blinking feature via the local display for simple device identification and assignment<br>▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM) |
| **System integration** | Information regarding system integration: Operating Instructions → 129.<br>▪ Cyclic data transmission<br>▪ Overview and description of the modules<br>▪ Status coding<br>▪ Startup configuration<br>▪ Factory setting |

### PROFINET with Ethernet-APL

| | |
|---|---|
| **Protocol** | Application layer protocol for decentral device periphery and distributed automation, Version 2.43 |
| **Communication type** | Ethernet Advanced Physical Layer 10BASE-T1L |
| **Conformance Class** | Conformance Class B (PA) |
| **Netload Class** | PROFINET Netload Robustness Class 2 10 Mbit/s |

| | |
|---|---|
| **Baud rates** | 10 Mbit/s Full-duplex |
| **Cycle times** | 64 ms |
| **Polarity** | Automatic correction of crossed "APL signal +" and "APL signal -" signal lines |
| **Media Redundancy Protocol (MRP)** | Not possible (point-to-point connection to APL field switch) |
| **System redundancy support** | System redundancy S2 (2 AR with 1 NAP) |
| **Device profile** | PROFINET PA profile 4 (Application interface identifier API: 0x9700) |
| **Manufacturer ID** | 17 |
| **Device type ID** | 0xA43B |
| **Device description files (GSD, DTM, FDI)** | Information and files available at:<br>▪ www.endress.com → Downloads section<br>▪ www.profibus.com |
| **Supported connections** | ▪ 2x AR (IO Controller AR)<br>▪ 2x AR (IO Supervisor Device AR connection allowed) |
| **Configuration options for measuring device** | ▪ DIP switches on the electronics module, for device name assignment (last part)<br>▪ Asset management software (FieldCare, DeviceCare, Field Xpert)<br>▪ Integrated Web server via Web browser and IP address<br>▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device.<br>▪ Onsite operation |
| **Configuration of the device name** | ▪ DIP switches on the electronics module, for device name assignment (last part)<br>▪ DCP protocol<br>▪ Asset management software (FieldCare, DeviceCare, Field Xpert)<br>▪ Integrated Web server |
| **Supported functions** | ▪ Identification & Maintenance, simple device identifier via:<br>  ▪ Control system<br>  ▪ Nameplate<br>▪ Measured value status<br>The process variables are communicated with a measured value status<br>▪ Blinking feature via the local display for simple device identification and assignment<br>▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM with FDI package) |
| **System integration** | Information regarding system integration: Operating Instructions → 🖹 129.<br>▪ Cyclic data transmission<br>▪ Overview and description of the modules<br>▪ Status coding<br>▪ Factory setting |

# Power supply

## Terminal assignment

### Transmitter: supply voltage, input/outputs

*HART*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

*FOUNDATION Fieldbus*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (A) | 27 (B) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

*PROFIBUS DP*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (B) | 27 (A) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

*PROFIBUS PA*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (B) | 27 (A) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

*Modbus RS485*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (B) | 27 (A) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

*Modbus TCP with Ethernet-APL*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (B) | 27 (A) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

*EtherNet/IP*

| Supply voltage | | Input/output 1 | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | EtherNet/IP (RJ45 connector) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | |

*PROFINET*

| Supply voltage | | Input/output 1 | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | PROFINET (RJ45 connector) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | |

*PROFINET with Ethernet-APL*

| Supply voltage | | Input/output 1 | | Input/output 2 | | Input/output 3 | | Input/output 4 | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (+) | 23 (–) | 20 (+) | 21 (–) |
| | | The terminal assignment depends on the specific device version ordered → 🖹 13. | | | | | | | |

### Transmitter and sensor connection housing: connecting cable

The sensor and transmitter, which are mounted in separate locations, are interconnected by a connecting cable. The cable is connected via the sensor connection housing and the transmitter housing.

Terminal assignment and connection of the connecting cable:
- Proline 500 – digital → 🖹 36
- Proline 500 → 🖹 37

## Available device plugs

Device plugs may not be used in hazardous areas!

**Device plugs for fieldbus systems:**
Order code for "Input; output 1"
- Option **SA** "FOUNDATION Fieldbus" → 🖹 33
- Option **GA** "PROFIBUS PA" → 🖹 33
- Option **NA** "EtherNet/IP" → 🖹 33
- Option **RA** "PROFINET" → 🖹 34
- Option **RB** "PROFINET with Ethernet-APL" → 🖹 34

**Device plug for connecting to the service interface:**
Order code for "Accessory mounted"
Option **NB**, RJ45 M12 adapter (service interface) → 🖹 35

### Order code for "Input; output 1", option SA "FOUNDATION Fieldbus"

| Order code for "Electrical connection" | Cable entry/connection → 🖹 38 | |
|---|---|---|
| | 2 | 3 |
| M, 3, 4, 5 | 7/8" connector | – |

### Order code for "Input; output 1", option GA "PROFIBUS PA"

| Order code for "Electrical connection" | Cable entry/connection → 🖹 38 | |
|---|---|---|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | – |

### Order code for "Input; output 1", option NA "EtherNet/IP"

| Order code for "Electrical connection" | Cable entry/connection → 🖹 38 | |
|---|---|---|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | – |
| R [1) 2)], S [1) 2)], T [1) 2)], V [1) 2)] | Connector M12 × 1 | Connector M12 × 1 |

1) Cannot be combined with an external WLAN antenna (order code for "Enclosed accessories", option P8) of an RJ45 M12 adapter for the service interface (order code for "Accessories mounted", option NB) or of the remote display and operating module DKX001
2) Suitable for integrating the device in a ring topology.

### Order code for "Input; output 1", option RA "PROFINET"

| Order code for "Electrical connection" | Cable entry/connection → 🖹 38 | |
|---|---|---|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | – |
| R [1) 2)], S [1) 2)], T [1) 2)], V [1) 2)] | Connector M12 × 1 | Connector M12 × 1 |

1) Cannot be combined with an external WLAN antenna (order code for "Enclosed accessories", option P8) of an RJ45 M12 adapter for the service interface (order code for "Accessories mounted", option NB) or of the remote display and operating module DKX001.
2) Suitable for integrating the device in a ring topology.

### Order code for "Input; output 1", option RB "PROFINET with Ethernet-APL"

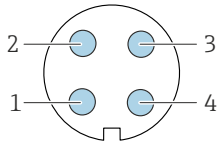
| Order code "Electrical connection" | Cable entry/connection → 🖹 38 | |
|---|---|---|
| | 2 | 3 |
| L, N, P, U | M12 plug × 1 | – |

### Order code for "Accessory mounted", option NB "Adapter RJ45 M12 (service interface)"

| Order code "Accessory mounted" | Cable entry/coupling → 🖹 38 | |
|---|---|---|
| | Cable entry 2 | Cable entry 3 |
| NB | Plug M12 × 1 | – |

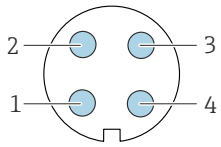
## Pin assignment, device plug

### FOUNDATION Fieldbus




| Pin | Assignment | | Coding | Plug/socket |
|---|---|---|---|---|
| 1 | + | Signal + | A | Plug |
| 2 | - | Signal – | | |
| 3 | | Grounding | | |
| 4 | | Not assigned | | |

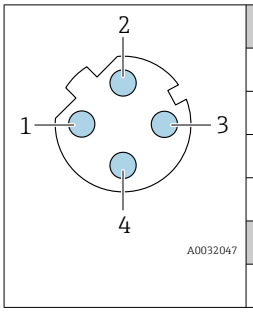
### PROFIBUS PA




| Pin | Assignment | | Coding | Plug/socket |
|---|---|---|---|---|
| 1 | + | PROFIBUS PA + | A | Plug |
| 2 | | Grounding | | |
| 3 | - | PROFIBUS PA – | | |
| 4 | | Not assigned | | |

Recommended plug:
- Binder, series 713, part no. 99 1430 814 04
- Phoenix, part no. 1413934 SACC-FS-4QO SH PBPA SCO

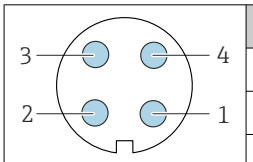
### PROFINET




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

Recommended plug:
- Binder, series 825, part no. 99 3729 810 04
- Phoenix, part no. 1543223 SACC-M12MSD-4Q

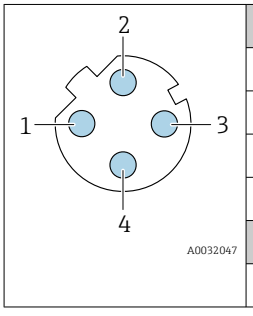
### PROFINET with Ethernet-APL




| Pin | Assignment | Coding | Plug/socket |
|---|---|---|---|
| 1 | APL signal - | A | Socket |
| 2 | APL signal + | | |
| 3 | Cable shield[1] | | |
| 4 | Not used | | |
| Metal plug housing | Cable shield | | |
| [1]If a cable shield is used | | | |

Recommended plug:
- Binder, series 713, part no. 99 1430 814 04
- Phoenix, part no. 1413934 SACC-FS-4QO SH PBPA SCO

### EtherNet/IP

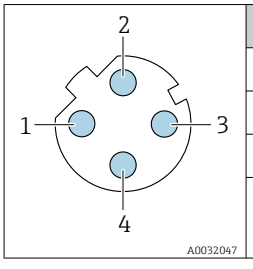



| Pin | | Assignment |
|---|---|---|
| 1 | + | Tx |
| 2 | + | Rx |
| 3 | - | Tx |
| 4 | - | Rx |
| **Coding** | | **Plug/socket** |
| D | | Socket |

Recommended plug:
- Binder, series 825, part no. 99 3729 810 04
- Phoenix, part no. 1543223 SACC-M12MSD-4Q

### Service interface for

Order code for "Accessories mounted", option **NB**: Adapter RJ45 M12 (service interface)




| Pin | | Assignment |
|---|---|---|
| 1 | + | Tx |
| 2 | + | Rx |
| 3 | - | Tx |
| 4 | - | Rx |

| | Coding | Plug/socket |
|---|---|---|
| | D | Socket |

Recommended plug:
- Binder, series 825, part no. 99 3729 810 04
- Phoenix, part no. 1543223 SACC-M12MSD-4Q

## Supply voltage

| Order code "Power supply" | Terminal voltage | | Frequency range |
|---|---|---|---|
| Option **D** | DC 24 V | ±20% | – |
| Option **E** | AC 100 to 240 V | −15…+10% | 50/60 Hz |
| Option **I** | DC 24 V | ±20% | – |
| | AC 100 to 240 V | −15…+10% | 50/60 Hz |

## Power consumption

**Transmitter**

Max. 10 W (active power)

| | |
|---|---|
| **switch-on current** | Max. 36 A (<5 ms) as per NAMUR Recommendation NE 21 |

## Current consumption

**Transmitter**

- Max. 400 mA (24 V)
- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

## Power supply failure

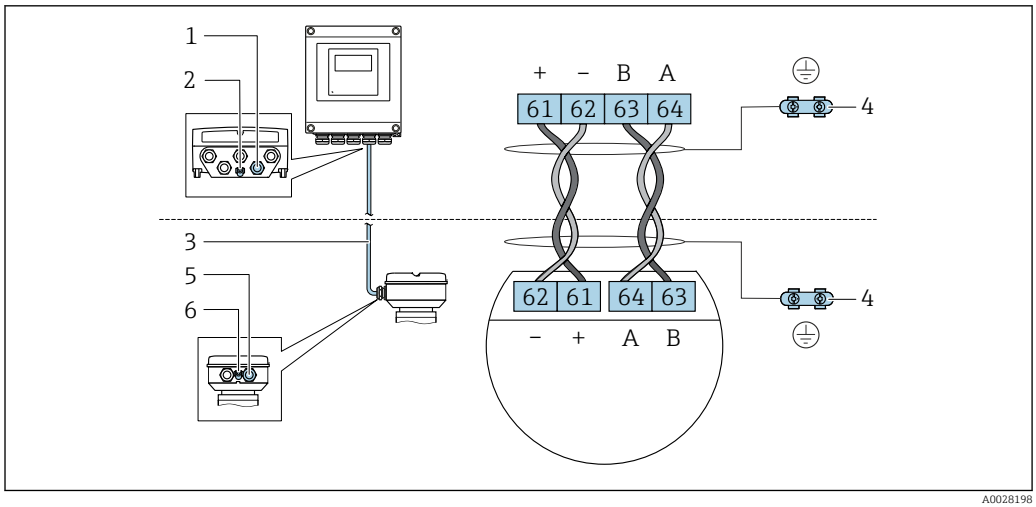
- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memory or in the pluggable data memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

## Overcurrent protection element

The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own.
- The circuit breaker must be easy to reach and labeled accordingly.
- Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.

## Electrical connection

**Connection of connecting cable: Proline 500 – digital**




A0028198

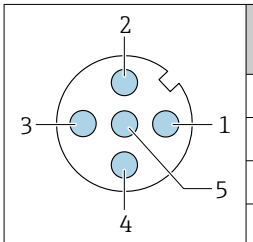
1 *Cable entry for cable on transmitter housing*
2 *Terminal connection for potential equalization (PE)*
3 *Connecting cable ISEM communication*
4 *Grounding via ground connection; in the version with a device plug, grounding is ensured through the plug itself*
5 *Cable entry for cable or connection of device plug on sensor connection housing*
6 *Terminal connection for potential equalization (PE)*

Depending on the device version of the sensor connection housing, the connecting cable is attached via terminals or device plugs.

| Sensor connection housing<br>Order code for "Housing" | Connection to sensor connection housing via | Connection to transmitter housing via |
|---|---|---|
| Option **A**: aluminum coated | Terminals | Terminals |
| Option **B**: stainless | Terminals | Terminals |
| Option **C**: ultra-compact, hygienic, stainless | Device plug | Terminals |
| Option **L**: cast, stainless | Terminals | Terminals |

*Pin assignment, device plug*

Device plugs are only available for device version, order code for "Housing":
Option **C**: ultra-compact, hygienic, stainless
For connection to sensor connection housing.




| Pin | Color [1] | Assignment | | Connection to terminal |
|---|---|---|---|---|
| 1 | Brown | + | Supply voltage | 61 |
| 2 | White | A | ISEM communication | 64 |
| 3 | Blue | B | | 63 |
| 4 | Black | – | Supply voltage | 62 |
| 5 | – | | – | – |
| **Coding** | | **Plug/socket** | | |
| A | | Plug | | |

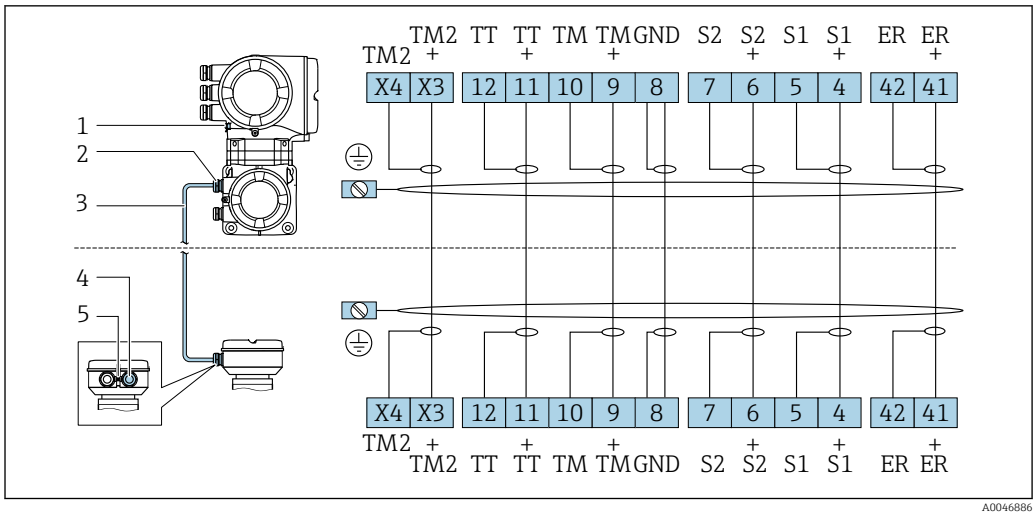
1) Cable colors of connecting cable

A connecting cable with a device plug is optionally available.

### Connection of the connecting cable: Proline 500

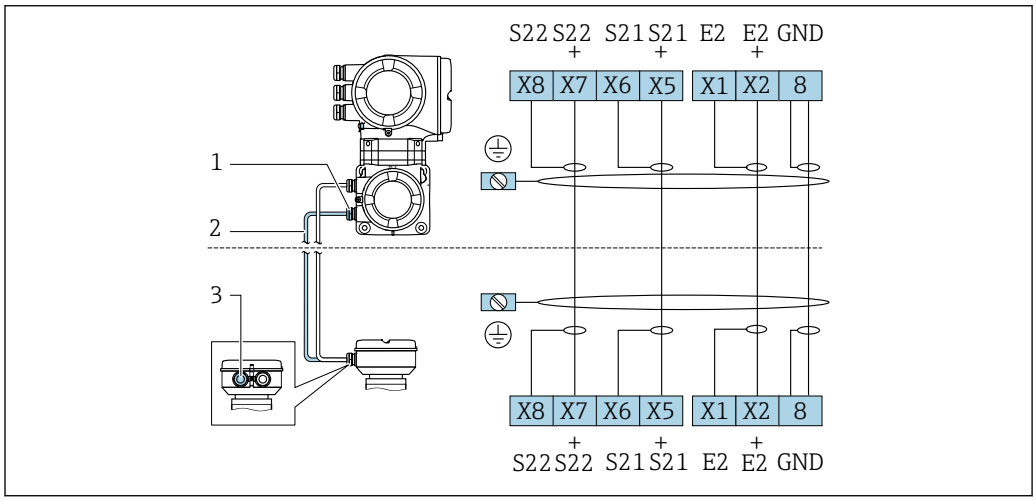
The number of connection cables depends on the nominal diameter of the device. A second, additional connection cable is required for devices with a nominal diameter DN ≥150 mm (6 in).

*First connection cable for all nominal diameters*




1 *Terminal connection for potential equalization (PE)*
2 *Cable entry for connecting cable on transmitter connection housing*
3 *Connecting cable*
4 *Cable entry for connecting cable on sensor connection housing*
5 *Terminal connection for potential equalization (PE)*

*Second, additional connection cable for nominal diameters DN ≥150 mm (6 in)*

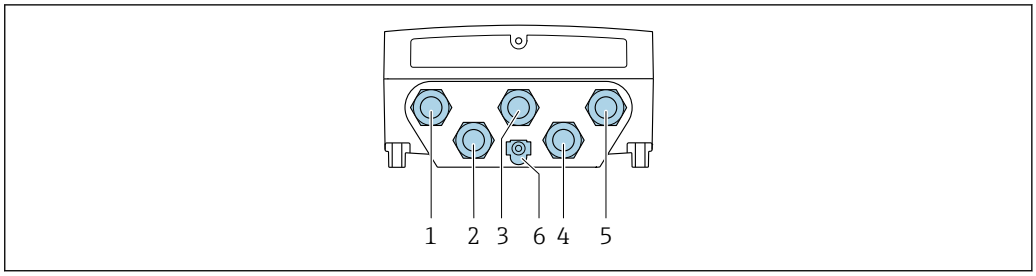



1 *Cable entry for second connecting cable on transmitter connection housing*
2 *Second connecting cable*
3 *Cable entry for second connecting cable on sensor connection housing*

### Transmitter connection

- Terminal assignment → 31
- Device plug pin assignment → 34

*Transmitter connection: Proline 500 – digital*




A0028200

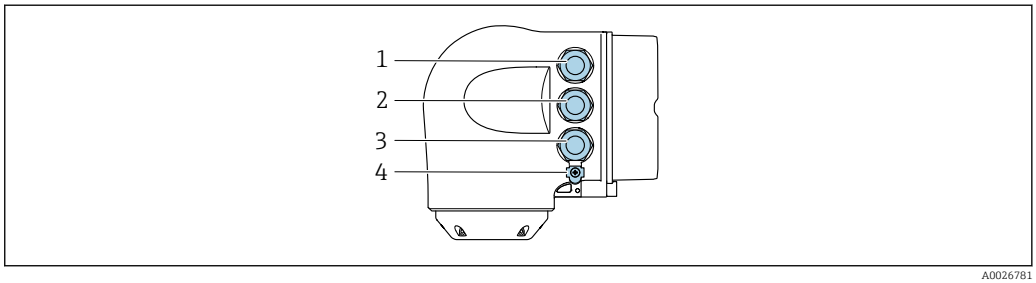
*1 Terminal connection for supply voltage*
*2 Terminal connection for signal transmission, input/output*
*3 Terminal connection for signal transmission, input/output*
*4 Terminal connection for connecting cable between sensor and transmitter*
*5 Terminal connection for signal transmission, input/output or terminal for network connection (DHCP client) via service interface (CDI-RJ45); optional: connection for external WLAN antenna*
*6 Terminal connection for potential equalization (PE)*

An adapter for the RJ45 to the M12 plug is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can thus be established via an M12 plug without opening the device.

Network connection (DHCP client) via service interface (CDI-RJ45) → 🖹 111

*Connecting the transmitter: Proline 500*




A0026781

*1 Terminal connection for supply voltage*
*2 Terminal connection for signal transmission, input/output*
*3 Terminal connection for signal transmission, input/output or terminal for network connection (DHCP client) via service interface (CDI-RJ45); optional: connection for external WLAN antenna*
*4 Terminal connection for potential equalization (PE)*

An adapter for the RJ45 to the M12 plug is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can thus be established via an M12 plug without opening the device.

Network connection (DHCP client) via service interface (CDI-RJ45) → 🖹 111

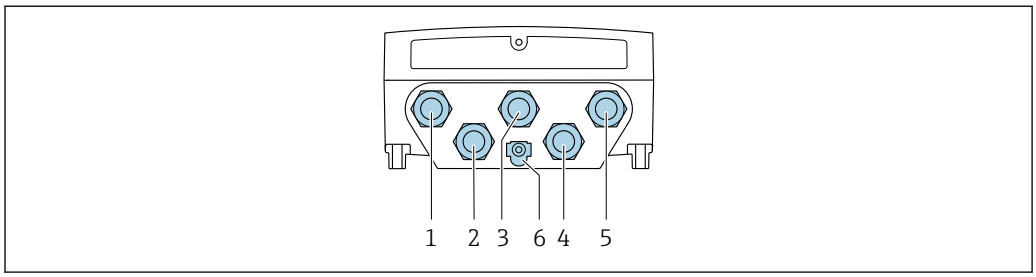
*Connecting in a ring topology*

Device versions with EtherNet/IP and PROFINET communication protocols can be integrated into a ring topology. The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45).

Transmitters with an Ex de approval may **not** be connected via the service interface (CDI-RJ45)!
Order code for "Approval transmitter + sensor", options (Ex de):
BA, BB, C1, C2, GA, GB, MA, MB, NA, NB

Integrate the transmitter in a ring topology:
- EtherNet/IP
- PROFINET

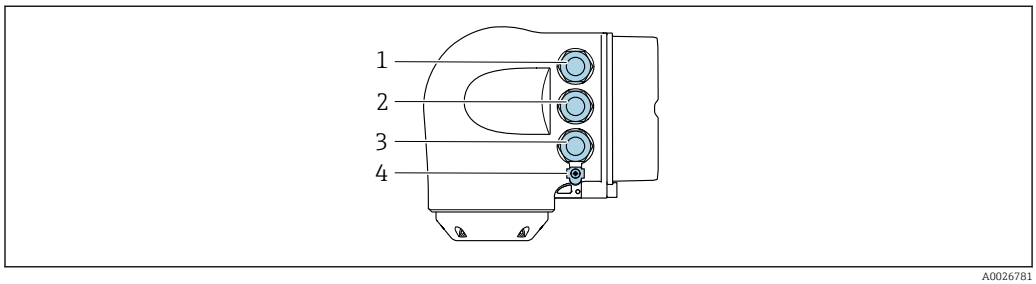
*Transmitter: Proline 500 – digital*




A0028200

*1 Terminal connection for supply voltage*
*2 Terminal connection for signal transmission, input/output*
*2 Terminal connection for signal transmission: PROFINET or EtherNet/IP (RJ45 plug)*
*4 Terminal connection for connecting cable between sensor and transmitter*
*5 Terminal connection to service interface (CDI-RJ45)*
*6 Terminal connection for potential equalization (PE)*

*Transmitter: Proline 500*



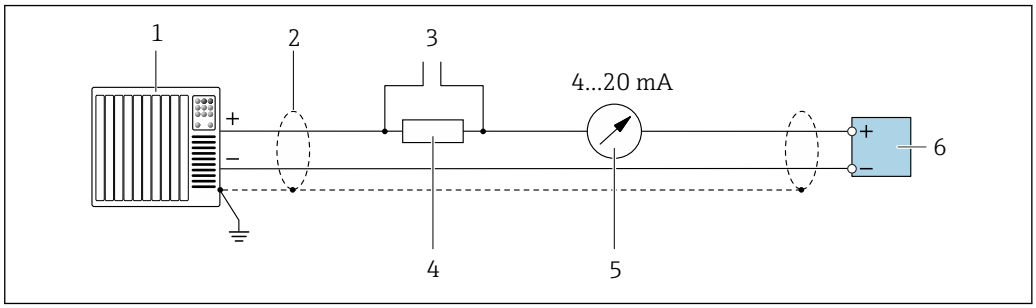

A0026781

*1 Terminal connection for supply voltage*
*2 Terminal connection for signal transmission: PROFINET or EtherNet/IP (RJ45 plug)*
*3 Terminal connection to service interface (CDI-RJ45)*
*4 Terminal connection for potential equalization (PE)*

If the device has additional inputs/outputs, these are routed in parallel via the cable entry for connection to the service interface.

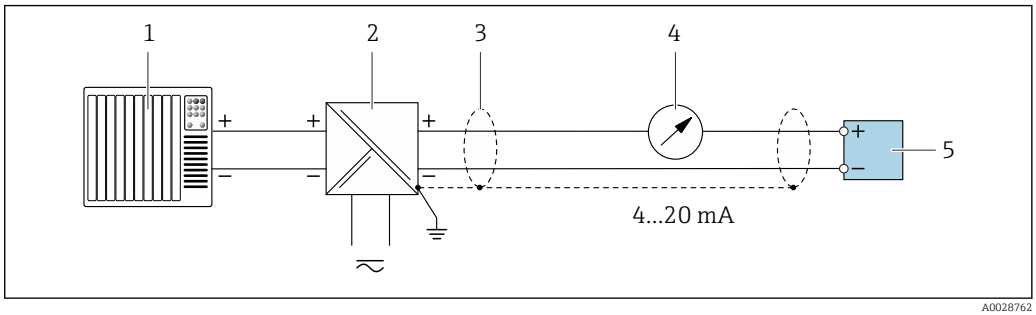
### Connection examples

*Current output 4 to 20 mA HART*




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

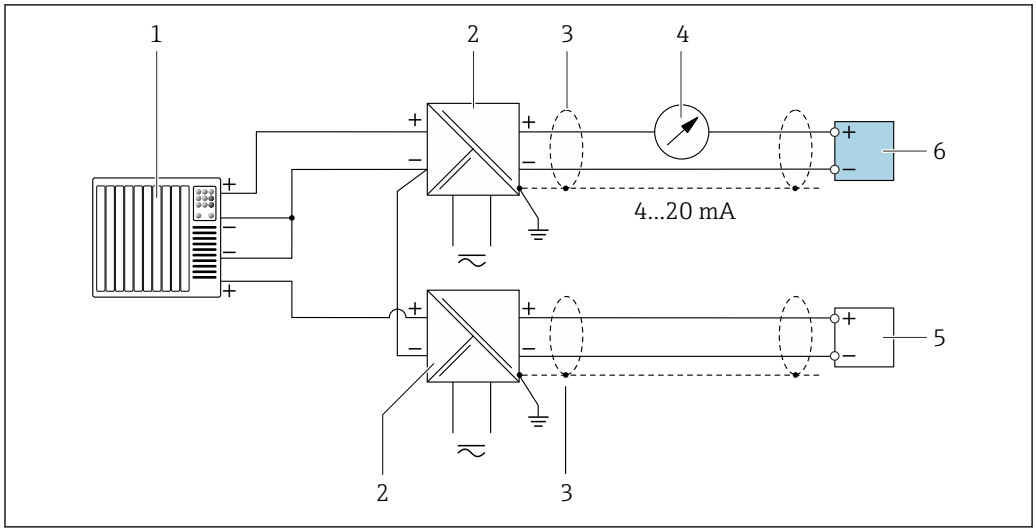
1 *Automation system with current input (e.g. PLC)*
2 *Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 51*
3 *Connection for HART operating devices → 105*
4 *Resistor for HART communication (≥ 250 Ω): observe maximum load → 15*
5 *Analog display unit: observe maximum load → 15*
6 *Transmitter*




*3 Connection example for 4 to 20 mA HART current output (passive)*

1 *Automation system with current input (e.g. PLC)*
2 *Power supply*
3 *Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 51*
4 *Analog display unit: observe maximum load → 15*
5 *Transmitter*

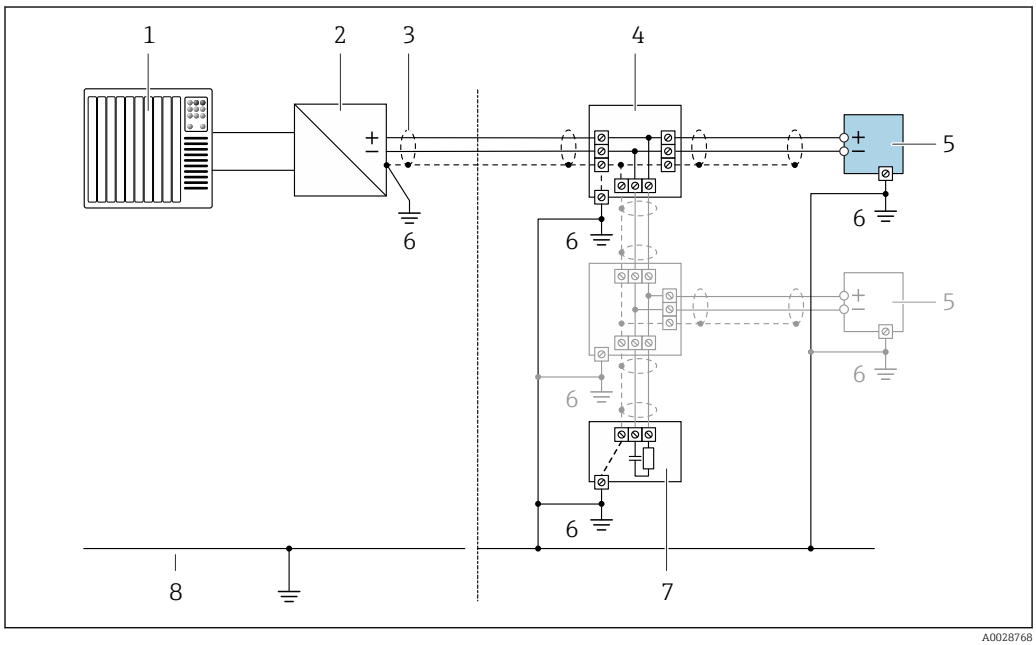
*HART input*




*4 Connection example for HART input with a common negative (passive)*

1 *Automation system with HART output (e.g. PLC)*
2 *Active barrier for power supply (e.g. RN221N)*
3 *Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
4 *Analog display unit: observe maximum load → 15*
5 *Pressure measuring device (e.g. Cerabar M, Cerabar S): observe requirements*
6 *Transmitter*

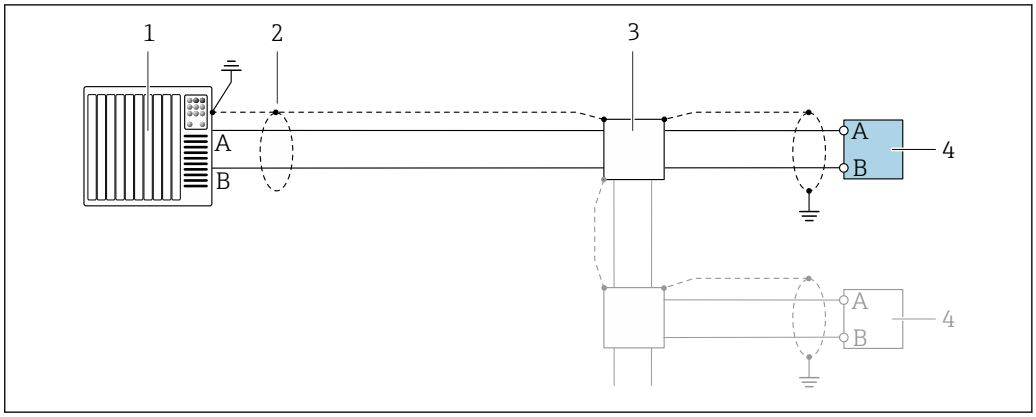
*PROFIBUS PA*




*5 Connection example for PROFIBUS PA*

1 *Control system (e.g. PLC)*
2 *PROFIBUS PA segment coupler*
3 *Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
4 *T-box*
5 *Measuring device*
6 *Local grounding*
7 *Bus terminator*
8 *Potential matching line*

*PROFIBUS DP*

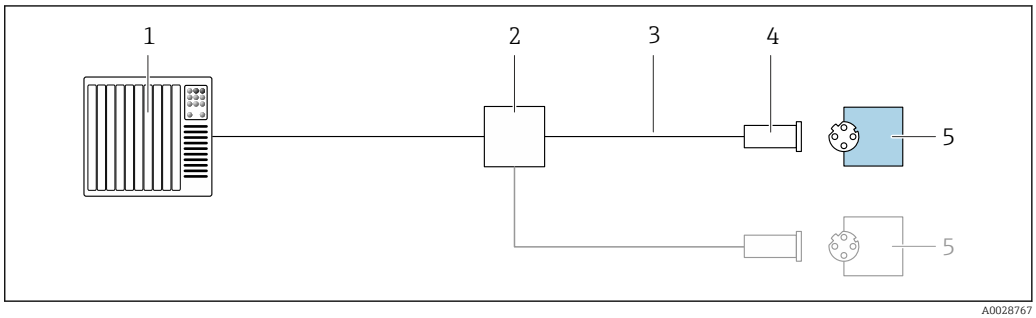



6 *Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2*

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

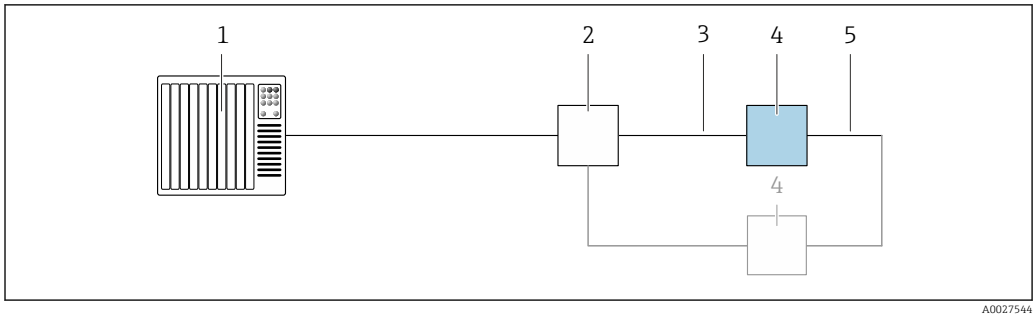
*EtherNet/IP*




7 *Connection example for EtherNet/IP*

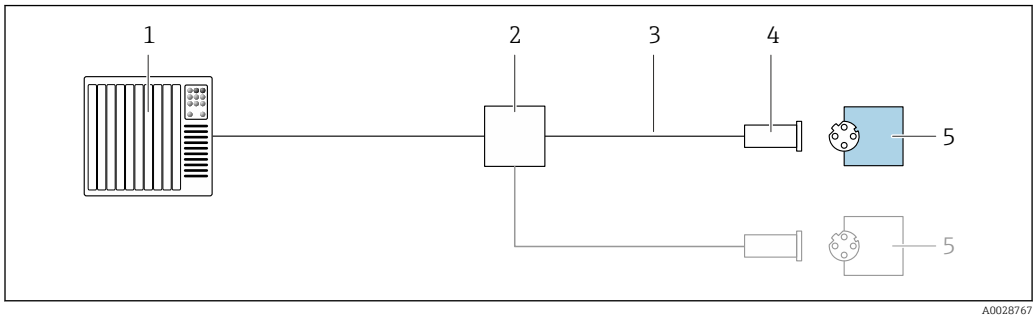
1 *Control system (e.g. PLC)*
2 *Ethernet switch*
3 *Observe cable specifications*
4 *Device plug*
5 *Transmitter*

*EtherNet/IP: DLR (Device Level Ring)*




*1 Control system (e.g. PLC)*
*2 Ethernet switch*
*3 Observe cable specifications → 📄 51*
*4 Transmitter*
*5 Connecting cable between the two transmitters*

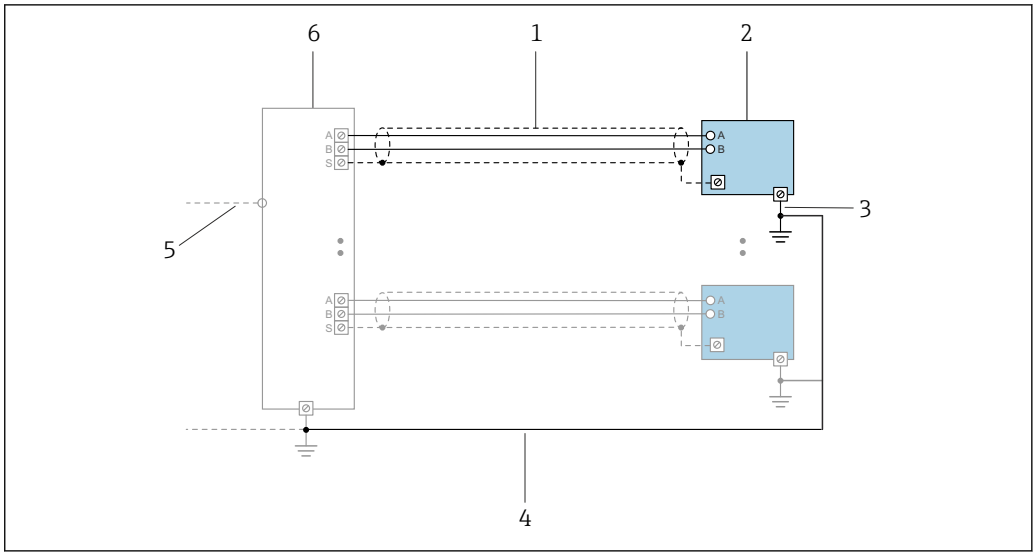
*PROFINET*




*8 Connection example for PROFINET*

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

*PROFINET with Ethernet-APL*

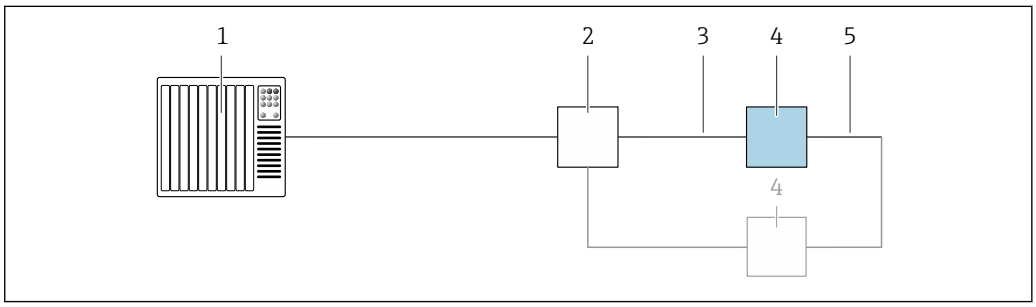



A0047536

9 *Connection example for PROFINET with Ethernet-APL*

1 *Cable shield*
2 *Measuring device*
3 *Local grounding*
4 *Potential equalization*
5 *Trunk or TCP*
6 *Field switch*

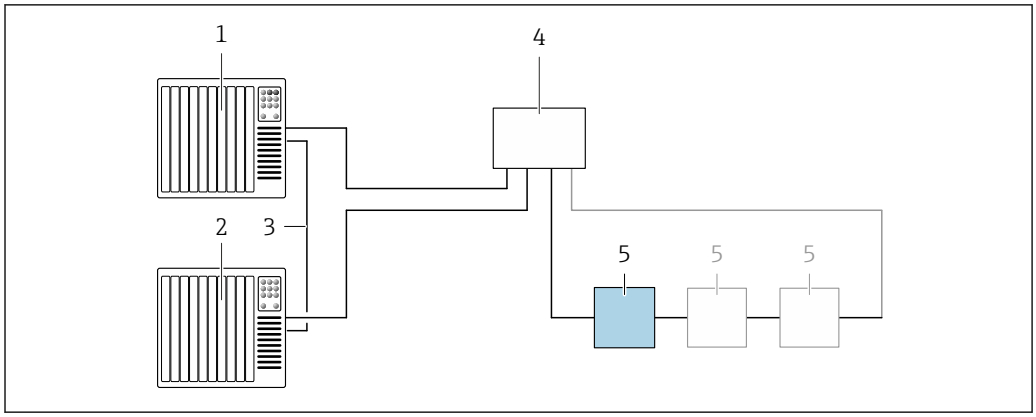
*PROFINET: MRP (Media Redundancy Protocol)*




A0027544

1 *Control system (e.g. PLC)*
2 *Ethernet switch*
3 *Observe cable specifications* → 📄 *51*
4 *Transmitter*
5 *Connecting cable between the two transmitters*

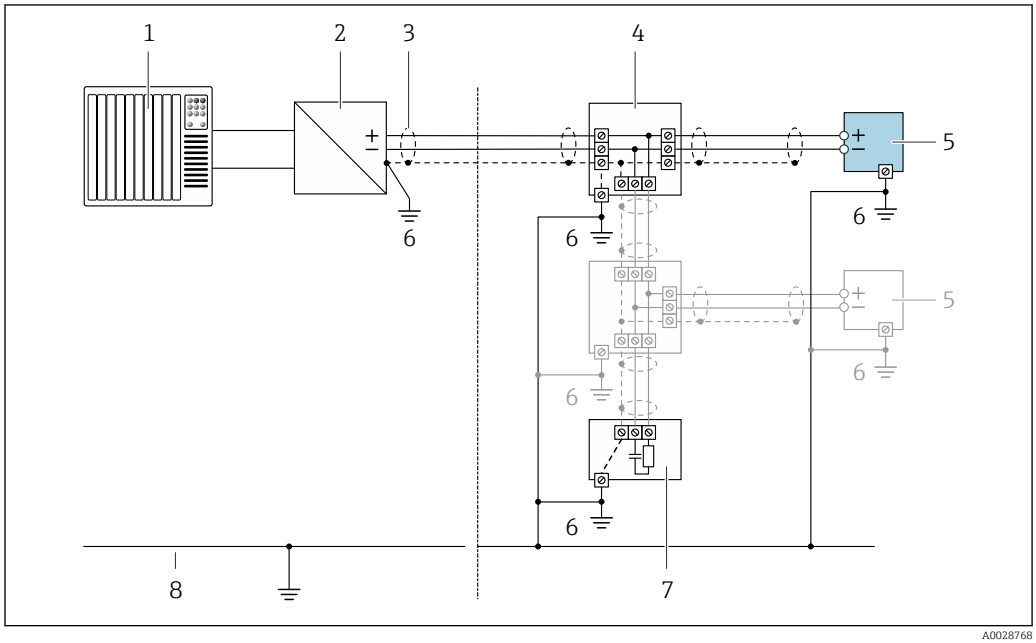
*PROFINET: system redundancy S2*




*10 Connection example for system redundancy S2*

1 *Control system 1 (e.g. PLC)*
2 *Synchronization of control systems*
3 *Control system 2 (e.g. PLC)*
4 *Industrial Ethernet Managed Switch*
5 *Transmitter*

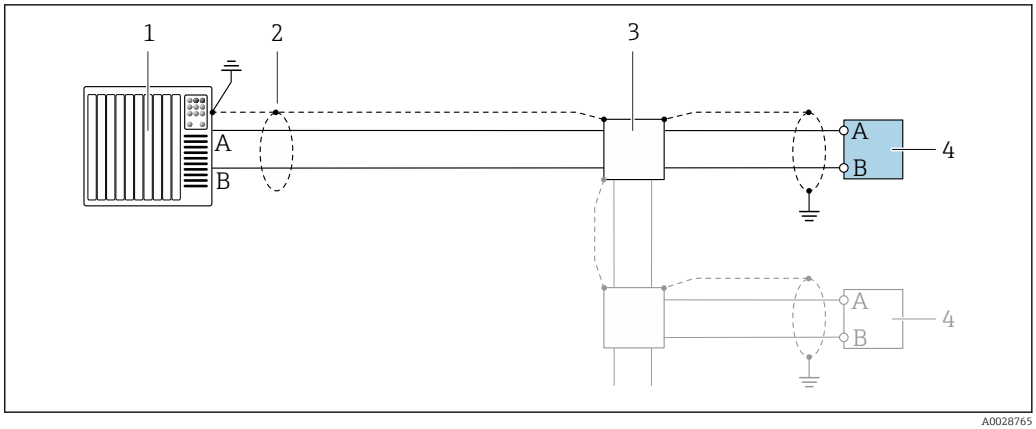
*FOUNDATION Fieldbus*




*11 Connection example for FOUNDATION Fieldbus*

1 *Control system (e.g. PLC)*
2 *Power Conditioner (FOUNDATION Fieldbus)*
3 *Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications*
4 *T-box*
5 *Measuring device*
6 *Local grounding*
7 *Bus terminator*
8 *Potential matching line*

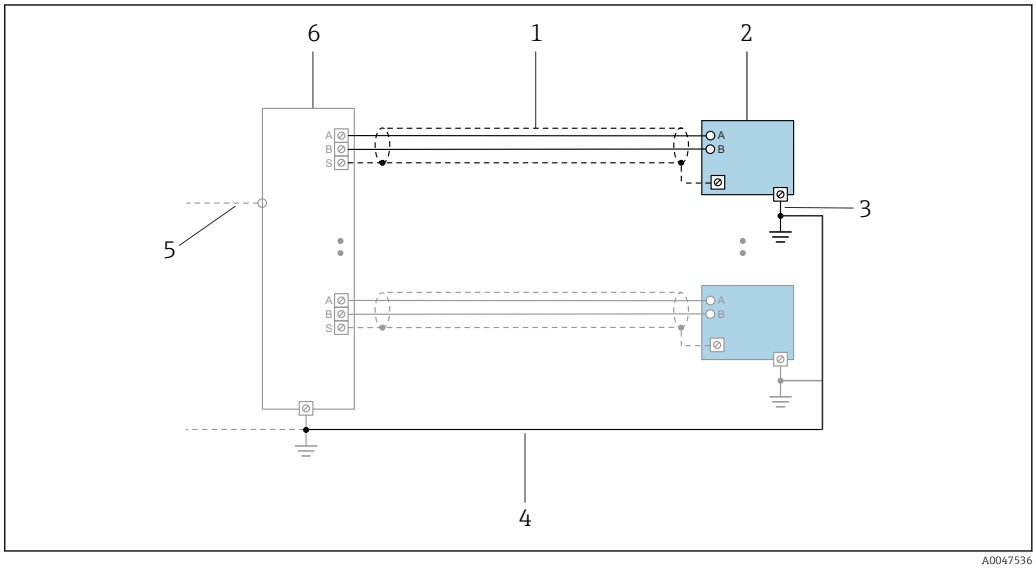
*Modbus RS485*




*12 Connection example for Modbus RS485, non-hazardous area and Zone 2; Class I, Division 2*

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

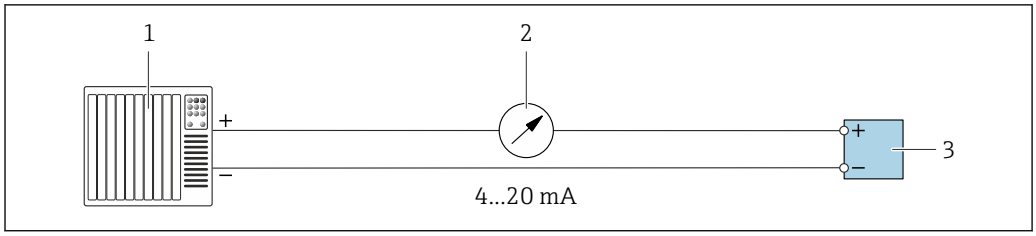
*Modbus with TCP-APL*




*13 Connection example for Modbus with TCP-APL*

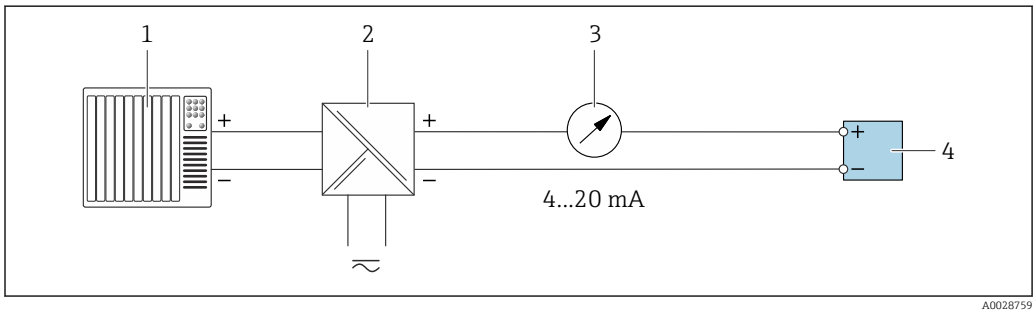
1 *Cable shield*
2 *Measuring device*
3 *Local grounding*
4 *Potential equalization*
5 *Trunk or TCP*
6 *Field switch*

*Current output 4-20 mA*




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

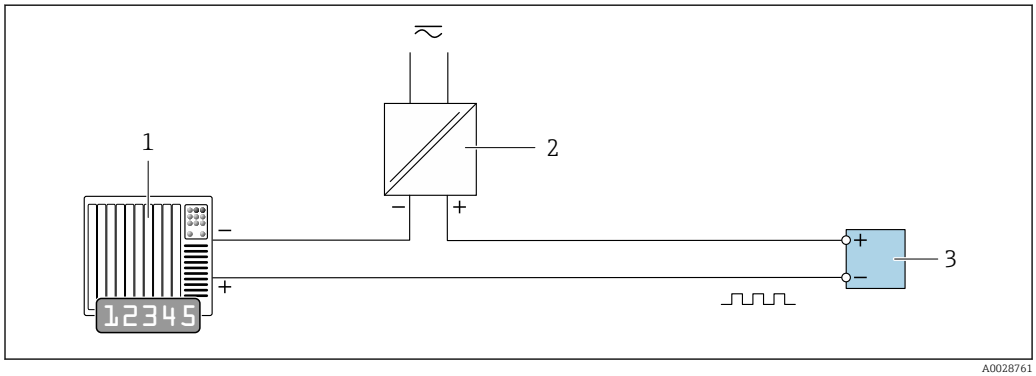
*1 Automation system with current input (e.g. PLC)*
*2 Analog display unit: observe maximum load → 15*
*3 Transmitter*




*15 Connection example for 4-20 mA current output (passive)*

*1 Automation system with current input (e.g. PLC)*
*2 Active barrier for power supply (e.g. RN221N)*
*3 Analog display unit: observe maximum load → 15*
*4 Transmitter*

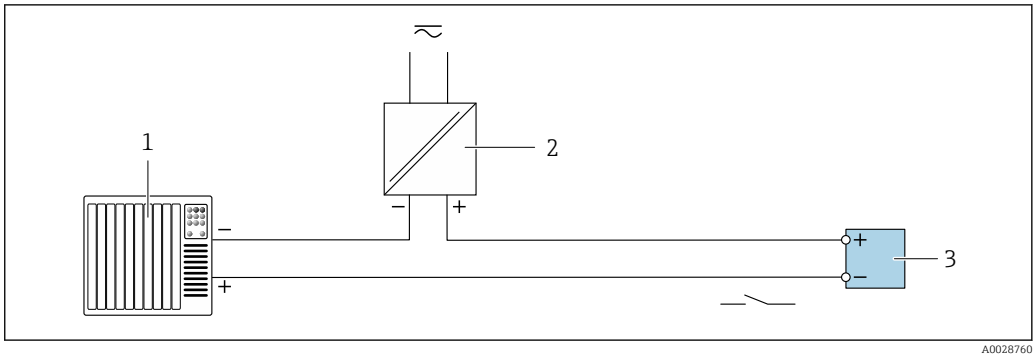
*Pulse/frequency output*




*16 Connection example for pulse/frequency output (passive)*

*1 Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)*
*2 Power supply*
*3 Transmitter: observe input values → 18*

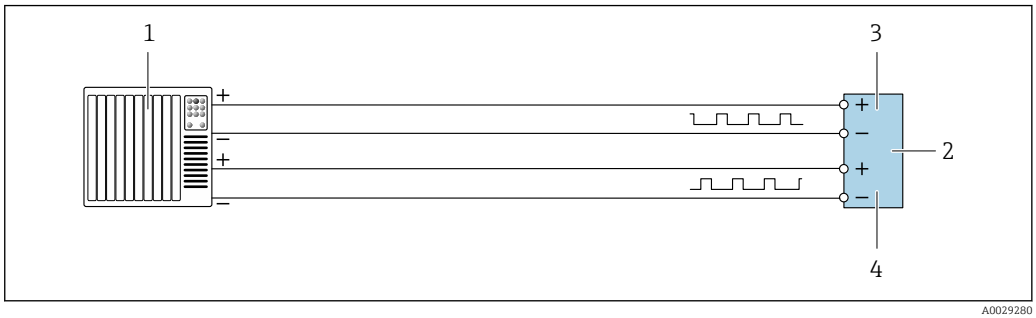
*Switch output*




17 *Connection example for switch output (passive)*

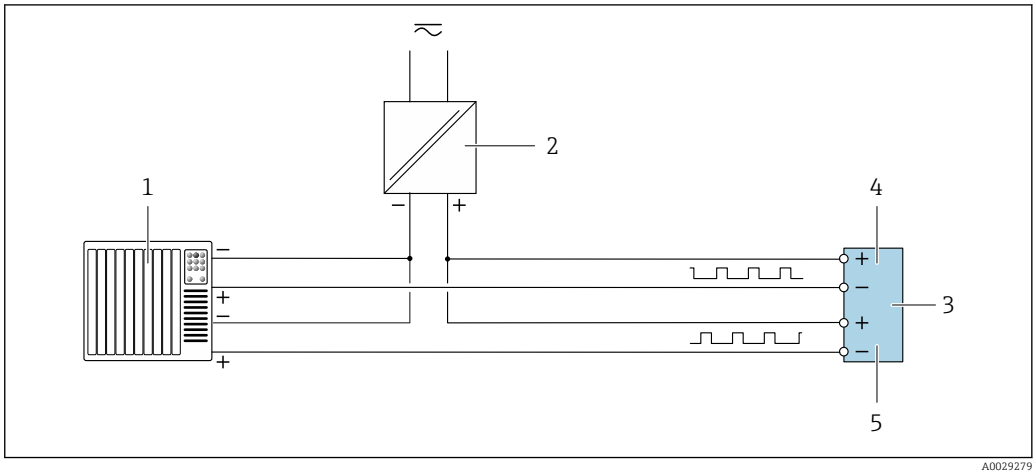
1 *Automation system with switch input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)*
2 *Power supply*
3 *Transmitter: observe input values → 18*

*Double pulse output*




18 *Connection example for double pulse output (active)*

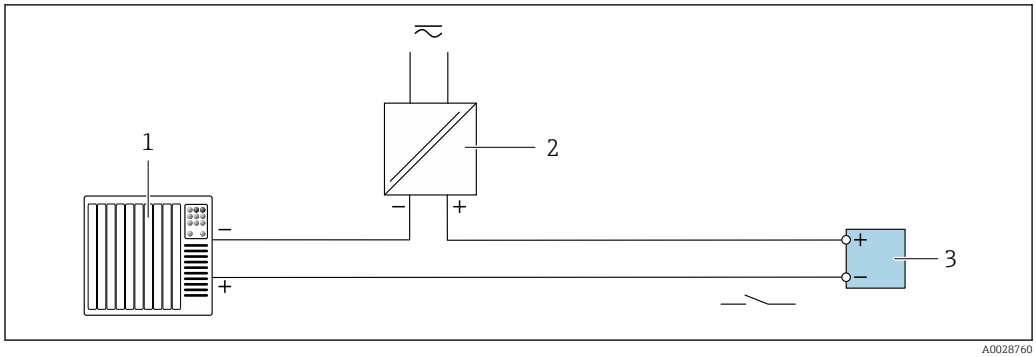
1 *Automation system with double pulse input (e.g. PLC)*
2 *Transmitter: observe input values → 20*
3 *Double pulse output*
4 *Double pulse output (slave), phase-shifted*




19 *Connection example for double pulse output (passive)*

1 *Automation system with double pulse input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)*
2 *Power supply*
3 *Transmitter: observe input values → 20*
4 *Double pulse output*
5 *Double pulse output (slave), phase-shifted*

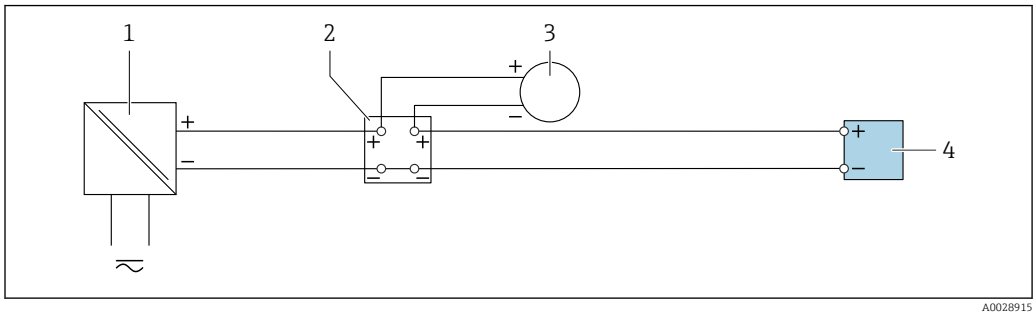
*Relay output*




*20 Connection example for relay output (passive)*

*1 Automation system with relay input (e.g. PLC)*
*2 Power supply*
*3 Transmitter: observe input values → 20*

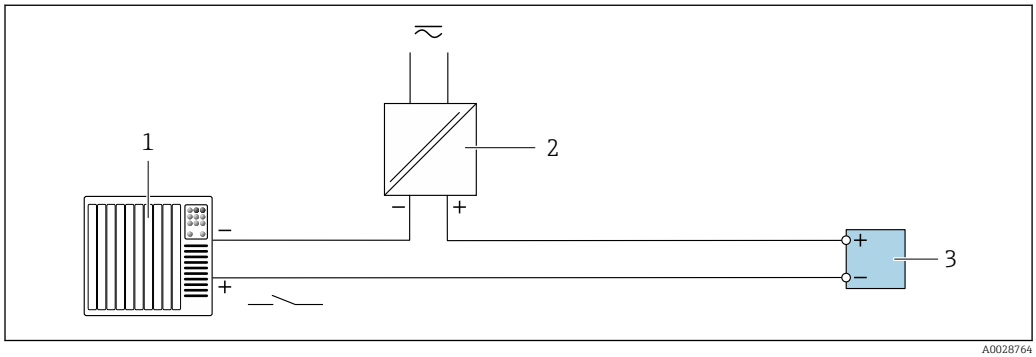
*Current input*




*21 Connection example for 4 to 20 mA current input*

*1 Power supply*
*2 Terminal box*
*3 External measuring device (to read in pressure or temperature, for instance)*
*4 Transmitter*

*Status input*




*22 Connection example for status input*

*1 Automation system with status output (e.g. PLC)*
*2 Power supply*
*3 Transmitter*

**Potential equalization**

**Requirements**

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

**Terminals**

Spring-loaded terminals: Suitable for strands and strands with ferrules.
Conductor cross-section 0.2 to 2.5 $mm^2$ (24 to 12 AWG).

**Cable entries**

- Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20
- Device plug for digital communication: M12
  Only available for certain device versions → 33.
- Device plug for connecting cable: M12
  A device plug is always used for the device version with the order code for "Sensor connection housing", option **C** "Ultra-compact, hygienic, stainless".

**Cable specification**

**Permitted temperature range**

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

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

Standard installation cable is sufficient.

**Protective grounding cable for the outer ground terminal**

Conductor cross-section < 2.1 $mm^2$ (14 AWG)

The use of a cable lug enables the connection of larger cross-sections.

The grounding impedance must be less than 2 Ω.

**Signal cable**

For custody transfer, all signal lines must be shielded cables (tinned copper braiding, optical coverage ≥ 85 %). The cable shield must be connected on both sides.

*Current output 4 to 20 mA HART*

Shielded twisted-pair cable.

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

*PROFIBUS PA*

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

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

*PROFIBUS DP*

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

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

*EtherNet/IP*

Twisted-pair Ethernet CAT 5 or better.

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

*PROFINET*

Only PROFINET cables.

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

*Ethernet-APL*

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

See https://www.profibus.com Ethernet-APL White Paper "

*FOUNDATION Fieldbus*

Twisted, shielded two-wire cable.

For further information on planning and installing FOUNDATION Fieldbus networks see:

- Operating Instructions for "FOUNDATION Fieldbus Overview" (BA00013S)
- FOUNDATION Fieldbus Guideline
- IEC 61158-2 (MBP)

*Modbus RS485*

Shielded twisted-pair cable.

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

*Current output 0 /4 to 20 mA (excluding HART)*

Standard installation cable is sufficient.

*Pulse /frequency /switch output*

Standard installation cable is sufficient.

*Relay output*

Standard installation cable is sufficient.

*Current input 4 to 20 mA*

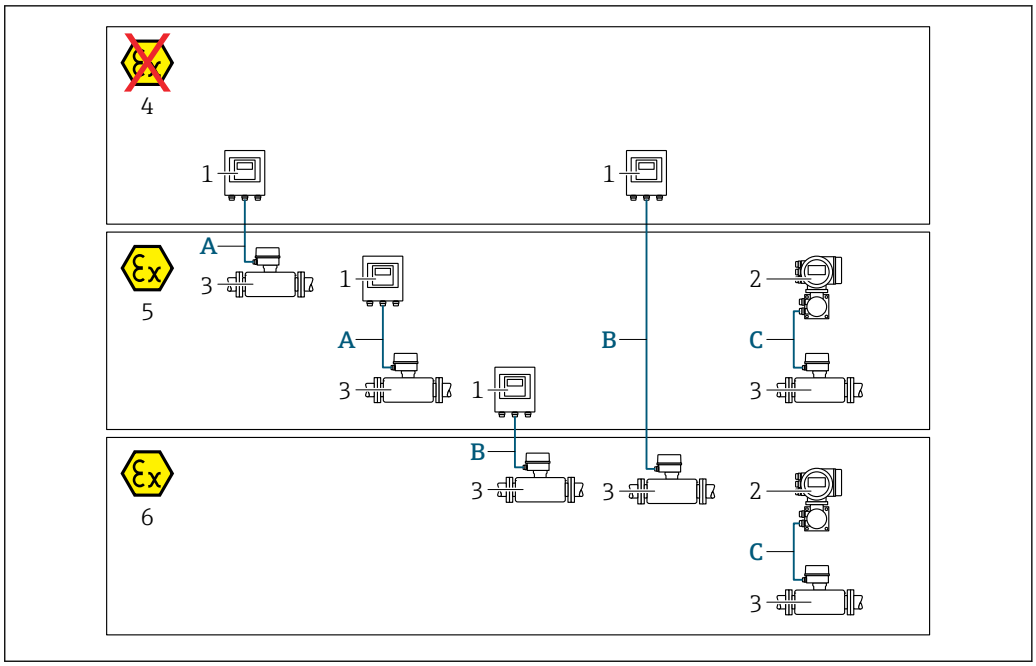
Standard installation cable is sufficient.

*Status input*

Standard installation cable is sufficient.

**Choice of connecting cable between the transmitter and sensor**

Depends on the type of transmitter and the installation zones




1 *Proline 500 digital transmitter*
2 *Proline 500 transmitter*
3 *Sensor Promass*
4 *Non-hazardous area*
5 *Hazardous area: Zone 2; Class I, Division 2*
6 *Hazardous area: Zone 1; Class I, Division 1*
A *Standard cable to 500 digital transmitter → 53*
*Transmitter installed in the non-hazardous area or hazardous area: Zone 2; Class I, Division 2/sensor installed in the hazardous area: Zone 2; Class I, Division 2*
B *Standard cable to 500 digital transmitter → 54*
*Transmitter installed in the hazardous area: Zone 2; Class I, Division 2/sensor installed in the hazardous area: Zone 1; Class I, Division 1*
C *Signal cable to 500 transmitter → 56*
*Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1*

### *A: Connecting cable between sensor and transmitter: Proline 500 – digital*

*Standard cable*

A standard cable with the following specifications can be used as the connecting cable.

| | |
|---|---|
| **Design** | 4 cores (2 pairs); uninsulated stranded CU wires; pair-stranded with common shield |
| **Shield** | Tin-plated copper braid, optical cover ≥ 85 % |
| **Loop resistance** | Power supply line (+, –): maximum 10 Ω |
| **Cable length** | Maximum 300 m (900 ft), see the following table. |
| **Device plug, side 1** | M12 socket, 5-pin, A-coded. |
| **Device plug, side 2** | M12 plug, 5-pin, A-coded. |
| **Pins 1+2** | Connected cores as twisted pair. |
| **Pins 3+4** | Connected cores as twisted pair. |

| Cross-section | Cable length [max.] |
|---|---|
| 0.34 mm² (AWG 22) | 80 m (240 ft) |
| 0.50 mm² (AWG 20) | 120 m (360 ft) |
| 0.75 mm² (AWG 18) | 180 m (540 ft) |

| Cross-section | Cable length [max.] |
|---|---|
| 1.00 mm² (AWG 17) | 240 m (720 ft) |
| 1.50 mm² (AWG 15) | 300 m (900 ft) |

*Optionally available connecting cable*

| | |
|---|---|
| **Design** | 2 × 2 × 0.34 mm² (AWG 22) PVC cable [1] with common shield (2 pairs, uninsulated stranded CU wires; pair-stranded) |
| **Flame resistance** | According to DIN EN 60332-1-2 |
| **Oil resistance** | According to DIN EN 60811-2-1 |
| **Shield** | Tin-plated copper braid, optical cover ≥ 85 % |
| **Continuous operating temperature** | When mounted in a fixed position: −50 to +105 °C (−58 to +221 °F); when cable can move freely: −25 to +105 °C (−13 to +221 °F) |
| **Available cable length** | Fixed: 20 m (60 ft); variable: up to maximum 50 m (150 ft) |

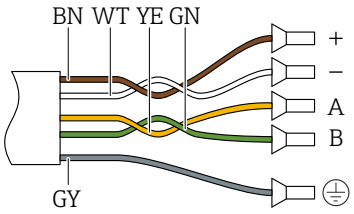
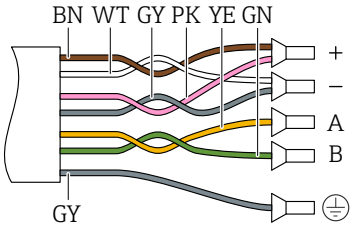
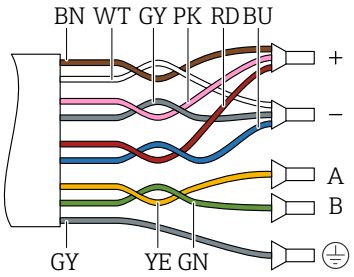
1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

*B: Connecting cable between sensor and transmitter: Proline 500 - digital*

*Standard cable*

A standard cable with the following specifications can be used as the connecting cable.

| | |
|---|---|
| **Design** | 4, 6, 8 cores (2, 3, 4 pairs); uninsulated stranded CU wires; pair-stranded with common shield |
| **Shielding** | Tin-plated copper braid, optical cover ≥ 85 % |
| **Capacitance C** | Maximum 760 nF IIC, maximum 4.2 µF IIB |
| **Inductance L** | Maximum 26 µH IIC, maximum 104 µH IIB |
| **Inductance/resistance ratio (L/R)** | Maximum 8.9 µH/Ω IIC, maximum 35.6 µH/Ω IIB (e.g. according to IEC 60079-25) |
| **Loop resistance** | Power supply line (+, −): maximum 5 Ω |
| **Cable length** | Maximum 150 m (450 ft), see the following table. |

| Cross-section | Cable length [max.] | Termination |
|---|---|---|
| 2 x 2 x 0.50 mm² (AWG 20) | 50 m (150 ft) | 2 x 2 x 0.50 mm² (AWG 20)<br>  <br>▪ +, – = 0.5 mm²<br>▪ A, B = 0.5 mm² |
| 3 x 2 x 0.50 mm² (AWG 20) | 100 m (300 ft) | 3 x 2 x 0.50 mm² (AWG 20)<br>  <br>▪ +, – = 1.0 mm²<br>▪ A, B = 0.5 mm² |
| 4 x 2 x 0.50 mm² (AWG 20) | 150 m (450 ft) | 4 x 2 x 0.50 mm² (AWG 20)<br>  <br>▪ +, – = 1.5 mm²<br>▪ A, B = 0.5 mm² |

*Optionally available connecting cable*

| | |
|---|---|
| **Connecting cable for** | Zone 1; Class I, Division 1 |
| **Standard cable** | 2 × 2 × 0.5 mm² (AWG 20) PVC cable [1] with common shield (2 pairs, pair-stranded) |
| **Flame resistance** | According to DIN EN 60332-1-2 |
| **Oil-resistance** | According to DIN EN 60811-2-1 |
| **Shielding** | Tin-plated copper braid, optical cover ≥ 85 % |
| **Operating temperature** | When mounted in a fixed position: –50 to +105 °C (–58 to +221 °F); when cable can move freely: –25 to +105 °C (–13 to +221 °F) |
| **Available cable length** | Fixed: 20 m (60 ft); variable: up to maximum 50 m (150 ft) |

1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

*C: Connecting cable between sensor and transmitter: Proline 500*

| | |
|---|---|
| **Design** | 7 × 0.38 mm² PUR cable [1] with individual shielded cores and common copper shield<br>With order code for «Approval; transmitter; sensor», options **AA**, **BS**, **CS**, **CZ**, **GR**, **GS**, **MS**, **NS**, **UR**, **US**:<br>7 × 0.38 mm² PVC cable [1] with individual shielded cores and common copper shield |
| **Conductor resistance** | ≤ 50 Ω/km (0.015 Ω/ft) |
| **Capacitance: core/shield** | ≤ 420 pF/m (128 pF/ft) |
| **Cable length (max.)** | 20 m (60 ft) |
| **Cable lengths (available for order)** | 5 m (15 ft), 10 m (30 ft), 20 m (60 ft) |
| **Cable diameter** | 11 mm (0.43 in) ± 0.5 mm (0.02 in) |
| **Operating temperature** | Depends on the device version and how the cable is installed:<br>▪ Standard version:<br>  ▪ Cable - fixed installation: −40 to +105 °C (−40 to +221 °F)<br>  ▪ Cable - movable: −25 to +105 °C (−13 to +221 °F)<br>▪ Order code for "Test, certificate", option **JP**:<br>  ▪ Cable - fixed installation: −50 to +105 °C (−58 to +221 °F)<br>  ▪ Cable - movable: −25 to +105 °C (−13 to +221 °F)<br>▪ Order code for "Test, certificate", option **JQ**:<br>  ▪ Cable - fixed installation: −60 to +105 °C (−76 to +221 °F)<br>  ▪ Cable - movable: −25 to +105 °C (−13 to +221 °F) |

1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

**Overvoltage protection**

| | |
|---|---|
| **Mains voltage fluctuations** | → 🖹 36 |
| **Overvoltage category** | Overvoltage category II |
| **Short-term, temporary overvoltage** | Between cable and ground up to 1200 V, for max. 5 s |
| **Long-term, temporary overvoltage** | Between cable and ground up to 500 V |

# Performance characteristics

**Reference operating conditions**

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

To obtain measured errors, use the *Applicator* sizing tool → 🖹 128

**Maximum measurement error**

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

**Base accuracy**

Design fundamentals → 🖹 60

*Mass flow and volume flow (liquids)*

- ±0.05 % o.r. (optional)
- ±0.10 % o.r. (standard)

*Mass flow (gases)*

±0.25 % o.r.

*Mass flow (cryogenic liquids and gases under −100 °C (−148 °F))*

±0.35 % o.r. (order code for "Measuring tube material", option LA)

*Density (liquids)*

Standard density
- ±0.2 kg/m³ ( ±0.0002 g/cm³ )
- Valid in density range: 0 to 2 000 kg/m³

Premium density (DN 25 (1"); order code for "Application package", option EI)
- ±0.1 kg/m³
- Valid in density range: 0 to 3 000 kg/m³

For additional information, see the Special Documentation on the advanced density function
→ 🖹 130

For highly accurate density measurement, the pitch and roll angle and pressure compensation must be configured.

For highly accurate density measurement, avoid significant tensile stresses due to the installation and ensure the flow velocity in the nominal diameter is > 0.1 m/s (0.33 ft/s).

*Density (cryogenic liquids and gases under −100 °C (−148 °F))*

±0.03 g/cm³ (order code for "Measuring tube material", option LA)

*Temperature*

±0.1 °C ± 0.003 · T °C (±0.18 °F ± 0.003 · (T − 32) °F)

**Zero point stability**

| DN | | Zero point stability | |
|---|---|---|---|
| [mm] | [in] | [kg/h] | [lb/min] |
| 25 | 1 | 0.36 | 0.013 |
| 50 | 2 | 1.3 | 0.048 |
| 80 | 3 | 4.4 | 0.162 |
| 100 | 4 | 11.5 | 0.42 |
| 150 | 6 | 16 | 0.59 |
| 200 | 8 | 24 | 0.88 |
| 250 | 10 | 50 | 1.84 |

**Flow values**

Flow values as turndown parameters depending on nominal diameter.

*SI units*

| DN | 1:1 | 1:10 | 1:20 | 1:50 | 1:100 | 1:500 |
|---|---|---|---|---|---|---|
| [mm] | [kg/h] | [kg/h] | [kg/h] | [kg/h] | [kg/h] | [kg/h] |
| 25 | 20 000 | 2 000 | 1 000 | 400 | 200 | 40 |
| 50 | 80 000 | 8 000 | 4 000 | 1 600 | 800 | 160 |
| 80 | 200 000 | 20 000 | 10 000 | 4 000 | 2 000 | 400 |
| 100 | 550 000 | 55 000 | 27 500 | 11 000 | 5 500 | 1 100 |
| 150 | 850 000 | 85 000 | 42 500 | 17 000 | 8 500 | 1 700 |
| 200 | 1 500 000 | 150 000 | 75 000 | 30 000 | 15 000 | 3 000 |
| 250 | 2 400 000 | 240 000 | 120 000 | 48 000 | 24 000 | 4 800 |

*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] |
| 1 | 735 | 73 | 37 | 15 | 7 | 1 |
| 2 | 2939 | 294 | 147 | 59 | 29 | 6 |
| 3 | 7349 | 735 | 367 | 147 | 73 | 15 |
| 4 | 20209 | 2021 | 1010 | 404 | 202 | 40 |
| 6 | 31232 | 3123 | 1562 | 625 | 312 | 62 |
| 8 | 55115 | 5511 | 2756 | 1102 | 551 | 110 |
| 10 | 88183 | 8818 | 4409 | 1764 | 882 | 176 |

### Accuracy of outputs

The outputs have the following base accuracy specifications.

*Current output*

| | |
|---|---|
| **Accuracy** | ±5 µA |

*Pulse/frequency output*

o.r. = of reading

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

**Repeatability**

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

### Base repeatability

Design fundamentals → 60

*Mass flow and volume flow (liquids)*

±0.025 % o.r.

*Mass flow (gases)*

±0.20 % o.r.

*Mass flow (cryogenic liquids and gases under −100 °C (−148 °F))*

±0.175 % % o.r. (order code for "Measuring tube material", option LA)

*Density (liquids)*

- ±0.1 kg/m³ / ±0.0001 g/cm³
- Premium density: ±0.02 kg/m³ / ±0.00002 g/cm³

*Density (cryogenic liquids and gases under −100 °C (−148 °F))*

±0.015 g/cm³ (order code for "Measuring tube material", option LA)

*Temperature*

±0.05 °C ± 0.0025 · T °C (±0.09 °F ± 0.0015 · (T−32) °F)

**Response time**

The response time depends on the configuration (damping).

**Influence of ambient temperature**

**Current output**

| | |
|---|---|
| **Temperature coefficient** | Max. 1 µA/°C |

**Pulse/frequency output**

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

**Influence of medium temperature**

**Mass flow**

o.f.s. = of full scale value

If there is a difference between the temperature at zero adjustment and the process temperature, the additional measurement error of the sensors is typically
DN 25 (1"): ±0.0001 % o.f.s./°C (±0.00005 % o.f.s./°F)
DN 50 to 250 (2 to 10"): ±0.00015 % o.f.s./°C (±0.000075 % o.f.s./°F)

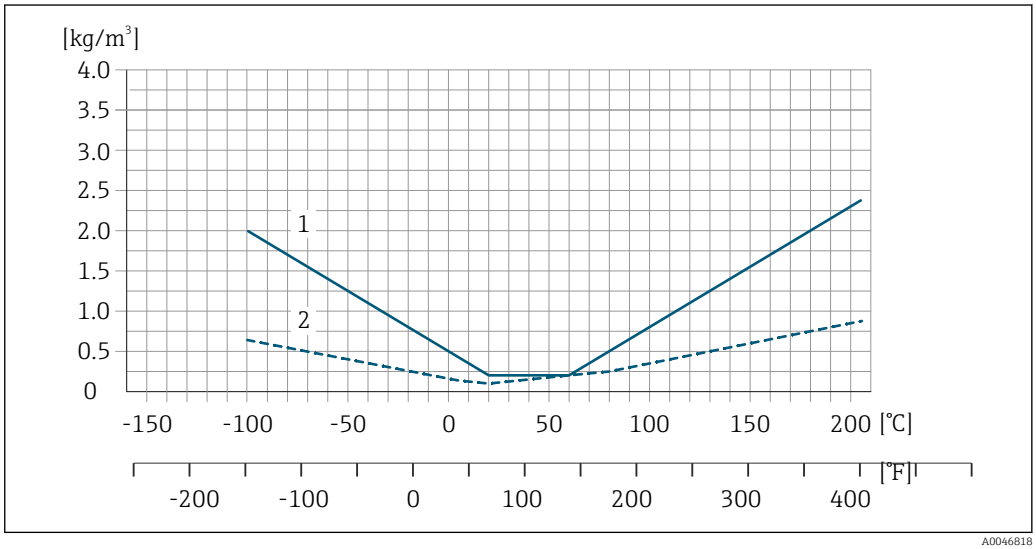
The influence is reduced when the zero adjustment is performed at process temperature.

**Density**
If there is a difference between the density calibration temperature and the process temperature, the measurement error of the sensors is typically ±0.015 kg/m³/°C (±0.0075 kg/m³/°F) outside of +20 to +60 °C (+68 to +140 °F)

**Premium density (order code for "Application package", option EI)**

If there is a difference between the reference temperature of 20°C and the process temperature, the additional maximum measured error of the sensors is typically
±0.0025 kg/m³/°C (±0.00139 kg/m³/°F) within the temperature calibration range.

Outside the calibrated temperature range, the influence of the process temperature is typically ±0.005 kg/m³/°C (±0.00278 kg/m³/°F)




*1 Standard density*
*2 Premium density*

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

**Influence of medium pressure**

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

o.r. = of reading

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

Operating Instructions → 129.

*Mass flow*

| DN | | [% o.r./bar] ±0.0005 | [% o.r./psi] ±0.00003 |
|---|---|---|---|
| [mm] | [in] | | |
| 25 | 1 | −0.0040 | −0.000276 |
| 50 | 2 | −0.0025 | −0.000172 |
| 80 | 3 | −0.0050 | −0.000345 |
| 100 | 4 | −0.0040 | −0.000276 |
| 150 | 6 | −0.0077 | −0.000531 |
| 200 | 8 | −0.0074 | −0.000510 |
| 250 | 10 | −0.0076 | −0.000524 |

*Density*

| DN | | [% o.r./bar] ±0.0006 ±0.0003 1) | [% o.r./psi] ±0.00004 ±0.00002 1) |
|---|---|---|---|
| [mm] | [in] | | |
| 25 | 1 | −0.0029 | −0.000200 |
| 50 | 2 | −0.0034 | −0.000234 |
| 80 | 3 | −0.0024 | −0.000166 |
| 100 | 4 | −0.0006 | −0.000041 |
| 150 | 6 | −0.0040 | −0.000276 |
| 200 | 8 | −0.0015 | −0.000103 |
| 250 | 10 | −0.0048 | −0.000331 |

1) Premium density

The values for the influence of medium pressure are based on the density of water.

**Design fundamentals**

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

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

MeasValue = measured value; ZeroPoint = zero point stability

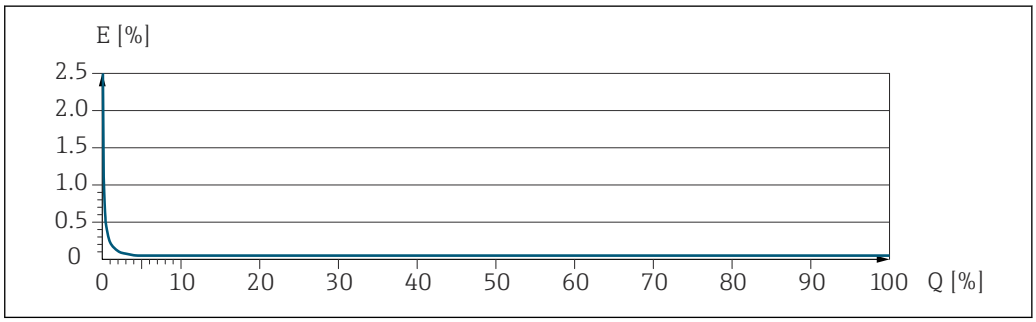
*Calculation of the maximum measured error as a function of the flow rate*

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

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

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

### Example of maximum measurement error

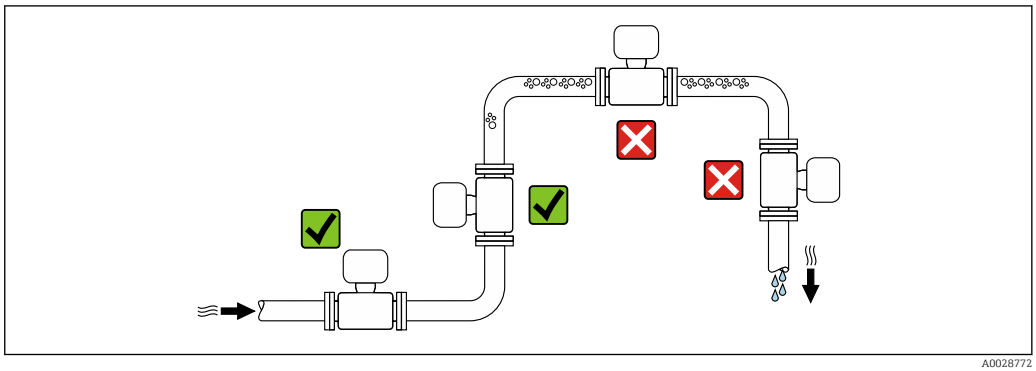



A0028741

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

# Mounting

## Installation point

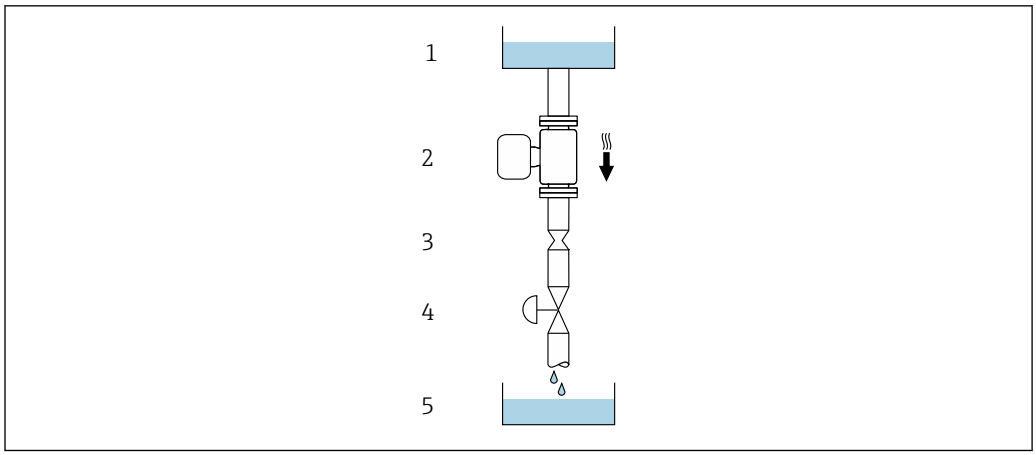


A0028772

To prevent measuring errors arising from accumulation of gas bubbles in the measuring pipe, avoid the following mounting locations in the piping:
- 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.



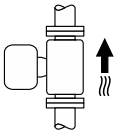
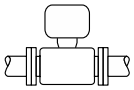

*23 Installation in a down pipe (e.g. for batching applications)*

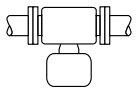
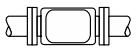
*1 Supply tank*
*2 Sensor*
*3 Orifice plate, pipe restriction*
*4 Valve*
*5 Filling vessel*

| DN | | Ø orifice plate, pipe restriction | |
|---|---|---|---|
| [mm] | [in] | [mm] | [in] |
| 25 | 1 | 14 | 0.55 |
| 50 | 2 | 28 | 1.10 |
| 80 | 3 | 50 | 1.97 |
| 100 | 4 | 65 | 2.60 |
| 150 | 6 | 90 | 3.54 |
| 200 | 8 | 120 | 4.72 |
| 250 | 10 | 150 | 5.91 |

## Orientation

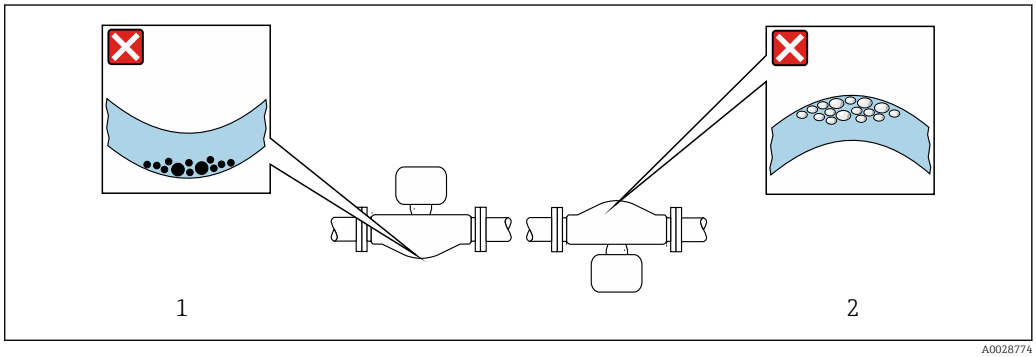
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

| Orientation | | | Recommendation |
|---|---|---|---|
| **A** | Vertical orientation |  A0015591 | ✓✓ [1] |
| **B** | Horizontal orientation, transmitter at top |  A0015589 | ✓✓ [2] Exception: → 24, 63 |

| Orientation | | | Recommendation |
|---|---|---|---|
| **C** | Horizontal orientation, transmitter at bottom |  A0015590 | ✓✓ [3] Exception: → 24, 63 |
| **D** | Horizontal orientation, transmitter at side |  A0015592 | ✓✓ → 65 [4] |

1) This orientation is recommended to ensure self-draining.
2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
4) Not recommended for inhomogeneous media.

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




24 *Orientation of sensor with curved measuring tube*

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

**Inlet and outlet runs**

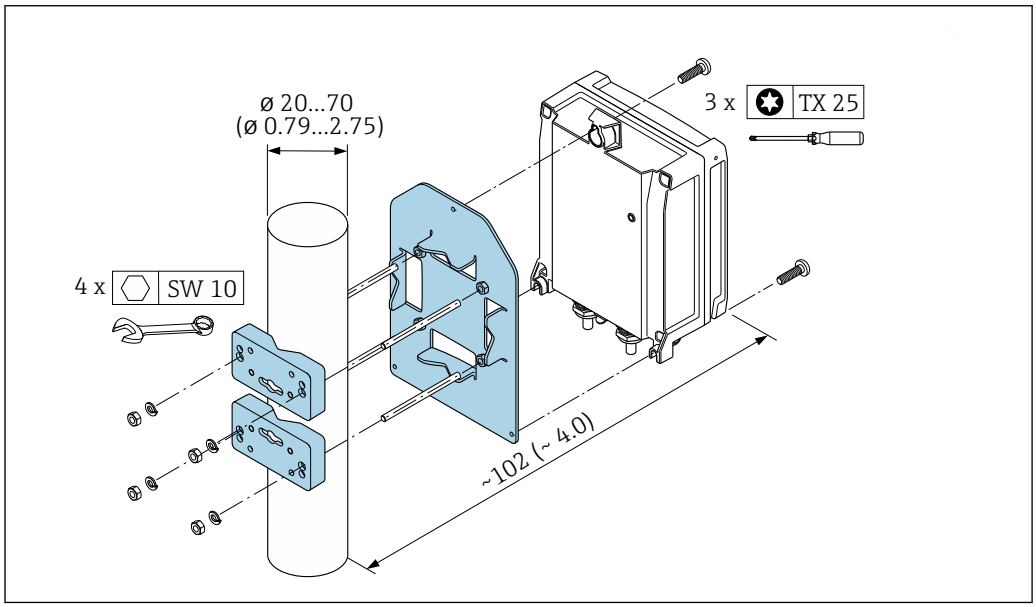
No special precautions need to be taken for fittings that create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 74.

## Mounting the transmitter housing

### Proline 500 – digital transmitter

*Pipe mounting*

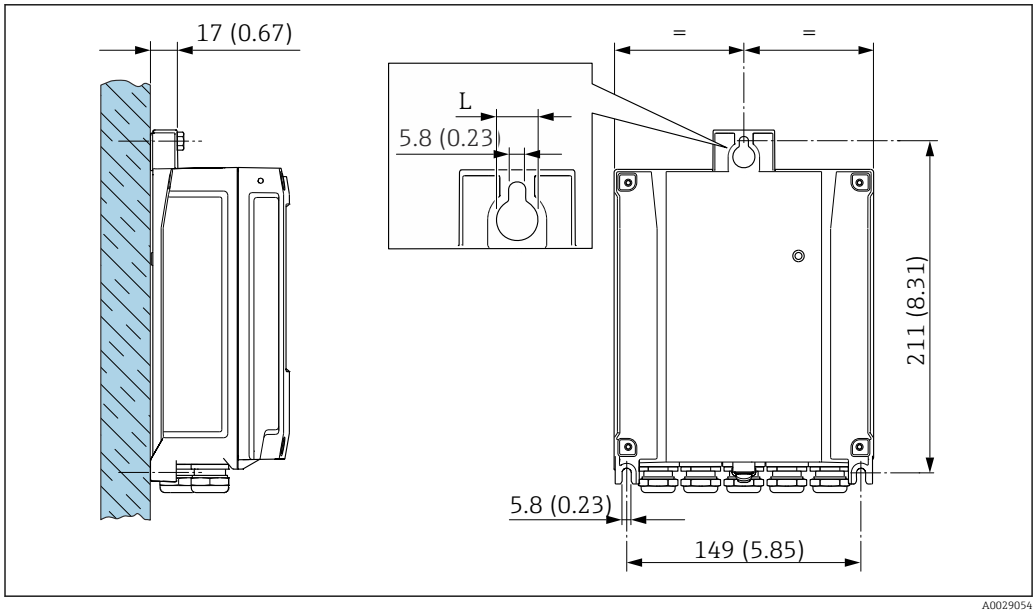
*Required tools:*
- Open-ended wrench AF 10
- Torx screwdriver TX 25




25 *Unit mm (in)*

*Wall mounting*

*Required tools:*
Drill with drill bit ø 6.0 mm




26 *Engineering unit mm (in)*

*L Depends on order code for "Transmitter housing"*

Order code for "Transmitter housing"
- Option **A**, aluminum, coated: L = 14 mm (0.55 in)
- Option **D**, polycarbonate: L = 13 mm (0.51 in)

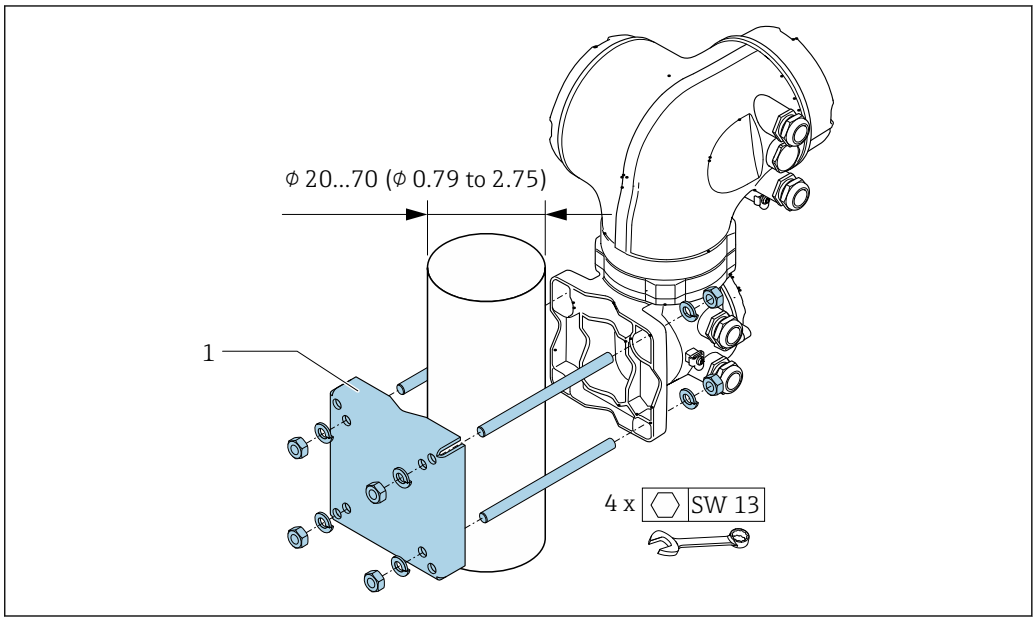
**Proline 500 transmitter**

*Pipe mounting*

Required tools
Open-ended wrench AF 13

**⚠ WARNING**

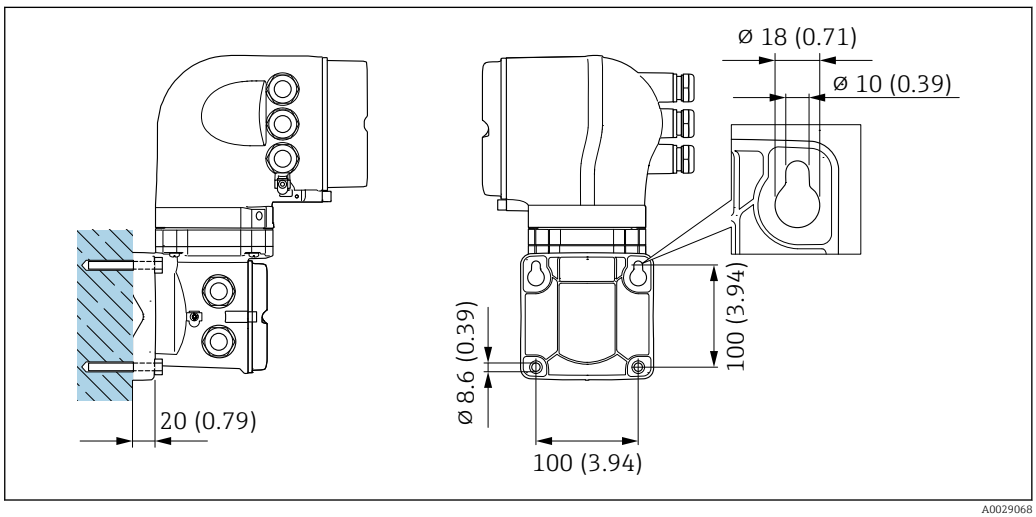
**Order code for "Transmitter housing", option L "Cast, stainless": cast transmitters are very heavy.**
They are unstable if they are not mounted on a secure, fixed post.
- ► Only mount the transmitter on a secure, fixed post on a stable surface.




27 *Engineering unit mm (in)*

*Wall mounting*

Required tools
Drill with drill bit Ø 6.0 mm




28 *Engineering unit mm (in)*

**Special installation instructions**

**Drainability**

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

### Hygienic compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 120

### Rupture disk

Process-related information: → 74.

**WARNING**

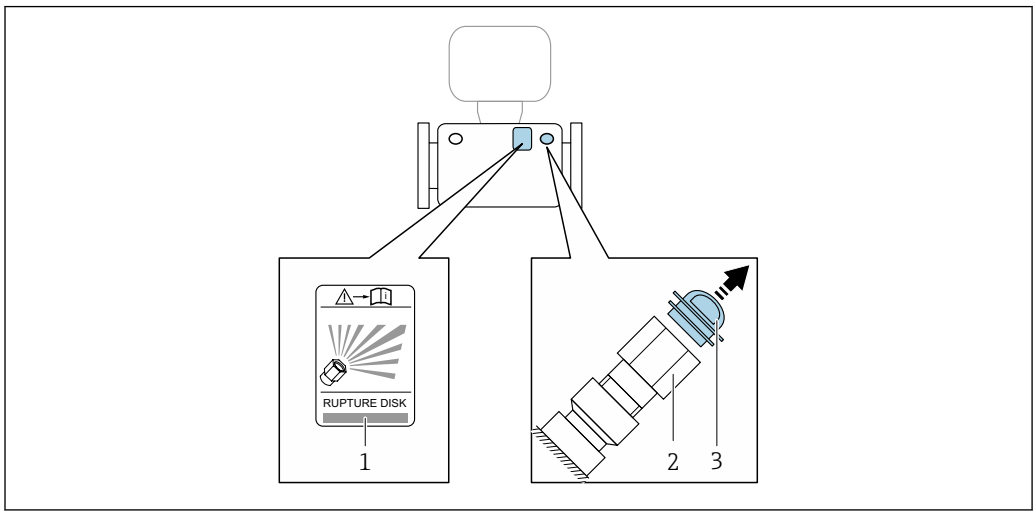
**Danger from medium escaping!**
Medium escaping under pressure can cause injury or material damage.
- Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- Observe the information on the rupture disk sticker.
- Make sure that the function and operation of the rupture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

The position of the rupture disk is indicated by a sticker affixed beside it.

The transportation guard must be removed.

The existing connecting nozzles are not intended for the purpose of rinsing or pressure monitoring, but instead serve as the mounting location for the rupture disk.

In the event of a failure of the rupture disk, a drain device can be screwed onto the internal thread of the rupture disk in order to drain off any escaping medium.




A0030346

*1 Rupture disk label*
*2 Rupture disk with 1/2" NPT internal thread and 1" width across flats*
*3 Transportation guard*

For information on the dimensions, see the "Mechanical construction" section (accessories).

### Zero verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 56. Therefore, a zero adjustment in the field is generally not required.

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

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

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

### Pitch and roll angles

If the device is used to measure the density of liquids, the pitch and roll angles must be taken into account during installation.

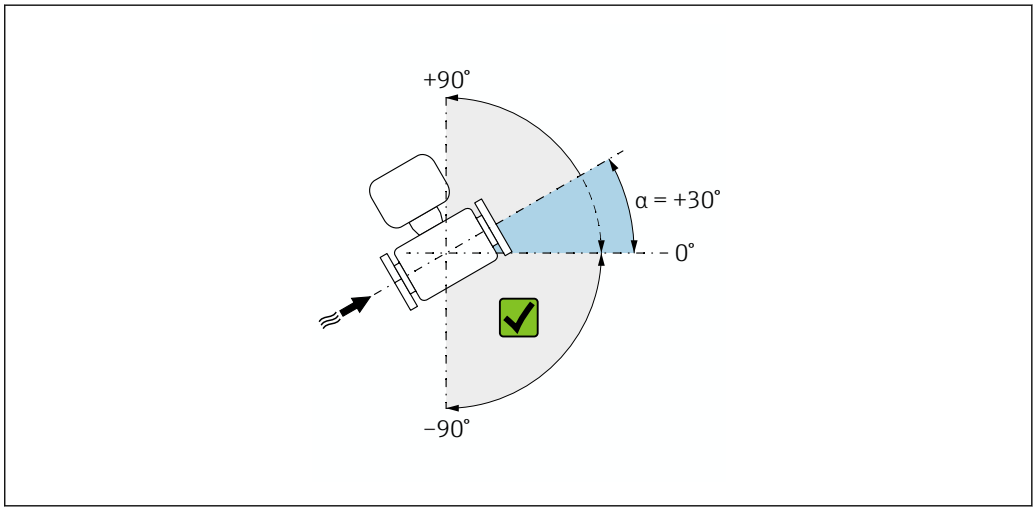
For correct measurement, the pitch angle and roll angle must be determined during commissioning (with a tolerance of ±10 °) and entered in the pitch angle and roll angle parameters.

For detailed information on density measurement, see the Special Documentation for the device → 130

*Pitch angle*

The technically relevant pitch angle is the angle shaded gray = −90 to +90 °.

Example (blue): Installation of the device with a pitch angle α = +30 °

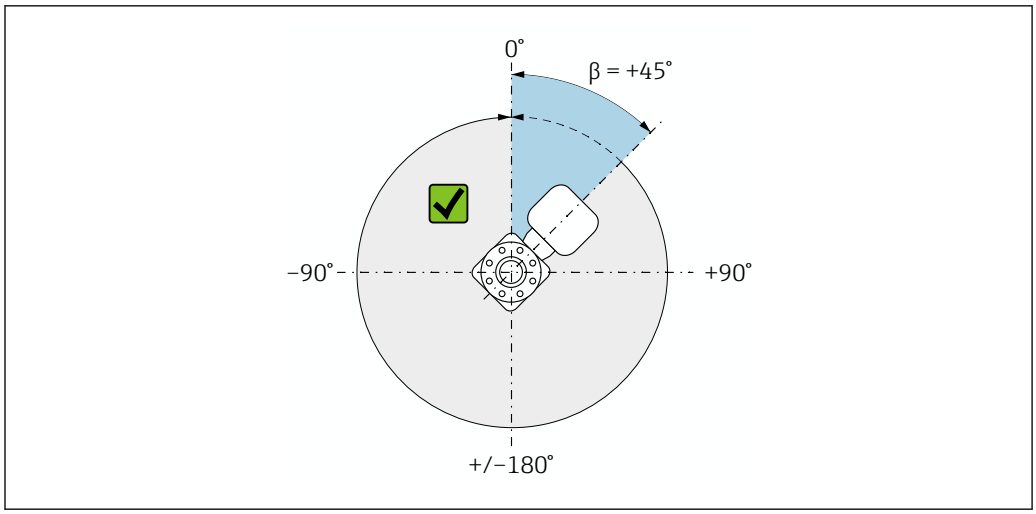



29 *Side view with flow direction from left to right.*

*Roll angle*

The technically relevant roll angle is the angle shaded gray = −180 to +180 °.

Example (blue): Installation of the device with a roll angle β = +45 °




30 *Top view in flow direction*

# Environment

**Ambient temperature range**

| | |
|---|---|
| **Measuring device** | ▪ −40 to +60 °C (−40 to +140 °F)<br>▪ Order code for "Test, certificate", option JP: −50 to +60 °C (−58 to +140 °F)<br>▪ Order code for "Test, certificate", option JQ:<br>  ▪ Sensor: −60 to +60 °C (−76 to +140 °F)<br>  ▪ Transmitter: −50 to +60 °C (−58 to +140 °F) |
| **Readability of the local display** | −20 to +60 °C (−4 to +140 °F)<br>The readability of the display may be impaired at temperatures outside the temperature range. |

Dependency of ambient temperature on medium temperature → 70

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

**Storage temperature**

**Climate class**

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

**Relative humidity**

The device is suitable for use outdoors and indoors with a relative humidity of 4 to 95 %.

**Operating height**

According to EN 61010-1
▪ ≤ 2 000 m (6 562 ft)
▪ > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

**Degree of protection**

**Transmitter**

▪ IP66/67, Type 4X enclosure, suitable for pollution degree 4
▪ When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
▪ Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

**Sensor**

▪ IP66/67, Type 4X enclosure, suitable for pollution degree 4
▪ When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2

*Optional*

DN 25 to 100: order code for "Sensor options", option CM "IP69

**External WLAN antenna**

IP67

**Shock and vibration resistance**

**Vibration sinusoidal, in accordance with IEC 60068-2-6**

Sensor: order code for "Meas. tube mat., wetted parts surface", option LA, SD, SE, SF, TH, TT, TU
- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 2 000 Hz, 1 g peak

Sensor: order code for "Meas. tube mat., wetted parts surface", option HA, SA, SB, SC
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

Transmitter
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

**Vibration broad-band random, according to IEC 60068-2-64**

Sensor: order code for "Meas. tube mat., wetted parts surface", option LA, SD, SE, SF, TH, TT, TU
- 10 to 200 Hz, 0.003 $g^2$/Hz
- 200 to 2 000 Hz, 0.001 $g^2$/Hz
- Total: 1.54 g rms

Sensor: order code for "Meas. tube mat., wetted parts surface", option HA, SA, SB, SC
- 10 to 200 Hz, 0.01 $g^2$/Hz
- 200 to 2 000 Hz, 0.003 $g^2$/Hz
- Total: 2.70 g rms

Transmitter
- 10 to 200 Hz, 0.01 $g^2$/Hz
- 200 to 2 000 Hz, 0.003 $g^2$/Hz
- Total: 2.70 g rms

**Shock half-sine, according to IEC 60068-2-27**

- Sensor: order code for "Meas. tube mat., wetted parts surface", option LA, SD, SE, SF, TH, TT, TU
  6 ms 30 g
- Sensor: order code for "Meas. tube mat., wetted parts surface", option HA, SA, SB, SC
  6 ms 50 g
- Transmitter
  6 ms 50 g

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

**Internal cleaning**

- CIP cleaning
- SIP cleaning

**Options**
- Oil- and grease-free version for wetted parts, without declaration
  Order code for "Service", option HA [1)]
- Oil- and grease-free version for wetted parts as per IEC/TR 60877-2.0 and BOC 50000810-4, with declaration
  Order code for "Service", option HB [1)]

**Mechanical load**

Transmitter housing and sensor connection housing:
- Protect against mechanical effects, such as shock or impact
- Do not use as a ladder or climbing aid

1) The cleaning refers to the measuring instrument only. Any accessories supplied are not cleaned.

**Electromagnetic compatibility (EMC)**

- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
- As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
- Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784

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

Details are provided in the Declaration of Conformity.

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

# Process

**Medium temperature range**

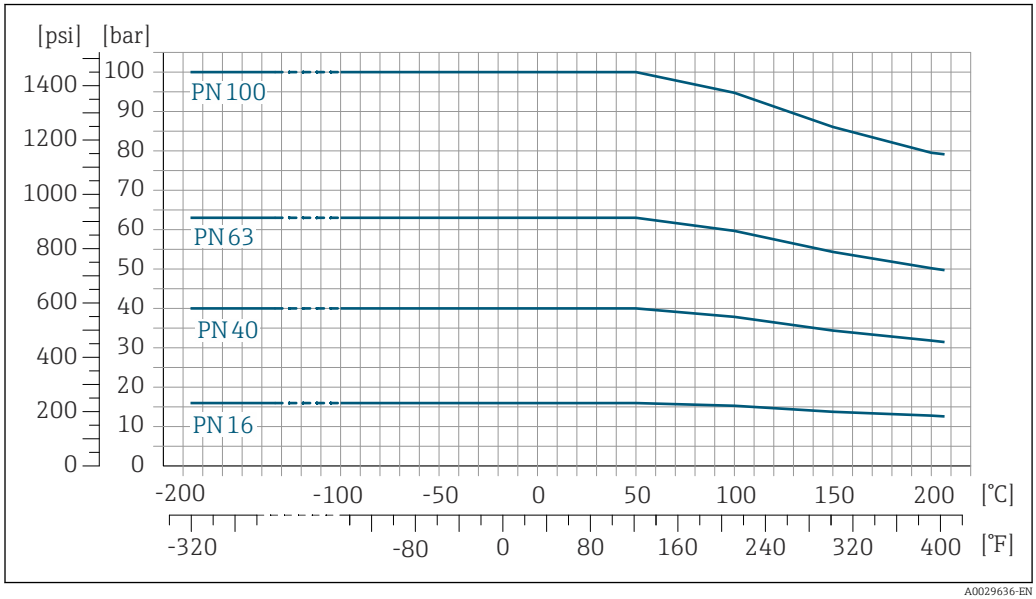
| | | |
|---|---|---|
| Standard version | −50 to +205 °C (−58 to +401 °F) | Order code for "Measuring tube mat., wetted surface", option SA, SB |
| Low-temperature version | −196 to +150 °C (−320 to +302 °F)<br>**NOTICE**<br>**Material fatigue due to excessive temperature difference!**<br>▶ Maximum temperature difference of media used: 300 K | Order code for "Measuring tube mat., wetted surface", option LA |

**Pressure-temperature ratings**

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

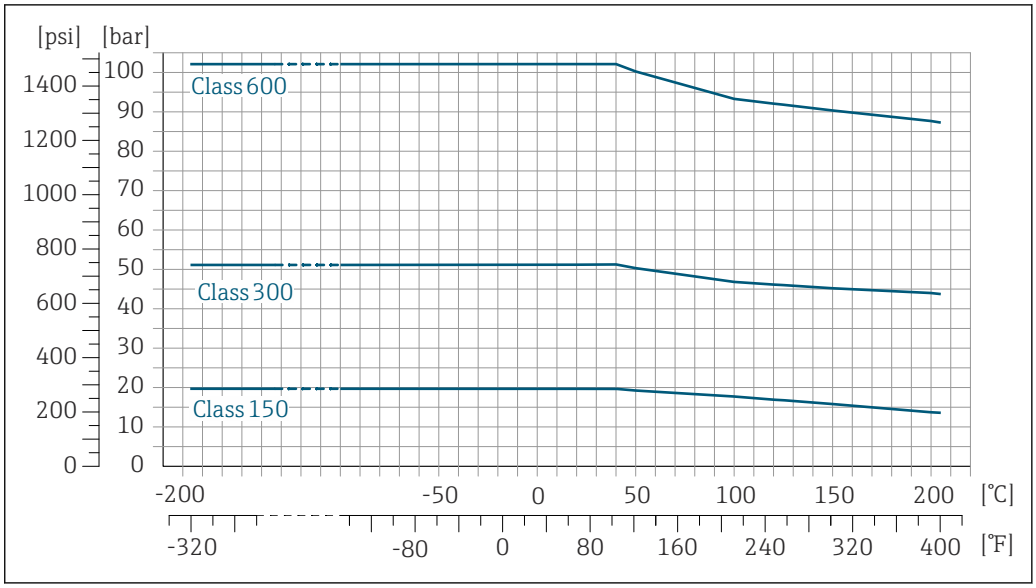
Pressure-temperature ratings with the +151 to +205 °C (+304 to +401 °F) temperature range are only for measuring devices with the extended temperature version.

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



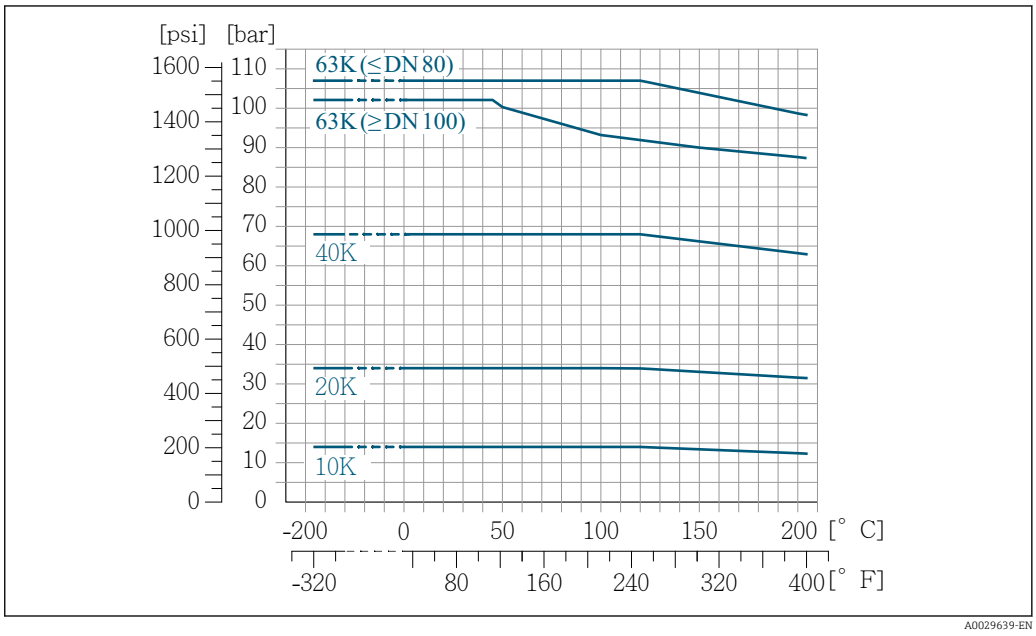

*31 With flange material 1.4404 (F316/F316L)*

### Flange similar to ASME B16.5



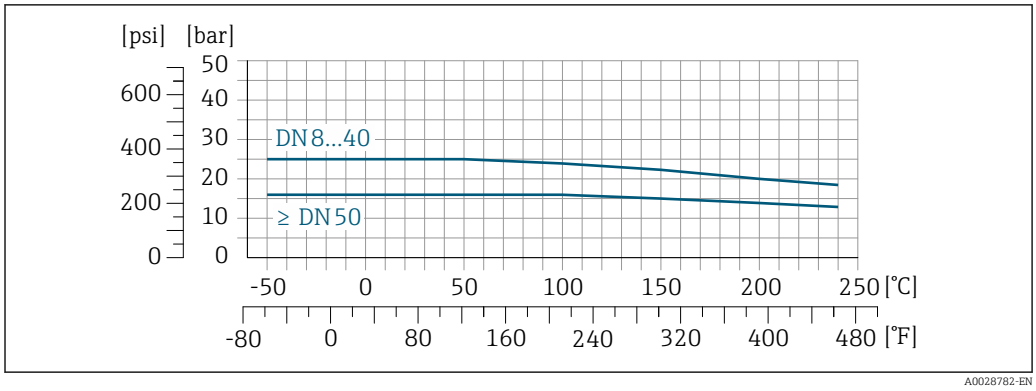

32 *With flange material 1.4404 (F316/F316L)*

### Flange JIS B2220



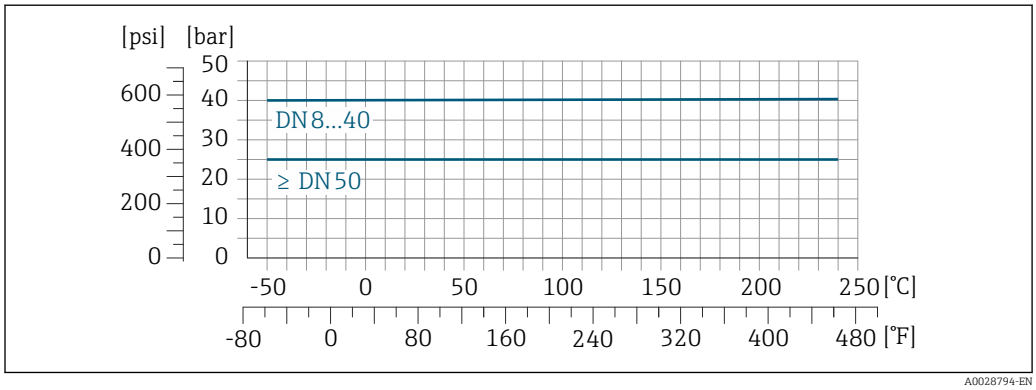

33 *With flange material 1.4404 (F316/F316L)*

### Flange DIN 11864-2 Form A




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

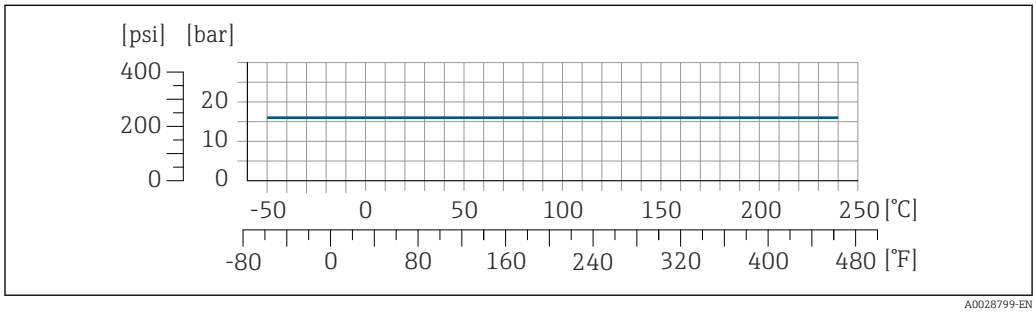
### Threaded adapter DIN 11851




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

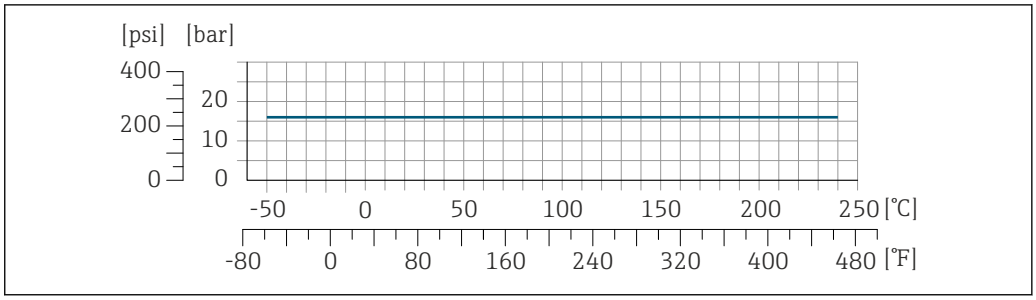
DIN 11851 allows for applications up to +140 °C (+284 °F) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

### Threaded adapter ISO 2853




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

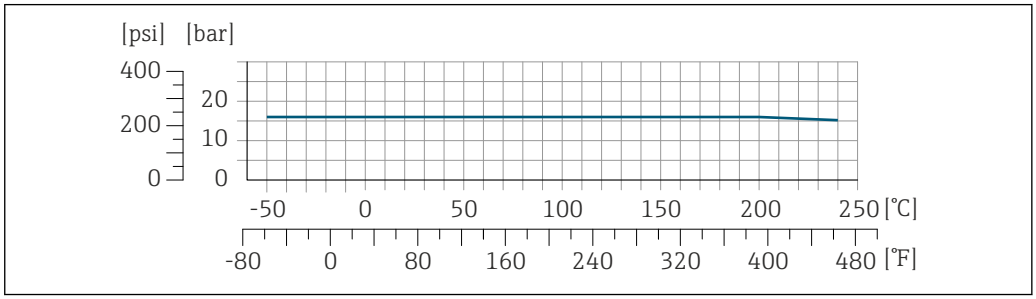
### Threaded adapter SMS 1145




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

SMS 1145 allows for applications up to 16 bar (232 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.

## Sensor housing

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

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

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

If there is a need to drain the leaking medium into a discharge device, the sensor should be fitted with a rupture disk. Connect the discharge to the additional threaded connection → 89.

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

Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. The use of helium at low pressure is recommended for purging.

Maximum pressure: 0.5 bar (7.3 psi)

### Burst pressure of the sensor housing

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

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

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

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

| DN | | Sensor housing burst pressure | |
|---|---|---|---|
| [mm] | [in] | [bar] | [psi] |
| 25 | 1 | 220 | 3 191 |
| 50 | 2 | 160 | 2 320 |
| 80 | 3 | 150 | 2 175 |
| 100 | 4 | 120 | 1 740 |
| 150 | 6 | 120 | 1740 |
| 200 | 8 | 100 | 1450 |
| 250 | 10 | 100 | 1450 |

For information on the dimensions: see the "Mechanical construction" section → 77

**Rupture disk**

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

For information on the dimensions: see the "Mechanical construction" section (accessories) → 89

**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 → 11

- 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).

To calculate the flow limit, use the *Applicator* sizing tool → 128

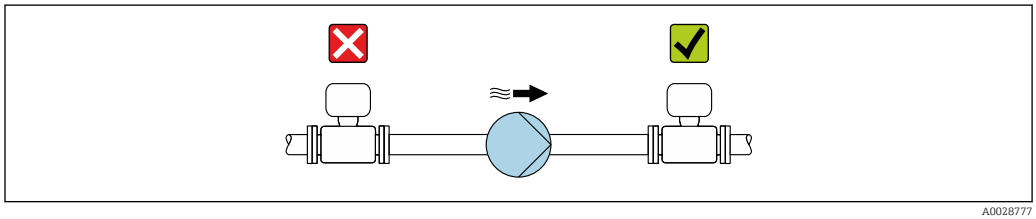
**Pressure loss**

To calculate the pressure loss, use the *Applicator* sizing tool → 128

**Static pressure**

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

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



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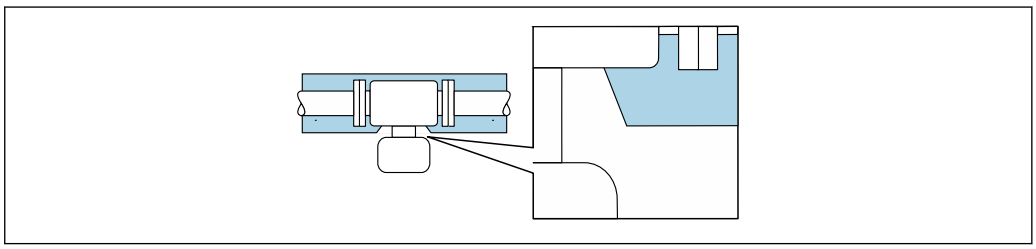
## Thermal insulation

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

NOTICE

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

- Recommended orientation: horizontal orientation, sensor connection housing pointing downwards.
- Do not insulate the sensor connection housing.
- Maximum permissible temperature at the lower end of the sensor connection housing: 80 °C (176 °F)
- Regarding thermal insulation with an exposed extended neck: We advise against insulating the extended neck to ensure optimal heat dissipation.



A0034391

*38 Thermal insulation with exposed extended neck*

Low-temperature version: It is generally not necessary to insulate the sensor connection housing. If insulation is provided, the rules that apply are the same as those for thermal insulation.

## Heating

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

**Heating options**

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

NOTICE

**Danger of overheating when heating**

- Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F).
- Ensure that sufficient convection takes place at the transmitter neck.
- When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.
- Consider the "830 ambient temperature too high" and "832 electronics temperature too high" process diagnostics if overheating cannot be ruled out based on a suitable system design.

## Vibrations

The operational reliability of the measuring system is not affected by plant vibrations.

2) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" → 131

# Custody transfer

The measuring device is optionally tested in accordance with OIML R117/R81 and has an EU type evaluation certificate which authorizes the use in EU type-examination certificates according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") for liquids other than water and cryogenic liquids (Annex VII).

The measuring device is optionally tested according to OIML R137 and has an EU type-examination certificate according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") as a gas meter (Annex IV).

The device is used with a legally controlled totalizer display on the local display and optionally with outputs subject to legal metrological control.

Measuring devices subject to legal metrological control totalize in both directions, i.e. all the outputs consider flow components in the positive (forward) and negative (reverse) flow direction.

Generally a measuring device subject to legal metrological control is secured against tampering by seals on the transmitter or sensor. These seals may normally only be opened by a representative of the competent authority for legal metrology controls.

After putting the device into circulation or after sealing the device, operation is only possible to a limited extent.

Detailed ordering information is available from your local Endress+Hauser sales center for national approvals, which are based on the OIML certificates, for applications with liquids other than water or cryogenic liquids.

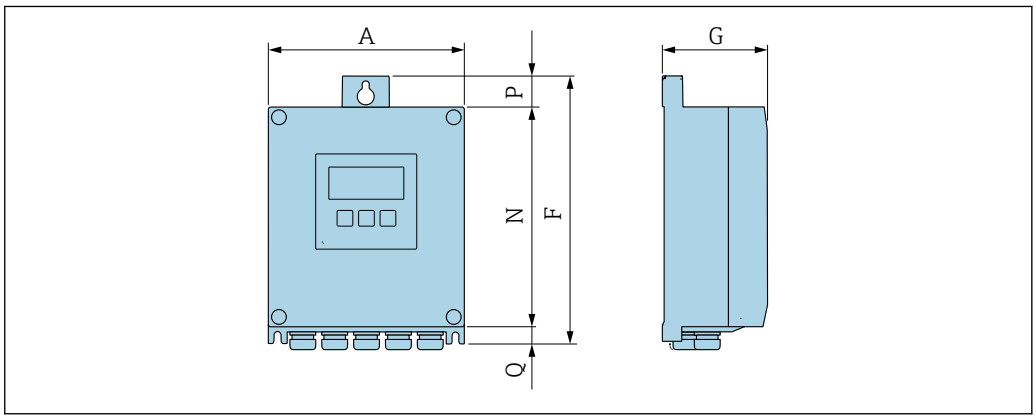
More information is provided in the supplementary documentation.

# Mechanical construction

**Dimensions in SI units**

**Housing of Proline 500 – digital transmitter**

**Non-hazardous area or hazardous area: Zone 2; Class I, Division 2**




A0033789

*Order code for "Transmitter housing", option A "Aluminum, coated" and order code for "Integrated ISEM electronics", option A "Sensor"*

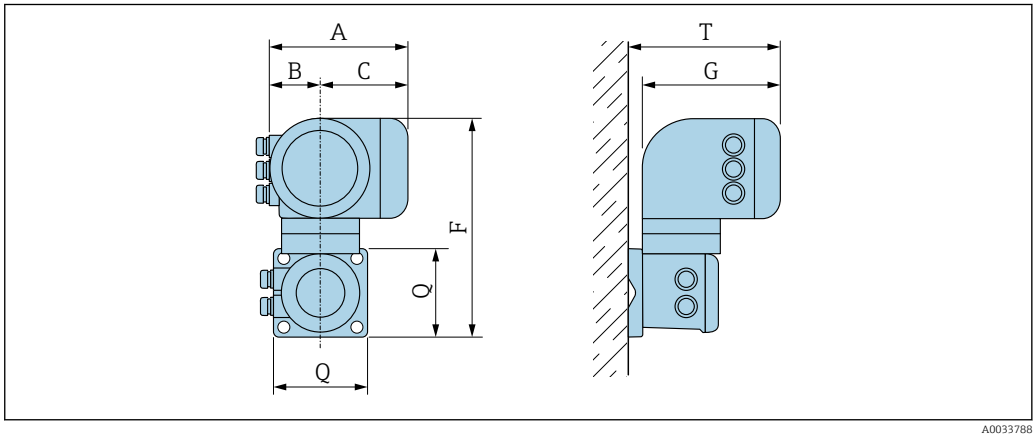
| A [mm] | F [mm] | G [mm] | N [mm] | P [mm] | Q [mm] |
|---|---|---|---|---|---|
| 167 | 232 | 89 | 187 | 24 | 21 |

*Order code for "Transmitter housing", option D "Polycarbonate" and order code for "Integrated ISEM electronics", option A "Sensor"*

| A [mm] | F [mm] | G [mm] | N [mm] | P [mm] | Q [mm] |
|---|---|---|---|---|---|
| 177 | 234 | 89 | 197 | 17 | 22 |

**Housing of Proline 500 transmitter**

**Hazardous area: Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1**




A0033788

*Order code for "Transmitter housing", option A "Aluminum, coated" and order code for "Integrated ISEM electronics", option B "Transmitter"*

| A [mm] | B [mm] | C [mm] | F [1] [mm] | G [mm] | Q [mm] | T [mm] |
|---|---|---|---|---|---|---|
| 188 | 85 | 103 | 318 | 217 | 130 | 239 |

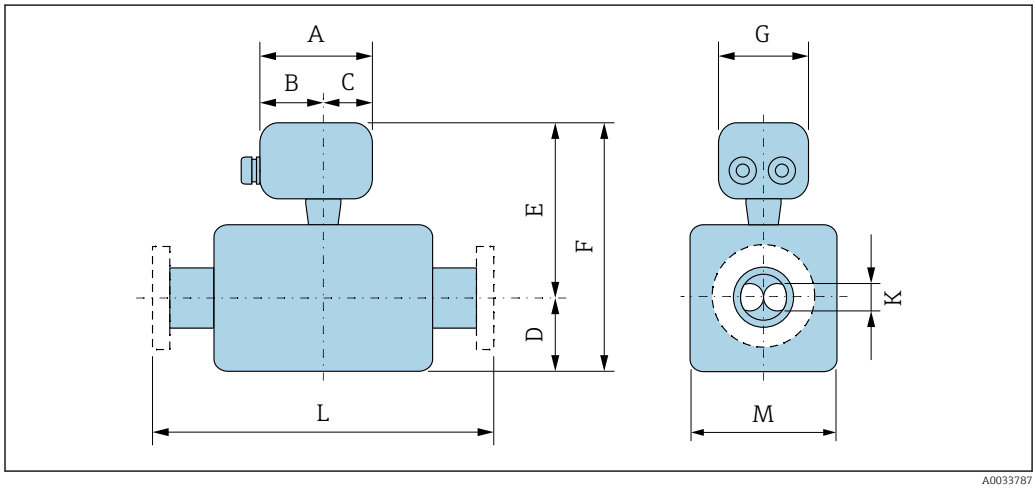
1) DN ≥ 150: values +72 mm

*Order code for "Transmitter housing", option L "Cast, stainless" and order code for "Integrated ISEM electronics", option B "Transmitter"*

| A [mm] | B [mm] | C [mm] | F [1] [mm] | G [mm] | Q [mm] | T [mm] |
|---|---|---|---|---|---|---|
| 188 | 85 | 103 | 295 | 217 | 130 | 239 |

1) DN ≥ 150: values +72 mm

### Sensor connection housing




*Order code for "Sensor connection housing", option A "Aluminum, coated"*

| DN [mm] | A [1] [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 148 | 94 | 54 | 217 | 256.5 | 473.5 | 136 | 15.2 | [2] | 73 |
| 50 | 148 | 94 | 54 | 408 | 277 | 685 | 136 | 28.0 | [2] | 115 |
| 80 | 148 | 94 | 54 | 524 | 304 | 828 | 136 | 43.3 | [2] | 169 |
| 100 | 148 | 94 | 54 | 655 | 330 | 985 | 136 | 68.9 | [2] | 220 |

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

*Order code for "Sensor connection housing", option B "Stainless"*

| DN [mm] | A [1] [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 137 | 78 | 59 | 217 | 251.5 | 468.5 | 134 | 15.2 | [2] | 73 |
| 50 | 137 | 78 | 59 | 408 | 272 | 680 | 134 | 28.0 | [2] | 115 |
| 80 | 137 | 78 | 59 | 524 | 299 | 823 | 134 | 43.3 | [2] | 169 |
| 100 | 137 | 78 | 59 | 655 | 325 | 980 | 134 | 68.9 | [2] | 220 |

| DN [mm] | A [1] [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 150 | 137 | 78 | 59 | 626 | 336 | 962 | 134 | 58.5 | [2] | 244 |
| 200 | 137 | 78 | 59 | 790 | 375 | 1166 | 134 | 71.5 | [2] | 323.9 |
| 250 | 137 | 78 | 59 | 887 | 392 | 1279 | 134 | 93.8 | [2] | 355.6 |

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

*Order code for "Sensor connection housing", option C "Ultra-compact hygienic, stainless"*

| DN [mm] | A [1] [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 124 | 68 | 56 | 217 | 251.5 | 468.5 | 112 | 15.2 | [2] | 73 |
| 50 | 124 | 68 | 56 | 408 | 272 | 680 | 112 | 28.0 | [2] | 115 |
| 80 | 124 | 68 | 56 | 524 | 299 | 823 | 112 | 43.3 | [2] | 169 |
| 100 | 124 | 68 | 56 | 655 | 325 | 980 | 112 | 68.9 | [2] | 220 |

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

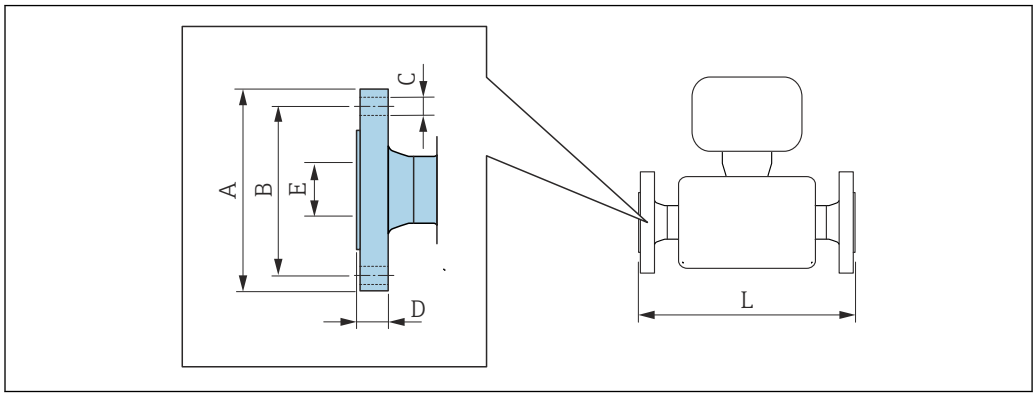
*Order code for "Sensor connection housing", option L "Cast, stainless"*

| DN [mm] | A [1] [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | K [mm] | L [mm] | M [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 145 | 86 | 59 | 217 | 280 | 497 | 136 | 15.2 | [2] | 73 |
| 50 | 145 | 86 | 59 | 408 | 300 | 708 | 136 | 28.0 | [2] | 115 |
| 80 | 145 | 86 | 59 | 524 | 327 | 851 | 136 | 43.3 | [2] | 169 |
| 100 | 145 | 86 | 59 | 655 | 353 | 1008 | 136 | 68.9 | [2] | 220 |
| 150 | 145 | 86 | 59 | 626 | 363 | 989 | 136 | 58.5 | [2] | 244 |
| 200 | 145 | 86 | 59 | 790 | 403 | 1193 | 136 | 71.5 | [2] | 324 |
| 250 | 145 | 86 | 59 | 887 | 419 | 1306 | 136 | 93.8 | [2] | 356 |

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

### Flange connections

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




A0015621

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

| **Flange similar to EN 1092-1 (DIN 2501 / DIN 2512N): PN16**<br>**1.4404 (F316/F316L):** *order code for "Process connection", option* **D1S**<br><br>**Flange with groove similar to EN 1092-1 Form D (DIN 2512N): PN16**<br>**1.4404 (F316/F316L):** *order code for "Process connection", option* **D5S** | | | | | | |
|---|---|---|---|---|---|---|
| **DN [mm]** | **A [mm]** | **B [mm]** | **C [mm]** | **D [mm]** | **E [mm]** | **L [mm]** |
| 100 | 220 | 180 | 8 × Ø18 | 20 | 107.1 | 1128 |
| 150 | 285 | 240 | 8 × Ø22 | 22 | 159.3 | 1136/1330 [1] |
| 200 | 340 | 295 | 12 × Ø22 | 24 | 206.5 | 1343 |
| 250 | 405 | 355 | 12 × Ø26 | 26 | 260.4 | 1775 |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

| **Flange similar to EN 1092-1 (DIN 2501): PN16 with reduction in nominal diameter**<br>**1.4404 (F316/F316L)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Flange DN [mm]** | **Device Reduction to DN [mm]** | **Order code "Process connection", Option** | **A [mm]** | **B [mm]** | **C [mm]** | **D [mm]** | **E [mm]** | **L [mm]** |
| 100 | 80 | DHS | 220 | 180 | 8 × Ø18 | 20 | 107.1 | 874 |
| 150 | 100 | DJS | 285 | 240 | 8 × Ø22 | 22 | 159.3 | 1167 |
| 200 | 150 | DLS | 340 | 295 | 12 × Ø22 | 24 | 206.5 | 1267 |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | | | |

| **Flange similar to EN 1092-1 (DIN 2501 / DIN 2512N): PN 40**<br>**1.4404 (F316/F316L):** *order code for "Process connection", option* **D2S**<br><br>**Flange with groove similar to EN 1092-1 Form D (DIN 2512N): PN 40**<br>**1.4404 (F316/F316L):** *order code for "Process connection", option* **D6S** | | | | | | |
|---|---|---|---|---|---|---|
| **DN [mm]** | **A [mm]** | **B [mm]** | **C [mm]** | **D [mm]** | **E [mm]** | **L [mm]** |
| 25 | 115 | 85 | 4 × Ø14 | 18 | 28.5 | 440 |
| 50 | 165 | 125 | 4 × Ø18 | 20 | 54.5 | 715 |

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

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 80 | 200 | 160 | 8 × Ø18 | 24 | 82.5 | 840 |
| 100 | 235 | 190 | 8 × Ø22 | 24 | 107.1 | 1128 |
| 150 | 300 | 250 | 8 × Ø26 | 28 | 159.3 | 1176/1370 [1] |
| 200 | 375 | 320 | 12 × Ø30 | 34 | 206.5 | 1395 |
| 250 | 450 | 385 | 12 × Ø33 | 38 | 258.8 | 1845 |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

**Flange similar to EN 1092-1 (DIN 2501): PN 40 with reduction in nominal diameter**
**1.4404 (F316/F316L)**

| Flange DN [mm] | Device Reduction to DN [mm] | Order code "Process connection", Option | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| 80 | 50 | DGS | 200 | 160 | 8 × Ø18 | 24 | 82.5 | 840 |
| 100 | 80 | DIS | 235 | 190 | 8 × Ø22 | 24 | 107.1 | 874 |
| 150 | 100 | DKS | 300 | 250 | 8 × Ø26 | 28 | 159.3 | 1167 |
| 200 | 150 | DMS | 375 | 320 | 12 × Ø30 | 34 | 206.5 | 1267 |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | | | |

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

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 | 180 | 135 | 4 × Ø22 | 26 | 54.5 | 724 |
| 80 | 215 | 170 | 8 × Ø22 | 28 | 81.7 | 875 |
| 100 | 250 | 200 | 8 × Ø26 | 30 | 106.3 | 1128 |
| 150 | 345 | 280 | 8 × Ø33 | 36 | 157.1 | 1216/1410 [1] |
| 200 | 415 | 345 | 12 × Ø36 | 42 | 204.9 | 1439 |
| 250 | 470 | 400 | 12 × Ø36 | 46 | 255.4 | 1885 |
| Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

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

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 140 | 100 | 4 × Ø18 | 24 | 28.5 | 470 |
| 50 | 195 | 145 | 4 × Ø26 | 28 | 53.9 | 740 |
| 80 | 230 | 180 | 8 × Ø26 | 32 | 80.9 | 885 |
| 100 | 265 | 210 | 8 × Ø30 | 36 | 104.3 | 1128 |
| 150 | 355 | 290 | 12 × Ø33 | 44 | 154.0 | 1256/1450 [1] |
| 200 | 430 | 360 | 12 × Ø36 | 52 | 199 | 1479 |
| 250 | 505 | 430 | 12 × Ø39 | 60 | 248 | 1949 |
| Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form E), Ra 0.8 to 3.2 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 110 | 79.4 | 4 × Ø15.7 | 14.2 | 26.7 | 440 |
| 50 | 150 | 120.7 | 4 × Ø19.1 | 19.1 | 52.6 | 715 |
| 80 | 190 | 152.4 | 4 × Ø19.1 | 23.9 | 78.0 | 840 |
| 100 | 230 | 190.5 | 8 × Ø19.1 | 23.9 | 102.4 | 1128 |
| 150 | 280 | 241.3 | 8 × Ø22.2 | 25.9 | 154.1 | 1203/1398 [1] |
| 200 | 345 | 298.5 | 8 × Ø22.2 | 29 | 202.7 | 1423 |
| 250 | 405 | 362 | 12 × Ø25.4 | 30.6 | 254.5 | 1832 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

**Flange similar to ASME B16.5: Class 150 with reduction in nominal diameter**
**1.4404 (F316/F316L)**

| Flange DN [mm] | Device Reduction to DN [mm] | Order code "Process connection", Option | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| 80 | 50 | AJS | 190 | 152.4 | 4 × Ø19.1 | 23.9 | 78.0 | 720 |
| 100 | 80 | ALS | 230 | 190.5 | 8 × Ø19.1 | 23.9 | 102.4 | 874 |
| 150 | 100 | ANS | 280 | 241.3 | 8 × Ø22.4 | 25.4 | 154.2 | 1167 |
| 200 | 150 | APS | 345 | 298.5 | 8 × Ø22.2 | 29 | 202.7 | 1266 |
| 250 | 200 | AVS | 405 | 362 | 12 × Ø25.4 | 30.6 | 254.6 | 1408/1832 [1] |
| 300 | 250 | AXS | 485 | 431.8 | 12 × Ø25.4 | 32.2 | 304.8 | 1935 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | | | |

1) Installed length such as Promass F, DN 250 (order code for "Sensor option", option CO)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 125 | 88.9 | 4 × Ø19.1 | 17.5 | 26.7 | 440 |
| 50 | 165 | 127 | 8 × Ø19.1 | 22.3 | 52.6 | 715 |
| 80 | 210 | 168.3 | 8 × Ø22.3 | 28.4 | 78.0 | 840 |
| 100 | 255 | 200 | 8 × Ø22.3 | 31.7 | 102.4 | 1128 |
| 150 | 320 | 269.9 | 12 × Ø22.2 | 37 | 154.1 | 1223/1417 [1] |
| 200 | 380 | 330.2 | 12 × Ø25.4 | 41.7 | 202.7 | 1443 |
| 250 | 445 | 387.4 | 16 × Ø28.5 | 48.1 | 254.5 | 1863 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

**Flange similar to ASME B16.5: Class 300 with reduction in nominal diameter**
**1.4404 (F316/F316L)**

| Flange DN [mm] | Device Reduction to DN [mm] | Order code "Process connection", Option | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|---|---|
| 80 | 50 | AKS | 210 | 168.3 | 8 × Ø22.3 | 28.4 | 78.0 | 732 |
| 100 | 80 | AMS | 255 | 200 | 8 × Ø22.3 | 31.7 | 102.4 | 894 |
| 150 | 100 | AOS | 320 | 269.9 | 12 × Ø22.3 | 36.5 | 154.2 | 1187 |
| 200 | 150 | AQS | 380 | 330.2 | 12 × Ø25.4 | 41.7 | 202.7 | 1266 |
| 250 | 200 | AWS | 445 | 374.4 | 16 × Ø28.6 | 48.1 | 254.6 | 1439/ 1863 [1] |
| 300 | 250 | AZS | 520 | 450.8 | 16 × Ø31.8 | 51.3 | 304.8 | 1935 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | | | |

1) Installed length such as Promass F, DN 250 (order code for "Sensor option", option CO)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 125 | 88.9 | 4 × Ø19.1 | 23.9 | 24.3 | 490 |
| 50 | 165 | 127 | 8 × Ø19.1 | 31.8 | 49.2 | 742 |
| 80 | 210 | 168.3 | 8 × Ø22.2 | 40.0 | 73.7 | 904 |
| 100 | 275 | 215.9 | 8 × Ø25.4 | 48.4 | 97.3 | 1158 |
| 150 | 355 | 292.1 | 12 × Ø28.5 | 54.7 | 154.1 | 1273/1467 [1] |
| 200 | 420 | 349.2 | 12 × Ø31.8 | 62.6 | 202.7 | 1499 |
| 250 | 510 | 431.8 | 16 × Ø35 | 70.5 | 254.5 | 1946 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 50 | 155 | 120 | 4 × Ø19 | 16 | 50 | 715 |
| 80 | 185 | 150 | 8 × Ø19 | 18 | 80 | 832 |
| 100 | 210 | 175 | 8 × Ø19 | 18 | 100 | 1128 |
| 150 | 280 | 240 | 8 × Ø23 | 22 | 150 | 1160/1354 [1] |
| 200 | 330 | 290 | 12 × Ø23 | 22 | 200 | 1379 |
| 250 | 400 | 355 | 12 × Ø25 | 24 | 250 | 1775 |
| Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 125 | 90 | 4 × Ø19 | 16 | 25 | 440 |
| 50 | 155 | 120 | 8 × Ø19 | 18 | 50 | 715 |
| 80 | 200 | 160 | 8 × Ø23 | 22 | 80 | 832 |
| 100 | 225 | 185 | 8 × Ø23 | 24 | 100 | 1128 |
| 150 | 305 | 260 | 12 × Ø25 | 28 | 150 | 1192/1386 [1] |
| 200 | 350 | 305 | 12 × Ø25 | 30 | 200 | 1379 |
| 250 | 430 | 380 | 12 × Ø27 | 34 | 250 | 1845 |
| Surface roughness (flange): Ra 1.6 to 3.2 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 130 | 95 | 4 × Ø19 | 22 | 25 | 485 |
| 50 | 165 | 130 | 8 × Ø19 | 26 | 50 | 760 |
| 80 | 210 | 170 | 8 × Ø23 | 32 | 75 | 890 |
| 100 | 250 | 205 | 8 × Ø25 | 36 | 100 | 1168 |
| 150 | 355 | 295 | 12 × Ø33 | 44 | 150 | 1304/1498 [1] |
| 200 | 405 | 345 | 12 × Ø33 | 50 | 200 | 1459 |
| Surface roughness (flange): Ra 1.6 to 3.2 µm | | | | | | |

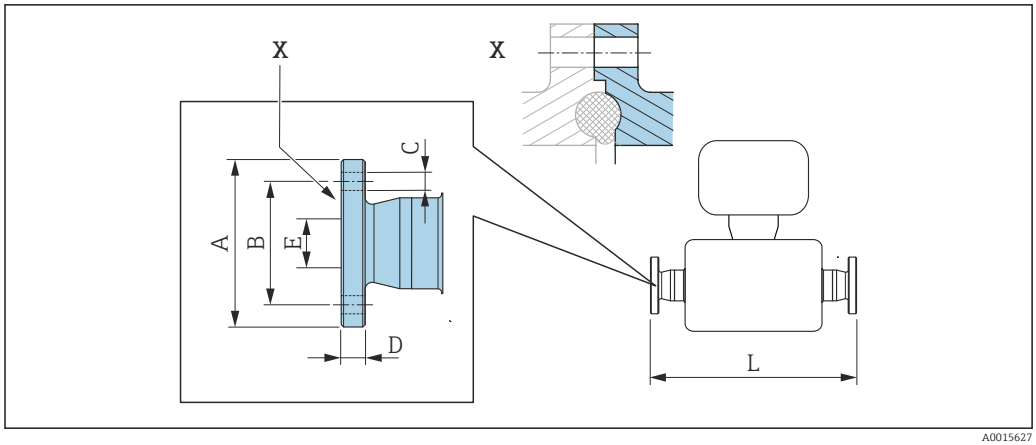
1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

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

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 140 | 100 | 4 × Ø23 | 27 | 22 | 494 |
| 50 | 185 | 145 | 8 × Ø23 | 34 | 48 | 775 |
| 80 | 230 | 185 | 8 × Ø25 | 40 | 73 | 915 |
| 100 | 270 | 220 | 8 × Ø27 | 44 | 98 | 1168 |
| 150 | 365 | 305 | 12 × Ø33 | 54 | 146 | 1334/1528 [1] |
| 200 | 425 | 360 | 12 × Ø33 | 60 | 190.9 | 1479 |
| Surface roughness (flange): Ra 1.6 to 3.2 µm | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

*Fixed flange DIN 11864-2*




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

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

**Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flange with notch**
**1.4404 (316/316L)**
*Order code for "Process connection", option* **KCS**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 25 | 70 | 53 | 4 × Ø9 | 10 | 26 | 454 |
| 50 | 94 | 77 | 4 × Ø9 | 10 | 50 | 720 |
| 80 | 133 | 112 | 8 × Ø11 | 12 | 81 | 900 |
| 100 | 159 | 137 | 8 × Ø11 | 14 | 100 | 1128 |

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

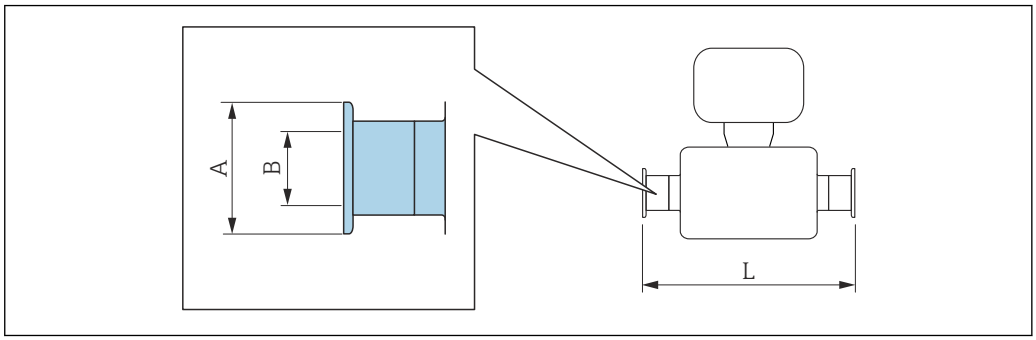
**Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flange with notch with nominal diameter reduction**
**1.4404 (316/316L)**
*Order code for "Process connection", option* **KAS**

| Flange DN [mm] | Device Reduction to DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|---|
| 40 | 25 | 82 | 65 | 4 × Ø9 | 10 | 38 | 454 |

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

### Clamp connections

*Tri-Clamp*




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

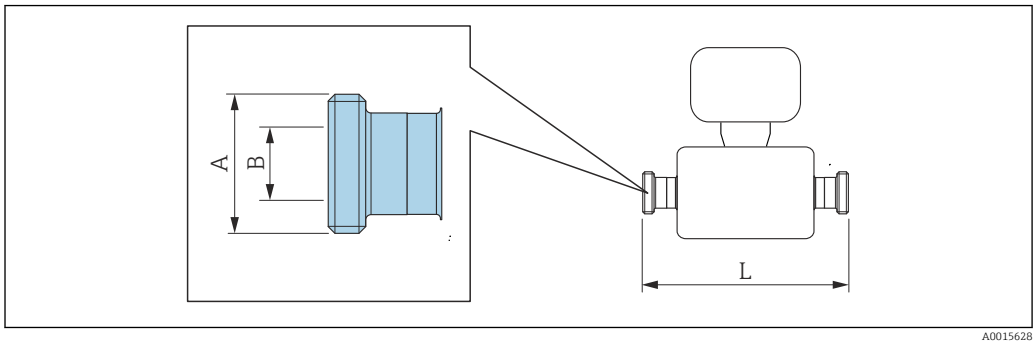
| **Tri-Clamp for pipe according to DIN 11866 series C<br>1.4404 (316/316L)**<br>*Order code for "Process connection", option* **FTS** | | | | |
|---|---|---|---|---|
| **DN [mm]** | **Clamp [in]** | **A [mm]** | **B [mm]** | **L [mm]** |
| 25 | 1 | 50.4 | 22.1 | 434 |
| 50 | 2 | 63.9 | 47.5 | 720 |
| 80 | 3 | 90.9 | 72.9 | 900 |
| 100 | 4 | 118.9 | 97.4 | 1 128 |
| 3A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ | | | | |

| **Tri-Clamp (1½), for pipe according to DIN 11866 series C with nominal diameter reduction<br>1.4404 (316L)**<br>*Order code for "Process connection", option* **FAS** | | | | | |
|---|---|---|---|---|---|
| **Tri-Clamp DN [mm]** | **Device Reduction to DN [mm]** | **Clamp [in]** | **A [mm]** | **B [mm]** | **L [mm]** |
| 40 | 25 | 1½ [1)] | 50.4 | 34.80 | 434 |
| 3A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ | | | | | |

1) The connection corresponds to the hygienic clamp dimensions according to ASME BPE.

### Glands

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




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

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

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 25 | Rd 52 × 1/6 | 26 | 434 |
| 50 | Rd 78 × 1/6 | 50 | 720 |
| 80 | Rd 110 × 1/4 | 81 | 900 |
| 100 | Rd 130 × 1/4 | 100 | 1 128 |
| 3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ | | | |

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

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 25 | Rd 52 × 1/8 | 26 | 434 |
| 50 | Rd 78 × 1/6 | 50 | 720 |
| 80 | Rd 110 × 1/4 | 81 | 900 |
| 100 | Rd 130 × 1/4 | 100 | 1 128 |
| 3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ | | | |

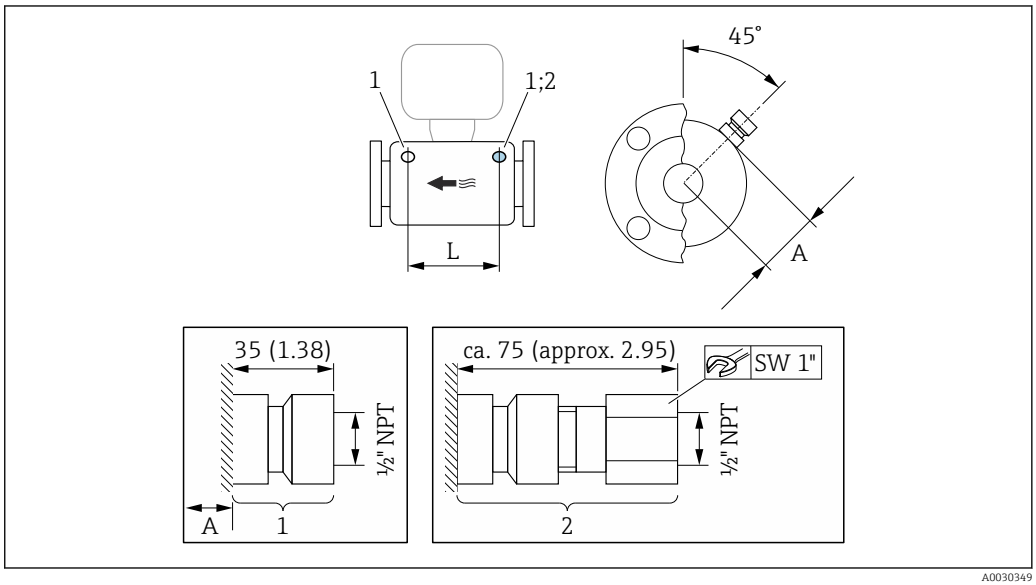
**Threaded adapter SMS 1145**
**1.4404 (316/316L)**
*Order code for "Process connection", option* **SCS**

| DN [mm] | A [in] | B [mm] | L [mm] |
|---|---|---|---|
| 25 | Rd 40 × 1/6 | 22.6 | 434 |
| 50 | Rd 70 × 1/6 | 48.6 | 720 |
| 80 | Rd 98 × 1/6 | 72.9 | 900 |

| **Threaded adapter SMS 1145<br>1.4404 (316/316L)**<br>*Order code for "Process connection", option* **SCS** | | | |
|---|---|---|---|
| **DN<br>[mm]** | **A<br>[in]** | **B<br>[mm]** | **L<br>[mm]** |
| 100 | Rd 132 × ⅛ | 97.6 | 1128 |
| 3A version available: order code for "Additional approval", option LP in conjunction with<br>Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ | | | |

## Accessories

*Rupture disk/purge connections*

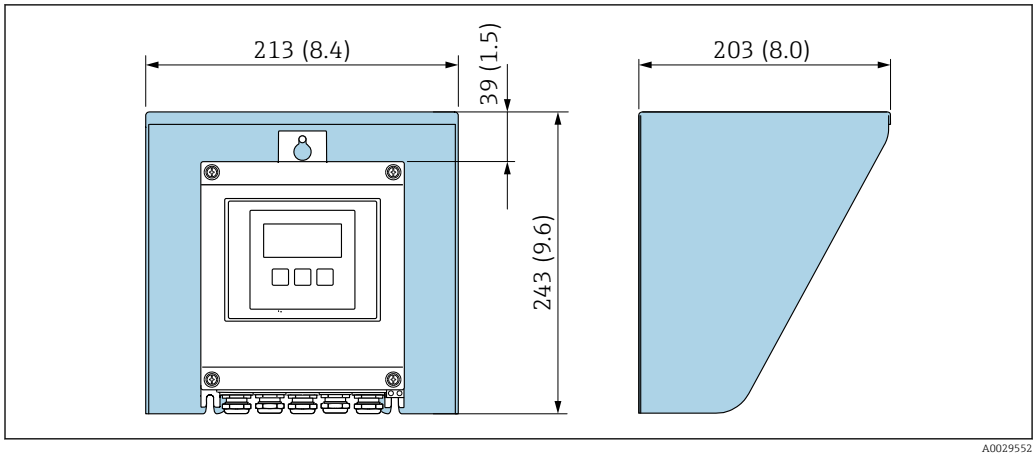



*40 Engineering unit mm (in)*

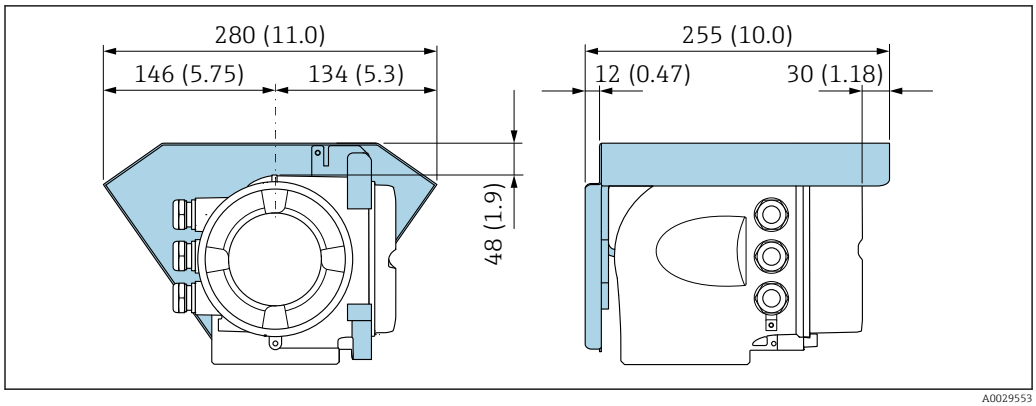
*1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"*
*2 Connection nipple with rupture disk: order code for "Sensor option", option CA "Rupture disk"*

| **DN** | **A** | **L** |
|---|---|---|
| **[mm]** | **[mm]** | **[mm]** |
| 25 | 32 | 240 |
| 50 | 53 | 452 |
| 80 | 80 | 380 |
| 100 | 106 | 584 |
| 150 | 118.5 | 584 |
| 200 | 158.5 | 584 |
| 250 | 174.3 | 584 |

*Weather protection cover*




41 *Weather protection cover for Proline 500 – digital; engineering unit mm (in)*



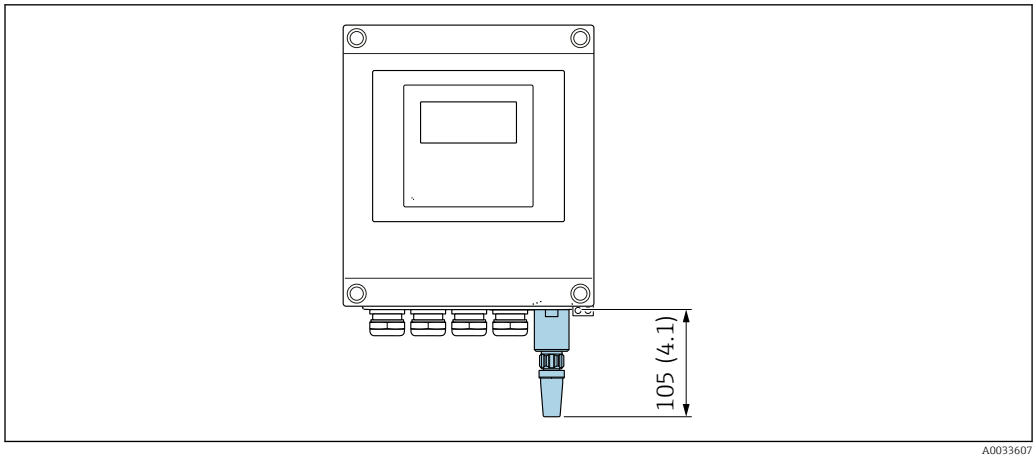

42 *Weather protection cover for Proline 500; engineering unit mm (in)*

*External WLAN antenna*

The external WLAN antenna is not suitable for use in hygienic applications.

*Proline 500 – digital*

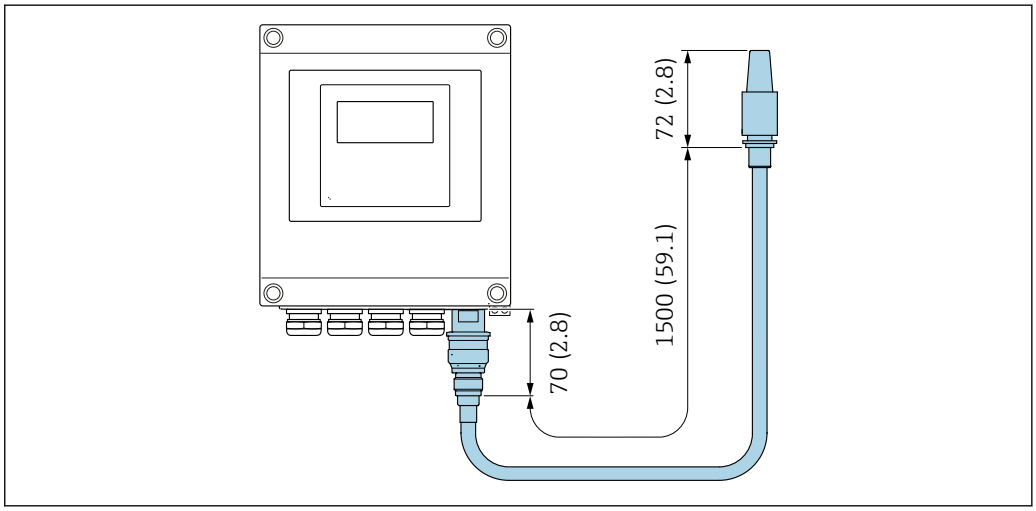
*External WLAN antenna mounted on device*




43 *Engineering unit mm (in)*

*External WLAN antenna mounted with cable*

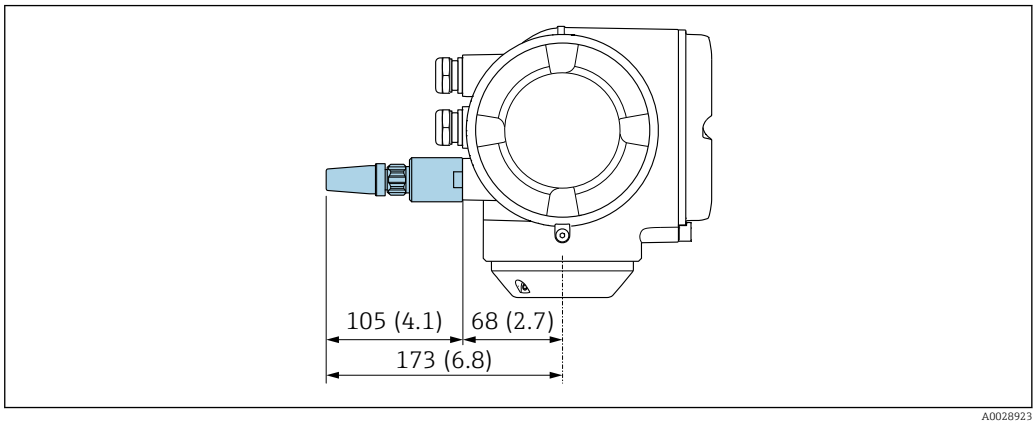
The external WLAN antenna can be mounted separately from the transmitter if the transmission/ reception conditions at the transmitter mounting location are poor.




44 *Engineering unit mm (in)*

*Proline 500*

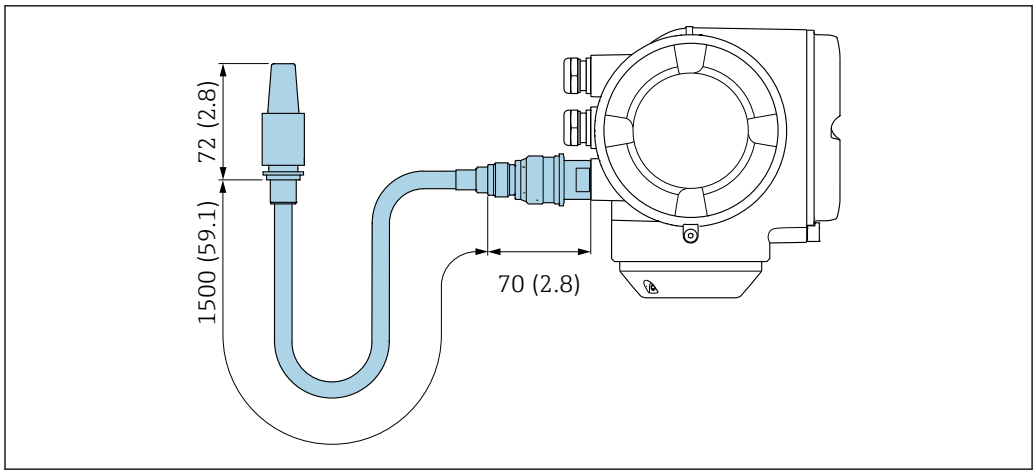
*External WLAN antenna mounted on device*




45 *Engineering unit mm (in)*

*External WLAN antenna mounted with cable*

The external WLAN antenna can be mounted separately from the transmitter if the transmission/ reception conditions at the transmitter mounting location are poor.

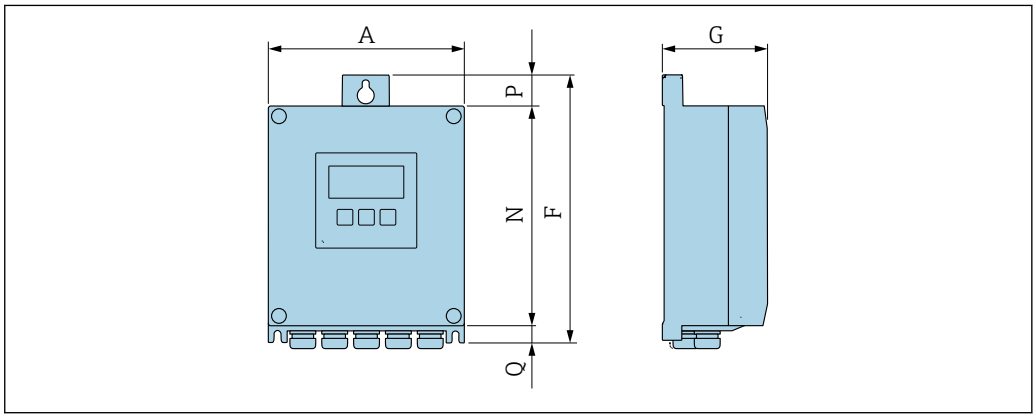



*46 Engineering unit mm (in)*

## Dimensions in US units

### Housing of Proline 500 – digital transmitter

**Non-hazardous area or hazardous area: Zone 2; Class I, Division 2**




A0033789

*Order code for "Transmitter housing", option A "Aluminum, coated" and order code for "Integrated ISEM electronics", option A "Sensor"*

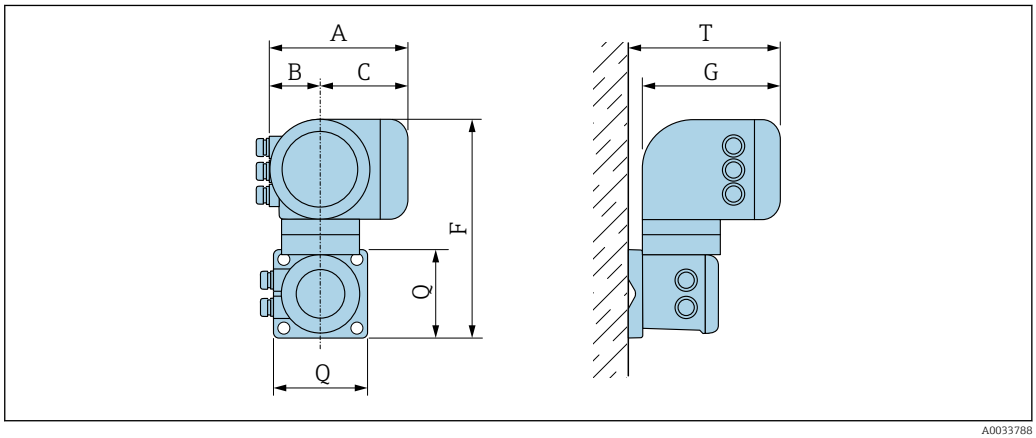
| A [in] | F [in] | G [in] | N [in] | P [in] | Q [in] |
|---|---|---|---|---|---|
| 6.57 | 9.13 | 3.50 | 7.36 | 0.94 | 0.83 |

*Order code for "Transmitter housing", option D "Polycarbonate" and order code for "Integrated ISEM electronics", option A "Sensor"*

| A [in] | F [in] | G [in] | N [in] | P [in] | Q [in] |
|---|---|---|---|---|---|
| 6.97 | 9.21 | 3.50 | 7.76 | 0.67 | 0.87 |

### Housing of Proline 500 transmitter

**Hazardous area: Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1**




A0033788

*Order code for "Transmitter housing", option A "Aluminum, coated" and order code for "Integrated ISEM electronics", option B "Transmitter"*

| A [in] | B [in] | C [in] | F [1] [in] | G [in] | Q [in] | T [in] |
|---|---|---|---|---|---|---|
| 7.40 | 3.35 | 4.06 | 12.5 | 8.54 | 5.12 | 9.41 |

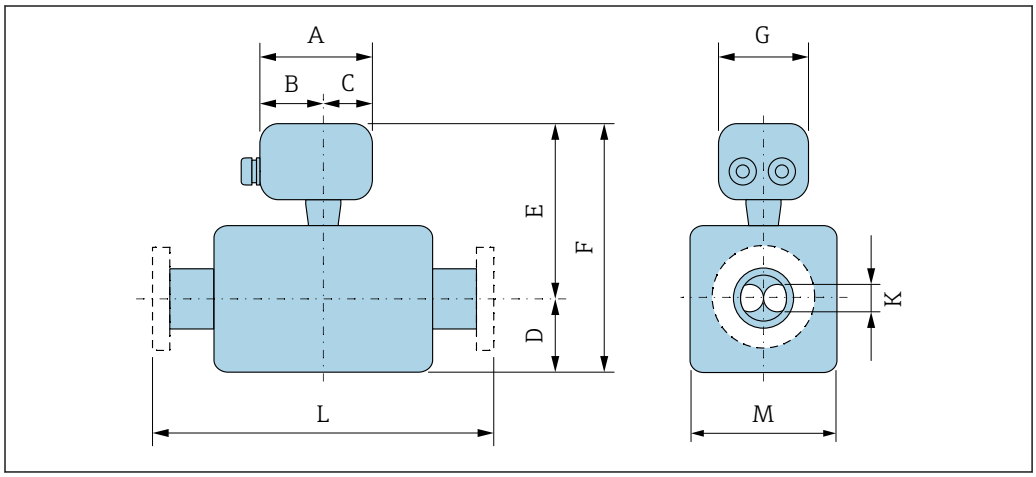
1) DN ≥ 6": values +2.83 in

*Order code for "Transmitter housing", option L "Cast, stainless" and order code for "Integrated ISEM electronics", option B "Transmitter"*

| A [in] | B [in] | C [in] | F [1] [in] | G [in] | Q [in] | T [in] |
|---|---|---|---|---|---|---|
| 7.40 | 3.35 | 4.06 | 11.6 | 8.54 | 5.12 | 9.41 |

1) DN ≥ 6: values +2.83 in

### Sensor connection housing




*Order code for "Sensor connection housing", option A "Aluminum, coated"*

| DN [in] | A [1] [in] | B [1] [in] | C [in] | D [in] | E [in] | F [in] | G [in] | K [in] | L [in] | M [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.83 | 3.70 | 2.13 | 8.54 | 10.1 | 18.64 | 5.35 | 0.60 | 2) | 2.87 |
| 2 | 5.83 | 3.70 | 2.13 | 16.06 | 10.91 | 26.97 | 5.35 | 1.10 | 2) | 4.53 |
| 3 | 5.83 | 3.70 | 2.13 | 20.63 | 11.97 | 32.6 | 5.35 | 1.70 | 2) | 6.65 |
| 4 | 5.83 | 3.70 | 2.13 | 25.79 | 12.99 | 38.78 | 5.35 | 2.71 | 2) | 8.66 |

1) Depending on the cable gland used: values up to +1.18 in
2) Depending on the process connection

*Order code for "Sensor connection housing", option B "Stainless"*

| DN [in] | A [1] [in] | B [in] | C [in] | D [in] | E [in] | F [in] | G [in] | K [in] | L [in] | M [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.39 | 3.07 | 2.32 | 8.54 | 9.9 | 18.44 | 5.28 | 0.60 | 2) | 2.87 |
| 2 | 5.39 | 3.07 | 2.32 | 16.06 | 10.71 | 26.77 | 5.28 | 1.10 | 2) | 4.53 |
| 3 | 5.39 | 3.07 | 2.32 | 20.63 | 11.77 | 32.4 | 5.28 | 1.70 | 2) | 6.65 |
| 4 | 5.39 | 3.07 | 2.32 | 25.79 | 12.8 | 38.58 | 5.28 | 2.71 | 2) | 8.66 |
| 6 | 5.39 | 3.07 | 2.32 | 24.65 | 13.23 | 37.87 | 5.28 | 2.30 | 2) | 9.61 |
| 8 | 5.39 | 3.07 | 2.32 | 31.10 | 14.76 | 45.91 | 5.28 | 2.81 | 2) | 12.75 |
| 10 | 5.39 | 3.07 | 2.32 | 34.92 | 15.43 | 50.35 | 5.28 | 3.69 | 2) | 14 |

1) Depending on the cable gland used: values up to +1.18 in
2) Depending on the process connection

*Order code for "Sensor connection housing", option C "Ultra-compact hygienic, stainless"*

| DN [in] | A [1] [in] | B [1] [in] | C [in] | D [in] | E [in] | F [in] | G [in] | K [in] | L [in] | M |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.88 | 2.68 | 2.20 | 8.54 | 9.9 | 18.44 | 4.41 | 0.60 | [2] | 2.87 |
| 2 | 4.88 | 2.68 | 2.20 | 16.06 | 10.71 | 26.77 | 4.41 | 1.10 | [2] | 4.53 |
| 3 | 4.88 | 2.68 | 2.20 | 20.63 | 11.77 | 32.4 | 4.41 | 1.70 | [2] | 6.65 |
| 4 | 4.88 | 2.68 | 2.20 | 25.79 | 12.8 | 38.58 | 4.41 | 2.71 | [2] | 8.66 |

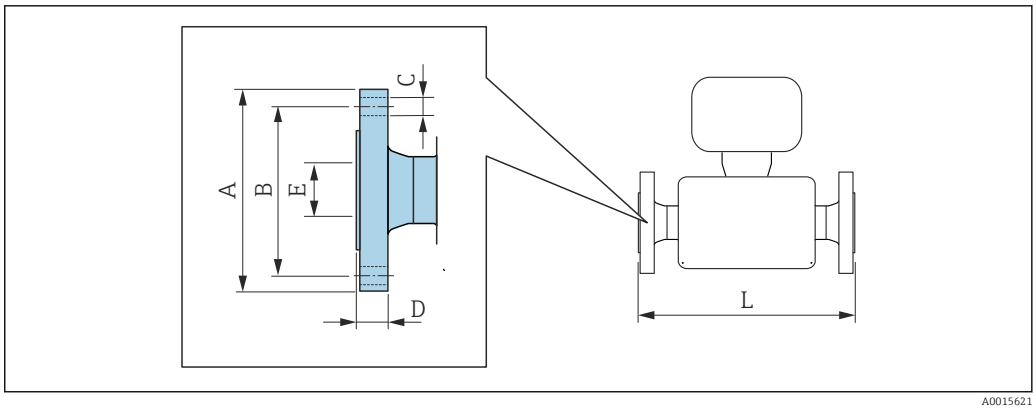
1) Depending on the cable gland used: values up to +1.18 in
2) Depending on the process connection

*Order code for "Sensor connection housing", option L "Cast, stainless"*

| DN [in] | A [1] [in] | B [in] | C [in] | D [in] | E [in] | F [in] | G [in] | K [in] | L [in] | M [in] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 5.71 | 3.39 | 2.32 | 8.54 | 11.02 | 19.57 | 5.35 | 0.60 | [2] | 2.87 |
| 2 | 5.71 | 3.39 | 2.32 | 16.06 | 11.81 | 27.87 | 5.35 | 1.10 | [2] | 4.53 |
| 3 | 5.71 | 3.39 | 2.32 | 20.63 | 12.87 | 33.5 | 5.35 | 1.70 | [2] | 6.65 |
| 4 | 5.71 | 3.39 | 2.32 | 25.79 | 13.9 | 39.69 | 5.35 | 2.71 | [2] | 8.66 |
| 6 | 5.71 | 3.39 | 2.32 | 24.65 | 14.29 | 38.94 | 5.35 | 23.03 | [2] | 9.61 |
| 8 | 5.71 | 3.39 | 2.32 | 31.10 | 15.87 | 46.97 | 5.35 | 28.15 | [2] | 12.76 |
| 10 | 5.71 | 3.39 | 2.32 | 34.92 | 16.5 | 51.42 | 5.35 | 36.93 | [2] | 14.02 |

1) Depending on the cable gland used: values up to +1.18 in
2) Depending on the process connection

### Fixed flange connections ASME B16.5




A0015621

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

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

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| 1 | 4.33 | 3.13 | 4 × Ø0.62 | 0.56 | 1.05 | 17.32 |
| 2 | 5.91 | 4.75 | 4 × Ø0.75 | 0.75 | 2.07 | 28.15 |
| 3 | 7.48 | 6.00 | 4 × Ø0.75 | 0.94 | 3.07 | 33.07 |

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

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| 4 | 9.06 | 7.50 | 8 × Ø0.75 | 0.94 | 4.03 | 44.41 |
| 6 | 11.02 | 9.5 | 8 × Ø0.87 | 1.02 | 6.07 | 47.36/55.04 [1] |
| 8 | 13.58 | 11.75 | 8 × Ø0.87 | 1.14 | 7.98 | 56.02 |
| 10 | 15.94 | 14.25 | 12 × Ø1 | 1.2 | 10.02 | 72.13 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

1) Installed length such as Promass F, DN 6" (order code for "Sensor option", option CN)

**Flange similar to ASME B16.5: Class 150 with reduction in nominal diameter**
**1.4404 (F316/F316L)**

| Flange DN [in] | Device Reduction to DN [in] | Order code "Process connection", Option | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|---|---|
| 3 | 2 | AJS | 7.48 | 6 | 4 × Ø0.75 | 0.94 | 3.07 | 28.35 |
| 4 | 3 | ALS | 9.06 | 7.5 | 8 × Ø0.75 | 0.94 | 4.03 | 34.41 |
| 6 | 4 | ANS | 11.02 | 9.5 | 8 × Ø0.88 | 1 | 6.07 | 45.94 |
| 8 | 6 | APS | 13.58 | 11.75 | 8 × Ø0.87 | 1.14 | 7.98 | 49.84 |
| 10 | 8 | AVS | 15.94 | 14.25 | 12 × Ø1 | 1.2 | 10.02 | 55.43/ 72.13 [1] |
| 12 | 10 | AXS | 19.09 | 17 | 12 × Ø1 | 1.27 | 12 | 76.18 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | | | |

1) Installed length such as Promass F, DN 10" (order code for "Sensor option", option CO)

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

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.69 | 1.05 | 17.32 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 0.88 | 2.07 | 28.15 |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 1.12 | 3.07 | 33.07 |
| 4 | 10.04 | 7.87 | 8 × Ø0.88 | 1.25 | 4.03 | 44.41 |
| 6 | 12.6 | 10.63 | 12 × Ø0.87 | 1.46 | 6.07 | 48.15/55.79 [1] |
| 8 | 14.96 | 13 | 12 × Ø1 | 1.64 | 7.98 | 56.81 |
| 10 | 17.52 | 15.25 | 16 × Ø1.12 | 1.89 | 10.02 | 73.35 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

| Flange similar to ASME B16.5: Class 300 with reduction in nominal diameter<br>1.4404 (F316/F316L) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Flange DN [in]** | **Device Reduction to DN [in]** | **Order code "Process connection", Option** | **A [in]** | **B [in]** | **C [in]** | **D [in]** | **E [in]** | **L [in]** |
| 3 | 2 | AKS | 8.27 | 6.63 | 8 × Ø0.88 | 1.12 | 3.07 | 28.82 |
| 4 | 3 | AMS | 10.04 | 7.87 | 8 × Ø0.88 | 1.25 | 4.03 | 35.2 |
| 6 | 4 | AOS | 12.6 | 10.63 | 12 × Ø0.88 | 1.44 | 6.07 | 46.73 |
| 8 | 6 | AQS | 14.96 | 13 | 12 × Ø1 | 1.64 | 7.98 | 49.84 |
| 10 | 8 | AWS | 17.52 | 14.74 | 16 × Ø1.13 | 1.89 | 10.02 | 56.65/ 73.35 [1] |
| 12 | 10 | AZS | 20.47 | 17.75 | 16 × Ø1.25 | 2.02 | 12 | 76.18 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | | | |

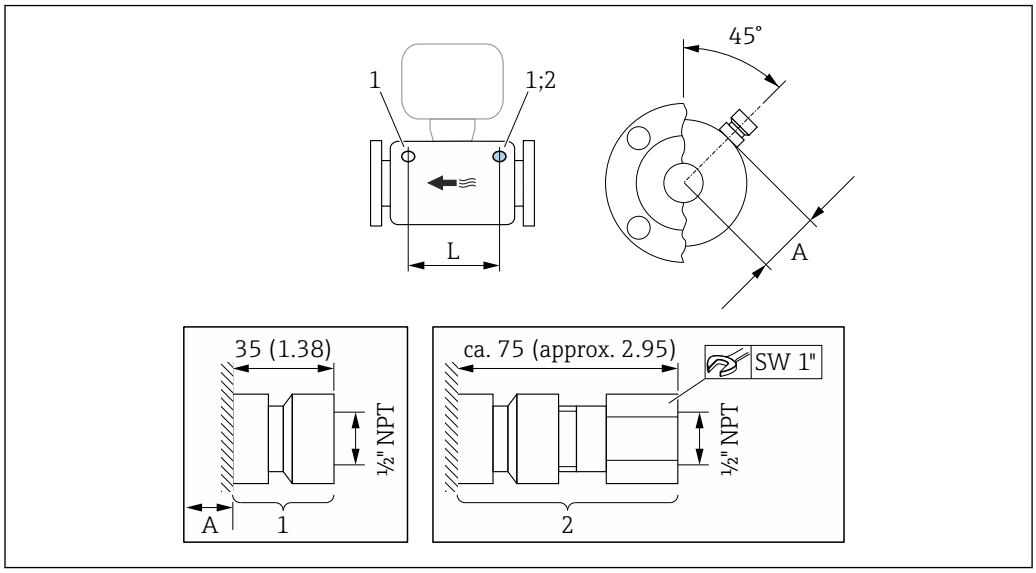
1) Installed length such as Promass F, DN 10" (order code for "Sensor option", option CO)

| Flange similar to ASME B16.5: Class 600<br>1.4404 (F316/F316L)<br>*Order code for "Process connection", option* **ACS** | | | | | | |
|---|---|---|---|---|---|---|
| **DN [in]** | **A [in]** | **B [in]** | **C [in]** | **D [in]** | **E [in]** | **L [in]** |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.94 | 0.96 | 19.29 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 1.25 | 1.94 | 29.21 |
| 3 | 8.27 | 6.63 | 8 × Ø0.87 | 1.57 | 2.90 | 35.59 |
| 4 | 10.83 | 8.50 | 8 × Ø1.00 | 1.91 | 3.83 | 45.59 |
| 6 | 13.98 | 11.5 | 12 × Ø1.12 | 2.15 | 6.07 | 50.12/57.76 [1] |
| 8 | 16.54 | 13.75 | 12 × Ø1.25 | 2.46 | 7.98 | 59.02 |
| 10 | 20.08 | 17 | 16 × Ø1.38 | 2.78 | 10.02 | 76.61 |
| Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

1) Installed length such as Promass F, DN 6" (order code for "Sensor option", option CN)

## Accessories

*Rupture disk/purge connections*

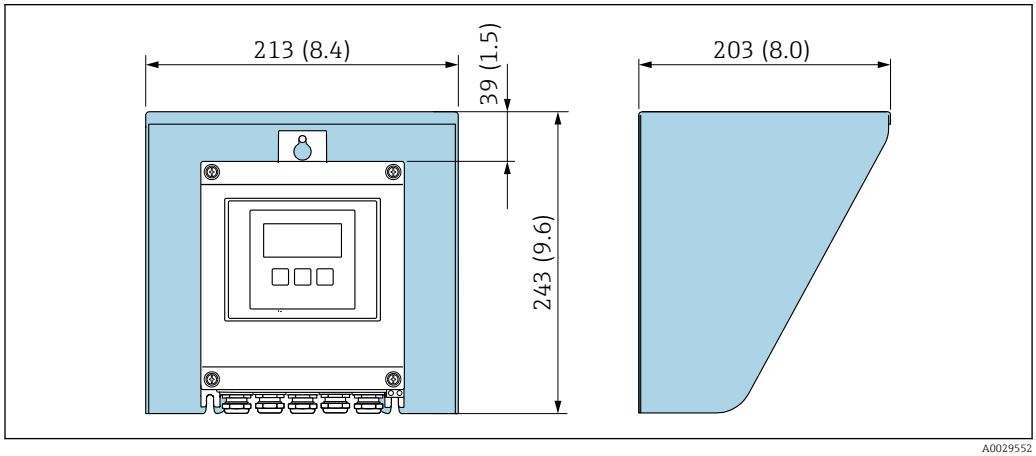



*47 Engineering unit mm (in)*

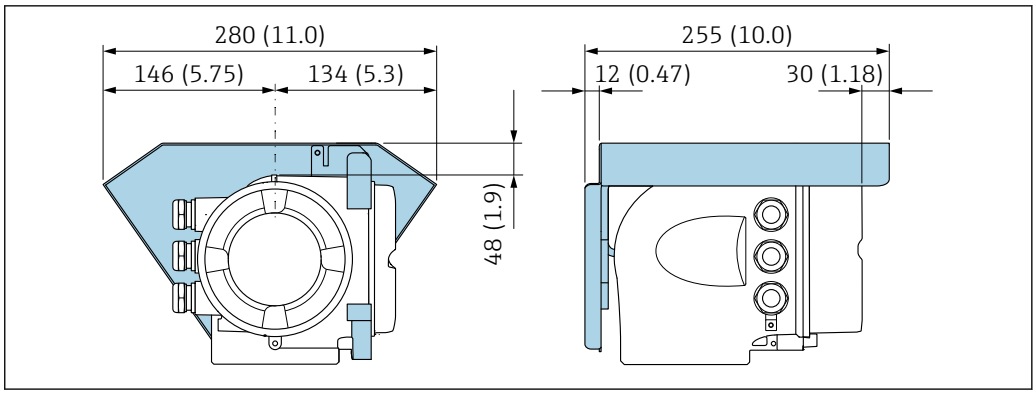
*1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"*
*2 Connection nipple with rupture disk: order code for "Sensor option", option CA "Rupture disk"*

| DN | A | L |
|---|---|---|
| [in] | [in] | [in] |
| 1 | 1.26 | 9.45 |
| 2 | 2.09 | 17.8 |
| 3 | 3.15 | 14.96 |
| 4 | 4.17 | 22.99 |
| 6 | 4.67 | 22.99 |
| 8 | 6.24 | 22.99 |
| 10 | 6.86 | 22.99 |

*Weather protection cover*




*48 Weather protection cover for Proline 500 – digital; engineering unit mm (in)*



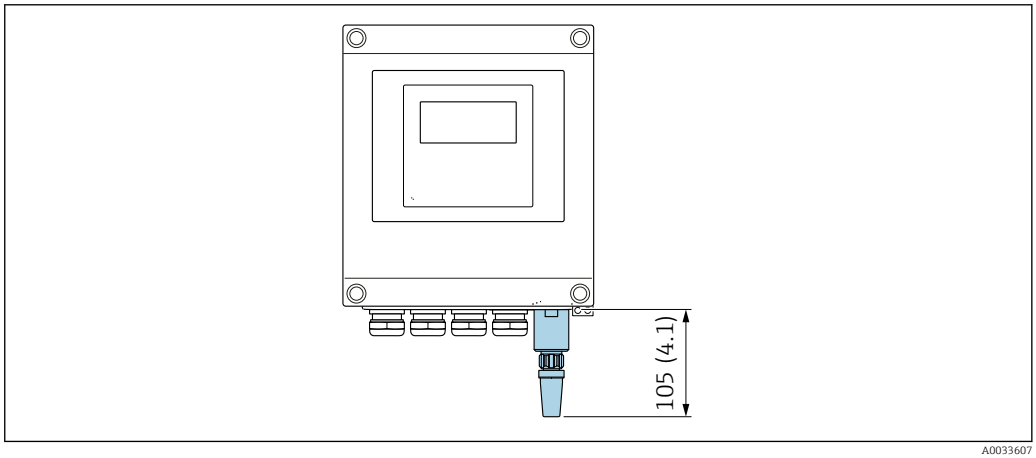

49 *Weather protection cover for Proline 500; engineering unit mm (in)*

*External WLAN antenna*

The external WLAN antenna is not suitable for use in hygienic applications.

*Proline 500 – digital*

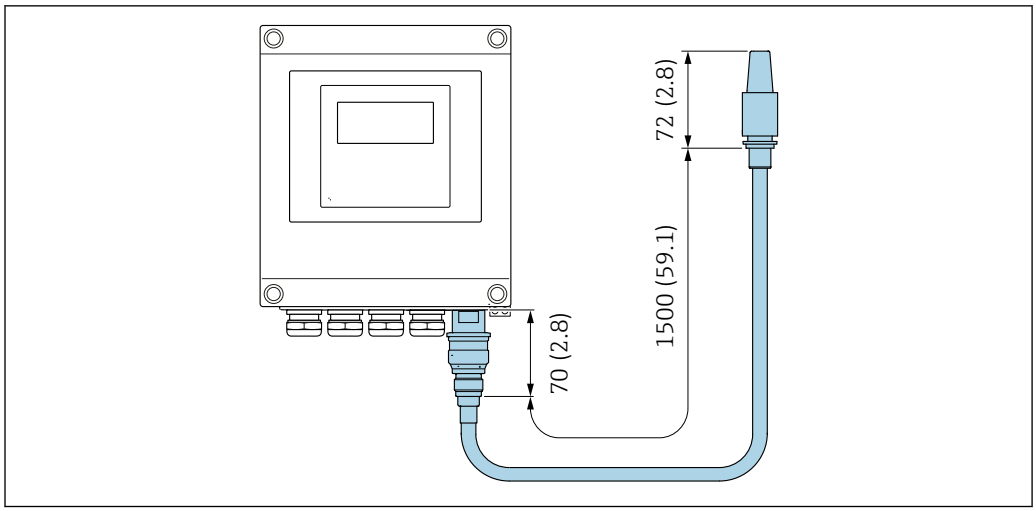
*External WLAN antenna mounted on device*




50 *Engineering unit mm (in)*

*External WLAN antenna mounted with cable*

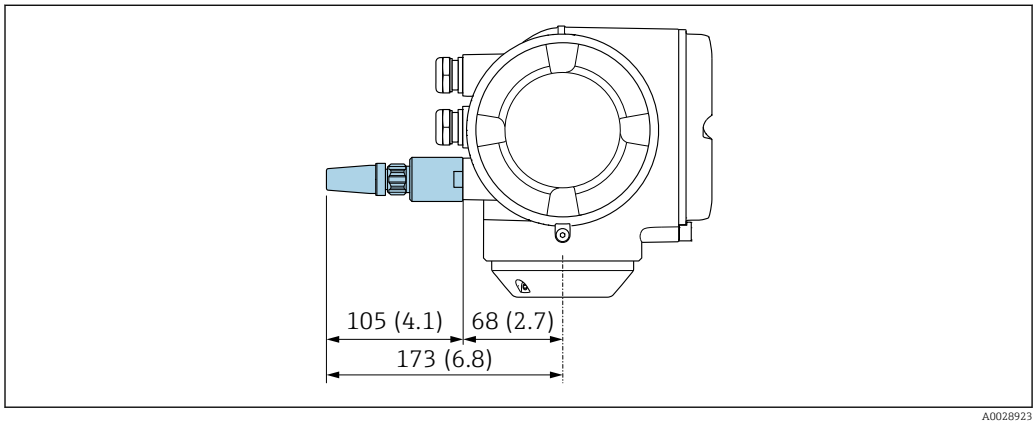
The external WLAN antenna can be mounted separately from the transmitter if the transmission/ reception conditions at the transmitter mounting location are poor.




51 *Engineering unit mm (in)*

*Proline 500*

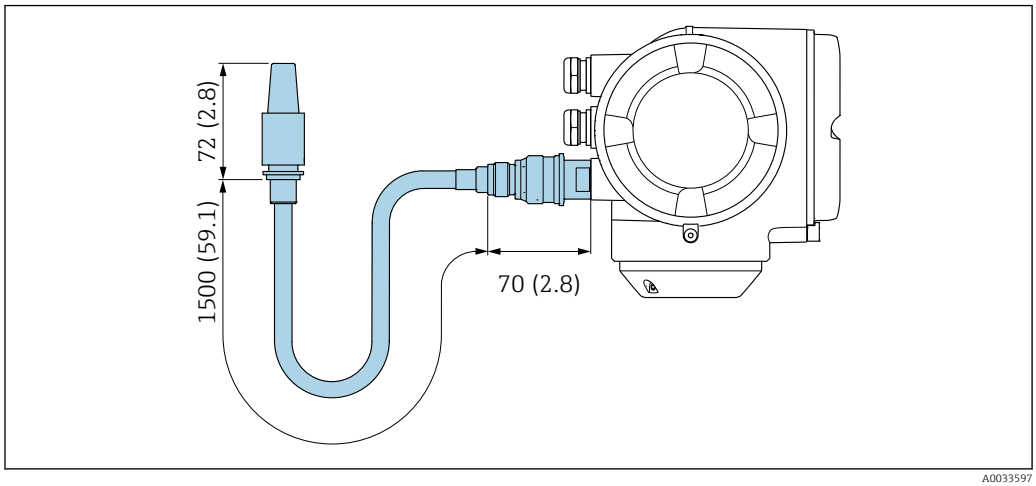
*External WLAN antenna mounted on device*




52 *Engineering unit mm (in)*

*External WLAN antenna mounted with cable*

The external WLAN antenna can be mounted separately from the transmitter if the transmission/ reception conditions at the transmitter mounting location are poor.




53 *Engineering unit mm (in)*

## Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges.

**Transmitter**
- Proline 500 – digital polycarbonate: 1.4 kg (3.1 lbs)
- Proline 500 – digital aluminum: 2.4 kg (5.3 lbs)
- Proline 500 aluminum: 6.5 kg (14.3 lbs)
  DN ≥ 150 (6"): 9 kg (19.8 lbs)
- Proline 500 cast, stainless: 15.6 kg (34.4 lbs)
  DN ≥ 150 (6"): 18.5 kg (40.8 lbs)

**Sensor**
- Sensor with cast connection housing version, stainless: +3.7 kg (+8.2 lbs)
- Sensor with aluminum connection housing version:

### Weight in SI units

| DN [mm] | Weight [kg] |
|---|---|
| 25 | 11 |
| 50 | 33 |
| 80 | 60 |
| 100 | 149 |
| 150 | 166 |
| 200 | 296 |
| 250 | 483 |

### Weight in US units

| DN [in] | Weight [lbs] |
|---|---|
| 1 | 24 |
| 2 | 73 |
| 3 | 132 |
| 4 | 329 |
| 6 | 366 |
| 8 | 653 |
| 10 | 1065 |

## Materials

### Transmitter housing

*Housing of Proline 500 – digital transmitter*

Order code for "Transmitter housing":
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **D** "Polycarbonate": polycarbonate

*Housing of Proline 500 transmitter*

Order code for "Transmitter housing":
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **L** "Cast, stainless": cast, stainless steel, 1.4409 (CF3M) similar to 316L

*Window material*

Order code for "Transmitter housing":
- Option **A** "Aluminum, coated": glass
- Option **D** "Polycarbonate": plastic
- Option **L** "Cast, stainless": glass

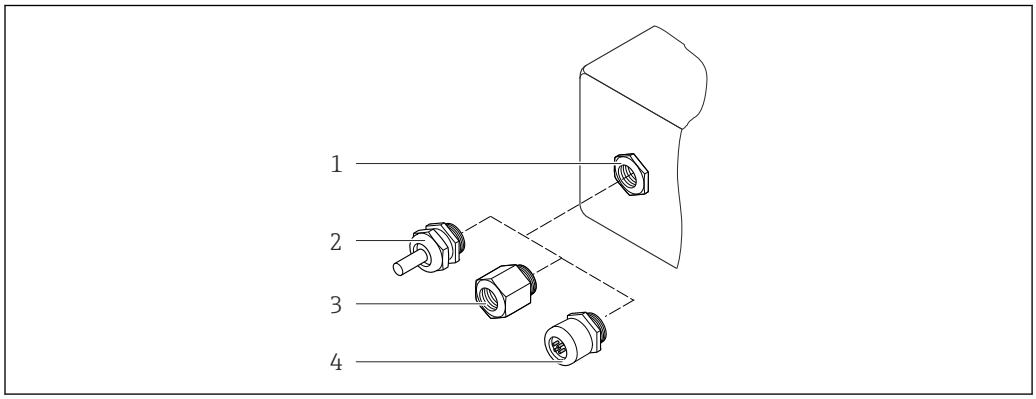
*Fastening components for mounting on a post*

- Screws, threaded bolts, washers, nuts: stainless A2 (chrome-nickel steel)
- Metal plates: stainless steel, 1.4301 (304)

### Sensor connection housing

Order code for "Sensor connection housing":
- Option **A** "Aluminum coated": aluminum, AlSi10Mg, coated
- Option **B** "Stainless":
  - Stainless steel 1.4301 (304)
  - Optional: Order code for "Sensor feature", option **CC** "Hygienic version, for maximum corrosion resistance": stainless steel, 1.4404 (316L)
- Option **C** "Ultra-compact, stainless":
  - Stainless steel 1.4301 (304)
  - Optional: Order code for "Sensor feature", option **CC** "Hygienic version, for maximum corrosion resistance": stainless steel, 1.4404 (316L)
- Option **L** "Cast, stainless": 1.4409 (CF3M) similar to 316L

### Cable entries/cable glands




*54 Possible cable entries/cable glands*

*1 Female thread M20 × 1.5*
*2 Cable gland M20 × 1.5*
*3 Adapter for cable entry with female thread G ½" or NPT ½"*
*4 Device plug*

| Cable entries and adapters | Material |
|---|---|
| Cable gland M20 × 1.5 | Plastic |
| ▪ Adapter for cable entry with female thread G ½"<br>▪ Adapter for cable entry with female thread NPT ½"<br><br>Only available for certain device versions:<br>▪ Order code for "Transmitter housing":<br>  ▪ Option A "Aluminum, coated"<br>  ▪ Option D "Polycarbonate"<br>▪ Order code for "Sensor connection housing":<br>  ▪ Proline 500 – digital:<br>  Option A "Aluminum coated"<br>  Option B "Stainless"<br>  Option L "Cast, stainless"<br>  ▪ Proline 500:<br>  Option B "Stainless"<br>  Option L "Cast, stainless" | Nickel-plated brass |

| Cable entries and adapters | Material |
|---|---|
| ▪ Adapter for cable entry with female thread G ½"<br>▪ Adapter for cable entry with female thread NPT ½"<br>Only available for certain device versions:<br>▪ Order code for "Transmitter housing": Option L "Cast, stainless"<br>▪ Order code for "Sensor connection housing": Option L "Cast, stainless" | Stainless steel, 1.4404 (316L) |
| Adapter for device plug<br>Device plug for digital communication: Only available for certain device versions → 33. | Stainless steel, 1.4404 (316L) |

### Device plug

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

### Connecting cables

UV rays can impair the cable outer sheath. Protect the cable from exposure to sun as much as possible.

*Connecting cable for sensor - Proline 500 – digital transmitter*

PVC cable with copper shield

*Connecting cable for sensor - Proline 500 transmitter*

- PUR cable with copper shield
- Devices with order code for «Approval; transmitter; sensor», options **AA**, **BS**, **CS**, **CZ**, **GR**, **GS**, **MS**, **NS**, **UR**, **US**: PVC cable with copper shield

### Measuring tubes

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

### Process connections

Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / as per JIS B2220: Stainless steel, 1.4404 (F316/F316L)

Available process connections→ 104

### Seals

Welded process connections without internal seals

### Accessories

*Protective cover*

Stainless steel, 1.4404 (316L)

*External WLAN antenna*

- Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass
- Adapter: Stainless steel and nickel-plated brass
- Cable: Polyethylene
- Plug: Nickel-plated brass
- Angle bracket: Stainless steel

**Process connections**

Fixed flange connections:
- EN 1092-1 (DIN 2501) flange
- EN 1092-1 (DIN 2512N) flange
- ASME B16.5 flange
- JIS B2220 flange

Process connection materials → 103

**Surface roughness**

All data refer to parts in contact with the medium.

*The following surface roughness categories can be ordered:*

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

1) Ra according to ISO 21920
2) Except for inaccessible welds between pipe and manifold

# Display and user interface

**Operation concept**

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

**Quick and safe commissioning**
- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief descriptions of the individual parameter functions
- Access to the device via web server
- WLAN access to the device via mobile handheld terminal, tablet or smart phone

**Reliable operation**
- Operation in local language
- Uniform operating philosophy applied to device and operating tools
- If replacing electronic modules, transfer the device configuration via the integrated memory (HistoROM backup) which contains the process and measuring device data and the event logbook. No need to reconfigure.

**Efficient diagnostics increase measurement reliability**
- Troubleshooting measures can be called up via the device and in the operating tools
- Diverse simulation options, logbook for events that occur and optional line recorder functions

**Languages**

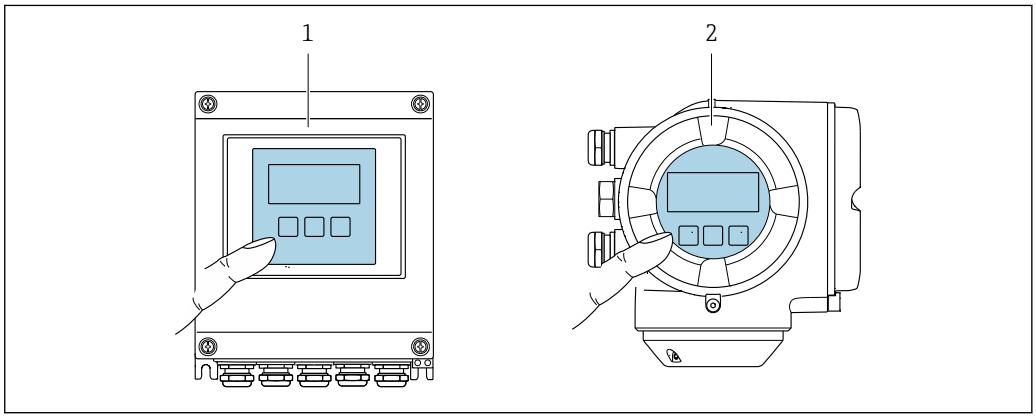
Can be operated in the following languages:
- Via local operation
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish
- Via web browser
  English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

**Onsite operation**

### Via display module

Features:
- Order code for "Display; operation", option F "4-line, illuminated, graphic display; touch control"
- Order code for "Display; operation", option G "4-line, illuminated, graphic display; touch control + WLAN"

Information about WLAN interface → 112




55 *Operation with touch control*

*1 Proline 500 – digital*
*2 Proline 500*

*Display elements*

- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured

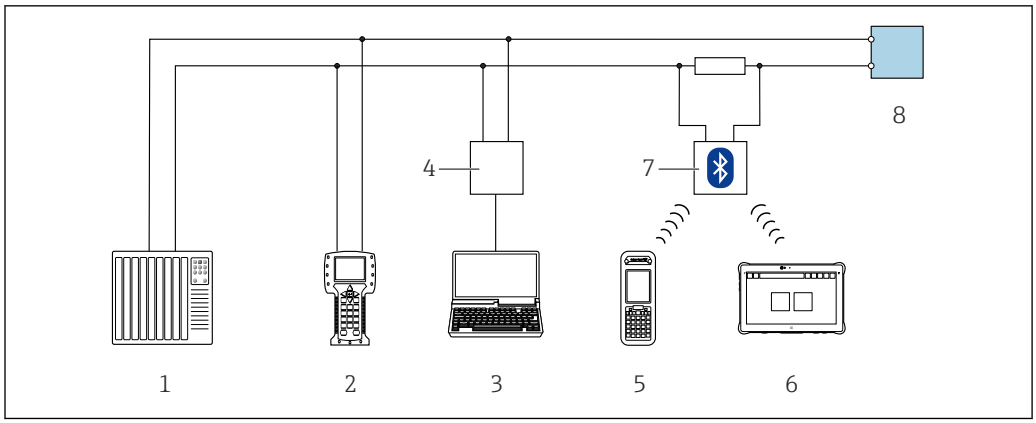
*Operating elements*

- External operation via touch control (3 optical keys) without opening the housing: ⊞, ⊟, ⊡
- Operating elements also accessible in the various zones of the hazardous area

**Remote operation**

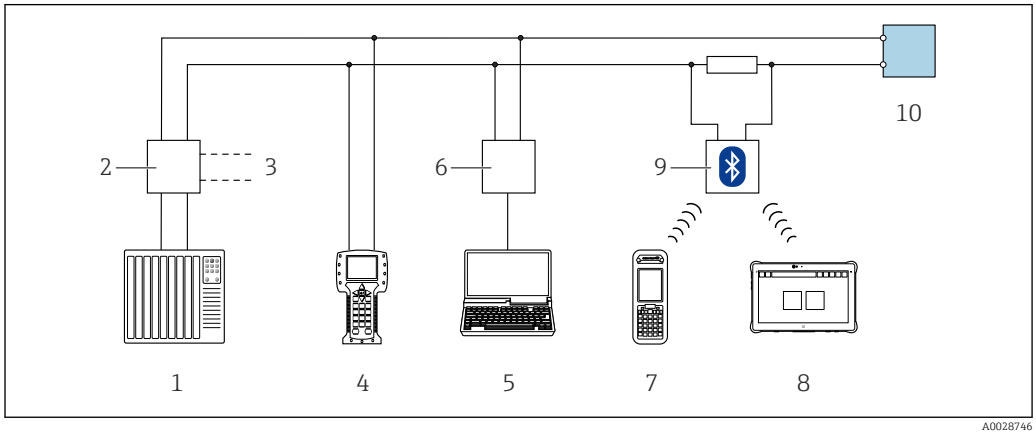
### Via HART protocol

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




56 *Options for remote operation via HART protocol (active)*

1 *Control system (e.g. PLC)*
2 *Field Communicator 475*
3 *Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"*
4 *Commubox FXA195 (USB)*
5 *Field Xpert SFX350 or SFX370*
6 *Field Xpert SMT70*
7 *VIATOR Bluetooth modem with connecting cable*
8 *Transmitter*

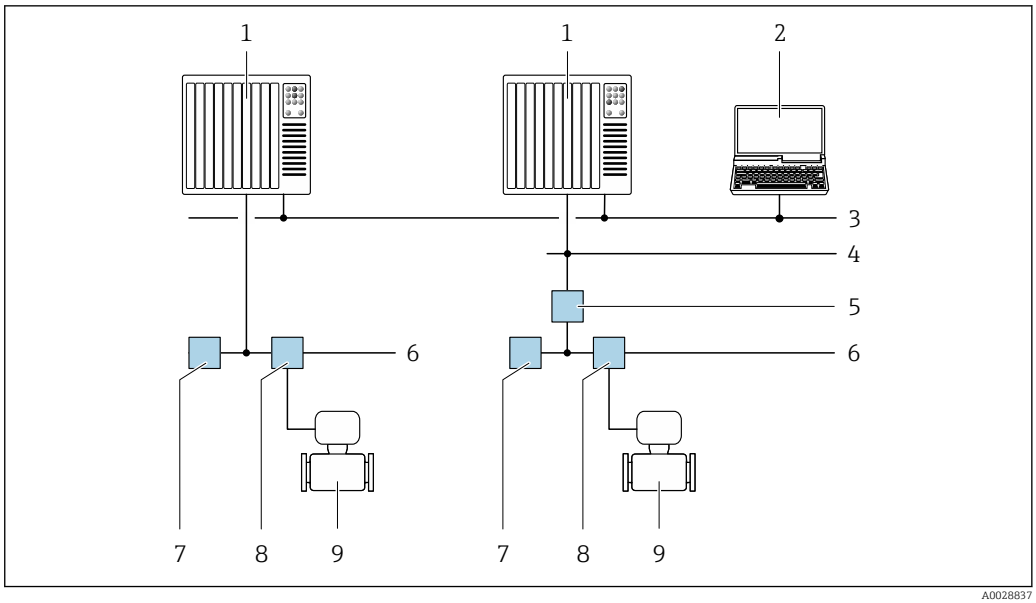



57 *Options for remote operation via HART protocol (passive)*

1 *Control system (e.g. PLC)*
2 *Transmitter power supply unit, e.g. RN221N (with communication resistor)*
3 *Connection for Commubox FXA195 and Field Communicator 475*
4 *Field Communicator 475*
5 *Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"*
6 *Commubox FXA195 (USB)*
7 *Field Xpert SFX350 or SFX370*
8 *Field Xpert SMT70*
9 *VIATOR Bluetooth modem with connecting cable*
10 *Transmitter*

### Via FOUNDATION Fieldbus network

This communication interface is available in device versions with FOUNDATION Fieldbus.

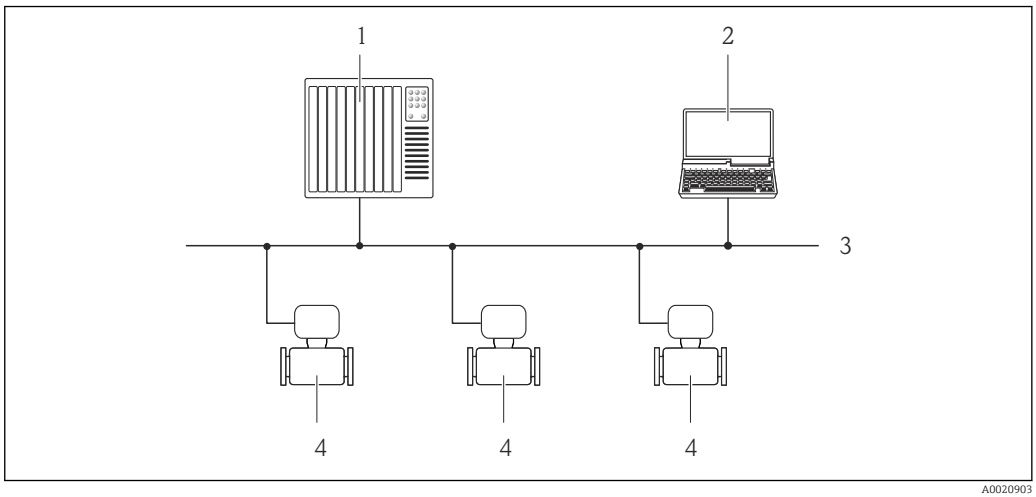



58 *Options for remote operation via FOUNDATION Fieldbus network*

1 *Automation system*
2 *Computer with FOUNDATION Fieldbus network card*
3 *Industry network*
4 *High Speed Ethernet FF-HSE network*
5 *Segment coupler FF-HSE/FF-H1*
6 *FOUNDATION Fieldbus FF-H1 network*
7 *Power supply FF-H1 network*
8 *T-box*
9 *Measuring device*

### Via PROFIBUS DP network

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

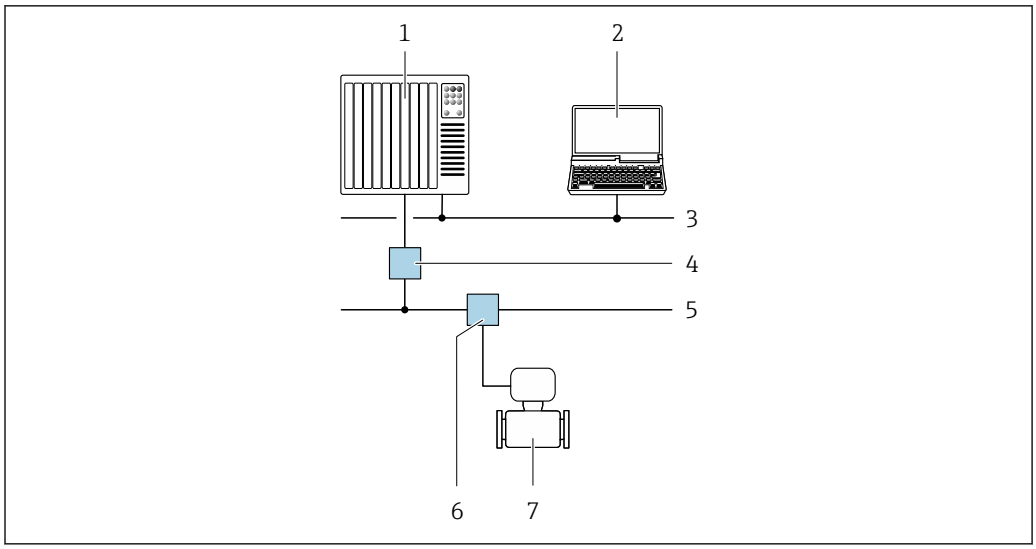



59 *Options for remote operation via PROFIBUS DP network*

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

### Via PROFIBUS PA network

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

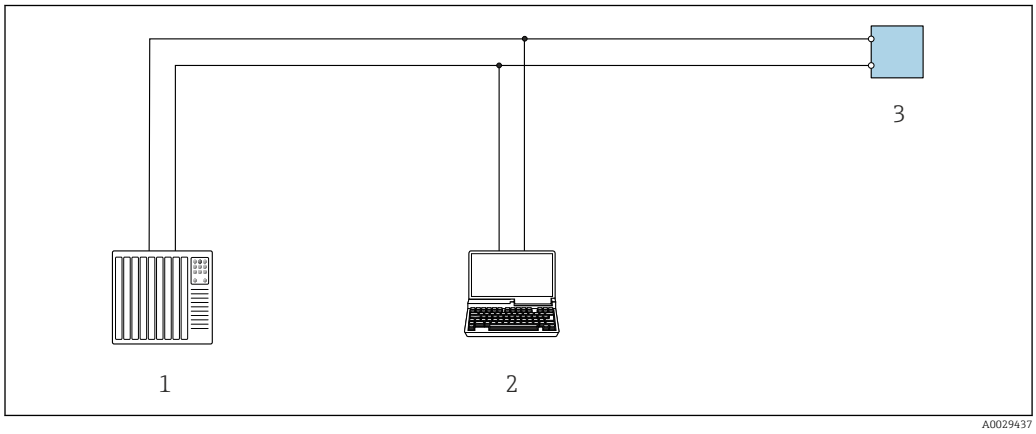



*60 Options for remote operation via PROFIBUS PA network*

1 *Automation system*
2 *Computer with PROFIBUS network card*
3 *PROFIBUS DP network*
4 *Segment coupler PROFIBUS DP/PA*
5 *PROFIBUS PA network*
6 *T-box*
7 *Measuring device*

### Via Modbus RS485 protocol

This communication interface is available in device versions with a Modbus RS485 output.



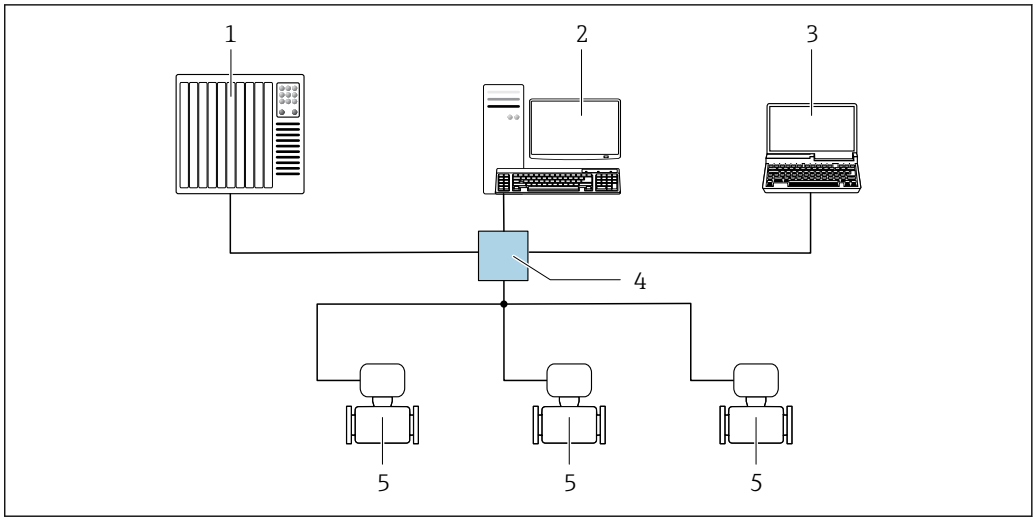

*61 Options for remote operation via Modbus RS485 protocol (active)*

1 *Control system (e.g. PLC)*
2 *Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP" or Modbus DTM*
3 *Transmitter*

### Via EtherNet/IP network

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

*Star topology*

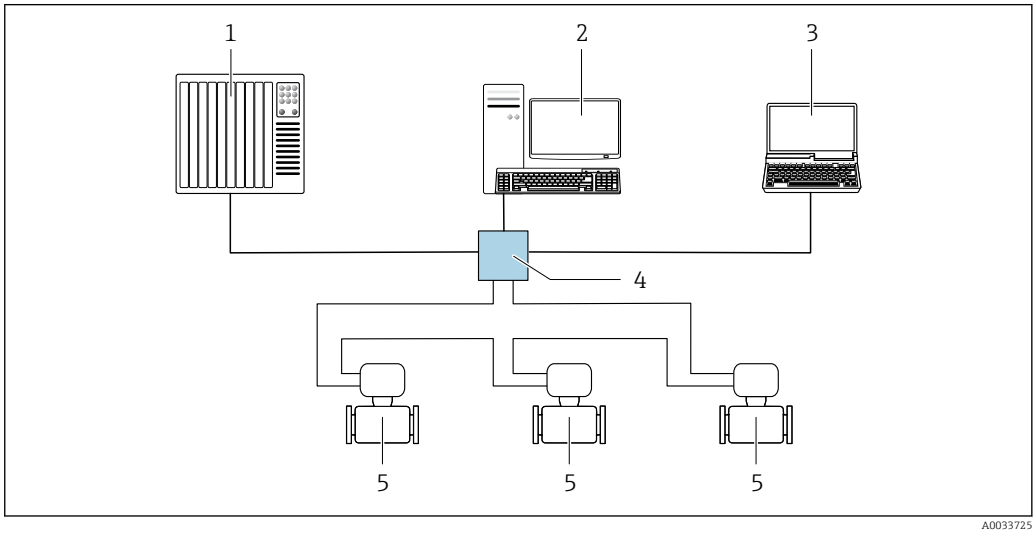



62 *Options for remote operation via EtherNet/IP network: star topology*

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

*Ring topology*

The device is integrated via the terminal connection for signal transmission (output 1) and the service interface (CDI-RJ45).



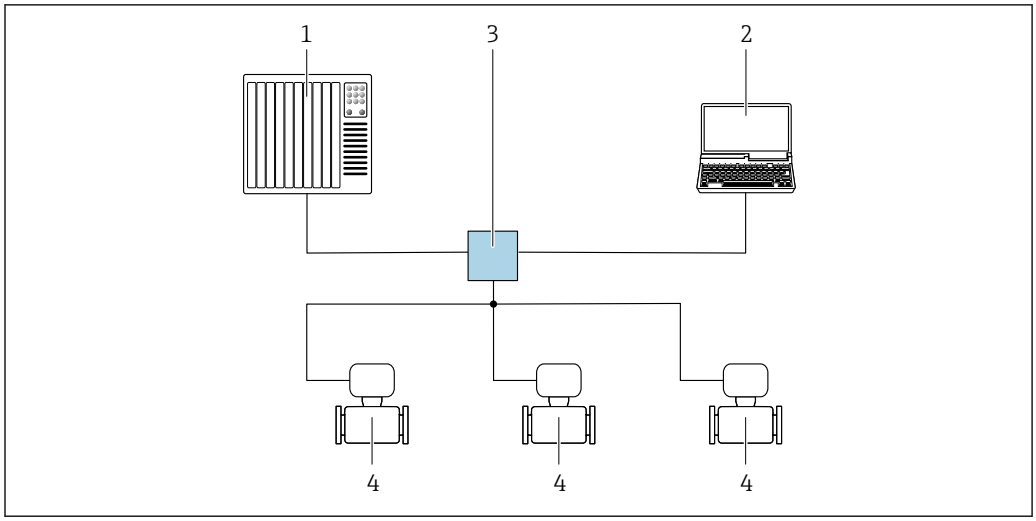

63 *Options for remote operation via EtherNet/IP network: ring topology*

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

**Via PROFINET network**

This communication interface is available in device versions with PROFINET.

*Star topology*

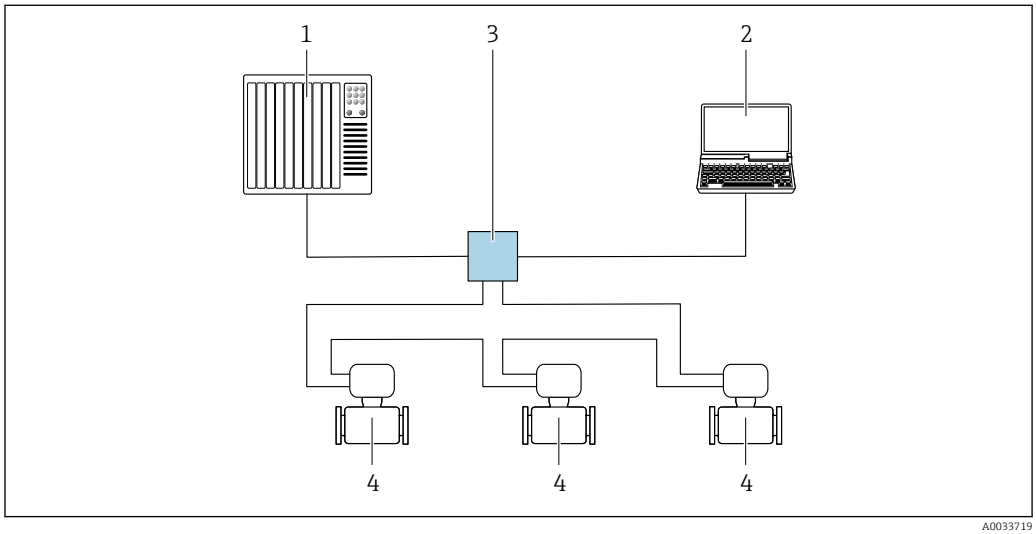



*64 Options for remote operation via PROFINET network: star topology*

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

*Ring topology*

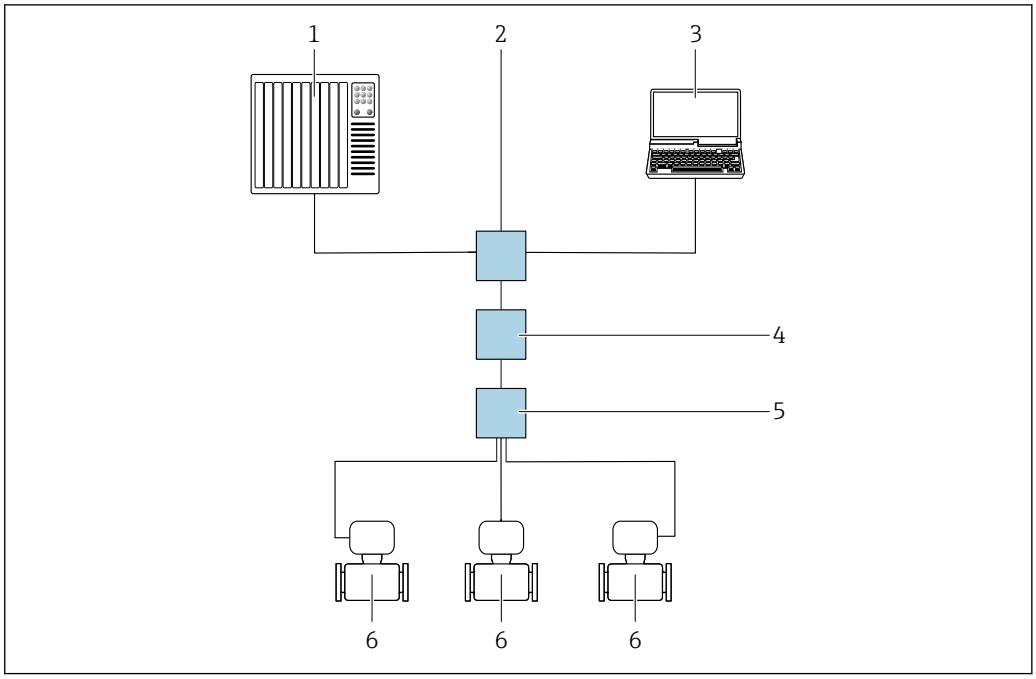
The device is integrated via the terminal connection for signal transmission (output 1) and the service interface (CDI-RJ45).




*65 Options for remote operation via PROFINET network: ring topology*

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

### Via APL network




66 *Options for remote operation via APL network*

1 *Automation system, e.g. Simatic S7 (Siemens)*
2 *Ethernet switch, e.g. Scalance X204 (Siemens)*
3 *Computer with Web browser (e.g. Internet Explorer) for access to integrated Web server or computer with operating tool (e.g. FieldCare, DeviceCare with PROFINET COM DTM or SIMATIC PDM with FDI-Package)*
4 *APL power switch (optional)*
5 *APL field switch*
6 *Measuring device*

## Service interface

### Via service interface (CDI-RJ45)

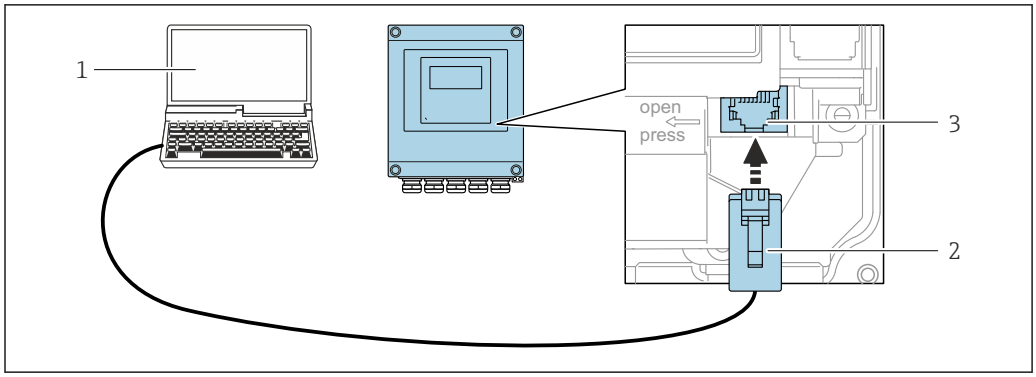
A point-to-point connection can be established to configure the device onsite. With the housing open, the connection is established directly via the service interface (CDI-RJ45) of the device.

An adapter for the RJ45 to the M12 plug is optionally available for the non-hazardous area:

Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can be established via an M12 plug without opening the device.

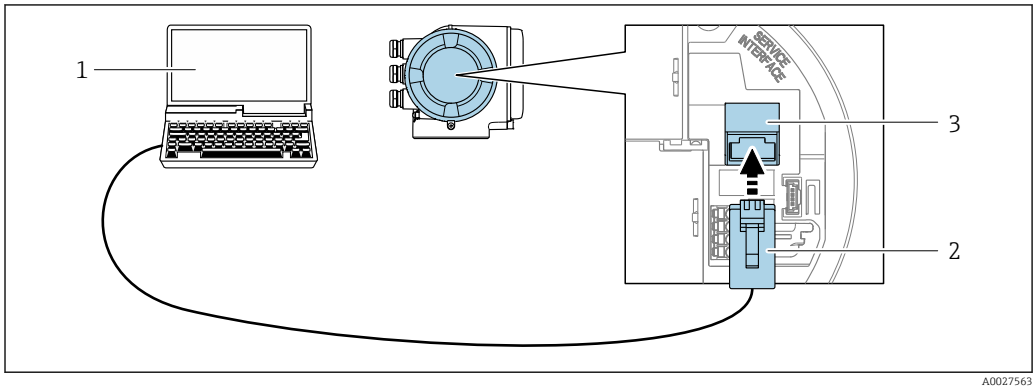
*Proline 500 – digital transmitter*




*67 Connection via service interface (CDI-RJ45)*

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

*Proline 500 transmitter*

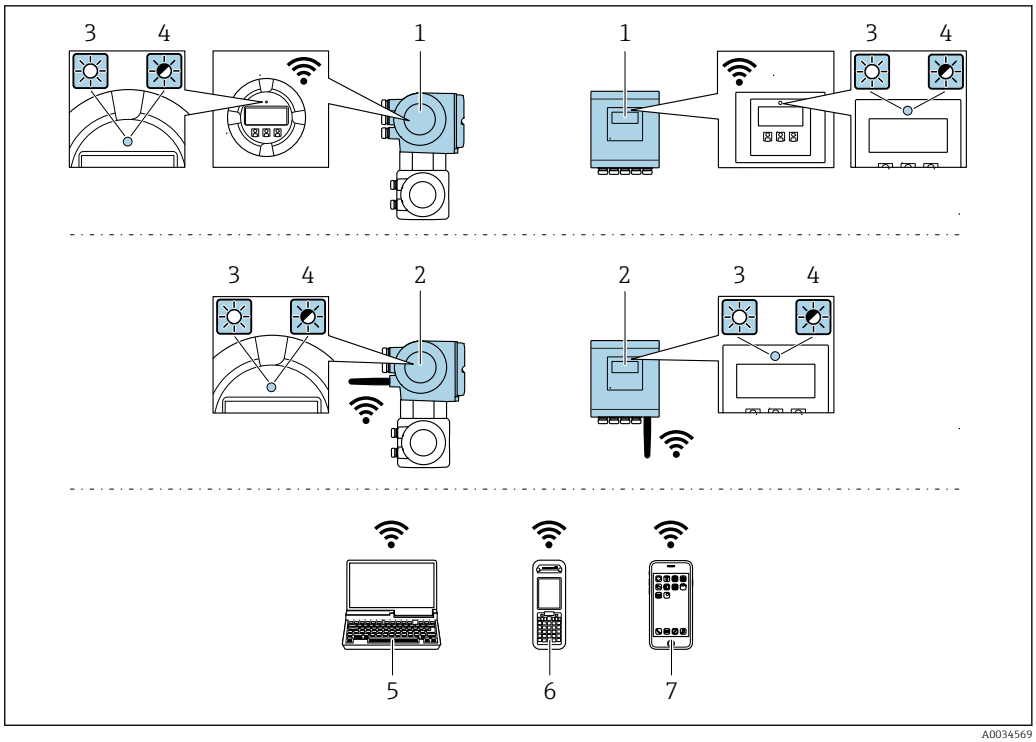



*68 Connection via service interface (CDI-RJ45)*

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

### Via WLAN interface

The optional WLAN interface is available on the following device version:
Order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN"




1 *Transmitter with integrated WLAN antenna*
2 *Transmitter with external WLAN antenna*
3 *LED lit constantly: WLAN reception is enabled on measuring device*
4 *LED flashing: WLAN connection established between operating unit and measuring device*
5 *Computer with WLAN interface and web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device web server or with operating tool (e.g. FieldCare, DeviceCare)*
6 *Mobile handheld terminal with WLAN interface and web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device web server or operating tool (e.g. FieldCare, DeviceCare)*
7 *Smart phone or tablet (e.g. Field Xpert SMT70)*

| | |
|---|---|
| Function | WLAN: IEEE 802.11 b/g (2.4 GHz)<br>▪ Access Point with DHCP server (factory setting)<br>▪ Network |
| Encryption | WPA2-PSK AES-128 (in accordance with IEEE 802.11i) |
| Configurable WLAN channels | 1 to 11 |
| Degree of protection | IP67 |
| Available antennas | ▪ Internal antenna<br>▪ External antenna (optional)<br>In the event of poor transmission/reception conditions at the place of installation.<br>Available as an accessory .<br>Only 1 antenna is active at any one time! |
| Range | ▪ Internal antenna: typically 10 m (32 ft)<br>▪ External antenna: typically 50 m (164 ft) |
| Materials (external antenna) | ▪ Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass<br>▪ Adapter: Stainless steel and nickel-plated brass<br>▪ Cable: Polyethylene<br>▪ Plug: Nickel-plated brass<br>▪ Angle bracket: Stainless steel |

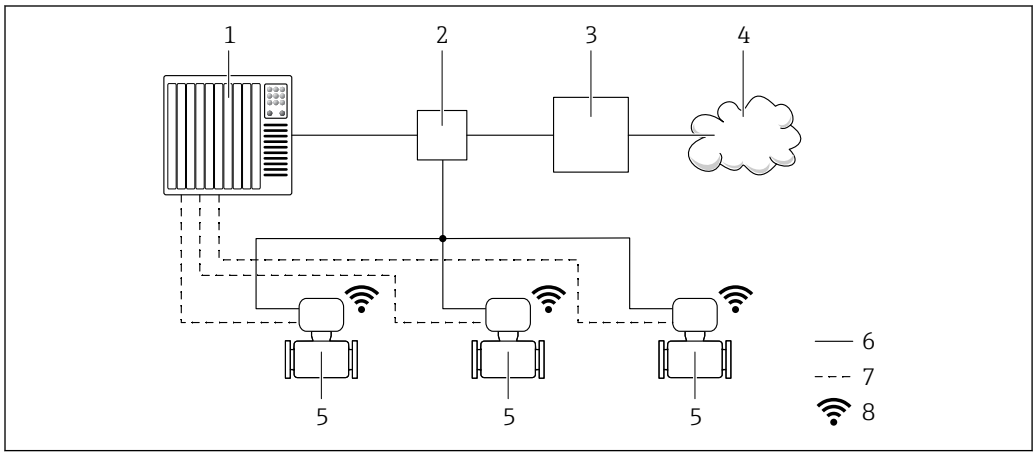
**Network integration**

Network integration is only available for the HART communication protocol.

With the optional "OPC-UA Server" application package, the device can be integrated into an Ethernet network via the service interface (CDI-RJ45 and WLAN) and communicate with OPC-UA clients. If the device is used in this way, IT security must be considered.

Transmitters with an Ex de approval may **not** be connected via the service interface (CDI-RJ45)!
Order code for "Approval transmitter + sensor", options (Ex de):
BA, BB, C1, C2, GA, GB, MA, MB, NA, NB

For permanent access to device data and for device configuration via the Web server, the device is incorporated directly in a network via the service interface (CDI-RJ45). In this way, the device can be accessed any time from the control station. The measured values are processed separately via the inputs and outputs through the automation system.




1 *Automation system, e.g. Simatic S7 (Siemens)*
2 *Ethernet switch*
3 *Edge Gateway*
4 *Cloud*
5 *Measuring device*
6 *Ethernet network*
7 *Measured values via inputs and outputs*
8 *Optional WLAN interface*

The optional WLAN interface is available on the following device version:
Order code for "Display; operation", option **G** "4-line, backlit, graphic display; touch control + WLAN"

Special Documentation for the OPC-UA Server application package → 130.

## Supported operating tools

Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

| Supported operating tools | Operating unit | Interface | Additional information |
|---|---|---|---|
| Web browser | Notebook, PC or tablet with Web browser | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Ethernet-based fieldbus (EtherNet/IP, PROFINET) | Special Documentation for device → 130 |
| DeviceCare SFE100 | Notebook, PC or tablet with Microsoft Windows system | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Fieldbus protocol | → 128 |
| FieldCare SFE500 | Notebook, PC or tablet with Microsoft Windows system | ▪ CDI-RJ45 service interface<br>▪ WLAN interface<br>▪ Fieldbus protocol | → 128 |

| Supported operating tools | Operating unit | Interface | Additional information |
|---|---|---|---|
| Field Xpert | SMT70/77/50 | ▪ All fieldbus protocols<br>▪ WLAN interface<br>▪ Bluetooth<br>▪ CDI-RJ45 service interface | Operating Instructions BA01202S<br>Device description files: Use update function of handheld terminal |
| SmartBlue app | Smartphone or tablet with iOs or Android | WLAN | → 🖹 128 |

Other operating tools based on FDT technology with a device driver such as DTM/iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:

- FactoryTalk AssetCentre (FTAC) from Rockwell Automation → www.rockwellautomation.com
- Process Device Manager (PDM) from Siemens → www.siemens.com
- Asset Management Solutions (AMS) from Emerson → www.emersonprocess.com
- FieldCommunicator 375/475 from Emerson → www.emersonprocess.com
- Field Device Manager (FDM) from Honeywell → www.process.honeywell.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The related device description files are available: www.endress.com → Download Area

**Web server**

With the integrated web server, the device can be operated and configured via a web browser using Ethernet-APL, and via the service interface (CDI-RJ45) or WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, status information on the device is displayed and can be used to monitor device health. Furthermore the device data can be managed and the network parameters can be configured.

Access to the network is required for the Ethernet-APL connection.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN". The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.

*Supported functions*
Data exchange between the operating unit (such as a notebook, for example,) and measuring instrument:
- Upload the configuration from the measuring instrument (XML format, configuration backup)
- Save the configuration to the measuring instrument (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat Technology verification report (PDF file, only available with the **Heartbeat Verification** → 🖹 124 application package)
- Flash firmware version for device firmware upgrade, for example
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package→ 🖹 124)

**HistoROM data management**

The measuring device features HistoROM data management. HistoROM data management comprises both the storage and import/export of key device and process data, making operation and servicing far more reliable, secure and efficient.

When the device is delivered, the factory settings of the configuration data are stored as a backup in the device memory. This memory can be overwritten with an updated data record, for example after commissioning.

### Additional information on the data storage concept

*There are different types of data storage units in which device data are stored and used by the device:*

| | HistoROM backup | T-DAT | S-DAT |
|---|---|---|---|
| **Available data** | ▪ Event logbook, e.g. diagnostic events<br>▪ Parameter data record backup<br>▪ Device firmware package<br>▪ Driver for system integration for exporting via web server, e.g.:<br>  ▪ GSD for PROFIBUS DP<br>  ▪ GSD for PROFIBUS PA<br>  ▪ GSDML for PROFINET<br>  ▪ EDS for EtherNet/IP<br>  ▪ DD for FOUNDATION Fieldbus | ▪ Measured value logging ("Extended HistoROM" order option)<br>▪ Current parameter data record (used by firmware at run time)<br>▪ Indicator (minimum/maximum values)<br>▪ Totalizer value | ▪ Sensor data: e.g. nominal diameter<br>▪ Serial number<br>▪ Calibration data<br>▪ Device configuration (e.g. SW options, fixed I/O or multi I/O) |
| **Storage location** | Fixed on the user interface PC board in the connection compartment | Can be plugged into the user interface PC board in the connection compartment | In the sensor plug in the transmitter neck part |

#### Data backup

**Automatic**
- The most important device data (sensor and transmitter) are automatically saved in the DAT modules
- If the transmitter or measuring device is replaced: once the T-DAT containing the previous device data has been exchanged, the new measuring device is ready for operation again immediately without any errors
- If the sensor is replaced: once the sensor has been replaced, new sensor data are transferred from the S-DAT in the measuring device and the measuring device is ready for operation again immediately without any errors
- If exchanging the electronics module (e.g. I/O electronics module): Once the electronics module has been replaced, the software of the module is compared against the current device firmware. The module software is upgraded or downgraded where necessary. The electronics module is available for use immediately afterwards and no compatibility problems occur.

**Manual**
Additional parameter data record (complete parameter settings) in the integrated device memory HistoROM backup for:
- Data backup function
  Backup and subsequent restoration of a device configuration in the device memory HistoROM backup
- Data comparison function
  Comparison of the current device configuration with the device configuration saved in the device memory HistoROM backup

#### Data transmission

**Manual**
- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.:
  - GSD for PROFIBUS DP
  - GSD for PROFIBUS PA
  - GSDML for PROFINET
  - EDS for EtherNet/IP
  - DD for FOUNDATION Fieldbus

#### Event list

**Automatic**
- Chronological display of up to 20 event messages in the events list
- If the **Extended HistoROM** application package (order option) is enabled: up to 100 event messages are displayed in the events list along with a time stamp, plain text description and remedial measures
- The events list can be exported and displayed via a variety of interfaces and operating tools e.g. DeviceCare, FieldCare or Web server

**Data logging**

**Manual**
If the **Extended HistoROM** application package (order option) is enabled:
- Recording of 1 to 4 channels of up to 1 000 measured values (up to 250 measured values per channel)
- User configurable recording interval
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

# Certificates and approvals

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

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

**CE mark**

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

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

**UKCA marking**

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

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

**RCM marking**

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

**Ex approval**

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

The following devices have equipment protection level (EPL) Ga/Gb (Zone 0 in the measuring tube):
- Device versions with the order code for "Integrated ISEM electronics", option A and the order code for "Approval; transmitter; sensor", option BI, BJ, BM or BN.
- Device versions with the order code for "Integrated ISEM electronics", option B and the order code for "Approval; transmitter; sensor", option BA, BB, BC or BD.

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

**Proline 500 – digital**

*ATEX/IECEx*

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

*Ex ia*

| Transmitter | | Sensor | |
|---|---|---|---|
| **Category** | **Type of protection** | **Category** | **Type of protection** |
| II(1)G | [Ex ia] IIC | II1/2G | Ex ia IIC T6...T1 Ga/Gb<br>Ex ia IIB T6...T1 Ga/Gb |
| II(1)G | [Ex ia] IIC | II2G | Ex ia IIC T6...T1 Gb<br>Ex ia IIB T6...T1 Gb |
| II3(1)G | Ex ec [ia Ga] IIC T5...T4 Gc | II1/2G | Ex ia IIC T6...T1 Ga/Gb<br>Ex ia IIB T6...T1 Ga/Gb |
| II3(1)G | Ex ec [ia Ga] IIC T5...T4 Gc | II2G | Ex ia IIC T6...T1 Gb<br>Ex ia IIB T6...T1 Gb |

*Ex tb*

| Transmitter | | Sensor | |
|---|---|---|---|
| **Category** | **Type of protection** | **Category** | **Type of protection** |
| II(1)D | [Ex ia] IIIC | II2D | Ex ia tb IIIC T** °C Db |

*Non-Ex / Ex ec*

| Transmitter | | Sensor | |
|---|---|---|---|
| **Category** | **Type of protection** | **Category** | **Type of protection** |
| Non - Ex | Non-Ex | II3G | Ex ec IIC T5...T1 Gc |
| II3G | Ex ec IIC T5...T4 Gc | II3G | Ex ec IIC T5...T1 Gc |

*$_{C}CSA_{US}$*

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

*IS (Ex nA, Ex i)*

| Transmitter | Sensor |
|---|---|
| Class I Division 2 Groups A - D | Class I, II, III Division 1 Groups A-G |
| Class I Division 2 Groups A - D | Class I, II, III Division 1 Groups C-G |

*NI (Ex nA)*

| Transmitter | Sensor |
|---|---|
| Class I Division 2 Groups A - D | |

*Ex nA / Ex i*

| Transmitter | Sensor |
|---|---|
| Class I, Zone 2 AEx/ Ex nA [ia Ga] IIC T5...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC T6...T1 Ga/Gb<br>Class I, Zone 1 AEx/ Ex ia IIB T6...T1 Ga/Gb |
| Class I, Zone 2 AEx/ Ex nA [ia Ga] IIC T5...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC T6...T1 Gb<br>Class I, Zone 1 AEx/ Ex ia IIB T6...T1 Gb |

*Ex nA*

| Transmitter | Sensor |
|---|---|
| Class I, Zone 2 AEx/ Ex nA IIC T5...T4 Gc | Class I, Zone 2 AEx/ Ex nA IIC T5...T1 Gc |

*Ex tb*

| Transmitter | Sensor |
|---|---|
| [AEx / Ex ia ] IIIC | Zone 21 AEx/ Ex ia tb IIIC T** °C Db |

**Proline 500**

*ATEX/IECEx*

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

*Ex db eb*

| Transmitter | | Sensor | |
|---|---|---|---|
| Category | Type of protection | Category | Type of protection |
| II2G | Ex db eb ia IIC T6...T4 Gb | II1/2G | Ex ia IIC T6...T1 Ga/Gb |
| II2G | Ex db eb ia IIB T6...T4 Gb | II1/2G | Ex ia IIB T6...T1 Ga/Gb |
| II2G | Ex db eb ia IIC T6...T4 Gb | II2G | Ex ia IIC T6...T1 Gb |
| II2G | Ex db eb ia IIB T6...T4 Gb | II2G | Ex ia IIB T6...T1 Gb |

*Ex db*

| Transmitter | | Sensor | |
|---|---|---|---|
| Category | Type of protection | Category | Type of protection |
| II2G | Ex db ia IIC T6...T4 Gb | II1/2G | Ex ia IIC T6...T1 Ga/Gb |
| II2G | Ex db ia IIB T6...T4 Gb | II1/2G | Ex ia IIB T6...T1 Ga/Gb |
| II2G | Ex db ia IIC T6...T4 Gb | II2G | Ex ia IIC T6...T1 Gb |
| II2G | Ex db ia IIB T6...T4 Gb | II2G | Ex ia IIB T6...T1 Gb |

*Ex tb*

| Category | Type of protection | |
|---|---|---|
| | Transmitter | Sensor |
| II2D | Ex tb IIIC T85°C Db | Ex ia tb IIIC T** °C Db |

*Ex ec*

| Category | Type of protection | |
|---|---|---|
| | Transmitter | Sensor |
| II3G | Ex ec IIC T5...T4 Gc | Ex ec IIC T5...T1 Gc |

*$_{C}CSA_{US}$*

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

*IS (Ex i) and XP (Ex d)*

| Transmitter | Sensor |
|---|---|
| Class I, II, III Division 1 Groups A-G | |
| Class I, II, III Division 1 Groups C-G | |

*NI (Ex nA)*

| Transmitter | Sensor |
|---|---|
| Class I Division 2 Groups ABCD | |

*Ex de*

| Transmitter | Sensor |
|---|---|
| Class I, Zone 1 AEx/ Ex de ia IIC T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC T6...T1 Ga/Gb |
| Class I, Zone 1 AEx/ Ex de ia IIB T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIB T6...T1 Ga/Gb |
| Class I, Zone 1 AEx/ Ex de ia IIC T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC T6...T1 Gb |
| Class I, Zone 1 AEx/ Ex de ia IIB T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIB T6...T1 Gb |

*Ex d*

| Transmitter | Sensor |
|---|---|
| Class I, Zone 1 AEx/ Ex d ia IIC T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC T6...T1 Ga/Gb |
| Class I, Zone 1 AEx/ Ex d ia IIB T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIB T6...T1 Ga/Gb |
| Class I, Zone 1 AEx/ Ex d ia IIC T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC T6...T1 Gb |
| Class I, Zone 1 AEx/ Ex d ia IIB T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIB T6...T1 Gb |

*Ex nA*

| Transmitter | Sensor |
|---|---|
| Class I, Zone 2 AEx/ Ex nA IIC T5...T4 Gc | Class I, Zone 2 AEx/ Ex nA IIC T5...T1 Gc |

*Ex tb*

| Transmitter | Sensor |
|---|---|
| Zone 21 AEx/ Ex tb IIIC T85°C Db | Zone 21 AEx/ Ex ia tb IIIC T** °C Db |

**Hygienic compatibility**

- 3-A approval
  - Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval.
  - The 3-A approval refers to the measuring instrument.
  - When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument.
    A remote display module must be installed in accordance with the 3-A Standard.
  - Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.
    Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG-tested
  Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG.
  To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedg.org).
  To meet the requirements for EHEDG certification, the device must be installed in a position that ensures drainability.
- FDA
- Food Contact Materials Regulation (EC) 1935/2004

Observe the special installation instructions

**HART certification**

**HART interface**

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

**FOUNDATION Fieldbus certification**

**FOUNDATION Fieldbus interface**

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:
- Certified in accordance with FOUNDATION Fieldbus H1
- Interoperability Test Kit (ITK), revision version 6.2.0 (certificate available on request)
- Physical Layer Conformance Test
- The device can also be operated with certified devices of other manufacturers (interoperability)

**Certification PROFIBUS**

**PROFIBUS interface**

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

**EtherNet/IP certification**

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

**Certification PROFINET**

**PROFINET interface**

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET Security Level 2– Netload Class 2 0 Mbps
- The device can also be operated with certified devices of other manufacturers (interoperability)
- The device supports PROFINET S2 system redundancy.

**PROFINET with Ethernet-APL certification**

**PROFINET interface**

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e. V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET PA Profile 4
  - PROFINET netload robustness Class 2 10 Mbit/s
  - APL conformance test
- The device can also be operated with certified devices of other manufacturers (interoperability)
- The device supports PROFINET S2 system redundancy.

**Pressure Equipment Directive**

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

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

**Radio approval**

The measuring device has radio approval.

For detailed information on the radio approval, see the Special Documentation → 130

**Measuring instrument approval**

The measuring device is approved as a component in measuring systems (MI-005) in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2014/32/EU (MID).

The measuring device is qualified to OIML R117 and has an OIML Certificate of Conformity (optional).

**Additional certification**

**CRN approval**

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

**Tests and certificates**

- ISO 23277 ZG2x (PT)+ISO 10675-1 ZG1 (RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME B31.3 NFS(RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME VIII Div.1(RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Visual+penetrant+radiographic testing NORSOK M-601 (RT) measuring pipe (VT+PT) +process connection (VT+RT) weld seam, Heartbeat Technology verification report
- ISO 23277 ZG2x (PT)+ISO 10675-1 ZG1 (DR) measuring pipe (PT) + process connection (DR) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME B31.3 NFS(DR) measuring pipe (PT) + process connection (DR) weld seam, Heartbeat Technology verification report
- Penetrant +radiographic testing ASME VIII Div.1(DR) measuring pipe (PT) + process connection (DR) weld seam, Heartbeat Technology verification report
- Visual +penetrant+radiographic testing NORSOK M-601 (DR) measuring pipe (VT+PT) +process connection (VT+DR) weld seam, Heartbeat Technology verification report

*Testing of welded connections*

| Option | Test standard | | | | Component | |
|---|---|---|---|---|---|---|
| | ISO 23277 AL2x (PT) ISO 10675-1 AL1 (RT, DR) | ASME B31.3 NFS | ASME VIII Div.1 Appx. 4+8 | NORSOK M-601 | Measuring pipe | Process connection |
| KF | x | | | | PT | RT |
| KK | | x | | | PT | RT |
| KP | | | x | | PT | RT |

| Option | Test standard | | | | Component | |
|---|---|---|---|---|---|---|
| | ISO 23277 AL2x (PT)<br>ISO 10675-1 AL1 (RT, DR) | ASME B31.3 NFS | ASME VIII Div.1 Appx. 4+8 | NORSOK M-601 | Measuring pipe | Process connection |
| KR | | | | x | VT, PT | VT, RT |
| K1 | x | | | | PT | DR |
| K2 | | x | | | PT | DR |
| K3 | | | x | | PT | DR |
| K4 | | | | x | VT, PT | VT, DR |
| PT = penetrant testing, RT = radiographic testing, VT = visual testing, DR = digital radiography<br>All options with test report | | | | | | |

**External standards and guidelines**

- EN 60529
  Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
  Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
  Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- EN 61326-1/-2-3
  EMC requirements for electrical equipment for measurement, control and laboratory use
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
  The application of the pressure equipment directive to process control devices
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnosis of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications
- NAMUR NE 132
  Coriolis mass meter
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components.
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

# Ordering information

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

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

3. Select **Configuration**.

**Product Configurator - the tool for individual product configuration**
- Up-to-the-minute configuration data
- Depending on the device: Direct input of 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 → 130

**Diagnostic functionality**

Order code for "Application package", option EA "Extended HistoROM"

Comprises extended functions concerning the event log and the activation of the measured value memory.

Event log:
Memory volume is extended from 20 message entries (standard version) to up to 100 entries.

Data logging (line recorder):
- Memory capacity for up to 1000 measured values is activated.
- 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.
- Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.

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

**Heartbeat Technology**

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

**Heartbeat Verification**
Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".
- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

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

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

**Concentration measurement**

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

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:
- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.).
- Common or user-defined units (°Brix, °Plato, % mass, % volume, mol/l etc.) for standard applications.
- Concentration calculation from user-defined tables.

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

**Advanced density function**

Order code for "Application package", option EH "Advanced density function"

Advanced software functions for density measurement:
- Easy integration into existing density applications with integrated time period signal (TPS).
- Two density values shown simultaneously on the local display.
- Advanced density coefficients for optimum recalibrations.

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

**Premium density and extended density function**

Order code for "Application package", option EI " Premium density, +/- 0.1 kg/m3 + extended density function"

Highest density measurement accuracy thanks to premium density calibration and extended software functions for density measurement:
- Easy integration into existing density applications with integrated time period signal (TPS).
- Two density values shown simultaneously on the local display.
- Advanced density coefficients for optimum recalibrations.

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

**Petroleum**

Order code for "Application package", option EJ "Petroleum"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package.

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

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

**Petroleum & locking function**

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

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

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

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

**OPC-UA Server**

Order code for "Application package", option EL "OPC-UA Server"

The application package provides an integrated OPC-UA server for comprehensive device services for IoT and SCADA applications.

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

# Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your

local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

## Device-specific accessories

### For the transmitter

| Accessories | Description |
|---|---|
| Transmitter<br>▪ Proline 500 – digital<br>▪ Proline 500 | Transmitter for replacement or storage. Use the order code to define the following specifications:<br>▪ Approvals<br>▪ Output<br>▪ Input<br>▪ Display/operation<br>▪ Housing<br>▪ Software<br>▪ Proline 500 – digital transmitter:<br>Order number: 8X5BXX-*********A<br>▪ Proline 500 transmitter:<br>Order number: 8X5BXX-*********B<br>Proline 500 transmitter for replacement:<br>It is essential to specify the serial number of the current transmitter when ordering. On the basis of the serial number, the device-specific data (e.g. calibration factors) of the replaced device can be used for the new transmitter.<br>▪ Proline 500 – digital transmitter: Installation Instructions EA01151D<br>▪ Proline 500 transmitter: Installation Instructions EA01152D |
| External WLAN antenna | External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area".<br>▪ The external WLAN antenna is not suitable for use in hygienic applications.<br>▪ Additional information regarding the WLAN interface → 🖹 112.<br>Order number: 71351317<br>Installation Instructions EA01238D |
| Pipe mounting set | Pipe mounting set for transmitter.<br>Proline 500 – digital transmitter<br>Order number: 71346427<br>Installation Instructions EA01195D<br>Proline 500 transmitter<br>Order number: 71346428 |
| Weather protection cover<br>Transmitter<br>▪ Proline 500 – digital<br>▪ Proline 500 | Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.<br>▪ Proline 500 – digital transmitter<br>Order number: 71343504<br>▪ Proline 500 transmitter<br>Order number: 71343505<br>Installation Instructions EA01191D |
| Display guard<br>Proline 500 – digital | Is used to protect the display against impact or scoring, for example from sand in desert areas.<br>Order number: 71228792<br>Installation Instructions EA01093D |

| | |
|---|---|
| Connecting cable<br>Proline 500 – digital<br>Sensor –<br>Transmitter | The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection) or as an accessory (order number DK8012).<br>The following cable lengths are available: order code for "Cable, sensor connection"<br>▪ Option B: 20 m (65 ft)<br>▪ Option E: User-configurable up to max. 50 m<br>▪ Option F: User-configurable up to max. 165 ft<br>Maximum possible cable length for a Proline 500 – digital connecting cable: 300 m (1000 ft) |
| Connecting cables<br>Proline 500<br>Sensor –<br>Transmitter | The connecting cable can be ordered directly with the measuring device (order code for "Cable, sensor connection") or as an accessory (order number DK8012).<br>The following cable lengths are available: order code for "Cable, sensor connection"<br>▪ Option 1: 5 m (16 ft)<br>▪ Option 2: 10 m (32 ft)<br>▪ Option 3: 20 m (65 ft)<br>Possible cable length for a Proline 500 connecting cable: max. 20 m (65 ft) |

### For the sensor

| Accessories | Description |
|---|---|
| Heating jacket | Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.<br>If using oil as a heating medium, please consult with Endress+Hauser.<br>Use the order code with the product root DK8003.<br>Special Documentation SD02161D |

## Communication-specific accessories

| Accessories | Description |
|---|---|
| Commubox FXA195<br>HART | For intrinsically safe HART communication with FieldCare via the USB port.<br>Technical Information TI00404F |
| HART loop converter<br>HMX50 | Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.<br>▪ Technical Information TI00429F<br>▪ Operating Instructions BA00371F |
| Fieldgate FXA42 | Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments<br>▪ Technical Information TI01297S<br>▪ Operating Instructions BA01778S<br>▪ Product page: www.endress.com/fxa42 |
| Field Xpert SMT50 | The Field Xpert SMT50 tablet PC for device configuration enables mobile plant asset management in the non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.<br>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.<br>▪ Technical Information TI01555S<br>▪ Operating Instructions BA02053S<br>▪ Product page: www.endress.com/smt50 |

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

## Service-specific accessories

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

## System components

| Accessories | Description |
|---|---|
| Memograph M graphic data manager | The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.<br>▪ Technical Information TI00133R<br>▪ Operating Instructions BA00247R |
| Cerabar M | The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.<br>▪ Technical Information TI00426P and TI00436P<br>▪ Operating Instructions BA00200P and BA00382P |

| Accessories | Description |
|---|---|
| Cerabar S | The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.<br>▪ Technical Information TI00383P<br>▪ Operating Instructions BA00271P |
| iTEMP | The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.<br>"Fields of Activity" document FA00006T |

# Supplemental documentation

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

**Standard documentation**

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

### Brief operating instructions

*Brief Operating Instructions for the sensor*

| Measuring instrument | Documentation code |
|---|---|
| Proline Promass Q | KA01262D |

*Brief operating instructions for transmitter*

| Measuring instrument | Documentation code | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | Ethernet/IP | PROFINET | PROFINET over Ethernet-APL |
| Proline 500 – digital | KA01315D | KA01233D | KA01392D | KA01390D | KA01319D | KA01346D | KA01351D | KA01521D |
| Proline 500 | KA01314D | KA01291D | KA01391D | KA01389D | KA01318D | KA01347D | KA01350D | KA01520D |

### Operating Instructions

| Measuring instrument | Documentation code | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | Ethernet/IP | PROFINET | PROFINET over Ethernet-APL |
| Promass Q 500 | BA01534D | BA01567D | BA01556D | BA01878D | BA01545D | BA01755D | BA01766D | BA02129D |

### Description of parameters

| Measuring instrument | Documentation code | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | Ethernet/IP | PROFINET | PROFINET over Ethernet-APL |
| Promass 500 | GP01060D | GP01096D | GP01061D | GP01137D | GP01062D | GP01120D | GP01121D | GP01173D |

## Supplementary device-dependent documentation

### Safety instructions

Safety instructions for electrical equipment for hazardous areas.

| Contents | Documentation code<br>Measuring device |
|---|---|
| ATEX/IECEx Ex i | XA01473D |
| ATEX/IECEx Ex ec | XA01474D |
| cCSAus IS | XA01475D |
| cCSAus Ex i | XA01509D |
| cCSAus Ex nA | XA01510D |
| INMETRO Ex i | XA01476D |
| INMETRO Ex ec | XA01477D |
| NEPSI Ex i | XA01478D |
| NEPSI Ex nA | XA01479D |
| NEPSI Ex i | XA01658D |
| NEPSI Ex nA | XA01659D |
| JPN | XA01780D |

### Functional Safety Manual

| Contents | Documentation code |
|---|---|
| Proline Promass 500 | SD01729D |

### Special documentation

| Contents | Documentation code |
|---|---|
| Information on the Pressure Equipment Directive | SD01614D |
| Radio approvals for WLAN interface for A309/A310 display module | SD01793D |
| OPC-UA server [1)] | SD02040D |
| Overrun measurement | SD02342D |

1) This Special Documentation is only available for device versions with a HART output.

| Contents | Documentation code | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | PROFINET | EtherNet/IP | PROFINET with Ethernet-APL |
| Web server | SD01666D | SD01669D | SD01668D | SD02232D | SD01667D | SD01971D | SD01970D | SD02769D |
| Heartbeat Technology | SD01643D | SD01608D | SD01705D | SD02203D | SD01704D | SD01989D | SD01983D | SD02732D |

| Contents | Documentation code | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | PROFINET | EtherNet/IP | PROFINET with Ethernet-APL |
| Concentration measurement | SD01645D | SD01709D | SD01711D | SD02213D | SD01710D | SD02007D | SD02006D | SD02736D |
| Petroleum | SD02013D | – | SD02292D | SD02217D | SD02014D | SD02015D | SD02012D | SD02740D |
| Petroleum & locking function | SD02499D | – | – | – | SD02500D | – | – | – |
| Extended density function | SD02354D | – | – | – | SD02354D | – | – | SD02354D |
| Gas fraction handler | SD02584D | – | – | – | SD02584D | SD02584D | – | SD02584D |
| Custody transfer (counter for liquids other than water) | SD01690D | – | – | – | SD01691D | – | – | – |
| Custody transfer (counter for gas) | SD02464D | – | – | – | SD02465D | – | – | – |
| Custody transfer (counter for gas, in accordance with the German Measurement and Calibration Ordinance (Mess- und Eichverordnung)) | SD02582D | – | – | – | SD02583D | – | – | – |

**Installation instructions**

| Contents | Note |
|---|---|
| Installation instructions for spare part sets and accessories | Documentation code: specified for each individual accessory → 126. |

# Registered trademarks

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

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

**FOUNDATION™ Fieldbus**
Registration-pending trademark of the FieldComm Group, Austin, Texas, USA

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

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

**Ethernet-APL™**
Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

**PROFINET®**
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