# Technical Information
# Proline Cubemass C 500

## Coriolis flowmeter



# Compact sensor for smallest quantities, with a transmitter remote version with up to 4 I/Os

### Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Measuring accurately smallest quantities of liquids and gases

*Device properties*
- Nominal diameter: DN 1 to 6 (¹⁄₂₄ to ¼")
- Process pressure up to 400 bar (5 800 psi)
- Medium temperature up to +205 °C (+401 °F)
- Remote version with up to 4 I/Os
- Backlit display with touch control and WLAN access
- Standard cable between sensor and transmitter

### Your benefits

- Space-saving installation – compact single-tube design
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Suitable for skids – lightweight sensor
- Full access to process and diagnostic information – numerous, freely combinable I/Os and fieldbuses
- Reduced complexity and variety – freely configurable I/O functionality
- Integrated verification – Heartbeat Technology

Endress+Hauser

People for Process Automation

# Table of contents

# About this document

**Symbols**

**Electrical symbols**

| Symbol | Meaning |
|---|---|
| ⎓ | Direct current |
| ∼ | Alternating current |
| ⎓∼ | Direct current and alternating current |
| ⏚ | **Ground connection**<br>A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
| ⏚ | **Protective Earth (PE)**<br>A terminal which must be connected to ground prior to establishing any other connections.<br><br>The ground terminals are situated inside and outside the device:<br>• Inner ground terminal: Connects the protectiv earth to the mains supply.<br>• Outer ground terminal: Connects the device to the plant grounding system. |

**Communication symbols**

| Symbol | Meaning |
|---|---|
| 📶 | **Wireless Local Area Network (WLAN)**<br>Communication via a wireless, local network. |
| ▣ | **LED**<br>Light emitting diode is off. |
| ▣ | **LED**<br>Light emitting diode is on. |
| ▣ | **LED**<br>Light emitting diode is flashing. |

**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. |
| ℹ | **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 |
| ⚠EX | Hazardous area |
| ⚠EX (crossed) | Safe area (non-hazardous area) |
| ≈➡ | Flow direction |

# Function and system design

**Measuring principle**

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

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

$F_c$ = Coriolis force

$\Delta m$ = moving mass

$\omega$ = rotational velocity

$v$ = radial velocity in rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass $\Delta m$, its velocity $v$ in the system and thus on the mass flow. Instead of a constant rotational velocity $\omega$, the sensor uses oscillation.

In the sensor, an oscillation is produced in the measuring tube. The Coriolis forces produced at the measuring tube loop cause a phase shift in the tube oscillations (see illustration):
- If there is zero flow (i.e. when the fluid stands still), the oscillation measured at points A and B has the same phase (no phase difference) (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).
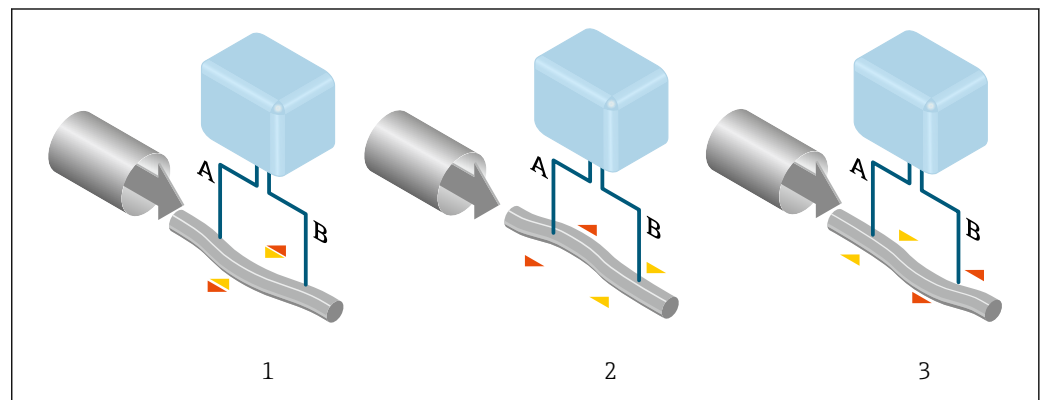


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The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet. System balance is ensured by the antiphase oscillation of the two measuring tubes. The measuring principle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

**Density measurement**

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

**Volume measurement**

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

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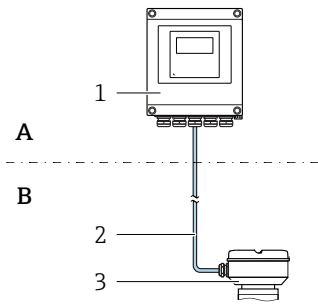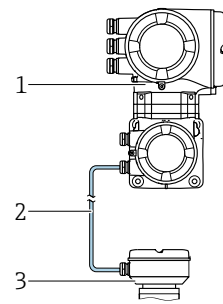
The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output signal.

| Measuring system | The 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. |
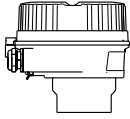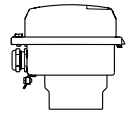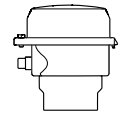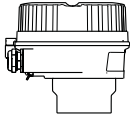
**Transmitter**

Two versions of the transmitter are available.
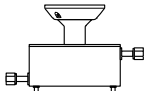
| Proline 500 – digital | Proline 500 |
|---|---|
| For use in applications not required to meet special requirements due to ambient or operating conditions.<br><br><br><br>*A  Non-hazardous area or Zone 2; Class I, Division 2*<br>*B  Non-hazardous area or Zone 2; Class I, Division 2 or Zone 1; Class I, Division 1*<br>*1  Transmitter*<br>*2  Connecting cable: cable, separate, standard*<br>*3  Sensor connection housing with integrated ISEM*<br><br>• Flexible and cost-effective separate installation.<br>• A standard cable can be used as the connecting cable.<br><br>• 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" | For use in applications required to meet special requirements due to ambient or operating conditions.<br><br><br><br>*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*<br><br>Application examples for sensors without electronics:<br>• Strong vibrations at the sensor.<br>• Sensor in underground installations.<br><br>• 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)→ 🔖 107 | |
| • 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) |
| **Hazardous area** | |
| Use in: Zone 2; Class I, Division 2<br><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 |
| **Device 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, backlit, graphic local display 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) | |

### 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><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>• Optional: order code for "Sensor feature", option CC "Hygienic version, for maximum corrosion resistance": stainless steel 1.4404 (316L)<br><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": 1.4409 (CF3M) similar to 316L |

### Sensor

| Cubemass C | The ultra compact, bent single-tube system for minimum flow rates and high pressure |
|---|---|
| A0029825 | • Simultaneous measurement of flow, volume flow, density and temperature (multivariable)<br>• Immune to process influences<br>• Nominal diameter range: DN 1 to 6 ($\frac{1}{24}$ to $\frac{1}{4}$ ")<br>• Materials:<br>  • Sensor: stainless steel, 1.4301 (304)<br>  • Measuring tube: stainless steel, 1.4539 (904L)<br>  • Process connections: stainless steel, 1.4404 (316/316L); 1.4539 (904L) |

**Equipment architecture**
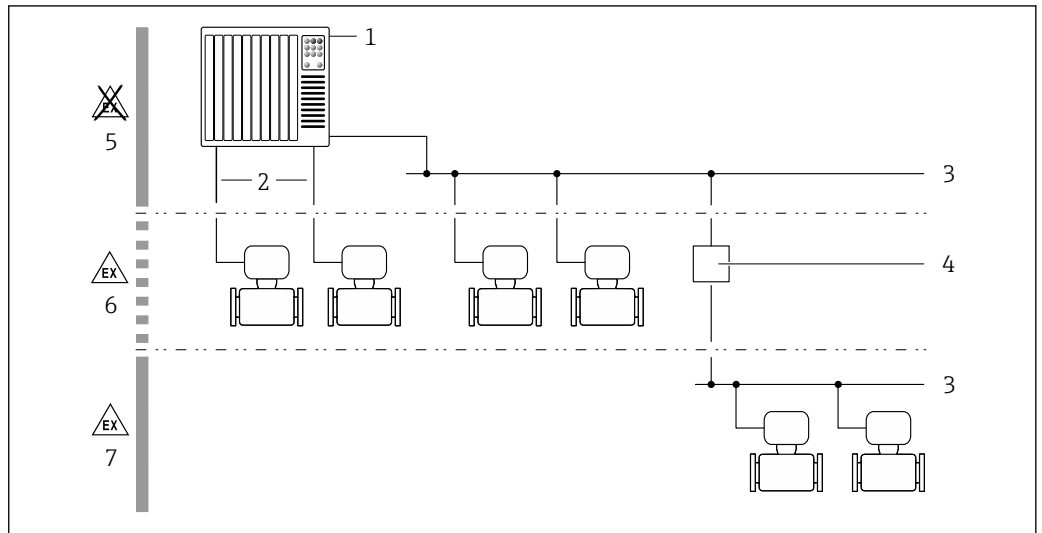


⊞ *1  Possibilities for integrating measuring devices into a system*

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*

**Safety**

### IT security

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

IT security measures, which provide additional protection for the device 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. An overview of the most important functions is provided in the following section.

| Function/interface | Factory setting | Recommendation |
|---|---|---|
| Write protection via hardware write protection switch → 🗎 10 | Not enabled. | On an individual basis following risk assessment. |
| Access code (also applies for Web server login or FieldCare connection) → 🗎 10 | 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) → 🗎 10 | Serial number | Assign an individual WLAN passphrase during commissioning. |
| WLAN mode | Access Point | On an individual basis following risk assessment. |
| Web server → 🗎 10 | Enabled. | On an individual basis following risk assessment. |
| CDI-RJ45 service interface → 🗎 11 | – | On an individual basis following risk assessment. |

*Protecting access via hardware write protection*

Write access to the device parameters 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 motherboard). 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.
- Follow the general rules for generating a secure password when defining and managing the access code or 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 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 or PROFINET (RJ45 connector).

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

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

> For detailed information on device parameters, see:
> The "Description of Device Parameters" document → 🖺 110

*Access via OPC-UA*

> The "OPC UA Server" application package is available in the device version with the HART communication protocol → 🖺 106.

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

The device can be integrated in 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) .

# Input

| Measured variable | **Direct measured variables** |
|---|---|

**Direct measured variables**

- Mass flow
- Density
- Temperature

**Calculated measured variables**

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

**Measuring range for liquids**

| DN | | Measuring range full scale values $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$ | |
|---|---|---|---|
| [mm] | [in] | [kg/h] | [lb/min] |
| 1 | $\frac{1}{24}$ | 0 to 20 | 0 to 0.735 |
| 2 | $\frac{1}{12}$ | 0 to 100 | 0 to 3.675 |
| 4 | $\frac{1}{8}$ | 0 to 450 | 0 to 16.54 |
| 6 | $\frac{1}{4}$ | 0 to 1000 | 0 to 36.75 |

**Measuring range for gases**

The full scale value depends on the density and the sound velocity of the gas used and can be calculated with the formula below:

$\dot{m}_{max(G)}$ = minimum ($\dot{m}_{max(F)} \cdot \rho_G : x$ ; $\rho_G \cdot c_G \cdot \pi/2 \cdot (d_i)^2 \cdot 3600$)

| $\dot{m}_{max(G)}$ | Maximum full scale value for gas [kg/h] |
|---|---|
| $\dot{m}_{max(F)}$ | Maximum full scale value for liquid [kg/h] |
| $\dot{m}_{max(G)} < \dot{m}_{max(F)}$ | $\dot{m}_{max(G)}$ can never be greater than $\dot{m}_{max(F)}$ |
| $\rho_G$ | Gas density in [kg/m³] at operating conditions |
| x | Constant dependent on nominal diameter |
| $c_G$ | Sound velocity (gas) [m/s] |
| $d_i$ | Measuring tube internal diameter [m] |

| DN | | x |
|---|---|---|
| [mm] | [in] | [kg/m³] |
| 1 | $\frac{1}{24}$ | 20 |
| 2 | $\frac{1}{12}$ | 20 |
| 4 | $\frac{1}{8}$ | 20 |
| 6 | $\frac{1}{4}$ | 20 |

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

**Recommended measuring range**

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** |

**External measured values**

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

ℹ️ Various pressure and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 🖹 109

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 → 🖹 13.

*Digital communication*

The measured values can be written from the automation system to the measuring via:
- FOUNDATION Fieldbus
- PROFIBUS DP
- PROFIBUS PA
- Modbus RS485
- EtherNet/IP
- PROFINET

**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**

[i] Options for output/input 3 and 4

| 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 |
| **Order code for "Output; input 2" (021) →** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Not assigned | A | A | A | A | A | A | A | A | A | A | A |
| Current output 4 to 20 mA | B | | | B | | B | B | | B | B | B |
| Current output 4 to 20 mA Ex i passive | | C | C | | C | | | C | | | |
| User-configurable input/output [1] | D | | | D | | D | D | | D | D | D |
| Pulse/frequency/switch output | E | | | E | | E | E | | E | E | E |
| Double pulse output [2] | F | | | | | | | F | | | |
| Pulse/frequency/switch output Ex i passive | | G | G | | G | | | G | | | |
| Relay output | H | | | H | | H | H | | H | H | H |
| Current input 0/4 to 20 mA | I | | | I | | I | I | | I | I | I |
| Status input | J | | | J | | J | J | | J | J | J |

1) A specific input or output can be assigned to a user-configurable input/output → 🕮 22.
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**

| 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 |
| **Order code for "Output; input 3" (022), "Output; input 4" (023) →** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Not assigned | A | A | A | A | A | A | A | A | A | A | A |
| Current output 4 to 20 mA | B | | | | | | | | B | B | B |
| Current output 4 to 20 mA Ex i passive [1] | | C | C | | | | | | | | |
| User-configurable input/output | D | | | | | | | | D | D | D |
| Pulse/frequency/switch output | E | | | | | | | | E | E | E |
| Double pulse output (slave) [2] | F | | | | | | | | F | | |
| Pulse/frequency/switch output Ex i passive [3] | | G | G | | | | | | | | |
| Relay output | H | | | | | | | | H | H | H |
| Current input 0/4 to 20 mA | I | | | | | | | | I | I | I |
| Status input | J | | | | | | | | J | J | J |

1) For output/input 4 the current output 4 to 20 mA Ex i passive (C) is not available.
2) The double pulse output (F) option is not available for input/output 4.
3) For output/input 4 the pulse/frequency/switch output Ex i passive (G) is not available.

| 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><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><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 |

**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 |
|---|---|

**Current output 4 to 20 mA**

| | |
|---|---|
| Order code | "Output; input 2" (21), "Output; input 3" (022) or "Output; input 4" (023): Option B: current output 4 to 20 mA |
| Signal mode | Can be set to: • Active • Passive |
| Current span | Can be set to: • 4 to 20 mA NAMUR • 4 to 20 mA US • 4 to 20 mA • 0 to 20 mA (only if the signal mode is active) • 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 • Volume flow • Corrected volume flow • Density • Reference density • Temperature • Electronics temperature • Oscillation frequency 0 • Oscillation damping 0 • Signal asymmetry • Exciter current 0<br><br>ℹ 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): Option C: current output 4 to 20 mA Ex i passive |
| Signal mode | Passive |
| Current span | Can be set to: • 4 to 20 mA NAMUR • 4 to 20 mA US • 4 to 20 mA • 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><br>ℹ The range of options increases if the measuring device has one or more application packages. |

**Pulse/frequency/switch output**

| Function | Can be set to pulse, frequency or switch output |
|---|---|
| Version | Open collector<br>Can be set to:<br>• Active<br>• Passive<br>• Passive NAMUR<br><br>ℹ 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 | Adjustable |
| Assignable measured variables | • Mass flow<br>• Volume flow<br>• Corrected volume flow |
| **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 | Adjustable: 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 | <ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li><li>Density</li><li>Reference density</li><li>Temperature</li><li>Electronics temperature</li><li>Oscillation frequency 0</li><li>Oscillation damping 0</li><li>Signal asymmetry</li><li>Exciter current 0</li></ul>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 | <ul><li>Off</li><li>On</li><li>Diagnostic behavior</li><li>Limit value<ul><li>Mass flow</li><li>Volume flow</li><li>Corrected volume flow</li><li>Density</li><li>Reference density</li><li>Temperature</li><li>Totalizer 1-3</li></ul></li><li>Flow direction monitoring</li><li>Status<ul><li>Partially filled pipe detection</li><li>Low flow cut off</li></ul></li></ul>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><br>Can be set to:<ul><li>Active</li><li>Passive</li><li>Passive NAMUR</li></ul> |
| 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 1 000 Hz |
| Damping | Configurable: 0 to 999 s |

| Pulse/pause ratio | 1:1 |
|---|---|
| Assignable measured variables | • Mass flow<br>• Volume flow<br>• Corrected volume flow<br>• Density<br>• Reference density<br>• Temperature<br><br>ℹ 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 | • Off<br>• On<br>• Diagnostic behavior<br>• Limit value<br>  • Mass flow<br>  • Volume flow<br>  • Corrected volume flow<br>  • Density<br>  • Reference density<br>  • Temperature<br>  • Totalizer 1-3<br>• Flow direction monitoring<br>• Status<br>  • Partially filled pipe detection<br>  • Low flow cut off<br><br>ℹ The range of options increases if the measuring device has one or more application packages. |

**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 |
|---|---|

### 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 |
|---|---|

### 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>• Freely 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>• Freely definable value between: 0 to 20.5 mA |
|---|---|

**Pulse/frequency/switch output**

| Pulse output | |
|---|---|
| Failure mode | Choose from:<br>• Actual value<br>• No pulses |
| **Frequency output** | |
| Failure mode | Choose from:<br>• Actual value<br>• 0 Hz<br>• Defined value ($f_{max}$ 2 to 12 500 Hz) |
| **Switch output** | |
| Failure 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 backlighting 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
  - EtherNet/IP
  - PROFINET
- Via service interface
  - CDI-RJ45 service interface
  - WLAN interface

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

**Web browser**

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

**Light emitting diodes (LED)**

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

**Load**          Output signal → 🗐 17

**Ex connection data**          Safety-related values

| Order code for "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 | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **LA** | PROFIBUS DP | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **MA** | Modbus RS485 | $U_N$ = 30 $V_{DC}$<br>$U_M$ = 250 $V_{AC}$ | |
| Option **SA** | FOUNDATION Fieldbus | $U_N$ = 30 $V_{DC}$<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 $V_{AC}$ | |

| Order code for "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 for "Output; input 1" | Output type | Intrinsically safe values "Output; input 1" | |
|---|---|---|---|
| | | 26 (+) | 27 (−) |
| Option **CA** | Current output 4 to 20 mA HART Ex i passive | $U_i$ = 30 V<br>$l_i$ = 100 mA<br>$P_i$ = 1.25 W<br>$L_i$ = 0 µH<br>$C_i$ = 6 nF | |
| Option **CC** | Current output 4 to 20 mA HART Ex i active | **Ex ia** [1]<br>$U_0$ = 21.8 V<br>$l_0$ = 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>$l_i$ = 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>$l_0$ = 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** [3]<br>$U_i$ = 30 V<br>$l_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF | **Ex ic** [4]<br>$U_i$ = 32 V<br>$l_i$ = 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** [3]<br>$U_i$ = 30 V<br>$l_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF | **Ex ic** [4]<br>$U_i$ = 32 V<br>$l_i$ = 570 mA<br>$P_i$ = 8.5 W<br>$L_i$ = 10 µH<br>$C_i$ = 5 nF |

1) Only available for the Zone 1; Class I, Division 1 version
2) Only available for the Zone 2; Class I, Division 2 version and only for the Proline 500 – digital transmitter
3) Only available for the Zone 1; Class I, Division 1 version
4) Only available for the Zone 2; Class I, Division 2 version and only for the Proline 500 – digital transmitter

| Order code for "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 4 to 20 mA Ex i passive | $U_i$ = 30 V<br>$l_i$ = 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>$l_i$ = 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 one another and from earth (PE).

---

**Protocol-specific data**

HART

| Manufacturer ID | 0x11 |
|---|---|
| Device type ID | 0x3B |
| HART protocol revision | 7 |
| Device description files (DTM, DD) | Information and files under: www.endress.com |
| HART load | Min. 250 Ω |
| System integration | Information on system integration: Operating Instructions → 🖺 110.<br><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.fieldbus.org |
| CFF revision | |
| Interoperability Test Kit (ITK) | Version 6.2.0 |
| ITK Test Campaign Number | Information:<br>• www.endress.com<br>• www.fieldbus.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 → 🕮 110. <br><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>• www.endress.com<br>  On the product page for the device: Documents/Software → Device drivers<br>• www.profibus.org |
| 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><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><br>🕮 Description of the function scope of compatibility: Operating Instructions → 🕮 110. |
| System integration | Information regarding system integration: Operating Instructions → 🕮 110.<br><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>• www.endress.com<br>• www.profibus.org |

| 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><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><br>Description of the function scope of compatibility:<br>Operating Instructions → 🖹 110. |
| System integration | Information regarding system integration: Operating Instructions → 🖹 110.<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 | • 1 200 BAUD<br>• 2 400 BAUD<br>• 4 800 BAUD<br>• 9 600 BAUD<br>• 19 200 BAUD<br>• 38 400 BAUD<br>• 57 600 BAUD<br>• 115 200 BAUD |
| Data transfer mode | • ASCII<br>• RTU |

| Data access | Each device parameter can be accessed via Modbus RS485. |
|---|---|
| | 📖 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><br>📖 Description of the function scope of compatibility:<br>Operating Instructions → 📄 110. |
| System integration | Information on system integration: Operating Instructions → 📄 110.<br><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 | 0x11 |
| 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 → 📄 110.<br><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 |

| | |
|---|---|
| **Conformity class** | Conformance Class B |
| **Netload Class** | Netload Class II |
| **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.org |
| **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>• Manufacturer-specific software (FieldCare, DeviceCare)<br>• Web browser<br>• Device master file (GSD), can be read out via the integrated Web server of the measuring device |
| **Configuration of the device name** | • DIP switches on the electronics module, for device name assignment (last part)<br>• DCP protocol<br>• Process Device Manager (PDM)<br>• Integrated Web server |
| **Supported functions** | • Identification & Maintenance<br>  Simple device identification via:<br>  • Control system<br>  • Nameplate<br>• Measured value status<br>  The process variables are communicated with a measured value status<br>• Blinking feature via the onsite display for simple device identification and assignment<br>• Device operation via operating tools (e.g. FieldCare, DeviceCare, SIMATIC PDM) |
| **System integration** | Information regarding system integration: Operating Instructions → 🖹 110.<br><br>• Cyclic data transmission<br>• Overview and description of the modules<br>• Status coding<br>• Startup configuration<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 (−) |
| | | Device-specific terminal assignment: adhesive label in terminal cover.→ 🕮 15. | | | | | | | |

*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 (−) |
| | | Device-specific terminal assignment: adhesive label in terminal cover. → 🕮 15. | | | | | | | |

*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 (−) |
| | | Device-specific terminal assignment: adhesive label in terminal cover. → 🕮 15. | | | | | | | |

*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 (−) |
| | | Device-specific terminal assignment: adhesive label in terminal cover. → 🕮 15. | | | | | | | |

*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 (−) |
| | | Device-specific terminal assignment: adhesive label in terminal cover. → 🕮 15. | | | | | | | |

*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 (−) |
| | | | Device-specific terminal assignment: adhesive label in terminal cover.→ 🕮 15. | | | | | |

*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 (−) |
| | | | Device-specific terminal assignment: adhesive label in terminal cover.→ 🕮 15. | | | | | |

**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

**Device plugs available**

ℹ️ 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" → 🕮 33

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

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

| Order code for | Cable entry/connection → 🕮 37 | |
|---|---|---|
| "Electrical connection" | 2 | 3 |
| M, 3, 4, 5 | 7/8" connector | – |

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

| Order code for | Cable entry/connection → 🕮 37 | |
|---|---|---|
| "Electrical connection" | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | – |

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

| Order code for | Cable entry/connection → 🕮 37 | |
|---|---|---|
| "Electrical connection" | 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"

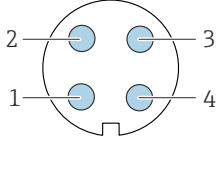| Order code for | Cable entry/connection → 🕮 37 | |
|---|---|---|
| "Electrical connection" | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | – |
| R [1][2], S [1][2], T [1][2], V [1][2] | Connector M12 × 1 | Connector M12 × 1 |

[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.

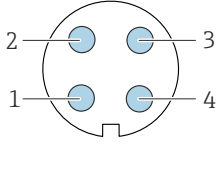Order code for "Accessory mounted", option NB "Adapter RJ45 M12 (service interface)"

| Order code | Cable entry/coupling → 🖹 37 | |
|---|---|---|
| "Accessory mounted" | Cable entry 2 | Cable entry 3 |
| NB | Plug M12 × 1 | – |

**Pin assignment, device plug**
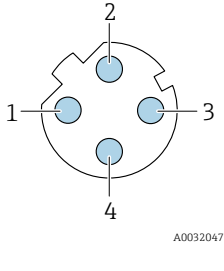
FOUNDATION Fieldbus

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

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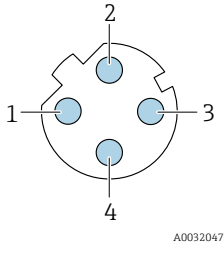
| Pin | | Assignment | Coding | Plug/socket |
|---|---|---|---|---|
| 1 | + | PROFIBUS PA + | A | Plug |
| 2 | | Grounding | | |
| 3 | - | PROFIBUS PA – | | |
| 4 | | Not assigned | | |

PROFINET

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

A0032047

ℹ Recommended plug:
• Binder, series 763, part no. 99 3729 810 04
• Phoenix, part no. 1543223 SACC-M12MSD-4Q
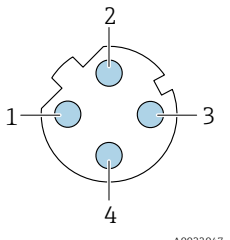
EtherNet/IP

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

A0032047

ℹ Recommended plug:
• Binder, series 763, part no. 99 3729 810 04
• Phoenix, part no. 1543223 SACC-M12MSD-4Q

### Service interface

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 763, part no. 99 3729 810 04
- Phoenix, part no. 1543223 SACC-M12MSD-4Q

**Supply voltage**

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

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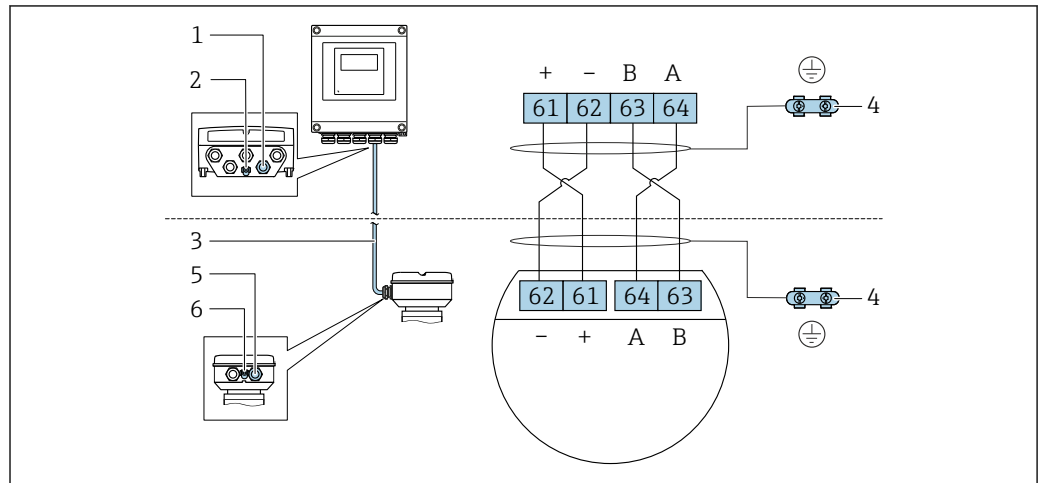


A0028198

*1    Cable entry for cable on transmitter housing*
*2    Protective ground (PE)*
*3    Connecting cable ISEM communication*
*4    Grounding via ground connection; on device plug versions grounding is through the plug itself*
*5    Cable entry for cable or connection of device plug on sensor connection housing*
*6    Protective ground (PE)*

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

| Sensor connection housing 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
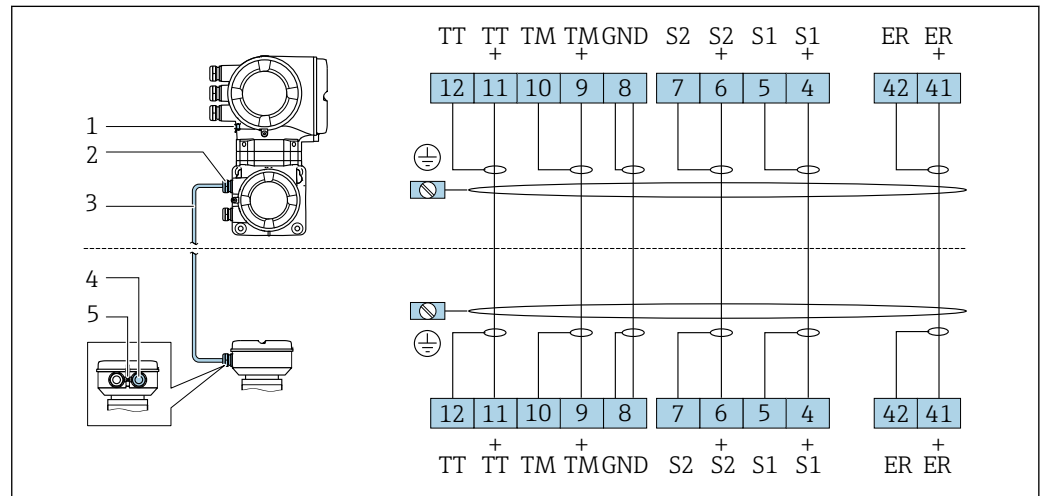For connection to sensor connection housing.

| Pin | Color [1] | | Assignment | Connection to terminal |
|---|---|---|---|---|
| 1 | Brown | + | Supply voltage | 61 |
| 2 | White | A | ISEM communication | 64 |
| 3 | Blue | B | ISEM communication | 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 connecting cable is connected via terminals.

*1 Protective ground (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 Protective ground (PE)*

### Connecting the transmitter

> • Terminal assignment → 🖹 32
> • Device plug pin assignment → 🖹 34
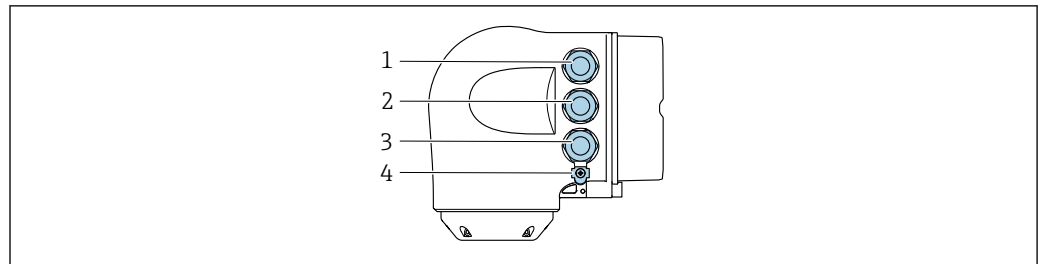
*Connecting the Proline 500 – digital transmitter*
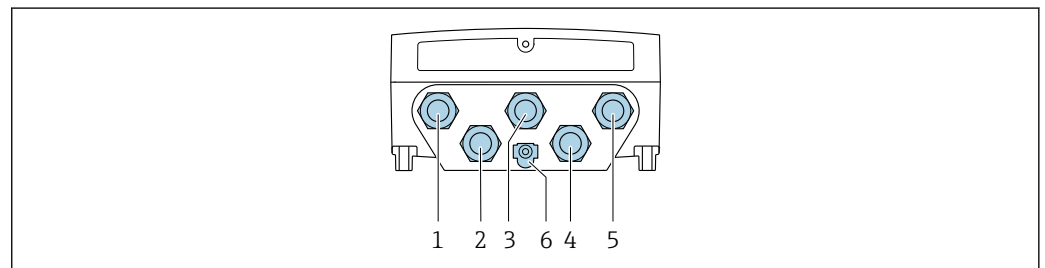
*1 Terminal connection for supply voltage*
*2 Terminal connection for signal transmission, input/output*
*3 Terminal connection for signal transmission, input/output*
*4 Terminal connection for connecting cable between sensor and transmitter*
*5 Terminal connection for signal transmission, input/output or terminal for network connection (DHCP client) via service interface (CDI-RJ45); optional: terminal connection for external WLAN antenna*
*6 Protective ground (PE)*

> An adapter for RJ45 and the M12 connector 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 connector mounted in the cable entry. Therefore the connection to the service interface can be established via an M12 connector without opening the device.

> Network connection (DHCP client) via service interface (CDI-RJ45) → 🖹 95

*Connecting the Proline 500 transmitter*



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: terminal connection for external WLAN antenna*
*4   Protective ground (PE)*

> An adapter for RJ45 and the M12 connector 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 connector mounted in the cable entry. Therefore the connection to the service interface can be established via an M12 connector without opening the device.

> Network connection (DHCP client) via service interface (CDI-RJ45) → 🗎 95

*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):
> BB, C2, GB, MB, NB

> Integrating the transmitter into a ring topology:
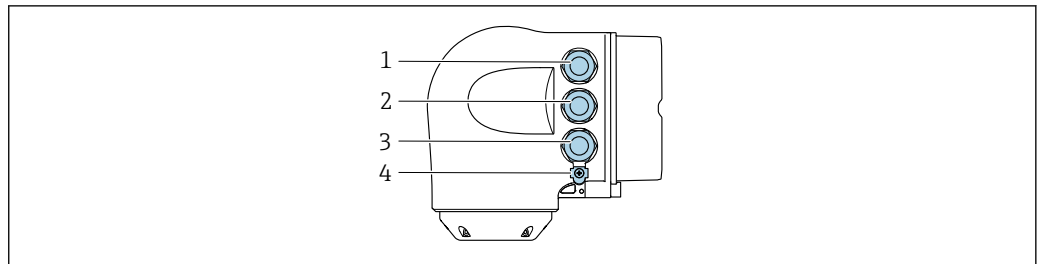> • EtherNet/IP
> • PROFINET

*Transmitter: Proline 500 – digital*
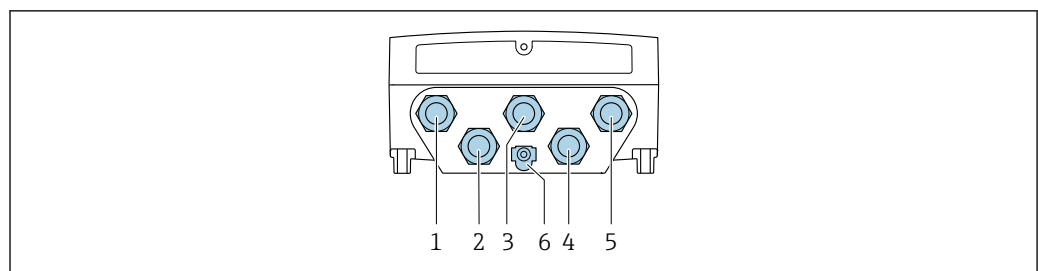


A0028200

*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 connector)*
*4   Terminal connection for connecting cable between sensor and transmitter*
*5   Terminal connection to service interface (CDI-RJ45)*
*6   Protective ground (PE)*

*Transmitter: Proline 500*



A0026781

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

If the device has additional inputs/outputs, these are routed in parallel via the cable entry for connection to the service interface (CDI-RJ45).
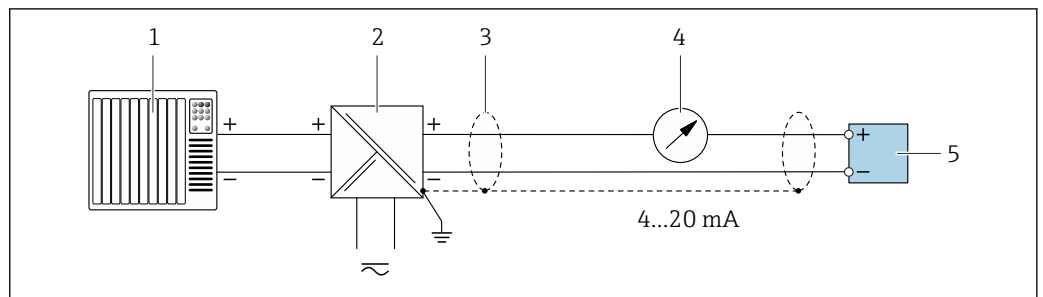
**Connection examples**

*Current output 4 to 20 mA HART*
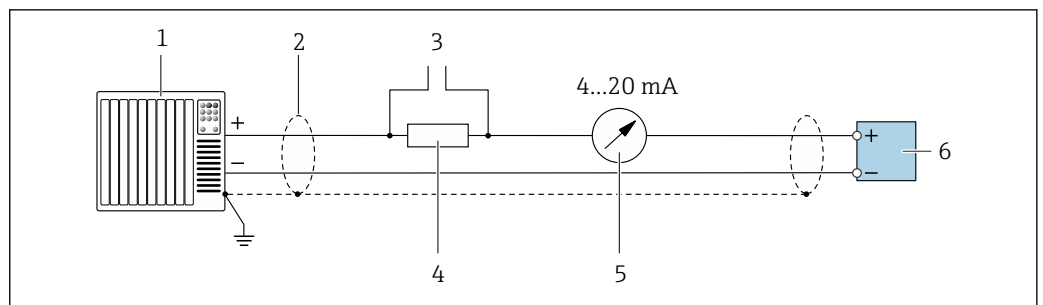


A0029055

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

*1    Automation system with current input (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 → 🖺 47*
*3    Connection for HART operating devices → 🖺 90*
*4    Resistor for HART communication (≥ 250 Ω): observe maximum load → 🖺 17*
*5    Analog display unit: observe maximum load → 🖺 17*
*6    Transmitter*



A0028762

🖾 *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    Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 🖺 47*
*4    Analog display unit: observe maximum load → 🖺 17*
*5    Transmitter*

*HART input*
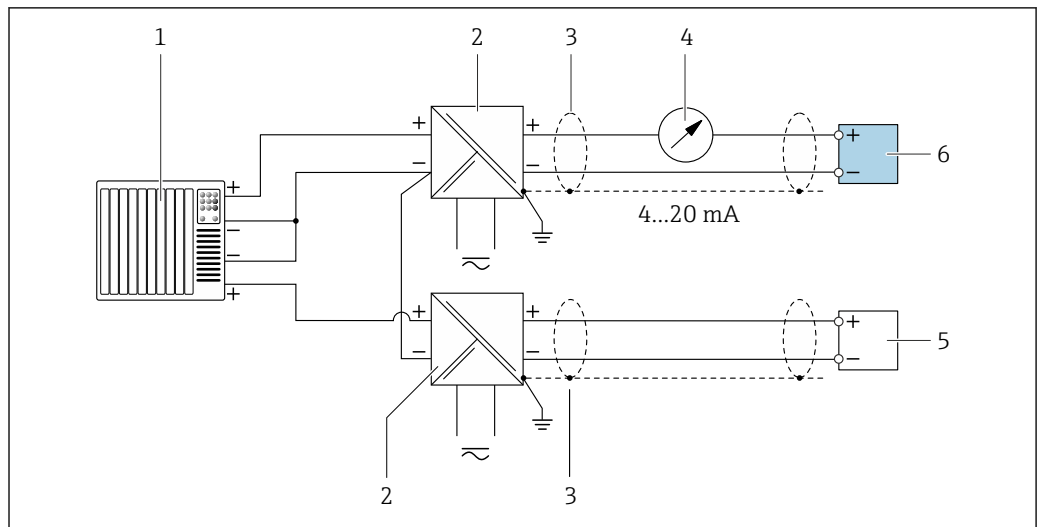


**⊠ 4**   *Connection example for HART input with a common negative (passive)*

*1   Automation system with HART output (e.g. PLC)*
*2   Active barrier for power supply (e.g. RN221N)*
*3   Cable shield provided 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 → ▤ 17*
*5   Pressure measuring device (e.g. Cerabar M, Cerabar S): see requirements*
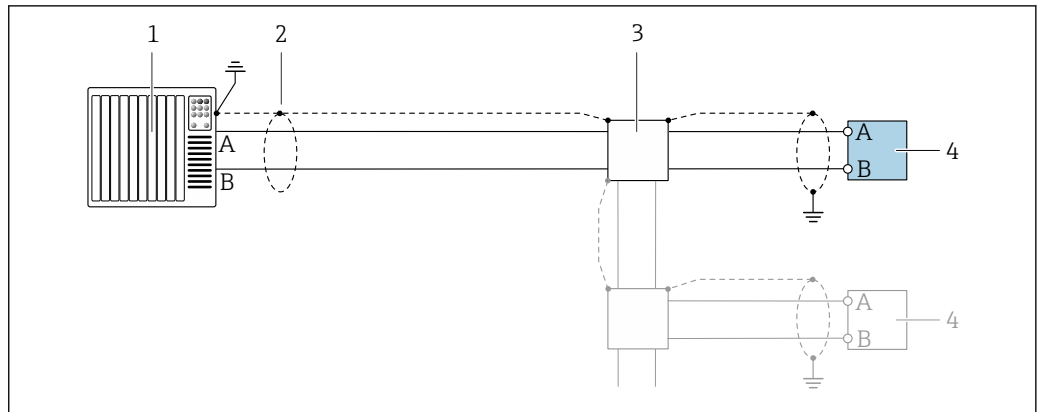*6   Transmitter*

*PROFIBUS PA*
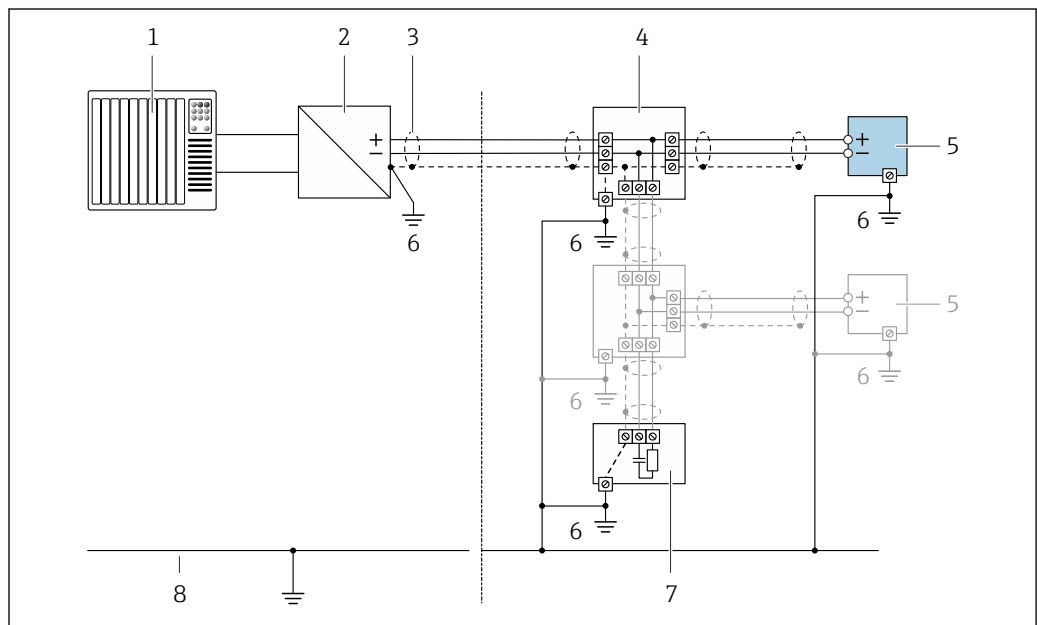


**⊠ 5**   *Connection example for PROFIBUS PA*

*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*



A0028765

⊠ *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.
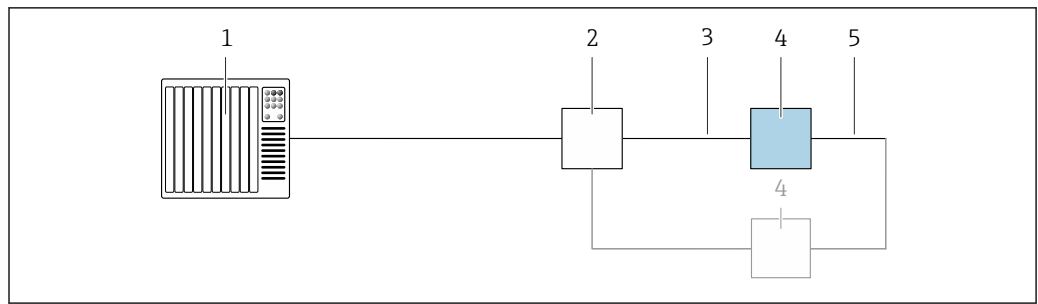
*EtherNet/IP*
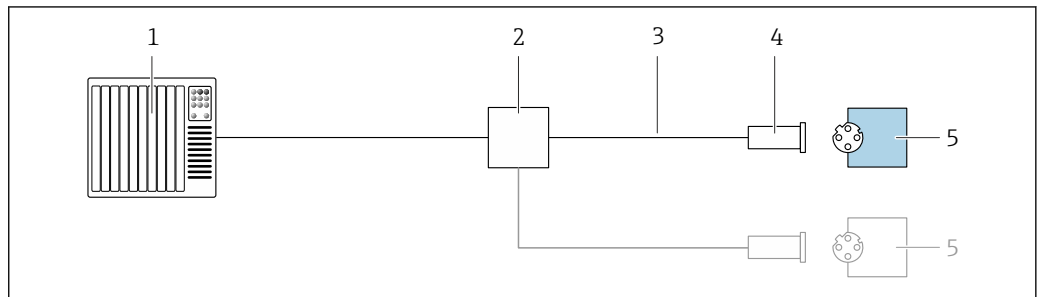


A0028767

⊠ *7      Connection example for EtherNet/IP*

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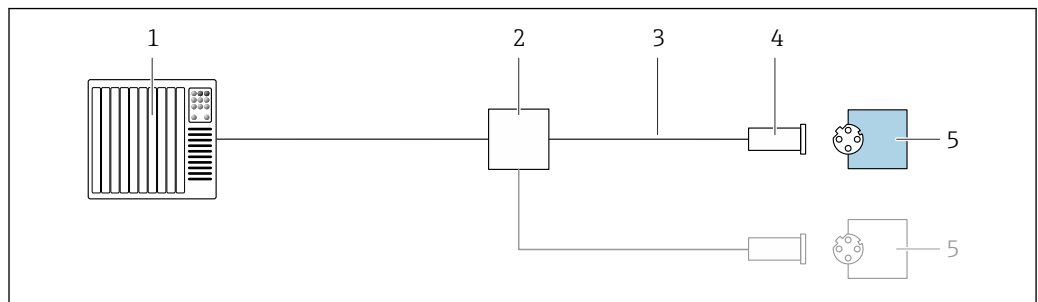*4      Device plug*
*5      Transmitter*

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



A0027544

*1    Control system (e.g. PLC)*
*2    Ethernet switch*
*3    Observe cable specifications → 🖹 47*
*4    Transmitter*
*5    Connecting cable between the two transmitters*

*PROFINET*



A0028767

 *🖼 8    Connection example for PROFINET*

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

*PROFINET: MRP (Media Redundancy Protocol)*



A0027544

*1    Control system (e.g. PLC)*
*2    Ethernet switch*
*3    Observe cable specifications → 🖹 47*
*4    Transmitter*
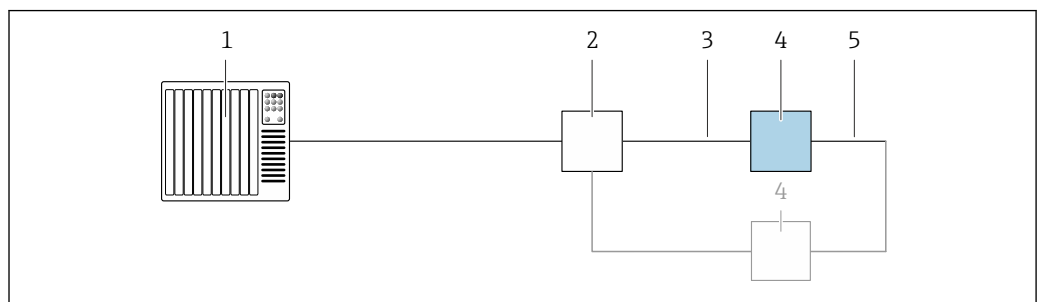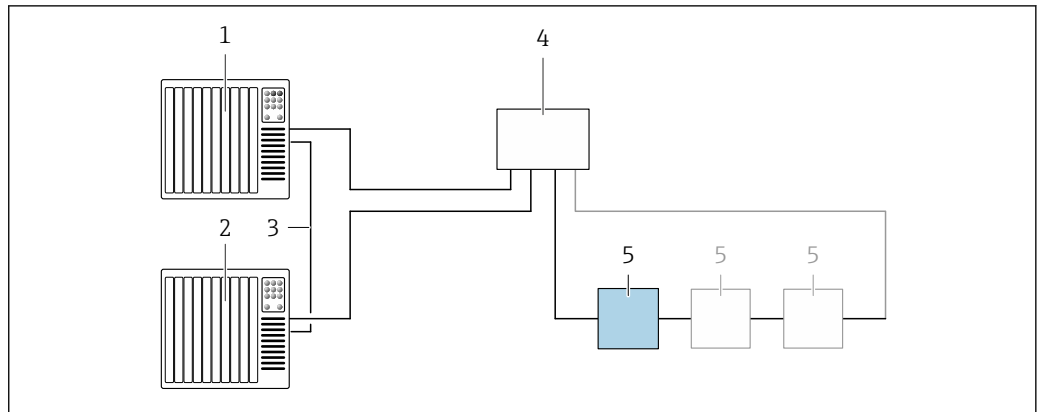*5    Connecting cable between the two transmitters*
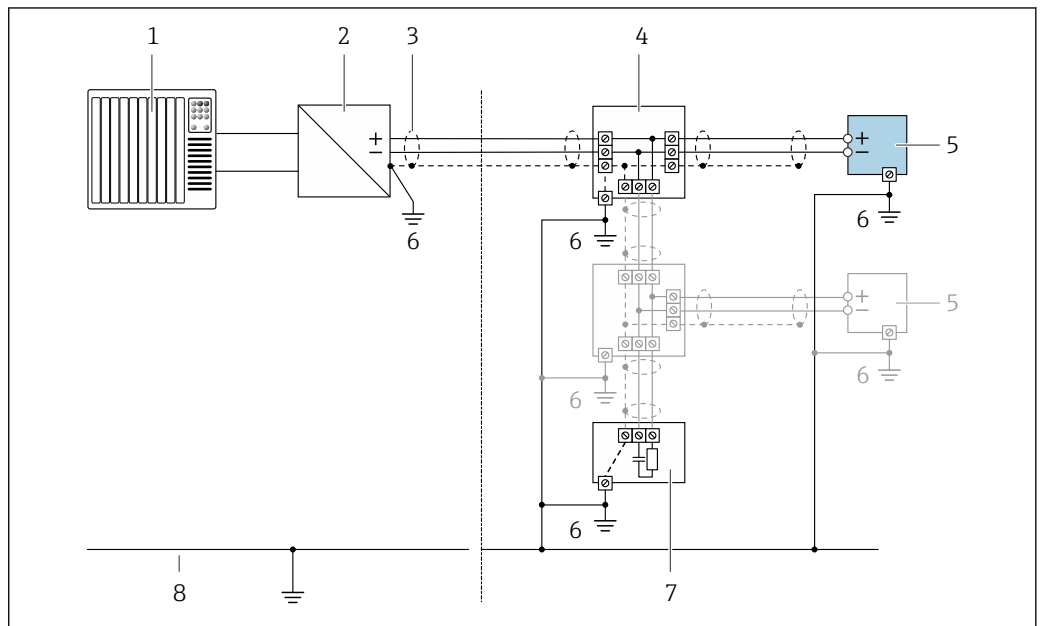
*PROFINET: system redundancy S2*



A0039553

 *9*     *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*



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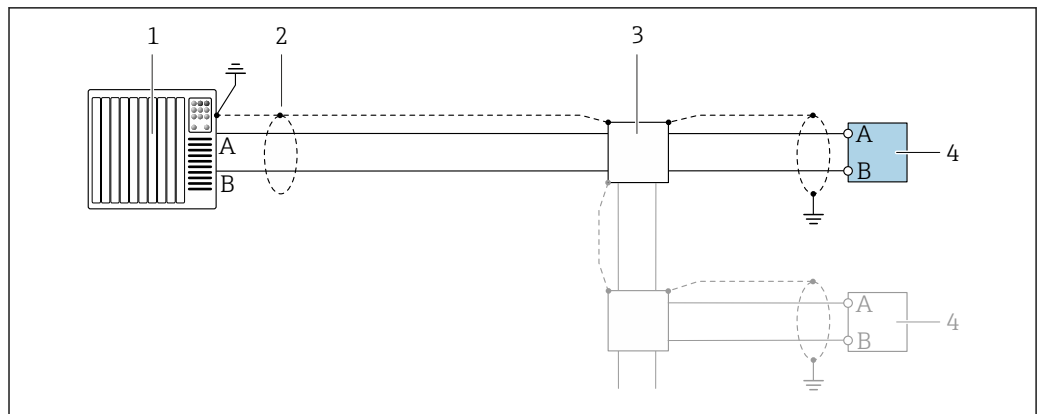 *10*    *Connection example for FOUNDATION Fieldbus*

*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*
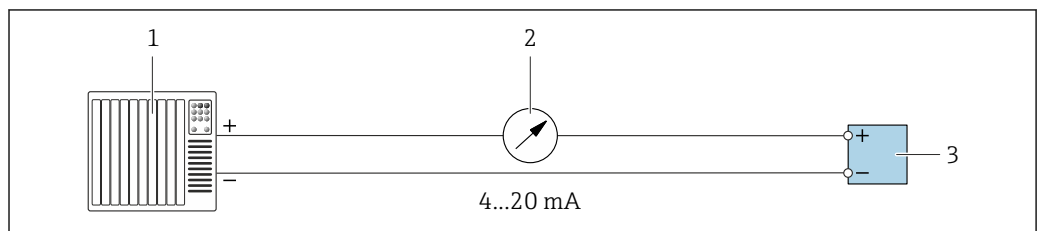
*Modbus RS485*



A0028765

🖻 *11    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*

*Current output 4-20 mA*



A0028758

🖻 *12    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 → 🖻 17*
*3    Transmitter*
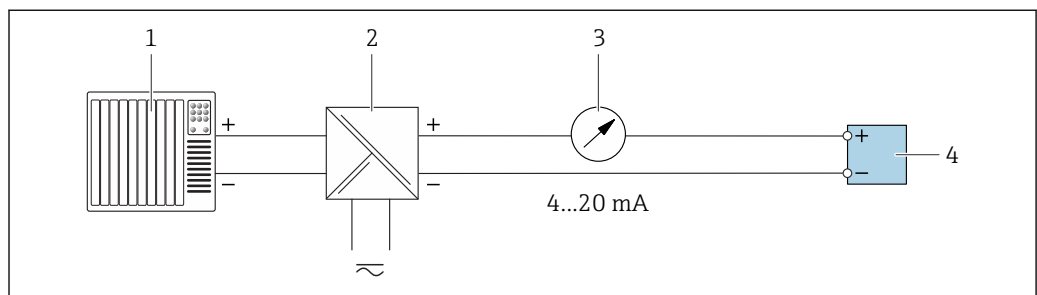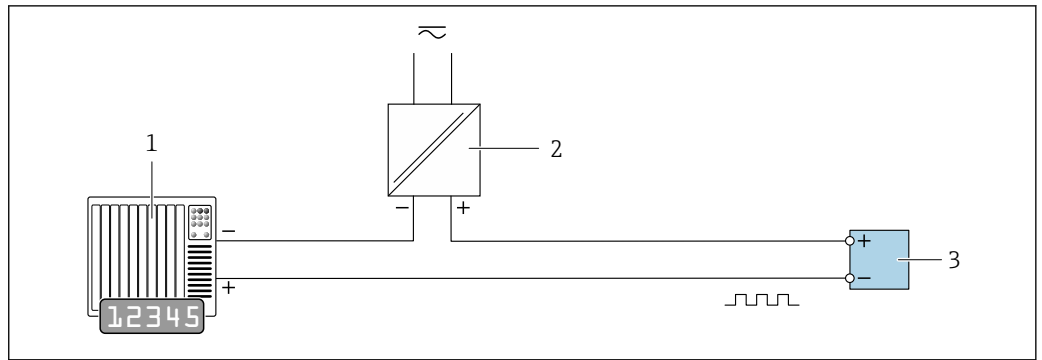


A0028759

🖻 *13    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 → 🖻 17*
*4    Transmitter*

*Pulse/frequency output*



A0028761

*□ 14    Connection example for pulse/frequency output (passive)*

*1    Automation system with pulse/frequency input (e.g. PLC)*

*2    Power supply*

*3    Transmitter: Observe input values → 🕮 20*

*Switch output*
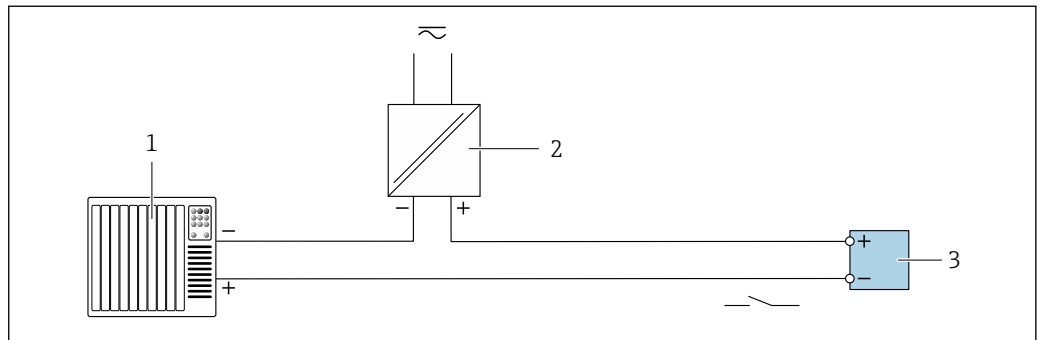


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*□ 15    Connection example for switch output (passive)*

*1    Automation system with switch input (e.g. PLC)*

*2    Power supply*

*3    Transmitter: Observe input values → 🕮 20*

*Double pulse output*
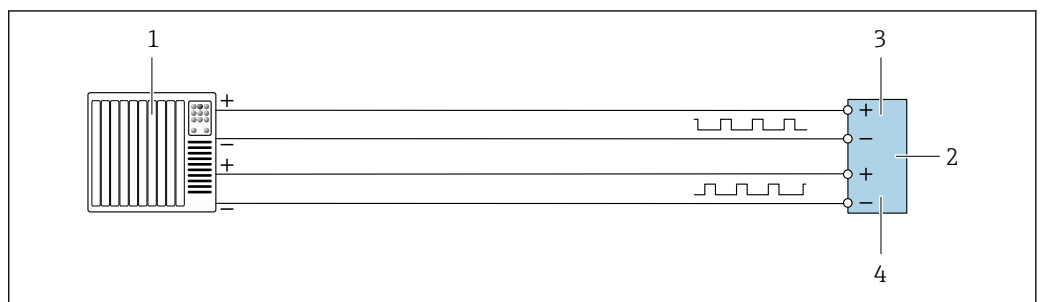


A0029280

*□ 16    Connection example for double pulse output (active)*

*1    Automation system with double pulse input (e.g. PLC)*

*2    Transmitter: Observe input values → 🕮 21*

*3    Double pulse output*

*4    Double pulse output (slave), phase-shifted*

*🖼 17    Connection example for double pulse output (passive)*

*1    Automation system with double pulse input (e.g. PLC)*
*2    Power supply*
*3    Transmitter: Observe input values → 🖩 21*
*4    Double pulse output*
*5    Double pulse output (slave), phase-shifted*

*Relay output*
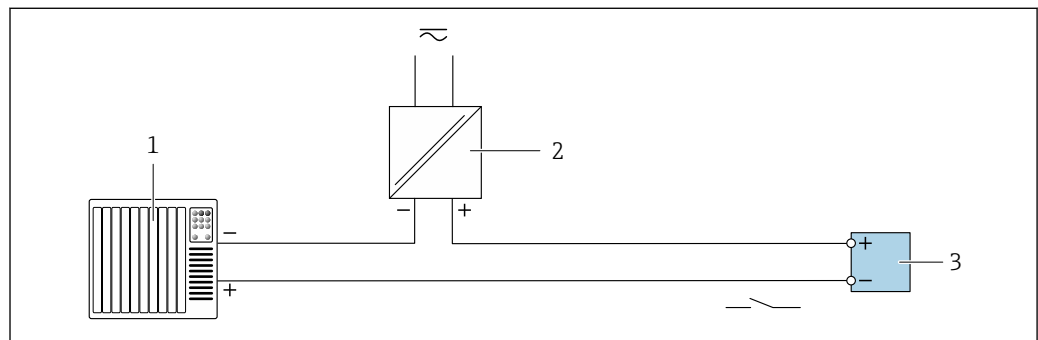


*🖼 18    Connection example for relay output (passive)*

*1    Automation system with relay input (e.g. PLC)*
*2    Power supply*
*3    Transmitter: Observe input values → 🖩 22*
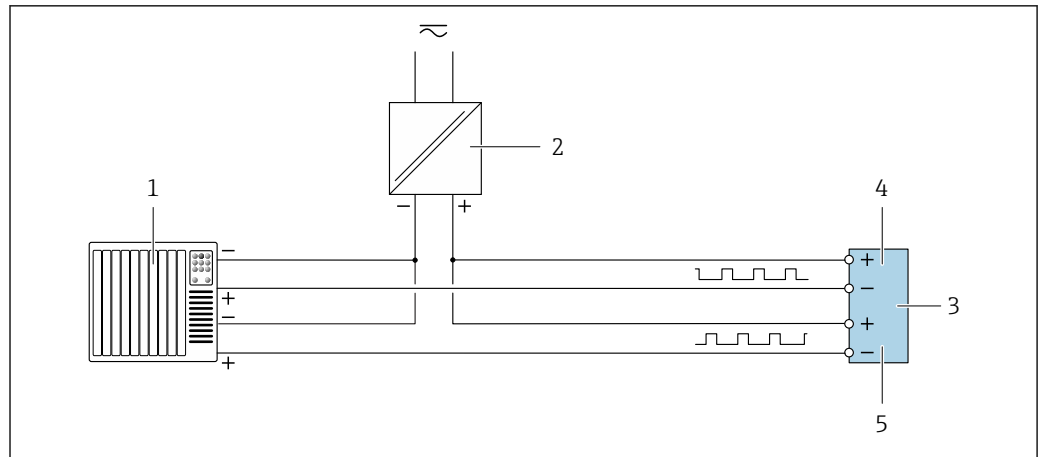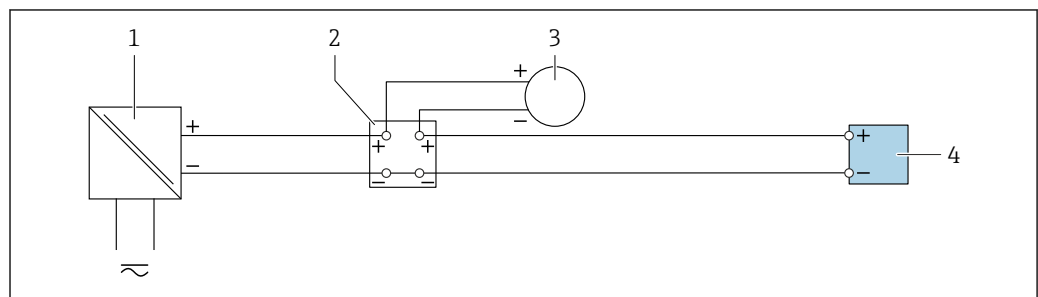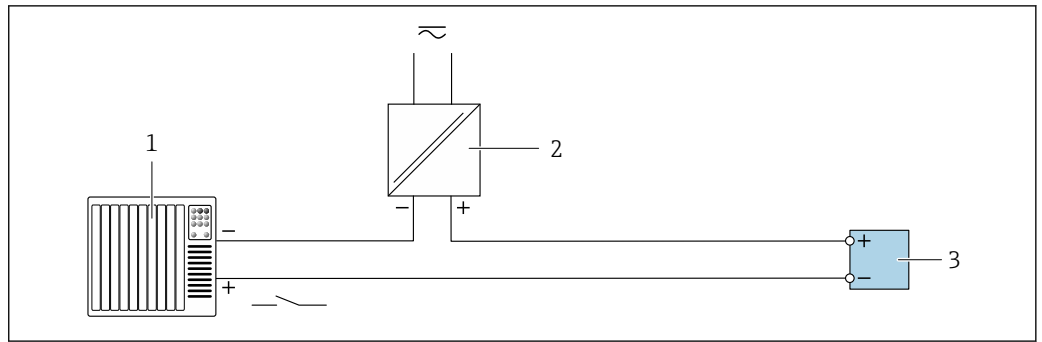
*Current input*



*🖼 19    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*



*20    Connection example for status input*

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

| Potential equalization | **Requirements** |
|---|---|
| | No special measures for potential equalization are required. |
| | Please consider the following to ensure correct measurement:<br>• Same electrical potential for the fluid and sensor<br>• Company-internal grounding concepts |
| **terminals** | Spring-loaded terminals: Suitable for strands and strands with ferrules.<br>Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG). |
| **Cable entries** | • Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)<br>• Thread for cable entry:<br>  • NPT ½"<br>  • G ½"<br>  • M20<br>• Device plug for digital communication: M12<br>  Only available for certain device versions → 🖹 33.<br>• Device plug for connecting cable: M12<br>  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.<br>• 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 ≤2.08 mm² (14 AWG) |
| | Grounding impedance must be less than 2 Ω. |
| | **Signal cable** |
| | *Current output 4 to 20 mA HART* |
| | A shielded cable is recommended. Observe grounding concept of the plant. |

*PROFIBUS PA*

Twisted, shielded two-wire cable. Cable type A is recommended .

For further information on planning and installing PROFIBUS networks see:
- Operating Instructions "PROFIBUS DP/PA: Guidelines for planning and commissioning" (BA00034S)
- PNO Directive 2.092 "PROFIBUS PA User and Installation Guideline"
- IEC 61158-2 (MBP)

*PROFIBUS DP*

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

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

For further information on planning and installing PROFIBUS networks see:
- Operating Instructions "PROFIBUS DP/PA: Guidelines for planning and commissioning" (BA00034S)
- PNO Directive 2.092 "PROFIBUS PA User and Installation Guideline"
- IEC 61158-2 (MBP)

*EtherNet/IP*

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

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

*PROFINET*

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

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

*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*

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

| Cable type | A |
|---|---|
| Characteristic impedance | 135 to 165 Ω at a measuring frequency of 3 to 20 MHz |

| Cable capacitance | < 30 pF/m |
|---|---|
| Wire cross-section | > 0.34 mm² (22 AWG) |
| Cable type | Twisted pairs |
| Loop resistance | ≤110 Ω/km |
| Signal damping | Max. 9 dB over the entire length of the cable cross-section |
| Shield | Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant. |

*Current output 0/4 to 20 mA*

Standard installation cable is sufficient.

*Pulse/frequency/switch output*

Standard installation cable is sufficient.

*Double pulse output*

Standard installation cable is sufficient.

*Relay output*

Standard installation cable is sufficient.
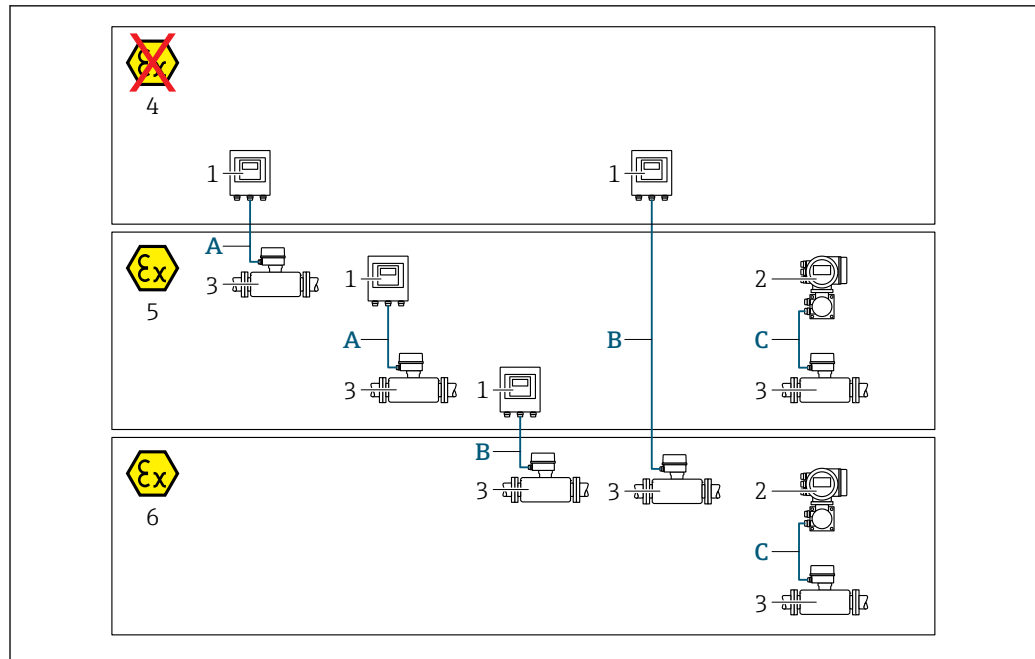
*Current input 0/4 to 20 mA*

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

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*1    Proline 500 digital transmitter*
*2    Proline 500 transmitter*
*3    Sensor Cubemass*
*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 → 🖥 50*
      *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 → 🖥 51*
      *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 → 🖥 53*
      *Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2 oder 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 |
|---|---|
| Shielding | Tin-plated copper-braid, optical cover ≥ 85 % |
| Loop resistance | Power supply line (+, –): maximum 10 Ω |
| Cable length | Maximum 300 m (1 000 ft), see the following table. |

| Cross-section | Cable length [max.] |
|---|---|
| 0.34 mm² (AWG 22) | 80 m (270 ft) |
| 0.50 mm² (AWG 20) | 120 m (400 ft) |
| 0.75 mm² (AWG 18) | 180 m (600 ft) |
| 1.00 mm² (AWG 17) | 240 m (800 ft) |
| 1.50 mm² (AWG 15) | 300 m (1 000 ft) |

*Optionally available connecting cable*

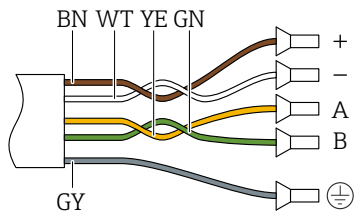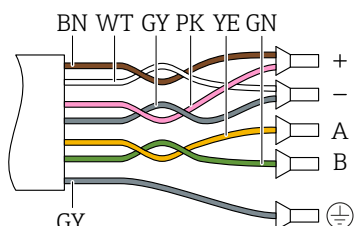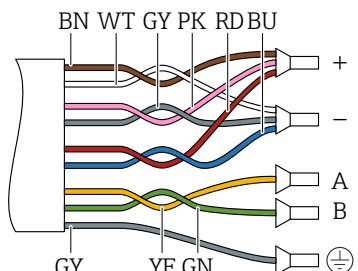| Design | $2 \times 2 \times 0.34$ mm² (AWG 22) PVC cable [1] with common shield (2 pairs, uninsulated stranded CU wires; pair-stranded) |
|---|---|
| Flame resistance | According to DIN EN 60332-1-2 |
| Oil-resistance | According to DIN EN 60811-2-1 |
| Shielding | Tin-plated copper-braid, optical 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 (65 ft); variable: up to maximum 50 m (165 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. in accordance with IEC 60079-25) |
| Loop resistance | Power supply line (+, −): maximum 5 Ω |
| Cable length | Maximum 150 m (500 ft), see the following table. |

| Cross-section | Cable length [max.] | Termination |
|---|---|---|
| 2 x 2 x 0.50 mm² (AWG 20) | 50 m (165 ft) | 2 x 2 x 0.50 mm² (AWG 20)<br><br>BN WT YE GN<br><br>+ − A B ⏚<br>GY<br><br>• +, − = 0.5 mm²<br>• A, B = 0.5 mm² |
| 3 x 2 x 0.50 mm² (AWG 20) | 100 m (330 ft) | 3 x 2 x 0.50 mm² (AWG 20)<br><br>BN WT GY PK YE GN<br><br>+ − A B ⏚<br>GY<br><br>• +, − = 1.0 mm²<br>• A, B = 0.5 mm² |
| 4 x 2 x 0.50 mm² (AWG 20) | 150 m (500 ft) | 4 x 2 x 0.50 mm² (AWG 20)<br><br>BN WT GY PK RD BU<br><br>+ − A B ⏚<br>GY   YE GN<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 ℃ (−58 to +221 ℉); when cable can move freely: −25 to +105 ℃ (−13 to +221 ℉) |
| **Available cable length** | Fixed: 20 m (65 ft); variable: up to maximum 50 m (165 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*

| Standard cable | 6 × 0.38 mm² PVC cable [1] with common shield and individually shielded cores |
|---|---|
| Conductor resistance | ≤50 Ω/km (0.015 Ω/ft) |
| Capacitance: core/shield | ≤420 pF/m (128 pF/ft) |
| Cable length (max.) | 20 m (65 ft) |
| Cable lengths (available for order) | 5 m (15 ft), 10 m (32 ft), 20 m (65 ft) |
| Operating temperature | max. 105 ℃ (221 ℉) |

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

# Performance characteristics

**Reference operating conditions**
- Error limits based on ISO 11631
- Water with +15 to +45 ℃ (+59 to +113 ℉) at2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.

To obtain measured errors, use the *Applicator* sizing tool → 🖹 109

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

**Base accuracy**

Design fundamentals → 🖹 56

*Mass flow and volume flow (liquids)*

±0.10 % o.r.

*Mass flow (gases)*

±0.50 % o.r.

*Density (liquids)*

| Under reference conditions | Standard density calibration [1] | Wide-range Density specification [2] [3] |
|---|---|---|
| [g/cm³] | [g/cm³] | [g/cm³] |
| ±0.0005 | ±0.02 | ±0.002 |

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

*Temperature*

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

**Zero point stability**

| DN | | Zero point stability | |
|---|---|---|---|
| [mm] | [in] | [kg/h] | [lb/min] |
| 1 | $\frac{1}{24}$ | 0.0008 | 0.00003 |
| 2 | $\frac{1}{12}$ | 0.002 | 0.00007 |
| 4 | $\frac{1}{8}$ | 0.014 | 0.0005 |
| 6 | $\frac{1}{4}$ | 0.02 | 0.0007 |

**Flow values**

Flow values as turndown parameter depending on nominal diameter.

*SI units*

| DN | 1:1 | 1:10 | 1:20 | 1:50 | 1:100 | 1:500 |
|---|---|---|---|---|---|---|
| [mm] | [kg/h] | [kg/h] | [kg/h] | [kg/h] | [kg/h] | [kg/h] |
| 1 | 20 | 2 | 1 | 0.4 | 0.2 | 0.04 |
| 2 | 100 | 10 | 5 | 2 | 1 | 0.2 |
| 4 | 450 | 45 | 22.5 | 9 | 4.5 | 0.9 |
| 6 | 1 000 | 100 | 50 | 20 | 10 | 2 |

*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] |
| $\frac{1}{24}$ | 0.735 | 0.074 | 0.037 | 0.015 | 0.007 | 0.001 |
| $\frac{1}{12}$ | 3.675 | 0.368 | 0.184 | 0.074 | 0.037 | 0.007 |
| $\frac{1}{8}$ | 16.54 | 1.654 | 0.827 | 0.331 | 0.165 | 0.033 |
| $\frac{1}{4}$ | 36.75 | 3.675 | 1.838 | 0.735 | 0.368 | 0.074 |

**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/cm$^3$ = 1 kg/l; T = medium temperature

**Base repeatability**

*Mass flow and volume flow (liquids)*

±0.05 % o.r.

*Mass flow (gases)*

±0.25 % o.r.

*Density (liquids)*

±0.00025 g/cm³

*Temperature*

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

| Response time | The response time depends on the configuration (damping). |
|---|---|

**Influence of ambient temperature**

**Current output**

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

**Pulse/frequency output**

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

**Influence of medium temperature**

**Mass flow and volume flow**

o.f.s. = of full scale value

When there is a difference between the temperature for zero point adjustment and the process temperature, the additional measured error of the sensor is typically ±0.0002 % o.f.s./°C (±0.0001 % o. f.s./°F).

The effect is reduced if zero point adjustment is performed at process temperature.

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

**Wide-range density specification (special density calibration)**
If the process temperature is outside the valid range (→ 🖺 53) the measured error is
±0.00005 g/cm³ /°C (±0.000025 g/cm³ /°F)
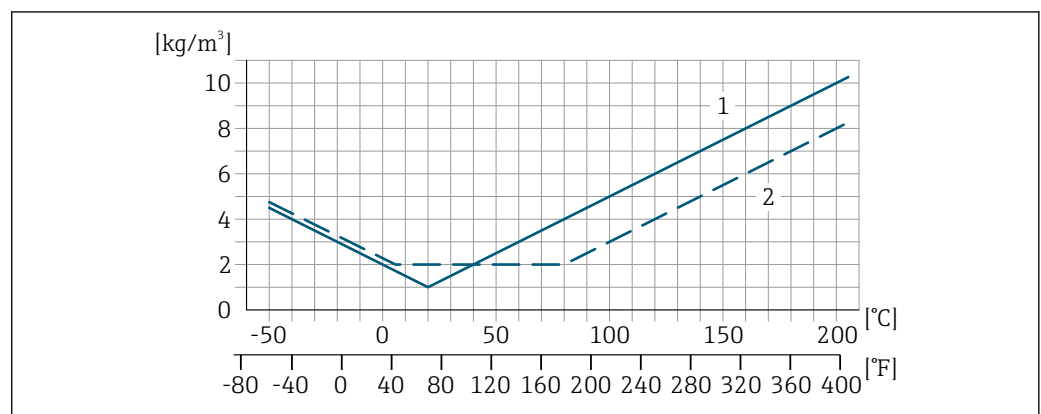


*1   Field density calibration, for example at +20 °C (+68 °F)*
*2   Special density calibration*

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

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

o.r. = of reading

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

📖 Operating Instructions→ 🕮 110.

| DN | | [% o.r./bar] | [% o.r./psi] |
|---|---|---|---|
| [mm] | [in] | | |
| 1 | $\frac{1}{24}$ | −0.001 | −0.00007 |
| 2 | $\frac{1}{12}$ | 0 | 0 |
| 4 | $\frac{1}{8}$ | −0.005 | −0.0004 |
| 6 | $\frac{1}{4}$ | −0.003 | −0.0002 |

| **Design fundamentals** | o.r. = of reading, o.f.s. = of full scale value |
|---|---|

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

MeasValue = measured value; ZeroPoint = zero point stability

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

| Flow rate | Maximum measured error in % o.r. |
|---|---|
| $\geq \dfrac{ZeroPoint}{BaseAccu} \cdot 100$ | $\pm\, BaseAccu$ |
| $< \dfrac{ZeroPoint}{BaseAccu} \cdot 100$ | $\pm\, \dfrac{ZeroPoint}{MeasValue} \cdot 100$ |

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

| Flow rate | Maximum repeatability in % o.r. |
|---|---|
| $\geq \dfrac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$ | $\pm\, BaseRepeat$ |
| $< \dfrac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$ | $\pm\, \frac{1}{2} \cdot \dfrac{ZeroPoint}{MeasValue} \cdot 100$ |

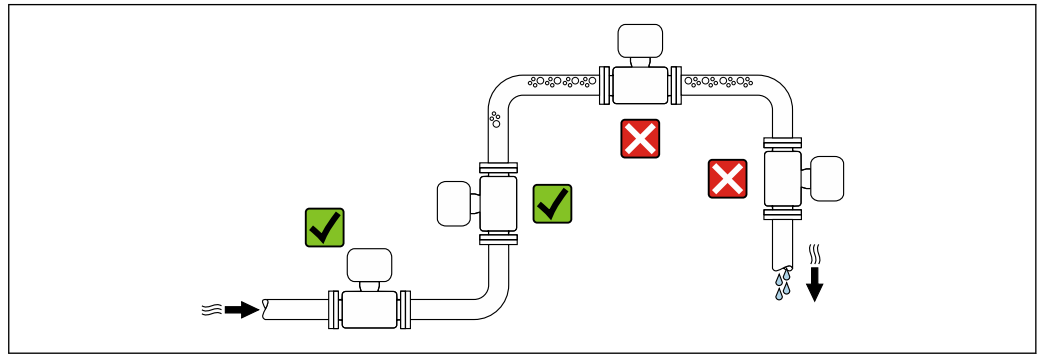**Example for maximum measured error**
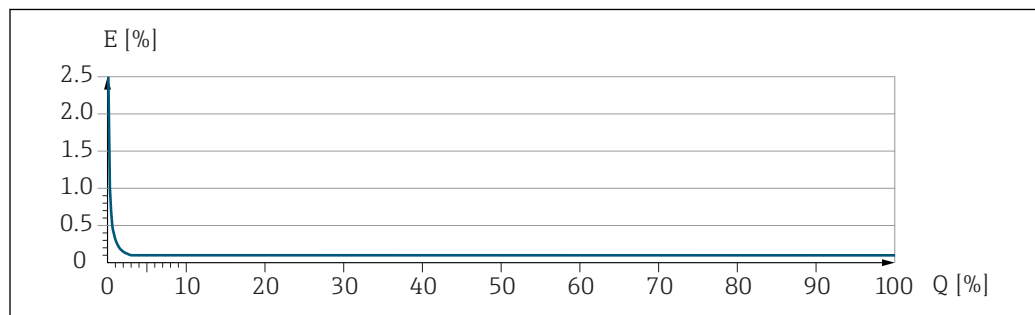


*E    Maximum measured error in % o.r. (example)*
*Q    Flow rate in % of maximum full scale value*

# Installation

**Mounting location**



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

### Installation in down pipes

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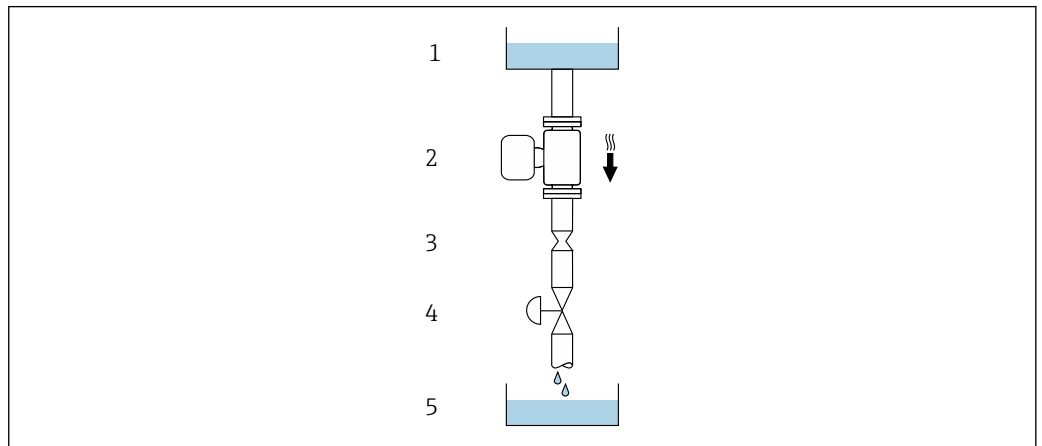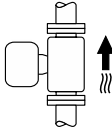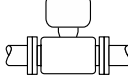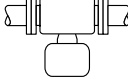


A0028773

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

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

| DN | | Ø orifice plate, pipe restriction | |
|---|---|---|---|
| [mm] | [in] | [mm] | [in] |
| 1 | $\frac{1}{24}$ | 0.8 | 0.03 |
| 2 | $\frac{1}{12}$ | 1.5 | 0.06 |
| 4 | $\frac{1}{8}$ | 3.0 | 0.12 |
| 6 | $\frac{1}{4}$ | 5.0 | 0.20 |

**Orientation**

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

| | Orientation | | Recommendation |
|---|---|---|---|
| **A** | Vertical orientation | A0015591 | ✅✅ |
| **B** | Horizontal orientation, transmitter at top | A0015589 | ✅✅ [1] |
| **C** | Horizontal orientation, transmitter at bottom | A0015590 | ✅✅ [2] |
| **D** | Horizontal orientation, transmitter at side | A0015592 | ❌ |

1)   Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
2)   Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
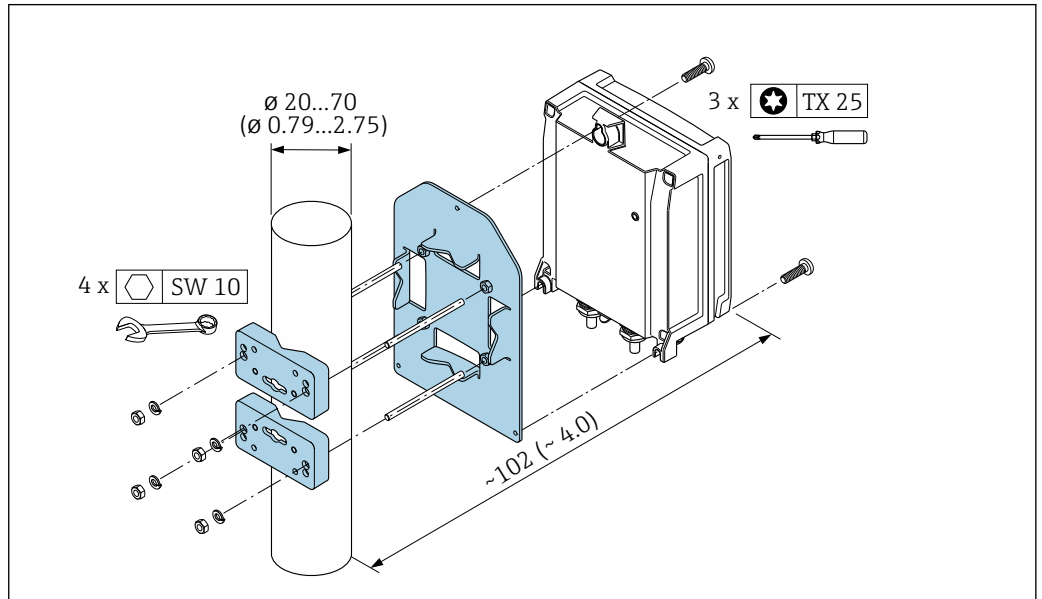
**Inlet and outlet runs**  No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 🖺 67.

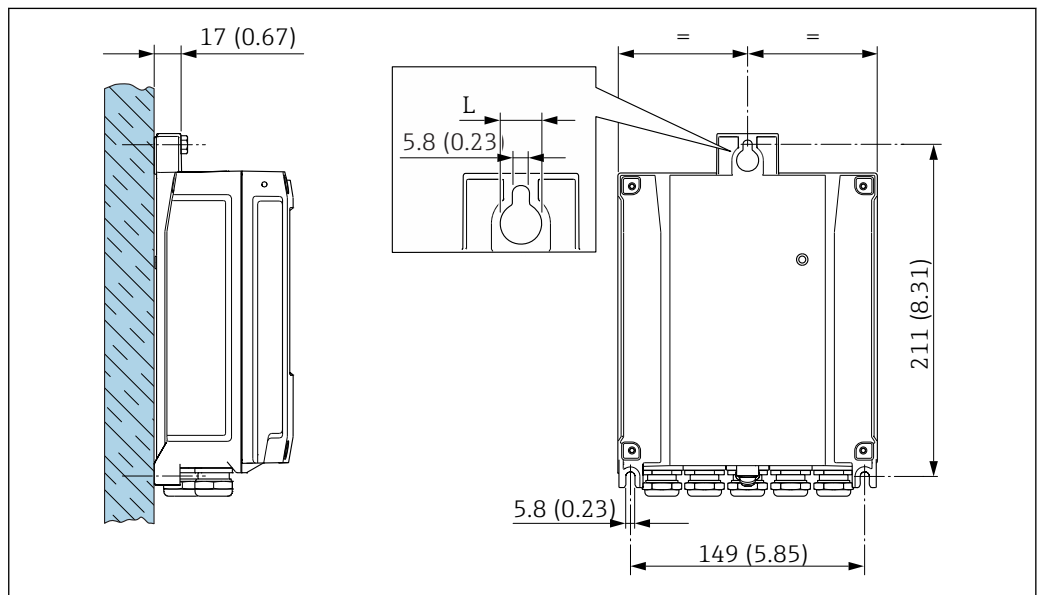**Mounting the transmitter housing**

**Proline 500 – digital transmitter**

*Post mounting*



*◻ 22    Engineering unit mm (in)*

*Wall mounting*



*◻ 23    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)
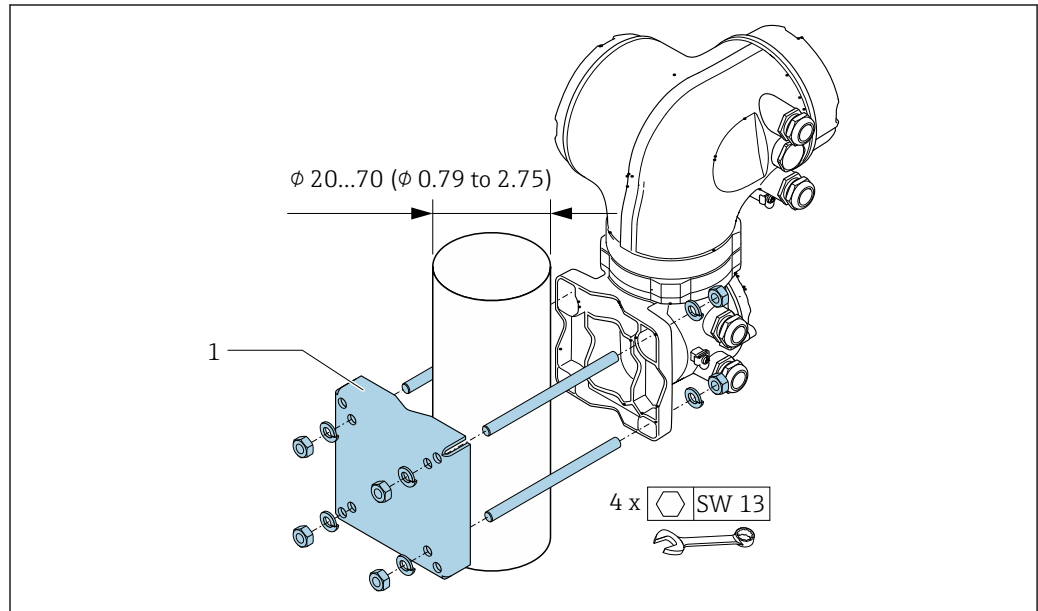
**Proline 500 transmitter**

*Post mounting*

⚠ **WARNING**

**Order code for "Transmitter housing", option L "Cast, stainless": cast transmitters are very heavy.**

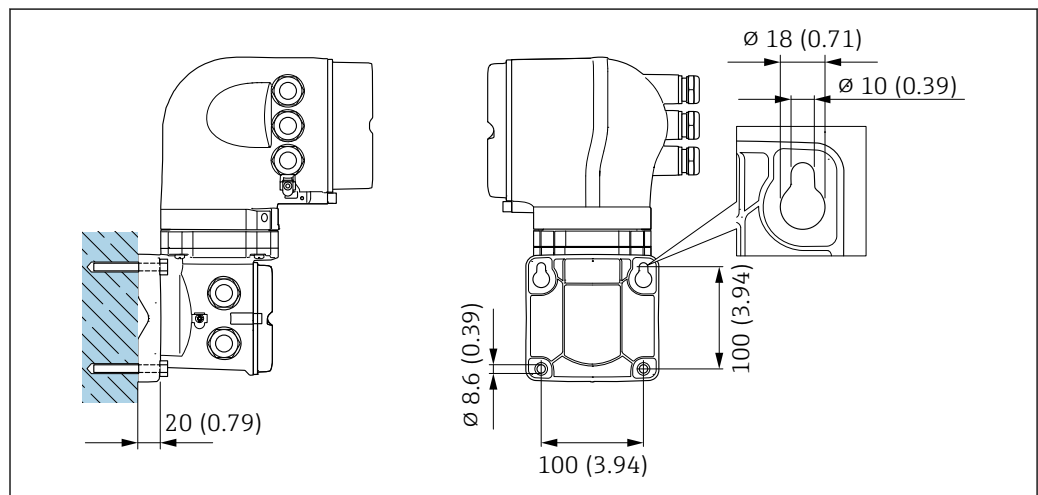They are unstable if they are not mounted on a secure, fixed post.

▸ Only mount the transmitter on a secure, fixed post on a stable surface.



▣ *24 Engineering unit mm (in)*

*Wall mounting*



▣ *25 Engineering unit mm (in)*

| Special mounting instructions | **Sanitary compatibility** |
|---|---|
| | ℹ When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section |
| | **Rupture disk** |
| | Information that is relevant to the process: → 🔖 67. |

⚠ **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 information on the rupture disk sticker.
▸ Make sure that the function and operation of the rupture disk is not impeded through the installation of the device.
▸ Do not use a heating jacket.
▸ Do not remove or damage the rupture disk.

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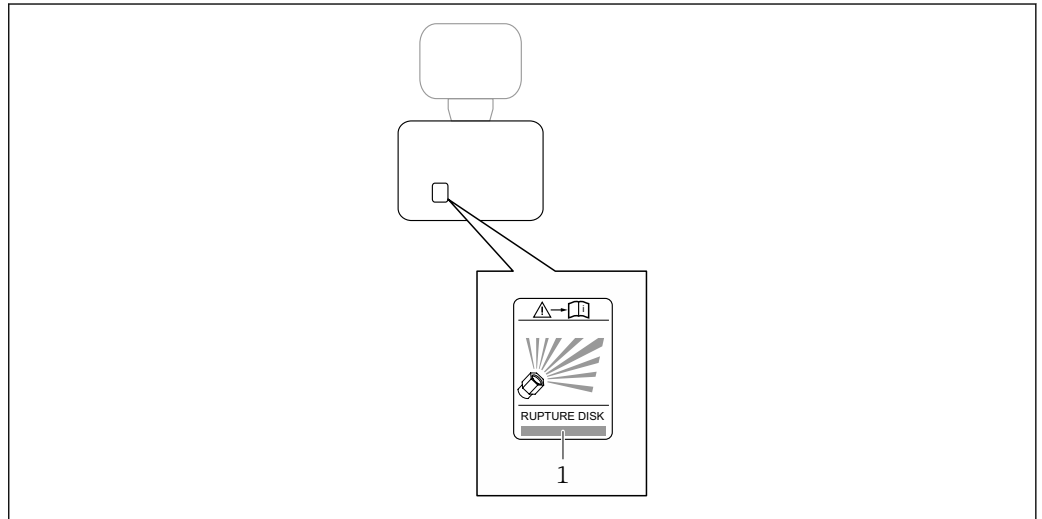


*1    Rupture disk label*

**Wall mounting**

⚠ **WARNING**

**Incorrect sensor mounting**

Risk of injury if measuring tube breaks

▸ The sensor should never be installed in a pipe in a way that it is freely suspended
▸ Using the base plate, mount the sensor directly on the floor, wall or ceiling.
▸ Support the sensor on a securely mounted support base (e.g. angle bracket).

The following mounting versions are recommended for the installation.
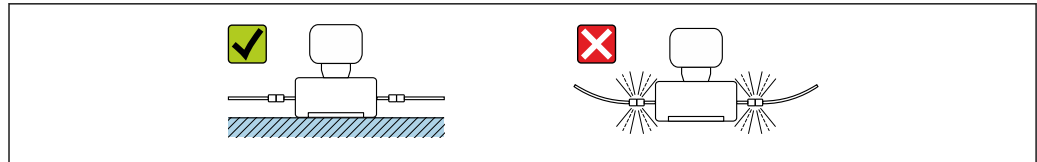
**Vertical**

• Mounted directly on a wall using the base plate, or
• Device supported on an angle bracket mounted on the wall
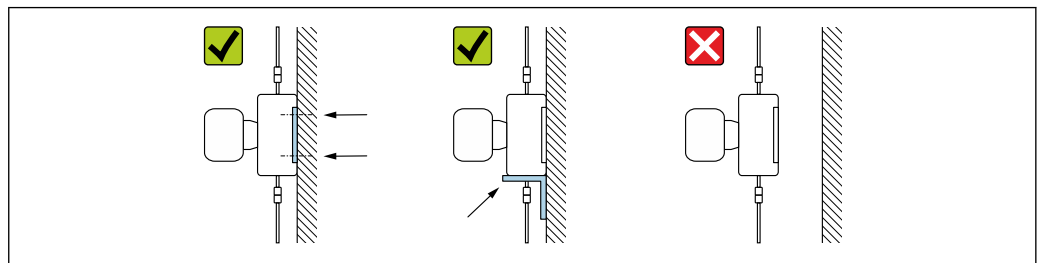


**Horizontal**
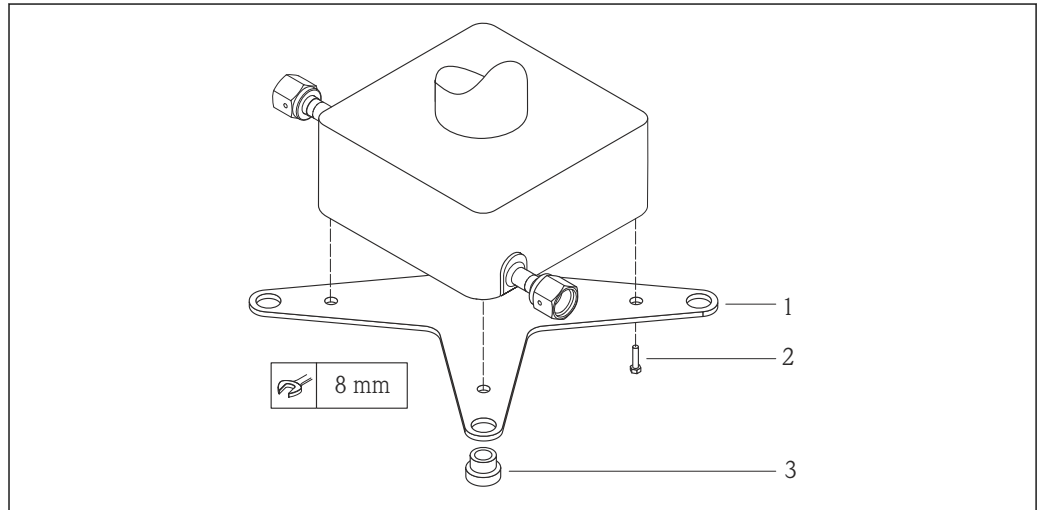
Device standing on a solid support base

### Mounting plate

The universal mounting plate can be used to affix or place the unit on a flat surface (order code for "Accessories", option PA).



🖎 *26    Mounting kit for Cubemass mounting plate*

*1    1 x Cubemass mounting plate*
*2    4 x screw M5 x 8*
*3    4 x grommet*

### Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions→ 🖎 53. Therefore, a zero point adjustment in the field is generally not required.

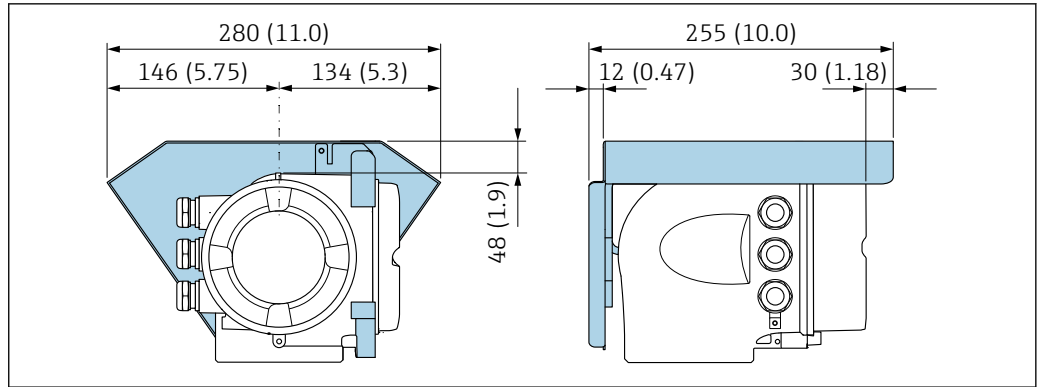Experience shows that zero point adjustment is advisable only in special cases:
• To achieve maximum measuring accuracy even with low flow rates.
• Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

### Protective cover
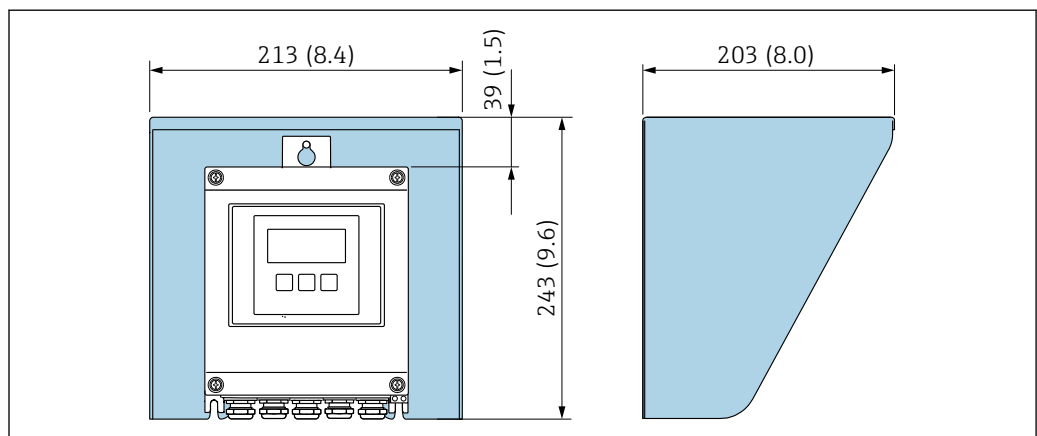


🖎 *27    Protective cover for Proline 500 – digital; engineering unit mm (in)*

*28    Protective cover for Proline 500; engineering unit mm (in)*

# Environment

| **Ambient temperature range** | **Measuring device** | • −40 to +60 ℃ (−40 to +140 ℉)<br>• Order code for "Test, certificate", option JP:<br>  −50 to +60 ℃ (−58 to +140 ℉) |
|---|---|---|
| | **Readability of the local display** | −20 to +60 ℃ (−4 to +140 ℉)<br>The readability of the display may be impaired at temperatures outside the temperature range. |

Dependency of ambient temperature on medium temperature→ 🖹 64

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

You can order a weather protection cover from Endress+Hauser. → 🖹 107.

| **Storage temperature** | −50 to +80 ℃ (−58 to +176 ℉) |
|---|---|

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

**Degree of protection**

**Transmitter**
• As standard: IP66/67, type 4X enclosure
• When housing is open: IP20, type 1 enclosure
• Display module: IP20, type 1 enclosure

**Sensor**
As standard: IP66/67, type 4X enclosure

**External WLAN antenna**
IP67

**Vibration- and shock-resistance**

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

Sensor
• 2 to 8.4 Hz, 3.5 mm peak
• 8.4 to 2 000 Hz, 1 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
- 10 to 200 Hz, 0.003 $g^2$/Hz
- 200 to 2 000 Hz, 0.001 $g^2$/Hz
- Total: 1.54 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
  6 ms 30 g
- Transmitter
  6 ms 50 g

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

| | |
|---|---|
| Interior cleaning | • Cleaning in place (CIP)<br>• Sterilization in place (SIP)<br>**Options**<br>Oil- and grease-free version for wetted parts, without declaration<br>Order code for "Service", option HA |
| Electromagnetic compatibility (EMC) | • As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)<br>• 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.
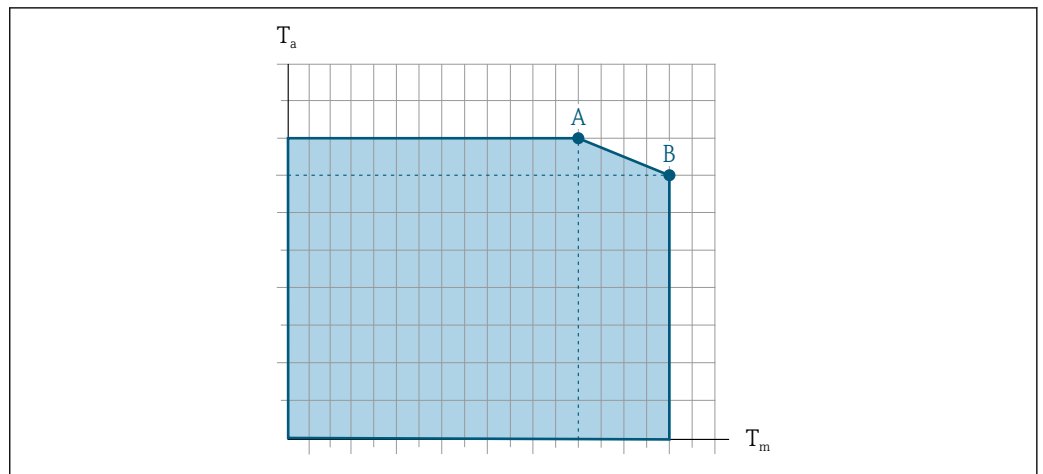
Details are provided in the Declaration of Conformity.

# Process

| | |
|---|---|
| Medium temperature range | −50 to +205 °C (−58 to +401 °F) |

**Dependency of ambient temperature on medium temperature**



*A0031121*

⊞ *29   Exemplary representation, values in the table below.*

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

Values for devices used in the hazardous area:
Separate Ex documentation (XA) for the device → 🔲 110.

| | Not insulated | | | | Insulated | | | |
| | A | | B | | A | | B | |
| Version | T_a | T_m | T_a | T_m | T_a | T_m | T_a | T_m |
|---|---|---|---|---|---|---|---|---|
| Cubemass C 500 – digital | 60 °C (140 °F) | 205 °C (401 °F) | – | – | 60 °C (140 °F) | 90 °C (194 °F) | 25 °C (77 °F) | 205 °C (401 °F) |
| Cubemass C 500 | 60 °C (140 °F) | 205 °C (401 °F) | – | – | 60 °C (140 °F) | 160 °C (320 °F) | 55 °C (131 °F) | 205 °C (401 °F) |

**Seals**

For mounting sets with screwed-on connections:
• Viton: –15 to +200 °C (–5 to +392 °F)
• EPDM: –40 to +160 °C (–40 to +320 °F)
• Silicon: –60 to +200 °C (–76 to +392 °F)
• Kalrez: –20 to +275 °C (–4 to +527 °F)

**Density**   0 to 5 000 kg/m³ (0 to 312 lb/cf)

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

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

Order code for "Mounting kit", option PE
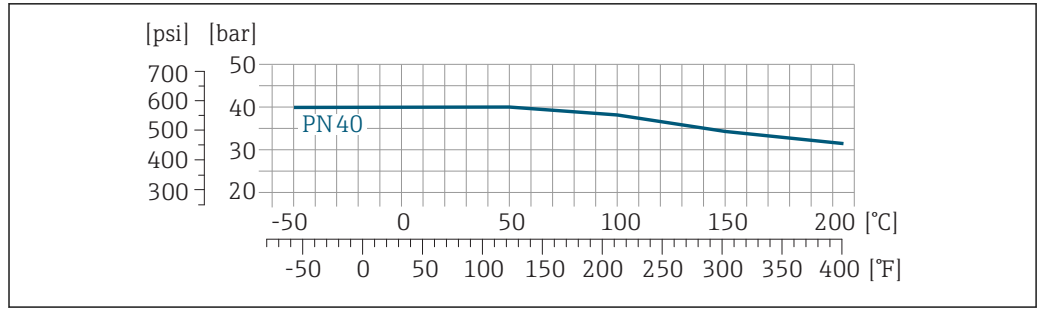
*30*    *With flange material: 1.4539 (904L), Alloy C22; lap joint flanges (not wetted) 1.4404 (316/316L)*

**Flange connection according to ASME B16.5**

Order code for "Mounting kit", option PF, PG



*31*    *With flange material: 1.4539 (904L); lap joint flanges (not wetted) 1.4404 (316/316L)*

**Flange connection according to JIS B2220**
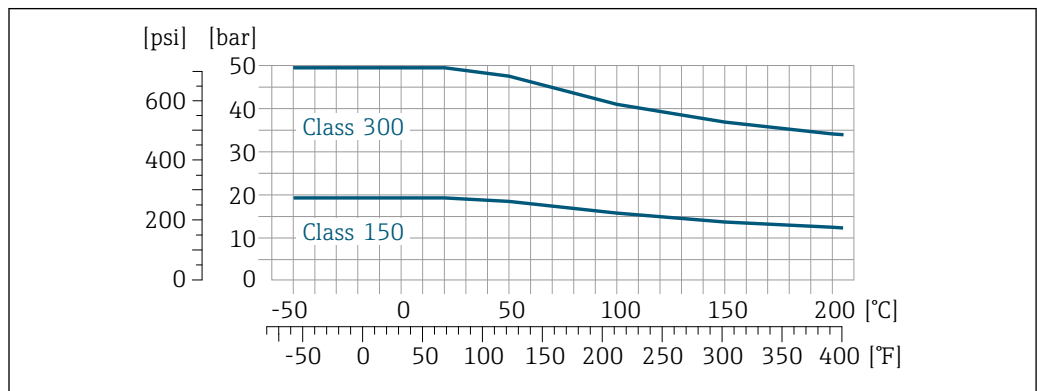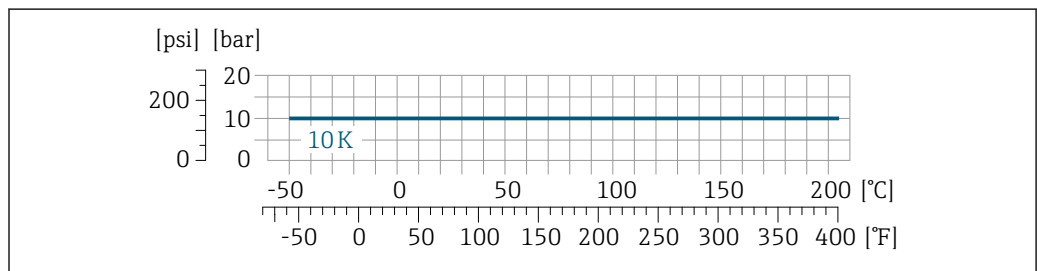
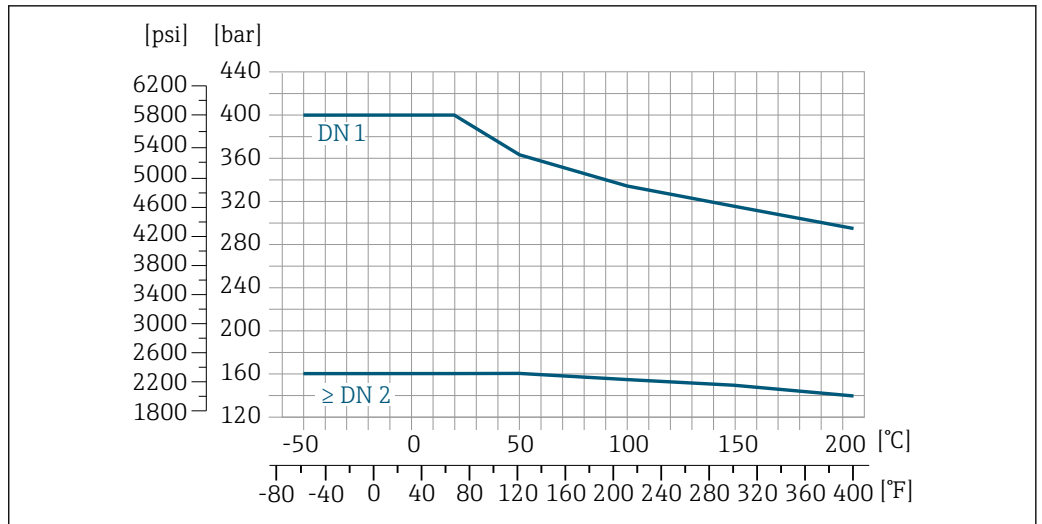Order code for "Mounting kit", option PH



*32*    *With flange material: 1.4539 (904L); lap joint flanges (not wetted): 1.4404 (316/316L)*

**Process connection 4-VCO-4, ¼ NPTF (DN 1 to 4); 8-VCO-4, ½ NPTF (DN 6)**

Order code for "Mounting kit", option PC, PD

*33   4-VCO-4 coupling: 1.4539 (904L); 8-VCO-4 coupling: 1.4539 (904L); NPTF threaded adapter: 1.4539 (904L)*

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

| Rupture disk | To guarantee the safety of the measuring device, the device version with a rupture disk with a triggering pressure of 10 to 15 bar (145 to 217.5 psi) is the standard version used. Special mounting instructions → 🖹 60. |
|---|---|

| 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 → 🖹 12

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
- For gas measurement the following rules apply:
  - The flow velocity in the measuring tubes should not exceed half the sound velocity (0.5 Mach).
  - The maximum mass flow depends on the density of the gas: formula → 🖹 12

To calculate the flow limit, use the *Applicator* sizing tool → 🖹 109

| Pressure loss | To calculate the pressure loss, use the *Applicator* sizing tool → 🖹 109 |
|---|---|

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

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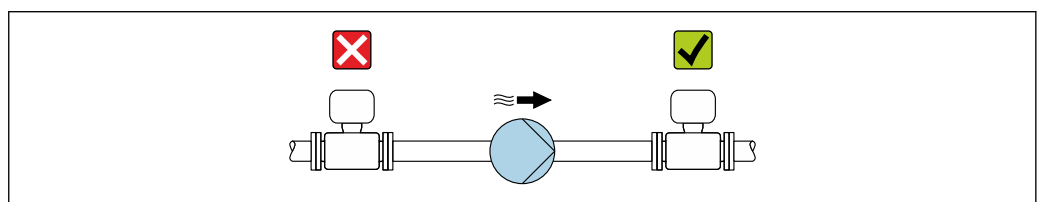


| Thermal insulation | In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation. |
|---|---|

**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)

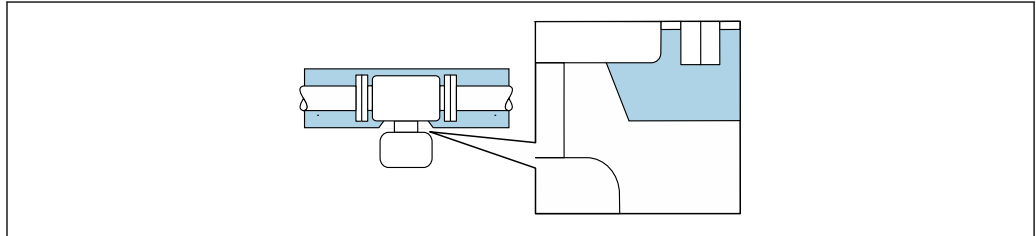▶ Thermal insulation with extended neck free: We recommend that you do not insulate the extended neck in order to ensure optimum dissipation of heat.



A0034391

 *34   Thermal insulation with extended neck free*

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

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

**NOTICE**

**Danger of overheating when heating**

▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F).

▶ Ensure that sufficient convection takes place at the transmitter neck.

▶ Ensure that a sufficiently large area of the transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.

▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.
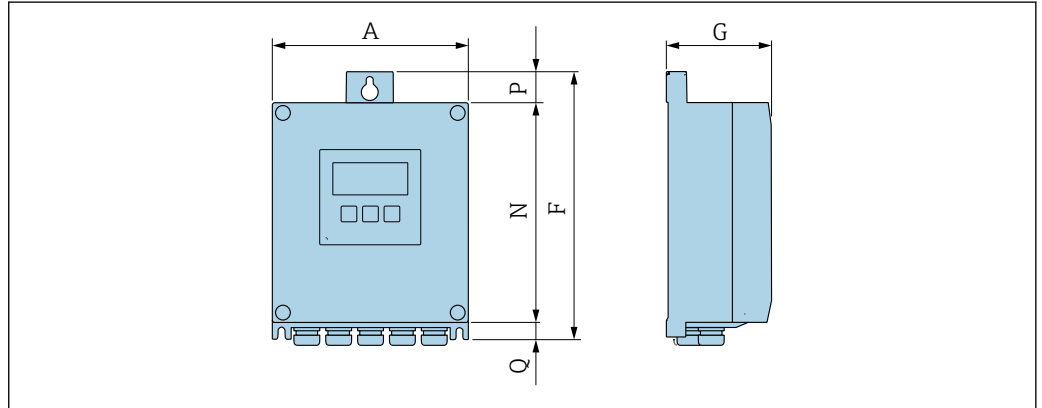
**Vibrations**    The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

# Mechanical construction

Dimensions in SI units

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

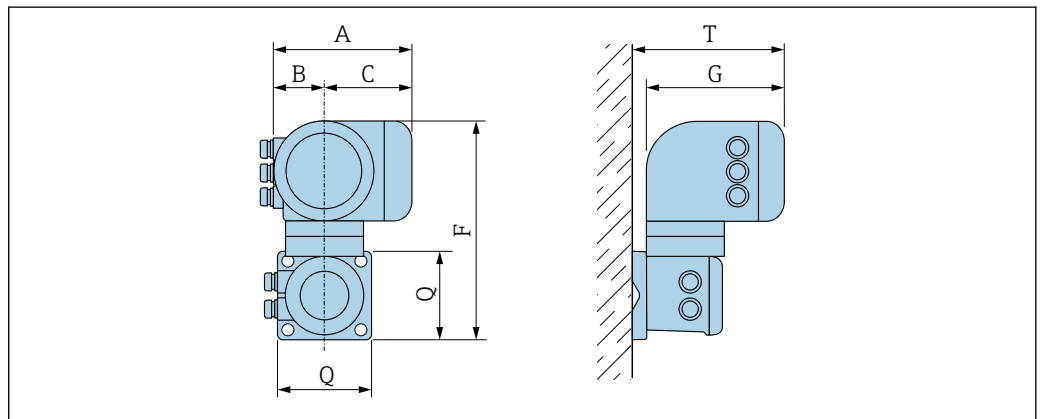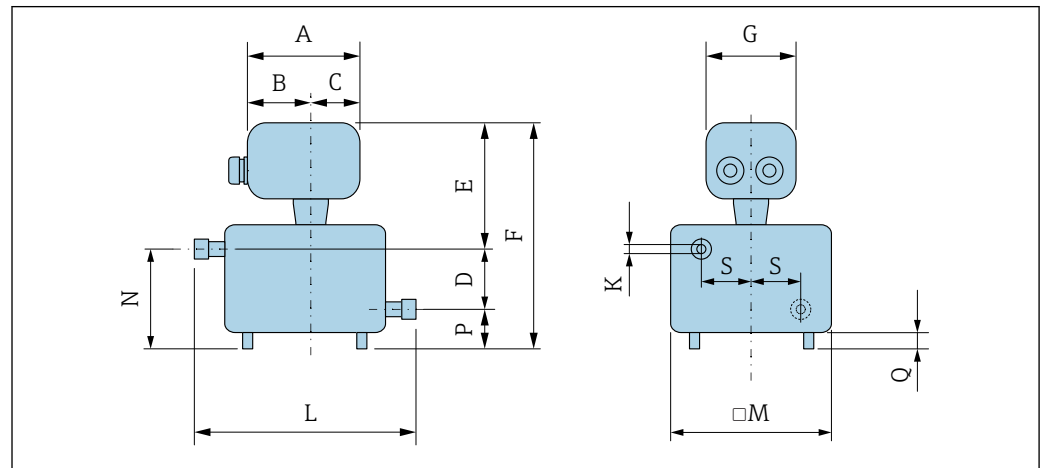*Order code for "Transmitter housing", option A "Aluminum, coated" and order code for "Integrated ISEM electronics", option B "Transmitter"*

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

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

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

**Sensor connection housing**



A0030029

| DN | D | K | M | N | P | Q | S | L |
|---|---|---|---|---|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 1 | 30 | 1.3 | 120 | 52 | 22 | 10 | 40 | 175 |
| 2 | 30 | 2 | 120 | 52 | 22 | 10 | 40 | 175 |
| 4 | 30 | 3.9 | 120 | 52 | 22 | 10 | 40 | 175 |
| 6 | 30 | 5.35 | 120 | 52 | 22 | 10 | 40 | 175 |

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

| DN | A [1] | B [1] | C | E | F | G |
|---|---|---|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 1 to 6 | 148 | 94 | 54 | 162 | 214 | 136 |

1)    Depending on the cable gland used: values up to + 30 in

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

| DN | A [1] | B | C | E | F | G |
|---|---|---|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 1 to 6 | 137 | 78 | 59 | 158 | 210 | 134 |

1)    Depending on the cable gland used: values up to + 30 in

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

| DN | A [1] | B | C | E | F | G |
|---|---|---|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 1 to 6 | 124 | 68 | 56 | 157 | 209 | 112 |

1) Depending on the cable gland used: values up to + 30 in

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

| DN | A [1] | B | C | E | F | G |
|---|---|---|---|---|---|---|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 1 to 6 | 145 | 86 | 59 | 185 | 237 | 136 |

1) Depending on the cable gland used: values up to + 30 in

**Cable glands**

*VCO coupling*
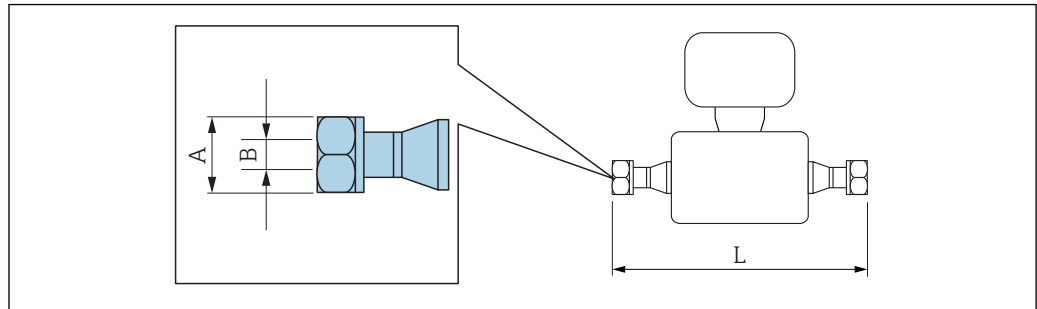


Length tolerance for dimension L in mm:
+1.5 / −2.0

| 4-VCO-4 | | | |
|---|---|---|---|
| **1.4539 (904L):** *order code for "Process connection", option* **HAW** | | | |
| DN [mm] | A [in] | B [mm] | L [mm] |
| 1 | SW $^{11}/_{16}$ | 12.5 | 175 |
| 2 | SW $^{11}/_{16}$ | 12.5 | 175 |
| 4 | SW $^{11}/_{16}$ | 12.5 | 175 |

| 8-VCO-4 | | | |
|---|---|---|---|
| **1.4404 (316/316L):** *order code for "Process connection", option* **CVS** | | | |
| DN [mm] | A [in] | B [mm] | L [mm] |
| 6 | AF 1 | 20 | 175 |

**Adapter**

*Adapter, DN 15 flange to VCO*
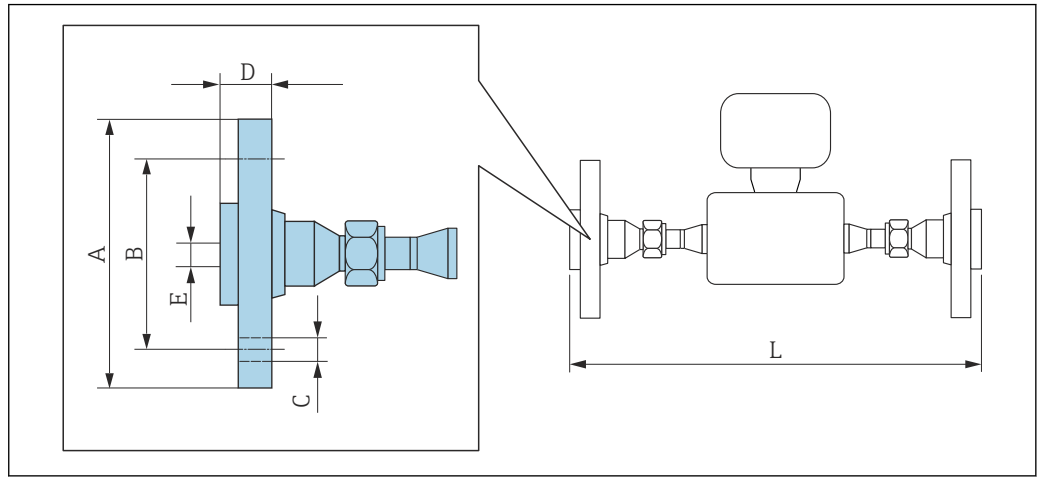


A0019725

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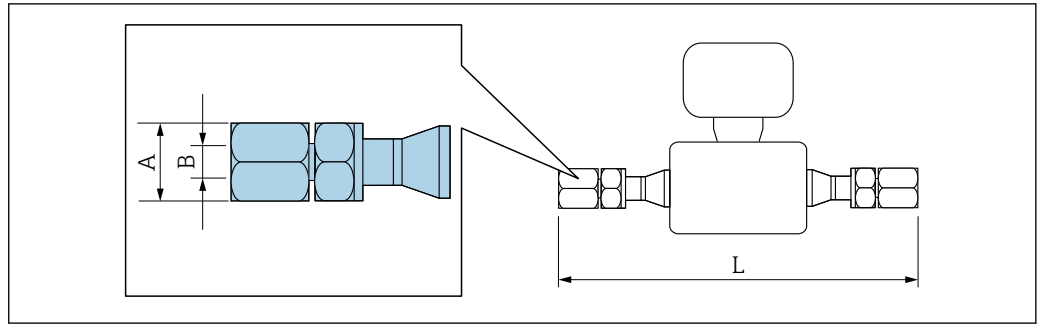+1.5 / –2.0

**Flange according to EN 1092-1 (DIN 2501): PN 40**
**1.4539 (904L):** *order code for "Accessories", option* **PE**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 1 to 6 | 95 | 65 | 4 × Ø14 | 28 | 17.3 | 278 |

DN 1 to 4 with 4-VCO-4, DN 6 with 8-VCO-4
Lap joint flanges (not wetted) made of stainless steel 1.4404 (316/316L)
Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez)

**Flange according to ASME B16.5: Class 150**
**1.4539 (904L):** *order code for "Accessories", option* **PF**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 1 to 6 | 90.0 | 66.5 | 4 × Ø15.7 | 17.7 | 15.7 | 278 |

DN 1 to 4 with 4-VCO-4, DN 6 with 8-VCO-4
Lap joint flanges (not wetted) made of stainless steel 1.4404 (316/316L)
Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez)

**Flange according to ASME B16.5: Class 300**
**1.4539 (904L):** *order code for "Accessories, option* **PG**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 1 to 6 | 95.0 | 66.5 | 4 × Ø15.7 | 20.7 | 15.7 | 278 |

DN 1 to 4 with 4-VCO-4, DN 6 with 8-VCO-4
Lap joint flanges (not wetted) made of stainless steel 1.4404 (316/316L)
Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez)

**Flange JIS B2220: 10K**
**1.4539 (904L):** *order code for "Accessories", option* **PH**

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
|---|---|---|---|---|---|---|
| 1 to 6 | 95 | 70 | 4 × Ø15 | 28 | 15.0 | 278 |

DN 1 to 4 with 4-VCO-4, DN 6 with 8-VCO-4
Lap joint flanges (not wetted) made of stainless steel 1.4404 (316/316L)
Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez)

*Adapter, NPTF to VCO*



A0019724

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

| ¼" NPTF to 4-VCO-4 | | | |
|---|---|---|---|
| **1.4539 (904L):** *order code for "Accessories", option* **PC** | | | |
| DN<br>[mm] | A<br>[in] | B<br>[in] | L<br>[mm] |
| 1 to 4 | AF ¾ | ¼ NPT | 246 |
| Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez) | | | |

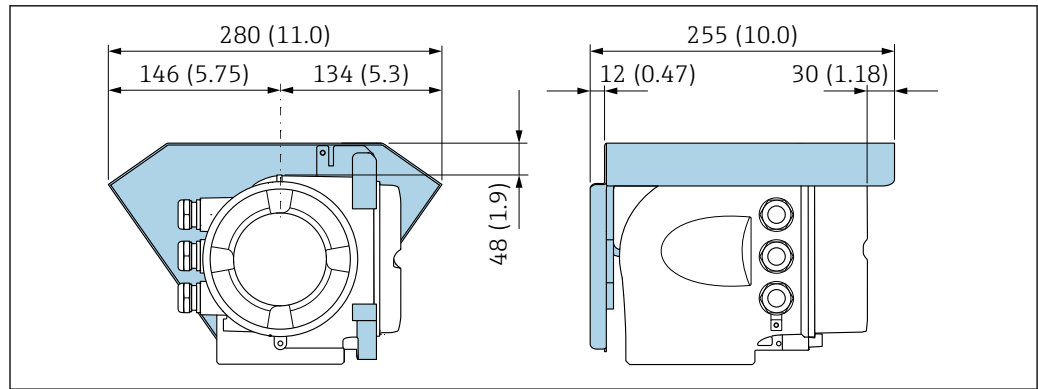| ¼" NPTF to 8-VCO-4 | | | |
|---|---|---|---|
| **1.4539 (904L):** *order code for "Accessories", option* **PD** | | | |
| DN<br>[mm] | A<br>[in] | B<br>[in] | L<br>[mm] |
| 6 | AF ¹¹⁄₁₆ | ½ NPT | 246 |
| Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez) | | | |

**Accessories**
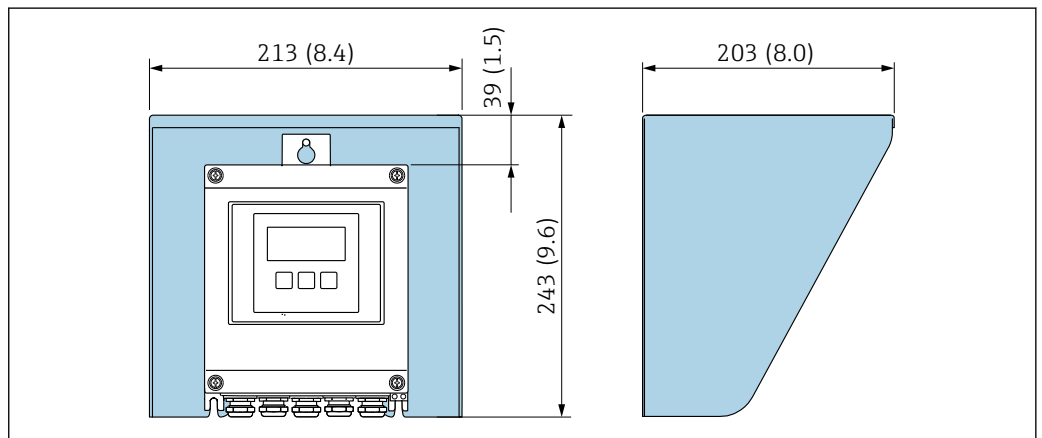
*Protective cover*



A0029552

⊞ *35   Protective cover for Proline 500 – digital; engineering unit mm (in)*
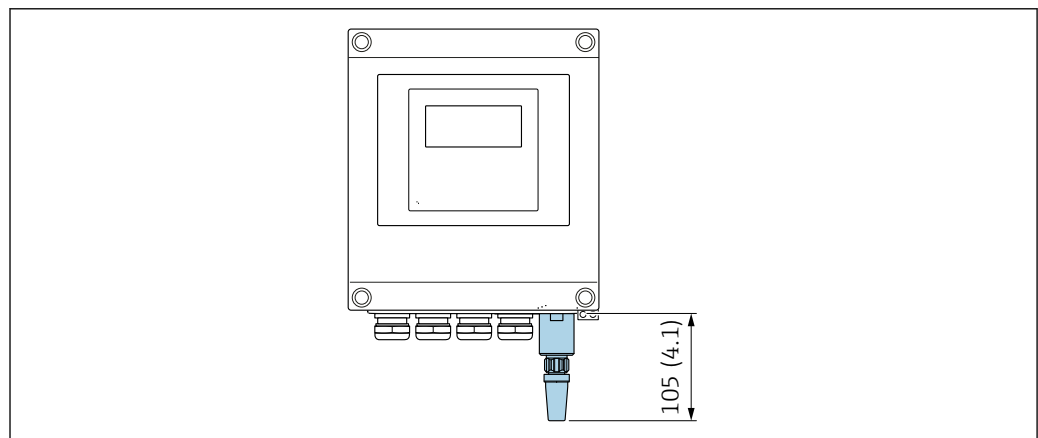
*☒ 36   Protective cover for Proline 500; engineering unit mm (in)*

*External WLAN antenna*

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

*Proline 500 – digital*

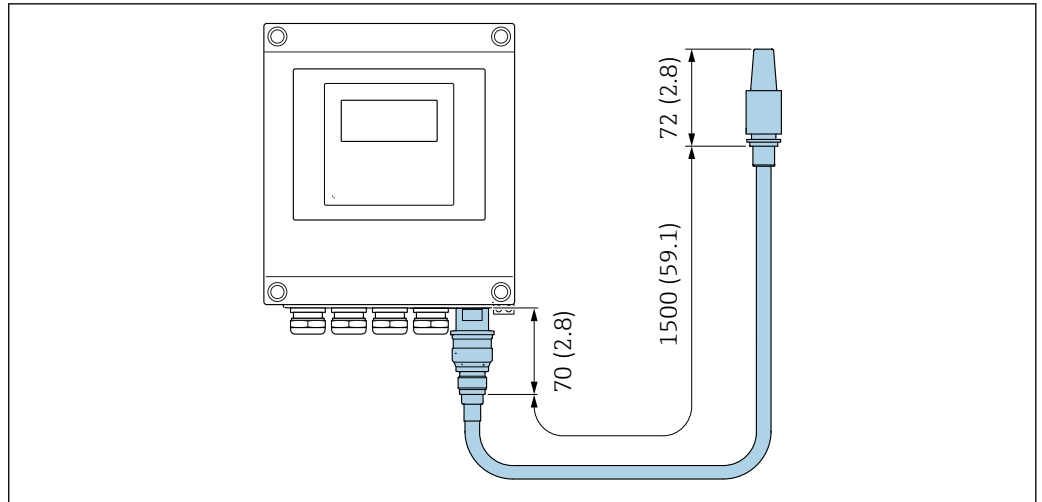*External WLAN antenna mounted on device*



*☒ 37   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.

🖼 *38    Engineering unit mm (in)*

*Proline 500*

*External WLAN antenna mounted on device*



🖼 *39    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.
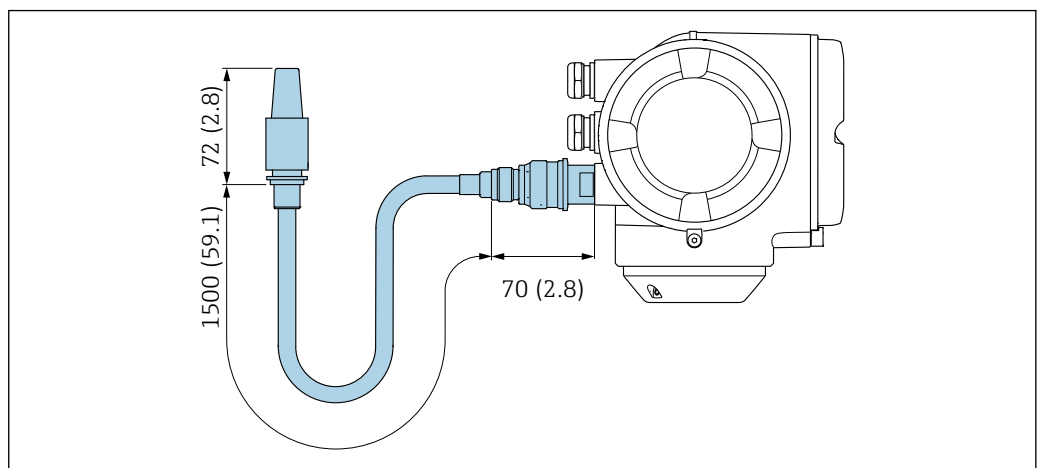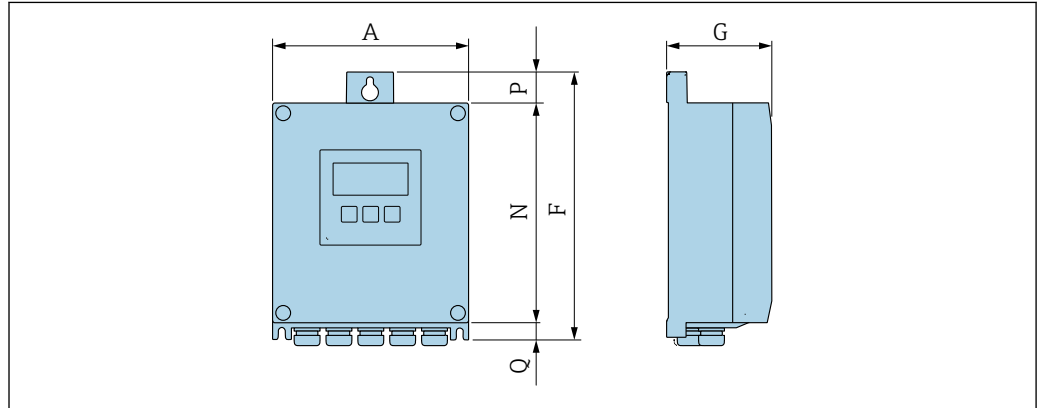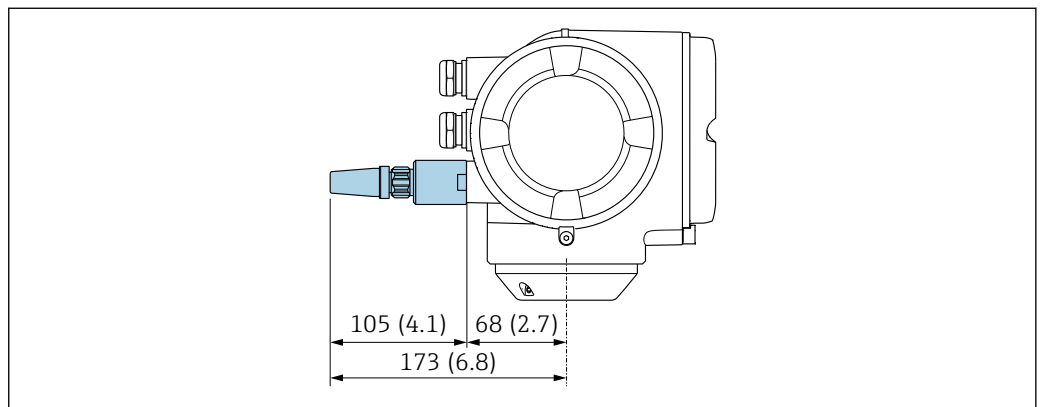


🖼 *40    Engineering unit mm (in)*

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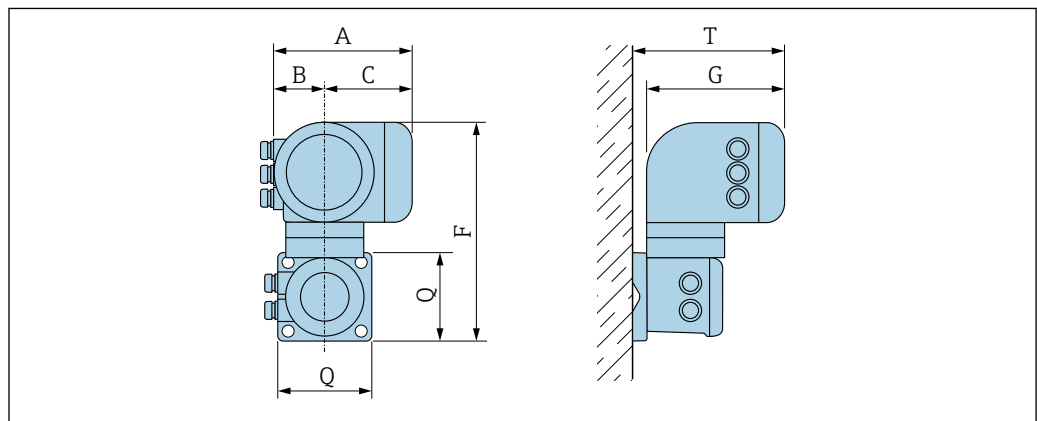
| A [in] | F [in] | G [in] | N [in] | P [in] | Q [in] |
|--------|--------|--------|--------|--------|--------|
| 6.57 | 9.13 | 3.50 | 7.36 | 0.94 | 0.83 |

*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 [in] | G [in] | Q [in] | T [in] |
|--------|--------|--------|--------|--------|--------|--------|
| 7.40 | 3.35 | 4.06 | 12.5 | 8.54 | 5.12 | 9.41 |

*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 [in] | G [in] | Q [in] | T [in] |
|---|---|---|---|---|---|---|
| 7.40 | 3.35 | 4.06 | 11.6 | 8.54 | 5.12 | 9.41 |

**Sensor connection housing**
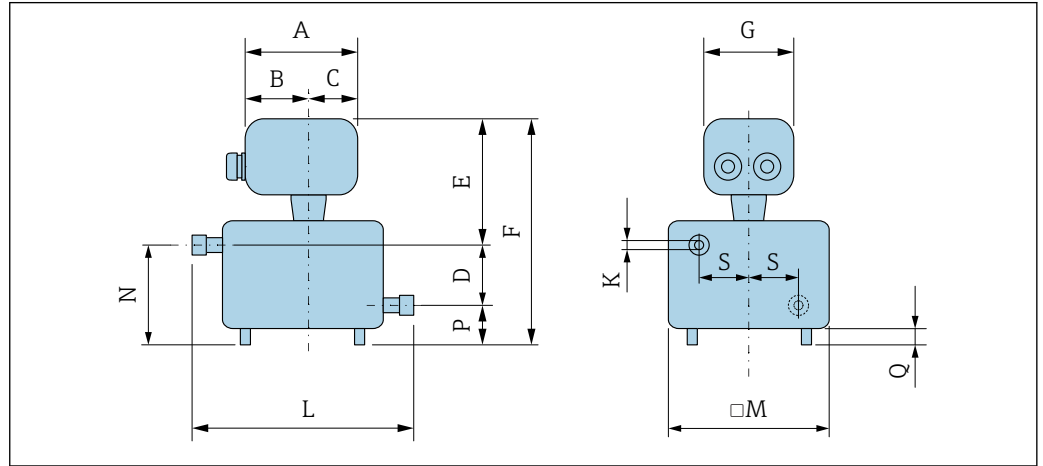


A0030029

| DN [in] | D [in] | K [in] | M [in] | N [in] | P [in] | Q [in] | S [in] | L [in] |
|---|---|---|---|---|---|---|---|---|
| $\frac{1}{24}$ | 1.18 | 0.05 | 4.72 | 2.05 | 0.87 | 0.39 | 1.57 | 6.89 |
| $\frac{1}{12}$ | 1.18 | 0.08 | 4.72 | 2.05 | 0.87 | 0.39 | 1.57 | 6.89 |
| $\frac{1}{8}$ | 1.18 | 0.15 | 4.72 | 2.05 | 0.87 | 0.39 | 1.57 | 6.89 |
| $\frac{1}{4}$ | 1.18 | 0.211 | 4.72 | 2.05 | 0.87 | 0.39 | 1.57 | 6.89 |

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

| DN [in] | A [in] [1] | B [in] [1] | C [in] | E [in] | F [in] | G [in] |
|---|---|---|---|---|---|---|
| $\frac{1}{24}$ to $\frac{1}{4}$ | 5.83 | 3.70 | 2.13 | 6.38 | 8.43 | 5.35 |

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

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

| DN [in] | A [in] [1] | B [in] | C [in] | E [in] | F [in] | G [in] |
|---|---|---|---|---|---|---|
| $\frac{1}{24}$ to $\frac{1}{4}$ | 5.39 | 3.07 | 2.32 | 6.22 | 8.27 | 5.28 |

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

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

| DN | A [1] | B | C | E | F | G |
|----|-------|---|---|---|---|---|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| $\frac{1}{24}$ to $\frac{1}{4}$ | 4.88 | 2.68 | 2.20 | 6.18 | 8.23 | 4.41 |

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

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

| DN | A [1] | B | C | E | F | G |
|----|-------|---|---|---|---|---|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| $\frac{1}{24}$ to $\frac{1}{4}$ | 5.71 | 3.39 | 2.32 | 7.28 | 9.33 | 5.35 |

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

**Cable glands**

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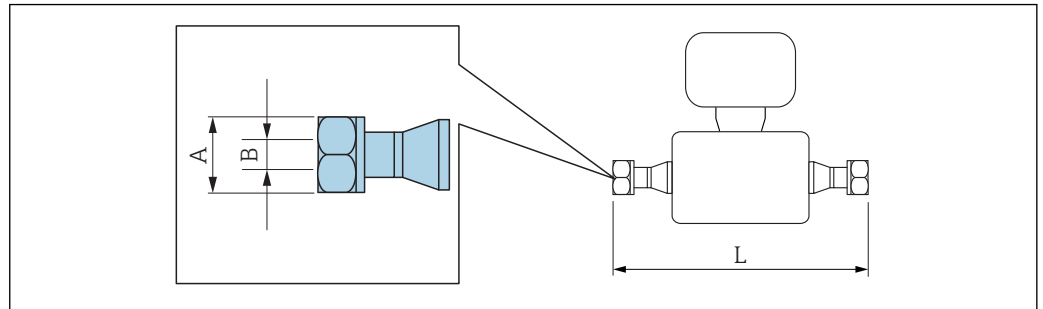
Length tolerance for dimension L in inch:
+0.06 / −0.08

| 4-VCO-4 | | | |
|---|---|---|---|
| **1.4539 (904L):** *order code for "Process connection", option* **HAW** | | | |
| DN<br>[mm] | A<br>[in] | B<br>[in] | L<br>[in] |
| $\frac{1}{24}$ | SW $^{11}/_{16}$ | 0.49 | 6.89 |
| $\frac{1}{12}$ | SW $^{11}/_{16}$ | 0.49 | 6.89 |
| $\frac{1}{8}$ | SW $^{11}/_{16}$ | 0.49 | 6.89 |

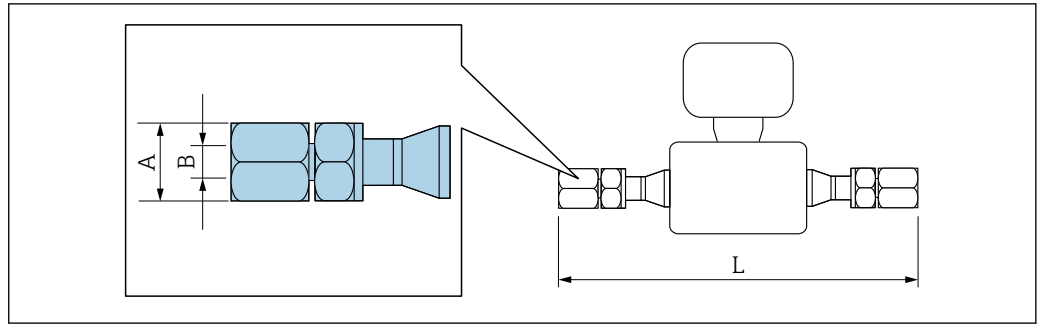| 8-VCO-4 | | | |
|---|---|---|---|
| **1.4404 (316/316L):** *order code for "Process connection", option* **CVS** | | | |
| DN<br>[mm] | A<br>[in] | B<br>[in] | L<br>[in] |
| $\frac{1}{4}$ | AF 1 | 0.79 | 6.89 |

**Adapter**

*Adapter, DN 15 flange to VCO*
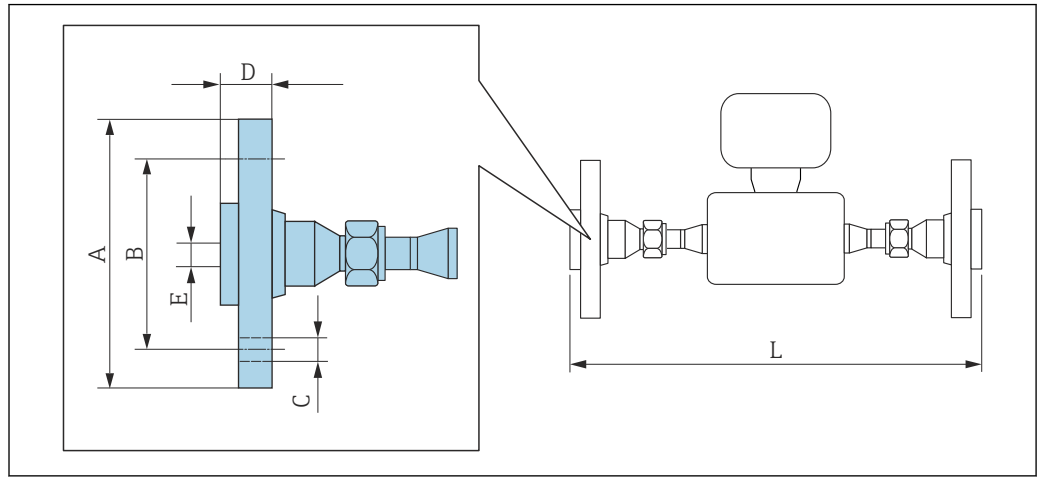


A0019725

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

**Flange according to ASME B16.5: Class 150**
**1.4539 (904L):** *order code for "Accessories", option* **PF**

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| ¹⁄₂₄ to ¼ | 3.54 | 2.62 | 4 × Ø0.62 | 0.7 | 0.62 | 10.94 |

DN ¹⁄₂₄ to ⅛ with 4-VCO-4, DN ¼ with 8-VCO-4
Lap joint flanges (not wetted) made of stainless steel 1.4404 (316/316L)
Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez)

**Flange according to ASME B16.5: Class 300**
**1.4539 (904L):** *order code for "Accessories, option* **PG**

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
|---|---|---|---|---|---|---|
| ¹⁄₂₄ to ¼ | 3.74 | 2.62 | 4 × Ø0.62 | 0.81 | 0.62 | 10.94 |

DN ¹⁄₂₄ to ⅛ with 4-VCO-4, DN ¼ with 8-VCO-4
Lap joint flanges (not wetted) made of stainless steel 1.4404 (316/316L)
Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez)
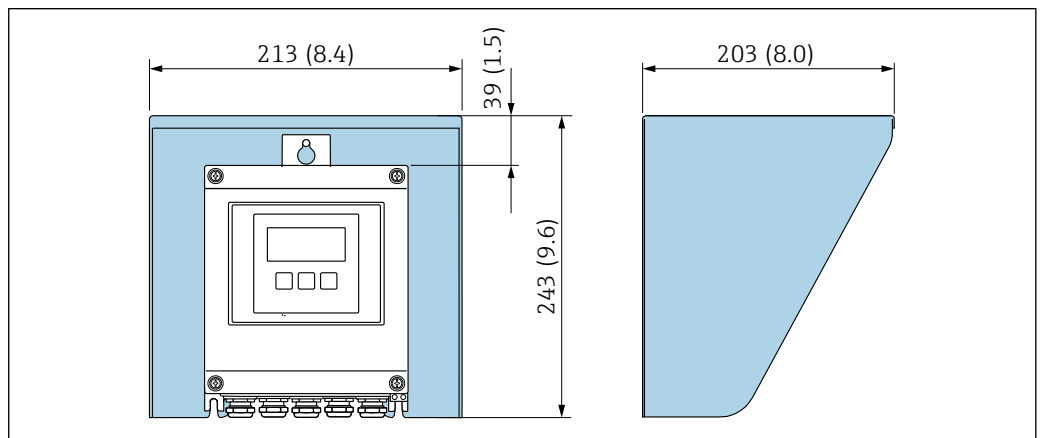
*Adapter, NPTF to VCO*



A0019724

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

| ¼" NPTF to 4-VCO-4 <br> **1.4539 (904L):** *order code for "Accessories", option* **PC** | | | |
|---|---|---|---|
| **DN** <br> **[mm]** | **A** <br> **[in]** | **B** <br> **[in]** | **L** <br> **[in]** |
| ¹⁄₂₄ to ⅛ | AF ¾ | ¼ NPT | 9.69 |
| Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez) | | | |

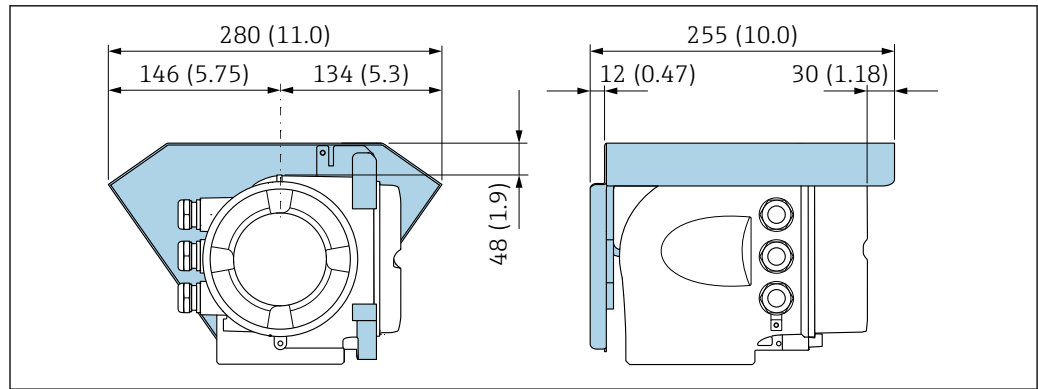| ¼" NPTF to 8-VCO-4 <br> **1.4539 (904L):** *order code for "Accessories", option* **PD** | | | |
|---|---|---|---|
| **DN** <br> **[mm]** | **A** <br> **[in]** | **B** <br> **[in]** | **L** <br> **[in]** |
| ¼ | AF ¹¹⁄₁₆ | ½ NPT | 9.69 |
| Sealing sets: order code for "Accessory enclosed", option **P1** (Viton), **P2** (EPDM), **P3** (silicone), **P4** (Kalrez) | | | |

**Accessories**

*Protective cover*



A0029552

🖼 *41    Protective cover for Proline 500 – digital; engineering unit mm (in)*
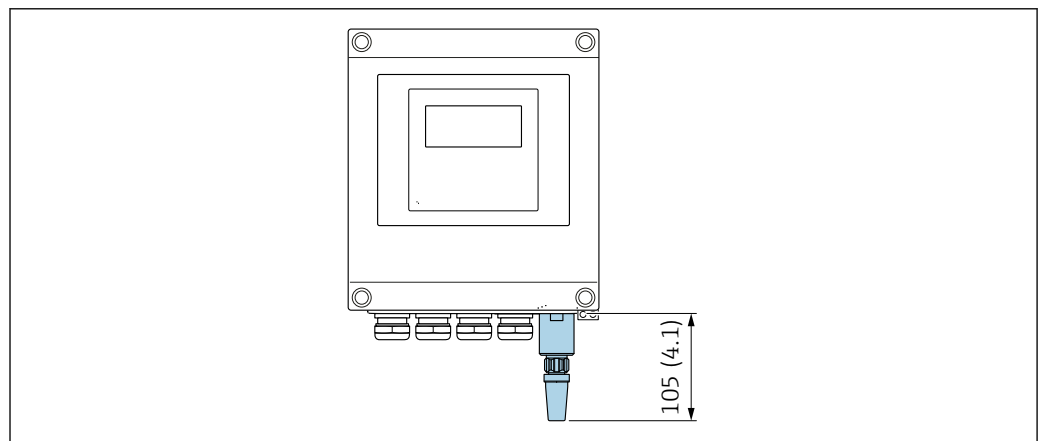
*🖻 42   Protective cover for Proline 500; engineering unit mm (in)*

*External WLAN antenna*

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

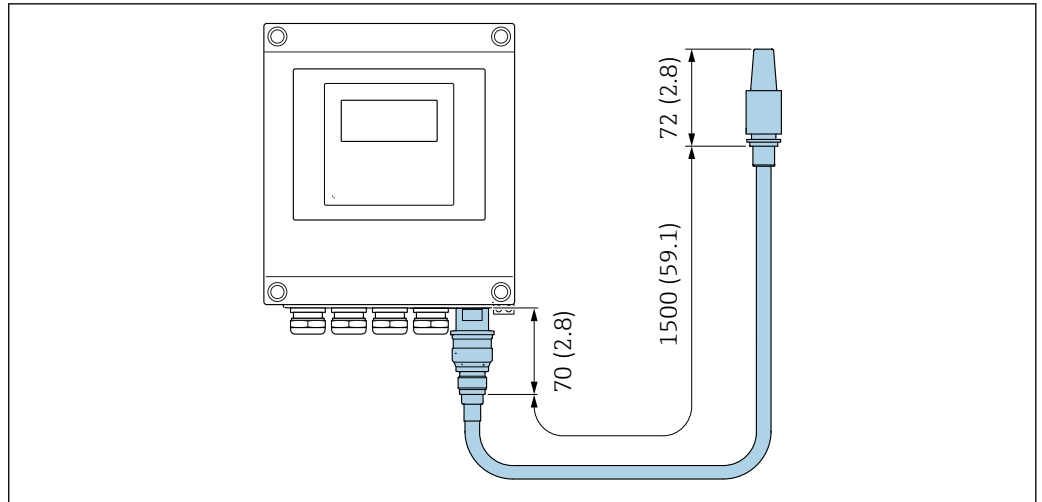*Proline 500 – digital*

*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.
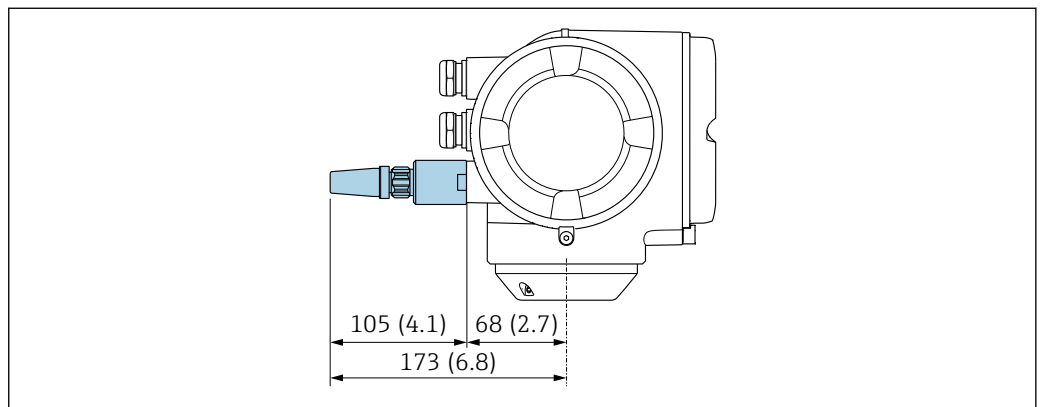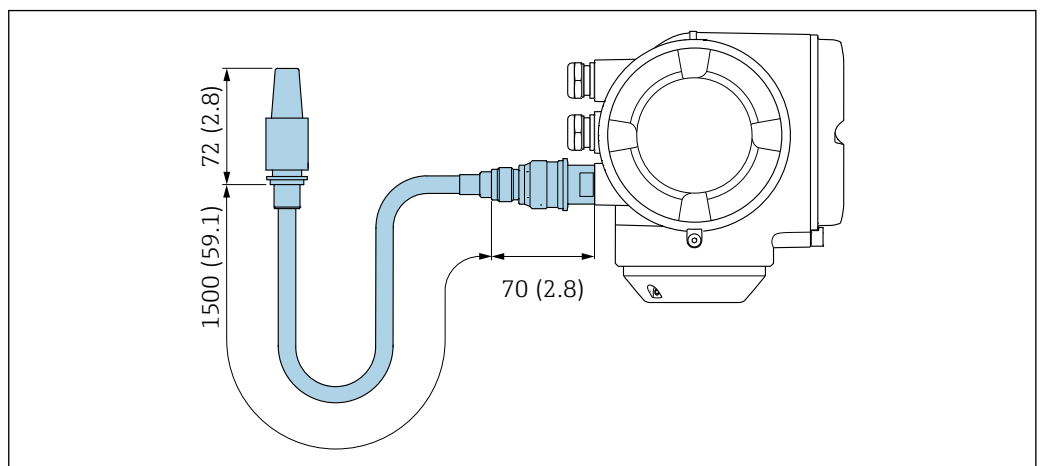
*⊠ 44    Engineering unit mm (in)*

*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)*

| Weight | All values (weight exclusive of packaging material) refer to devices with VCO couplings. |

**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)
- Proline 500 cast, stainless: 15.6 kg (34.4 lbs)

**Sensor**
- Sensor with aluminum connection housing version: see the information in the following table
- Sensor with cast connection housing version, stainless: +3.7 kg (+8.2 lbs)

**Weight in SI units**

| DN<br>[mm] | Weight [kg] |
|---|---|
| 1 to 6 | 3.5 |

**Weight in US units**

| DN<br>[in] | Weight [lbs] |
|---|---|
| $^1/_{24}$ to $^1/_4$ | 8 |

| 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
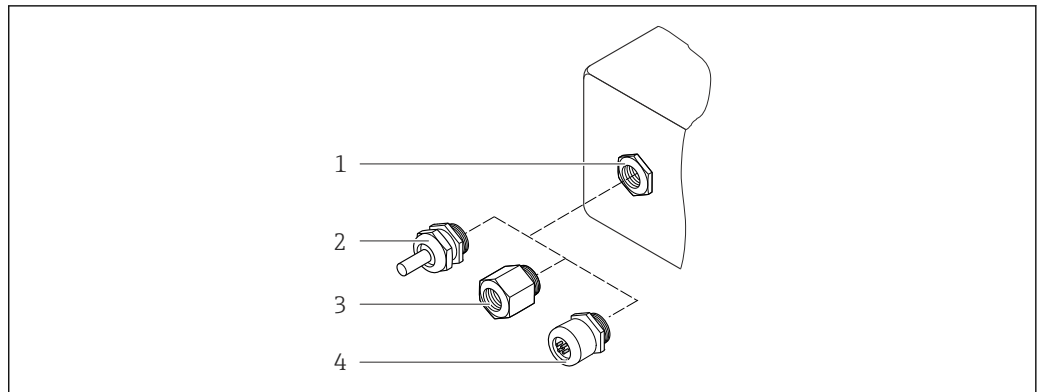


*47    Possible cable entries/cable glands*

*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 plugs*

| 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 |
| • 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 L "Cast, stainless"<br>• Order code for "Sensor connection housing":<br>  Option L "Cast, stainless" | Stainless steel, 1.4404 (316L) |
| Adapter for device plug<br><br>• Device plug for digital communication:<br>  Only available for certain device versions → 🖹 33.<br>• Device plug for connecting cable:<br>  A device plug is always used for the device version, order code for "Sensor connection housing", option C (ultra-compact, hygienic, stainless). | 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 cable

ℹ 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*

- Standard cable: PVC cable with copper shield
- Armored cable: PVC cable with copper shield and additional steel wire braided jacket

### Sensor housing

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

### Measuring tubes

Stainless steel, 1.4539 (904L)

### Process connections

VCO connection:
VCO connection: stainless steel, 1.4539 (904L)

Adapter for DN 15 flange according to EN 1092-1 (DIN2501) / according to ASME B 16.5 / as per JIS B2220:
Stainless steel, 1.4539 (904L)

NPTF adapter:
Stainless steel, 1.4539 (904L)

ℹ Available process connections→ 🖺 89

### Seals

Welded process connections without internal seals

#### Seals for mounting kit
- Viton
- EPDM
- Silicone
- Kalrez

### Accessories

*Protective cover*

Stainless steel, 1.4404 (316L)

*External WLAN antenna*

- Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) 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: <br>   • EN 1092-1 (DIN 2512N) flange <br>   • ASME B16.5 flange <br>   • JIS B2220 flange <br> • VCO connections: <br>   • 4-VCO-4 <br>   • 8-VCO-4 <br> • Adapter for VCO connections: <br>   • Flange EN 1092-1 (DIN 2501) <br>   • Flange ASME B16.5 <br>   • Flange JIS B2220 <br>   • NPT <br><br>   Process connection materials →  🖺 88 |

| | |
|---|---|
| **Surface roughness** | All data relate to parts in contact with fluid. The following surface roughness quality can be ordered. <br> Not polished |

# Human interface

| | |
|---|---|
| **Operating concept** | **Operator-oriented menu structure for user-specific tasks** <br> • Commissioning <br> • Operation <br> • Diagnostics <br> • Expert level <br><br> **Fast and safe commissioning** <br> • Guided menus ("Make-it-run" wizards) for applications <br> • Menu guidance with brief descriptions of the individual parameter functions <br> • Access to the device via Web server →  🖺 109 <br> • WLAN access to the device via mobile handheld terminal, tablet or smart phone <br><br> **Reliable operation** <br> • Operation in local language →  🖺 89 <br> • Uniform operating philosophy applied to device and operating tools <br> • 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. <br><br> **Efficient diagnostics increase measurement availability** <br> • Troubleshooting measures can be called up via the device and in the operating tools <br> • Diverse simulation options, logbook for events that occur and optional line recorder functions |
| **Languages** | Can be operated in the following languages: <br> • Via local operation <br>   English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech, Swedish <br> • Via Web browser <br>   English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Bahasa (Indonesian), Vietnamese, Czech, Swedish <br> • Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese |
| **Local operation** | **Via display module** <br><br> Equipment: <br> • Order code for "Display; operation", option F "4-line, illuminated, graphic display; touch control" <br> • Order code for "Display; operation", option G "4-line, illuminated, graphic display; touch control + WLAN" <br><br>   Information about WLAN interface →  🖺 96 |
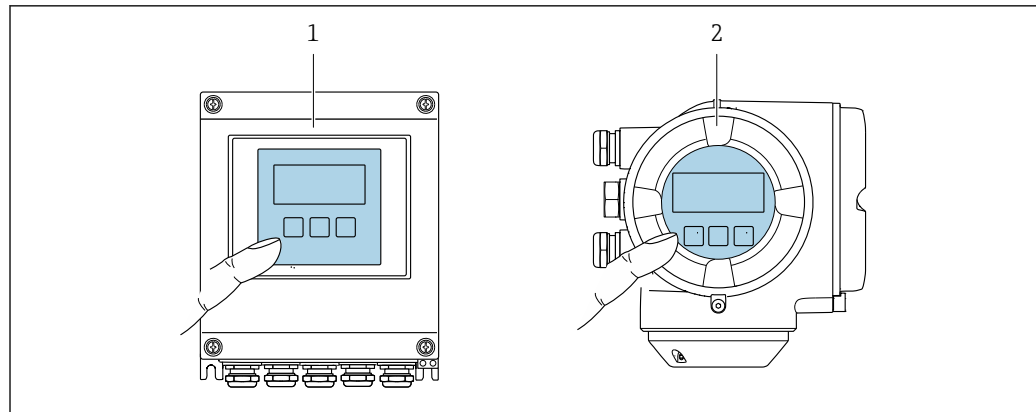
*⊞ 48    Operation with touch control*

*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
- Permitted ambient temperature for the display: –20 to +60 °C (–4 to +140 °F)
  The readability of the display may be impaired at temperatures outside the temperature range.

*Operating elements*

- External operation via touch control (3 optical keys) without opening the housing: $\boxplus$, $\boxminus$, $\boxed{E}$
- Operating elements also accessible in the various zones of the hazardous area
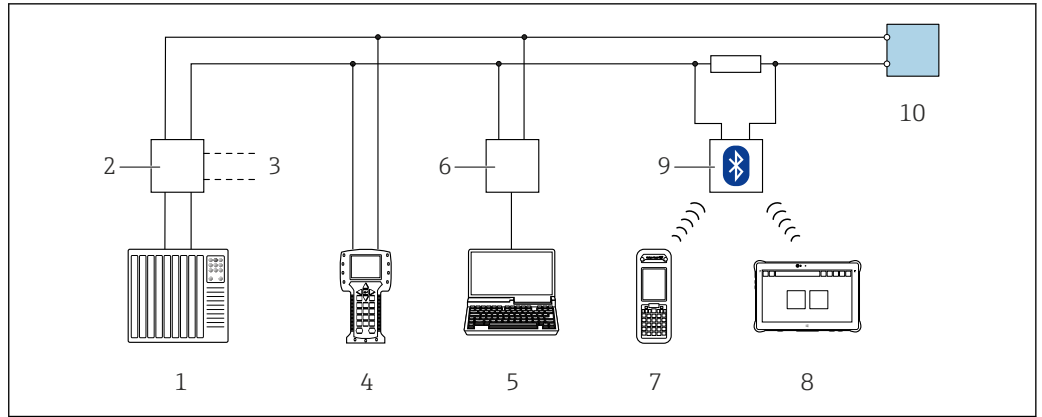
**Remote operation**     **Via HART protocol**

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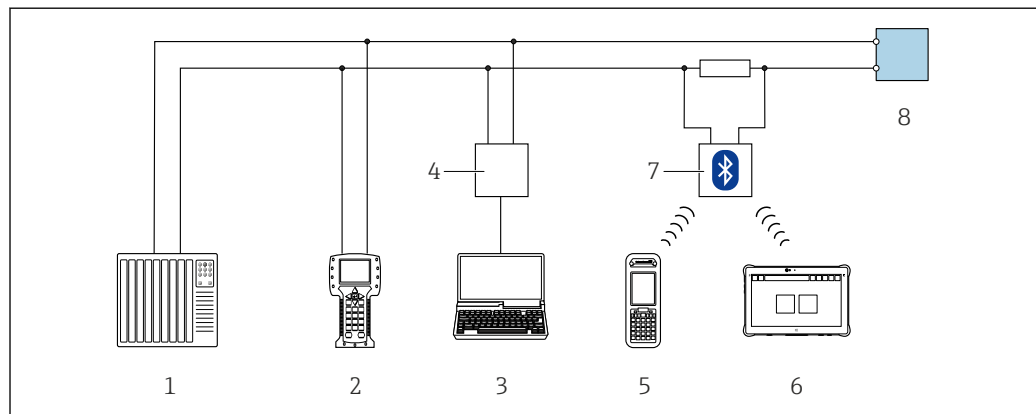


*⊞ 49    Options for remote operation via HART protocol (active)*

*1    Control system (e.g. PLC)*
*2    Field Communicator 475*
*3    Computer with Web browser (e.g. Internet Explorer) for access to the integrated device Web server or*
*     computer with an 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*

*🖾 50    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. Internet Explorer) for access to the integrated device Web server or computer with an 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**

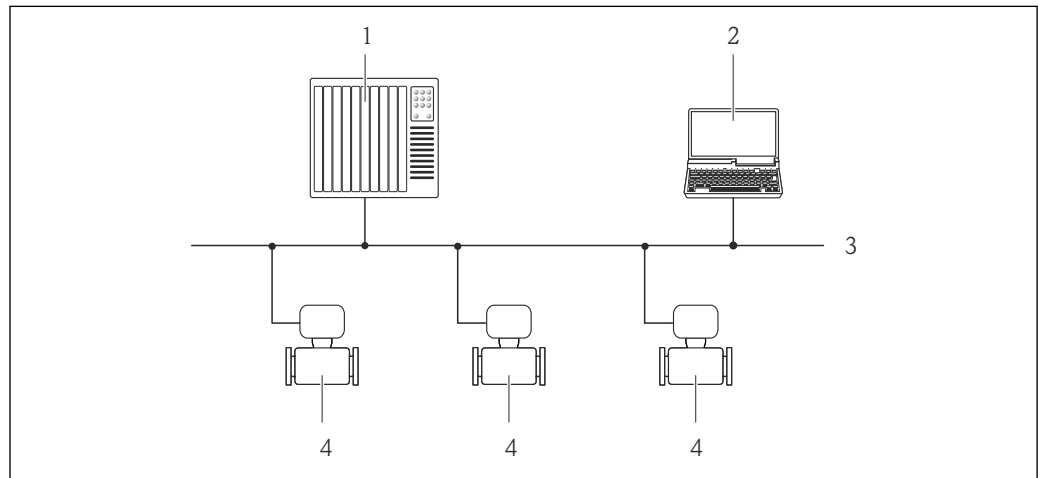This communication interface is available in device versions with FOUNDATION Fieldbus.
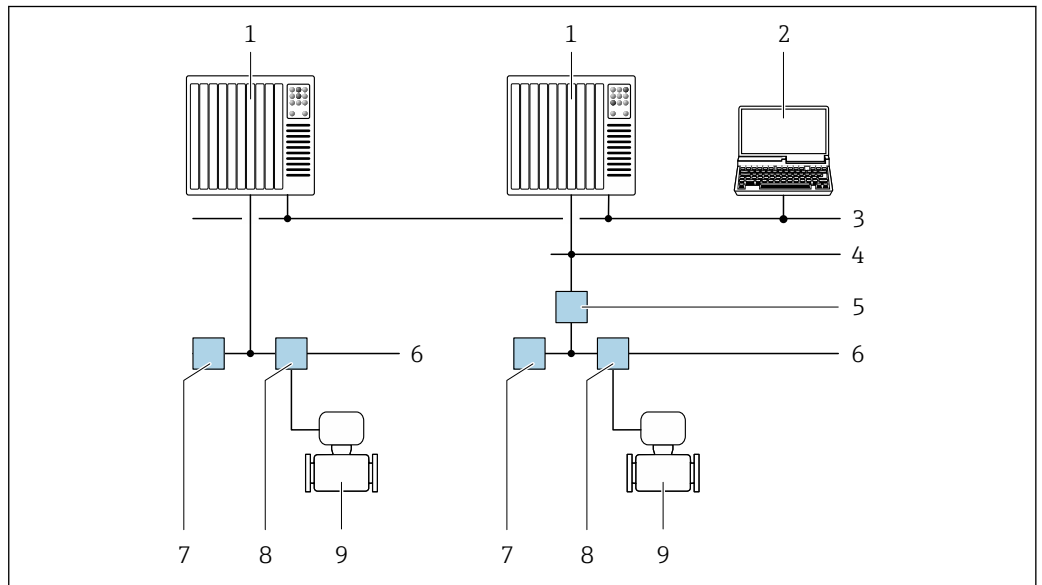


*🖾 51    Options for remote operation via FOUNDATION Fieldbus network*

*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

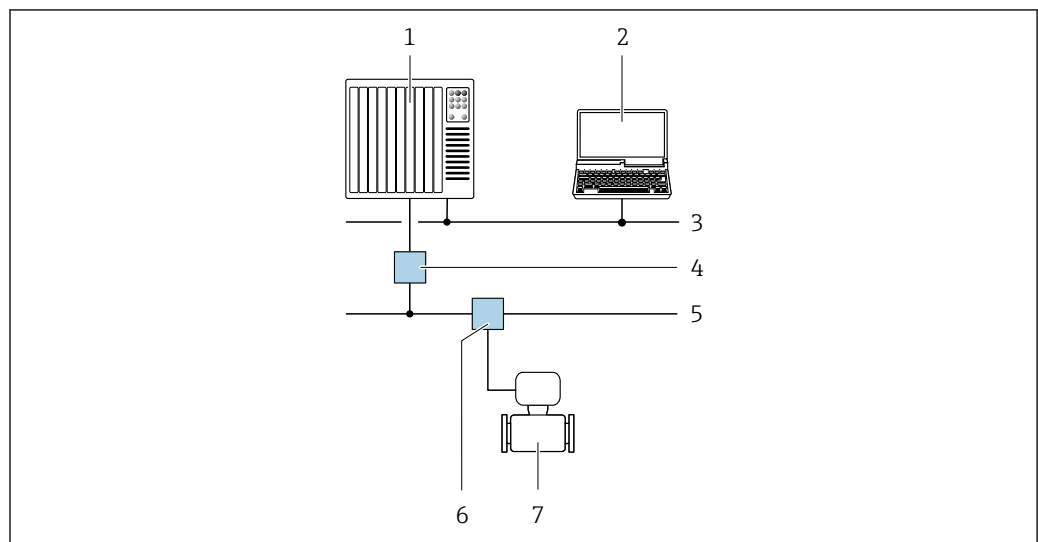This communication interface is available in device versions with PROFIBUS DP.



*⊠ 52   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

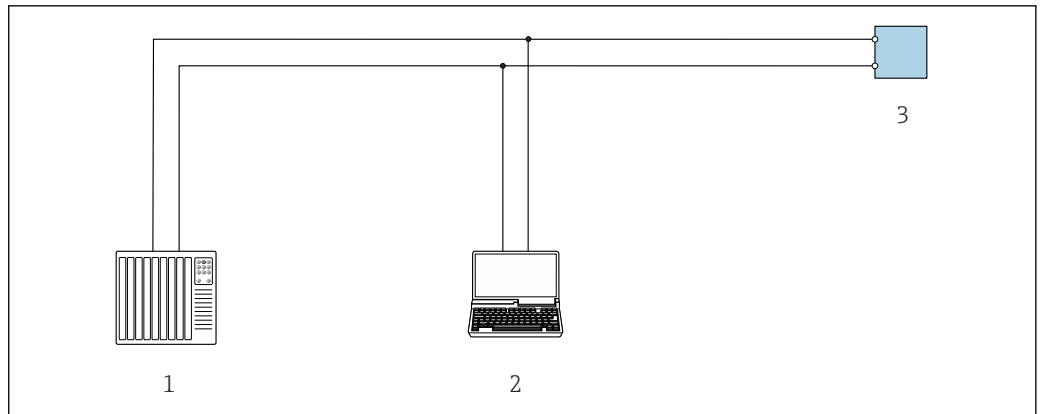This communication interface is available in device versions with PROFIBUS PA.



*⊠ 53   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.
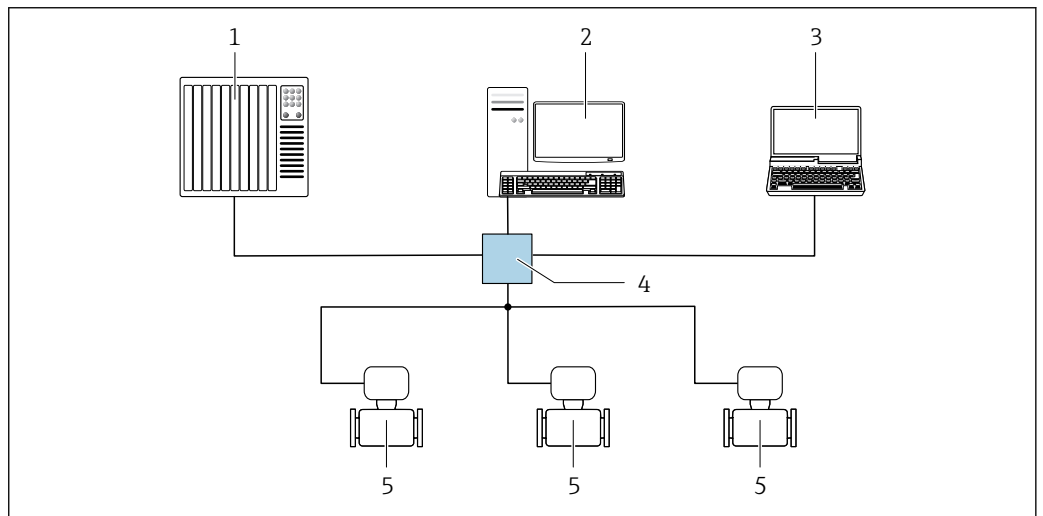
*A0029437*

⊠ *54 Options for remote operation via Modbus-RS485 protocol (active)*

*1 Control system (e.g. PLC)*
*2 Computer with Web browser (e.g. Internet Explorer) for accessing 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.
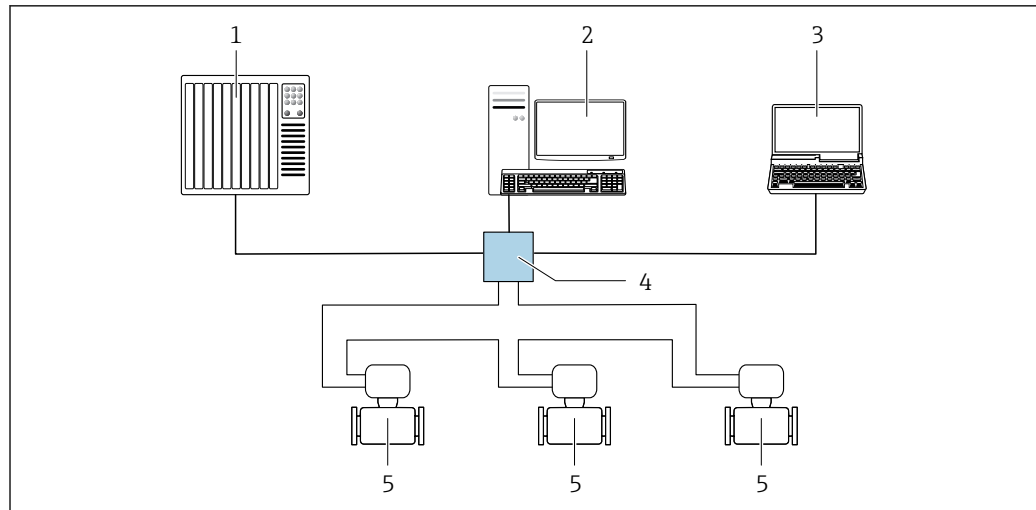
*Star topology*



*A0032078*

⊠ *55 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 device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"*
*4 Ethernet switch*
*5 Measuring device*

*Ring topology*

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

A0033725

*🖻 56    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 device Web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"*
*4    Ethernet switch*
*5    Measuring device*

**Via PROFINET network**

This communication interface is available in device versions with PROFINET.
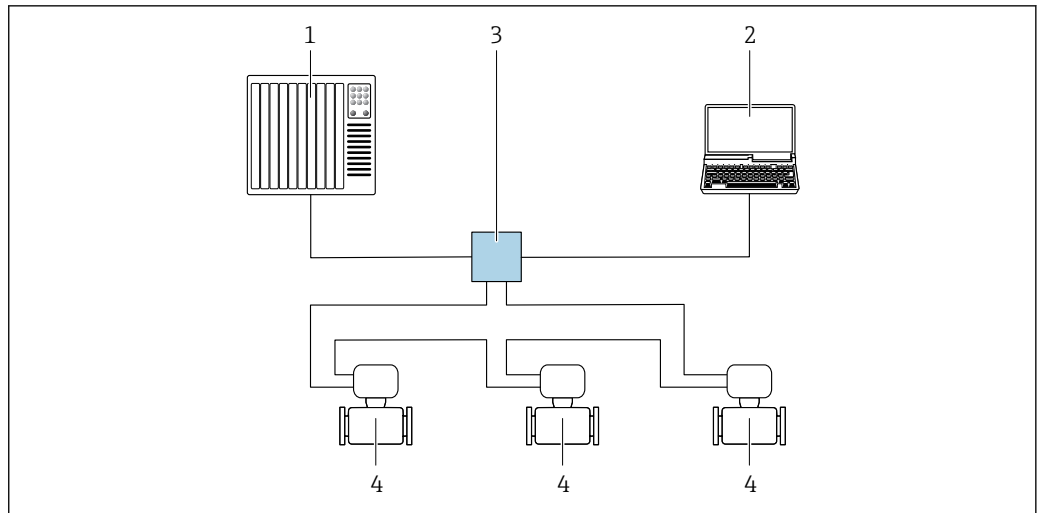
*Star topology*
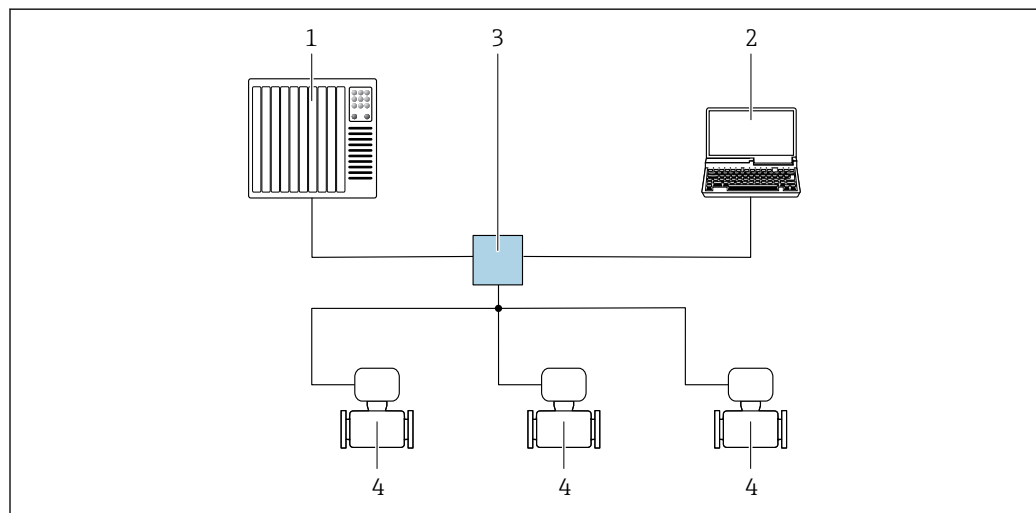


A0026545

*🖻 57    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 device Web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"*
*3    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).

A0033719

*🖾 58    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 device Web server or*
*      computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication*
*      TCP/IP"*
*3    Switch, e.g. Scalance X204 (Siemens)*
*4    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 RJ45 and the M12 connector 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 connector mounted in the cable entry. Therefore the connection to the service interface can be established via an M12 connector without opening the device.

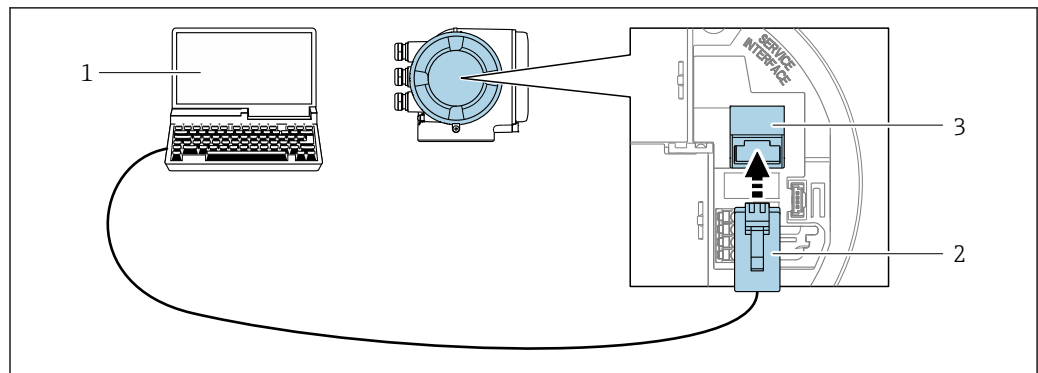*Proline 500 – digital transmitter*
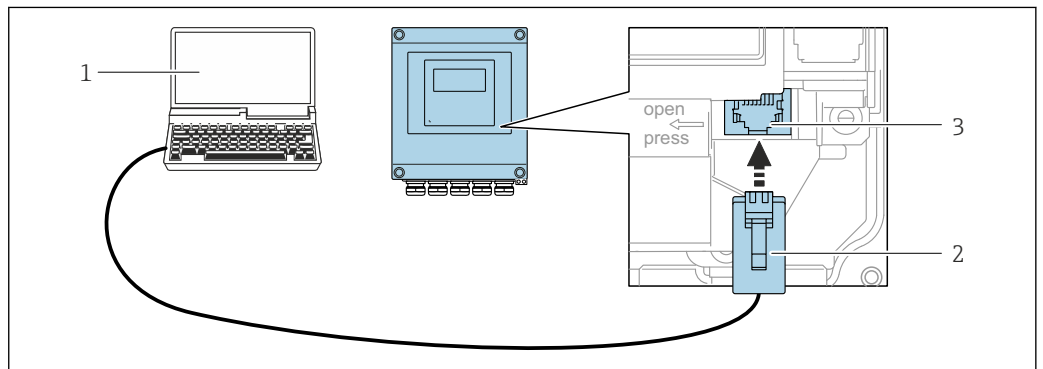


A0029163

*🖾 59    Connection via service interface (CDI-RJ45)*

*1    Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated*
*      device Web server or with "FieldCare", "DeviceCare" operating tool with COM DTM "CDI Communication TCP/IP"*
*      or Modbus DTM*
*2    Standard Ethernet connecting cable with RJ45 connector*
*3    Service interface (CDI-RJ45) of the measuring device with access to the integrated Web server*
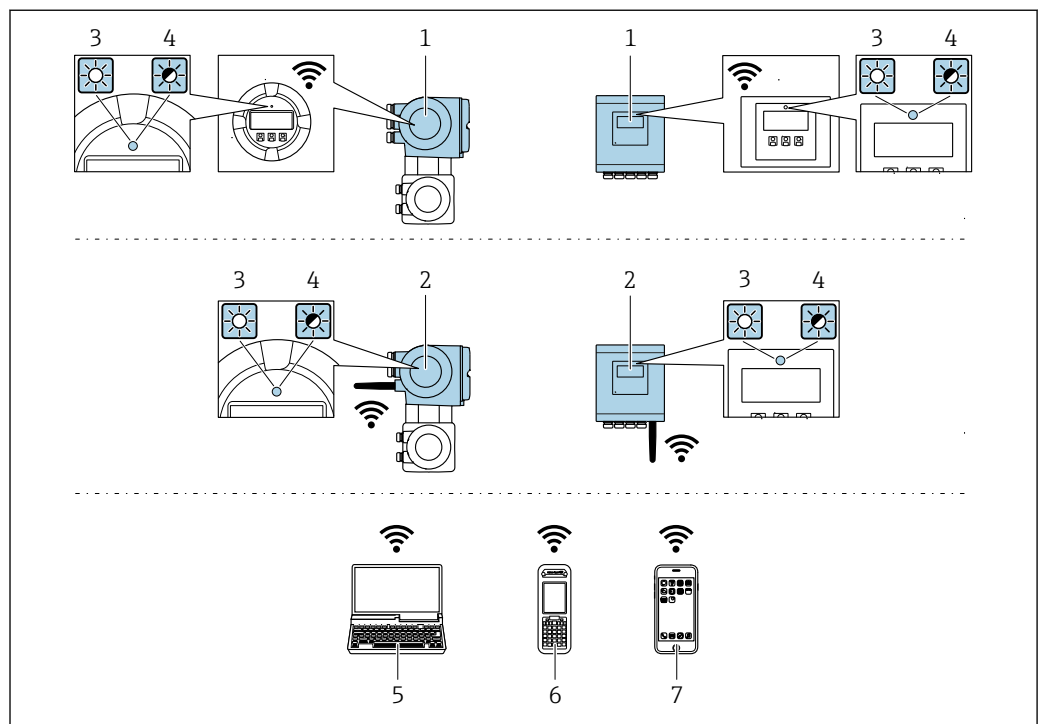
*Proline 500 transmitter*



**⊞ 60** *Connection via service interface (CDI-RJ45)*

*1 Computer with Web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device Web server or with "FieldCare", "DeviceCare" operating tool with COM DTM "CDI Communication TCP/IP" or Modbus DTM*
*2 Standard Ethernet connecting cable with RJ45 connector*
*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 (default 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 → 🗎 107.<br><br>ℹ Only one antenna active in each case! |
| Range | • Internal antenna: typically 10 m (32 ft)<br>• External antenna: typically 50 m (164 ft) |
| Materials (external antenna) | • Antenna: ASA plastic (acrylic ester-styrene-acrylonitrile) and nickel-plated brass<br>• Adapter: Stainless steel and nickel-plated brass<br>• Cable: Polyethylene<br>• Connector: Nickel-plated brass<br>• Angle bracket: Stainless steel |

**Network integration**

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.

ℹ 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): BB, C2, GB, MB, 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.
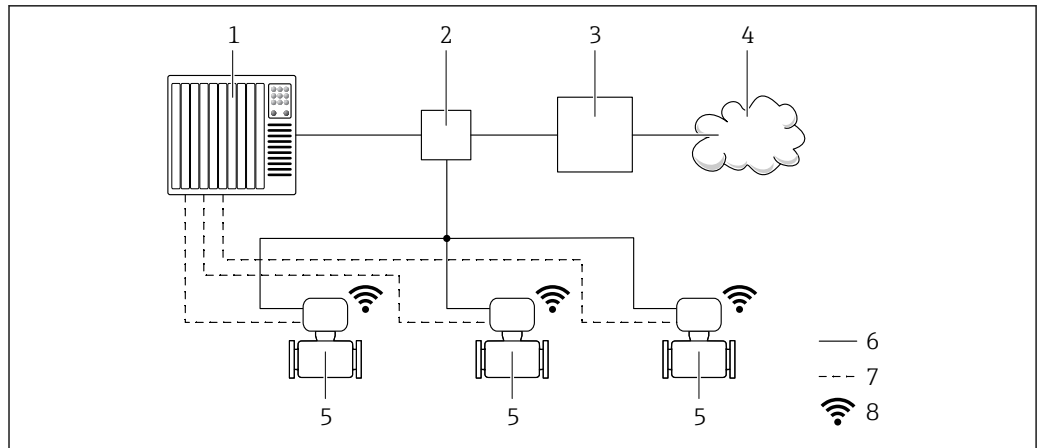
*A0033618*

*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, illuminated, graphic display; touch control + WLAN"

Special Documentation for the OPC-UA Server application package → 🖥 111.

| 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 → 🖥 111 |
| DeviceCare SFE100 | Notebook, PC or tablet with Microsoft Windows system | • CDI-RJ45 service interface<br>• WLAN interface<br>• Fieldbus protocol | → 🖥 109 |

| Supported operating tools | Operating unit | Interface | Additional information |
|---|---|---|---|
| FieldCare SFE500 | Notebook, PC or tablet with Microsoft Windows system | • CDI-RJ45 service interface<br>• WLAN interface<br>• Fieldbus protocol | → 🖺 109 |
| Device Xpert | Field Xpert SFX 100/350/370 | HART and FOUNDATION Fieldbus fieldbus protocol | Operating Instructions BA01202S<br><br>Device description files: Use update function of handheld terminal |

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

The associated device description files are available at: www.endress.com → Downloads

**Web server**

Thanks to the integrated Web server, the device can be operated and configured via a Web browser and via a service interface (CDI-RJ45) or via a 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 also displayed and allows the user to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

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 the measuring device:

- Upload the configuration from the measuring device (XML format, configuration backup)
- Save the configuration to the measuring device (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 verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package → 🖺 106)

Web server special documentation → 🖺 111

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:*

|  | Device memory | T-DAT | S-DAT |
|---|---|---|---|
| Available data | • Event logbook such as diagnostic events for example<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>• Peakhold indicator (min/max values)<br>• Totalizer values | • Sensor data: nominal diameter etc.<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 board in the connection compartment | Attachable to the user interface 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 transfer**

**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:
- Record up to 1 000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

# Certificates and approvals

Currently available certificates and approvals can be called up via the product configurator.

| 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. |

| RCM-tick symbol | The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)". |
|---|---|

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

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

**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 |
| II(1)G | [Ex ia] IIC | II2G | Ex ia IIC T6...T1 Gb |
| II3(1)G | Ex ec [ia Ga] IIC T5...T4 Gc | II1/2G | Ex ia IIC T6...T1 Ga/Gb |
| II3(1)G | Ex ec [ia Ga] IIC T5...T4 Gc | II2G | Ex ia IIC 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 |

*cCSAUS*

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 |

*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 |
| Class I, Zone 2 AEx/ Ex nA [ia Ga] IIC T5...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC 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 IIC T6...T4 Gb | II2G | Ex ia IIC 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 IIC T6...T4 Gb | II2G | Ex ia IIC 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, III, III Division 1 Groups A-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 IIC T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC 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 IIC T6...T4 Gb | Class I, Zone 1 AEx/ Ex ia IIC 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 |

**Functional safety**

The measuring device can be used for flow monitoring systems (min., max., range) up to SIL 2 (single-channel architecture; order code for "Additional approval", option LA) and SIL 3 (multichannel architecture with homogeneous redundancy) and is independently evaluated and certified by the TÜV in accordance with IEC 61508.

The following types of monitoring in safety equipment are possible:
- Mass flow
- Volume flow
- Density

Functional Safety Manual with information on the SIL device → 🖹 110

| | |
|---|---|
| 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 User Organization Organization). The measuring system meets all the requirements of the following specifications: |
| | • Certified in accordance with PROFIBUS 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 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 |
| | • The device can also be operated with certified devices of other manufacturers (interoperability) |
| | • The device supports PROFINET S2 system redundancy. |
| Radio approval | The measuring device has radio approval. |
| | For detailed information regarding radio approval, see Special Documentation → 🔲 111 |
| Additional certification | **CRN approval** |
| | Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device. |
| | **Tests and certificates** |
| | • EN10204-3.1 material certificate, parts and sensor housing in contact with medium |
| | • Pressure testing, internal procedure, inspection certificate |
| | • PMI test (XRF), internal procedure, wetted parts, test report |
| Other standards and guidelines | • EN 60529 |
| | Degrees of protection provided by enclosures (IP code) |
| | • IEC/EN 60068-2-6 |
| | Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal). |
| | • IEC/EN 60068-2-31 |
| | Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices. |
| | • EN 61010-1 |
| | Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements |

- IEC/EN 61326
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 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

# Ordering information

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

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.

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

# Application packages

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

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

Detailed information on the application packages:
Special Documentation for the device → 🖺 110

**Diagnostics functions**

| Package | Description |
|---|---|
| Extended HistoROM | Comprises extended functions concerning the event log and the activation of the measured value memory.<br><br>Event log:<br>Memory volume is extended from 20 message entries (standard version) to up to 100 entries.<br><br>Data logging (line recorder):<br>• Memory capacity for up to 1000 measured values is activated.<br>• 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user.<br>• Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server. |

**Heartbeat Technology**

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

**Concentration**

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

**Special density**

| Package | Description |
|---|---|
| Special density | Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.<br>The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions. |

**OPC-UA server**

| Package | Description |
|---|---|
| OPC-UA-Server | The application package provides the user with an integrated OPC-UA server for comprehensive instrument services for IoT and SCADA applications.<br><br>📖 Special Documentation for the "OPC-UA-Server" application package → 🖹 111. |

# 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><br>• Proline 500 – digital transmitter:<br>  Order number: 8X5BXX-*********A<br>• Proline 500 transmitter:<br>  Order number: 8X5BXX-*********B<br><br>Proline 500 transmitter for replacement:<br>It is essential to specify the serial number of the current transmitter when ordering. Based on the serial number, the device-specific data (e.g., calibration factors) of the replacement device can be used for the new transmitter.<br><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><br>• The external WLAN antenna is not suitable for use in hygienic applications.<br>• Further information on the WLAN interface → 🖺 96.<br><br>Order number: 71351317<br><br>Installation Instructions EA01238D |
| Pipe mounting set | Pipe mounting set for transmitter.<br><br>Proline 500 – digital transmitter<br>Order number: 71346427<br><br>Installation Instructions EA01195D<br><br>Proline 500 transmitter<br>Order number: 71346428 |
| Protective cover<br><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><br>• Proline 500 – digital transmitter<br>  Order number: 71343504<br>• Proline 500 transmitter<br>  Order number: 71343505<br><br>Installation Instructions EA01191D |
| Display guard<br>Proline 500 – digital | Is used to protect the display against impact or scoring from sand in desert areas.<br><br>Order number: 71228792<br><br>Installation Instructions EA01093D |

| Connecting cable Proline 500 – digital Sensor – 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). |
| --- | --- |
| | 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 |
| | ⓘ  Maximum possible cable length for a Proline 500 – digital connecting cable: 300 m (1000 ft) |
| Connecting cable Proline 500 Sensor – 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). |
| | 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) |
| | ⓘ  Possible cable length for a Proline 500 connecting cable: max. 20 m (65 ft) |

**Communication-specific accessories**

| Accessories | Description |
| --- | --- |
| Commubox FXA195 HART | For intrinsically safe HART communication with FieldCare via the USB interface.<br>📖  Technical Information TI00404F |
| HART Loop Converter HMX50 | Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.<br>📖  • Technical Information TI00429F<br>• Operating Instructions BA00371F |
| Fieldgate FXA42 | Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices<br>📖  • Technical Information TI01297S<br>• Operating Instructions BA01778S<br>• Product page: www.endress.com/fxa42 |
| Field Xpert SMT70 | The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.<br>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.<br>📖  • Technical Information TI01342S<br>• Operating Instructions BA01709S<br>• Product page: www.endress.com/smt70 |
| Field Xpert SMT77 | The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.<br>📖  • Technical Information TI01418S<br>• Operating Instructions BA01923S<br>• Product page: www.endress.com/smt77 |

**Service-specific accessories**

| Accessories | Description |
|---|---|
| Applicator | Software for selecting and sizing Endress+Hauser measuring devices:<br>• Choice of measuring devices for industrial requirements<br>• Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy.<br>• Graphic illustration 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><br>Applicator is available:<br>• Via the Internet: https://portal.endress.com/webapp/applicator<br>• As a downloadable DVD for local PC installation. |
| W@M | W@M Life Cycle Management<br>Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle.<br>W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime.<br>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement |
| FieldCare | FDT-based plant asset management tool from Endress+Hauser.<br>It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.<br><br>📖 Operating Instructions BA00027S and BA00059S |
| DeviceCare | Tool to connect and configure Endress+Hauser field devices.<br><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><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><br>📖 • Technical Information TI00426P and TI00436P<br>• Operating Instructions BA00200P and BA00382P |
| Cerabar S | The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.<br><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><br>📖 "Fields of Activity" document FA00006T |

# Supplementary documentation

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

**Standard documentation**  **Brief Operating Instructions**

*Brief Operating Instructions for the sensor*

| Measuring device | Documentation code |
|---|---|
| Proline Cubemass C | KA01217D |

*Brief Operating Instructions for transmitter*

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

**Operating Instructions**

| Measuring device | Documentation code | | | | | | |
|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Cubemass C 500 | BA01527 D | BA01560D | BA01549D | BA01871D | BA01538D | BA01748D | BA01759D |

**Description of Device Parameters**

| Measuring device | Documentation code | | | | | | |
|---|---|---|---|---|---|---|---|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Cubemass 500 | GP01089D | GP01097D | GP01090D | GP01139D | GP01091D | GP01122D | GP01123D |

**Device-dependent additional documentation**  **Safety instructions**

Safety instructions for electrical equipment for hazardous areas.

| Contents | Documentation code / Measuring device |
|---|---|
| ATEX/IECEx Ex i | XA01487D |
| ATEX/IECEx Ex ec | XA01488D |
| cCSAus IS | XA01489D |
| cCSAus Ex i | XA01511D |
| cCSAus Ex nA | XA01512D |
| INMETRO Ex i | XA01491D |
| INMETRO Ex ec | XA01490D |
| NEPSI Ex i | XA01492D |

| Contents | Documentation code |
|---|---|
| | Measuring device |
| NEPSI Ex nA | XA01493D |
| JPN | XA01779D |

**Special Documentation**

| Contents | Documentation code |
|---|---|
| Information on the Pressure Equipment Directive | SD01614D |
| Functional Safety Manual | SD01728D |
| Radio approvals for WLAN interface for A309/A310 display module | SD01793D |
| OPC-UA Server [1] | SD02042D |

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 |
| Web server | SD01674D | SD01677D | SD01676D | SD02234D | SD01675D | SD01975D | SD01974D |
| Heartbeat Technology | SD01700D | SD01699D | SD01702D | SD02205D | SD01701D | SD01991D | SD01985D |
| Concentration measurement | SD01716D | SD01717D | SD01719D | SD02215D | SD01718D | SD02011D | SD02010D |

**Installation Instructions**

| Contents | Comment |
|---|---|
| Installation instructions for spare part sets and accessories | Documentation code: specified for each individual accessory → 🗐 107. |

# Registered trademarks

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

**PROFIBUS®**
Registered trademark of the 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.

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

Endress+Hauser

People for Process Automation

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