

Technical Information

Proline Promass I 300

Coriolis flowmeter



Combines in-line viscosity and flow measurement with a compact, easily accessible transmitter

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Measuring liquids and gases in applications requiring low pressure loss and gentle fluid treatment

Device properties

- Straight, easy-to-clean single-tube system
- TMB technology
- Measuring tube made of Titanium
- Compact dual-compartment housing with up to 3 I/Os
- Backlit display with touch control and WLAN access
- Remote display available

Your benefits

- Energy-saving – full-bore design enables minimal pressure loss
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in-/outlet run needs
- Full access to process and diagnostic information – numerous, freely combinable I/Os and Ethernet
- Reduced complexity and variety – freely configurable I/O functionality
- Integrated verification – Heartbeat Technology

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

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About this document

Symbols









Electrical symbols

| Symbol | Meaning |
|---|--|
|  | Direct current |
|  | Alternating current |
|  | Direct current and alternating current |
|  | Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
|  | Potential equalization connection (PE: protective earth) Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: <ul style="list-style-type: none"> ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system. |




Communication-specific symbols

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

Symbols for certain types of information

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

Symbols in graphics

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

Function and system design

Measuring principle

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

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

F_c = Coriolis force

Δm = moving mass

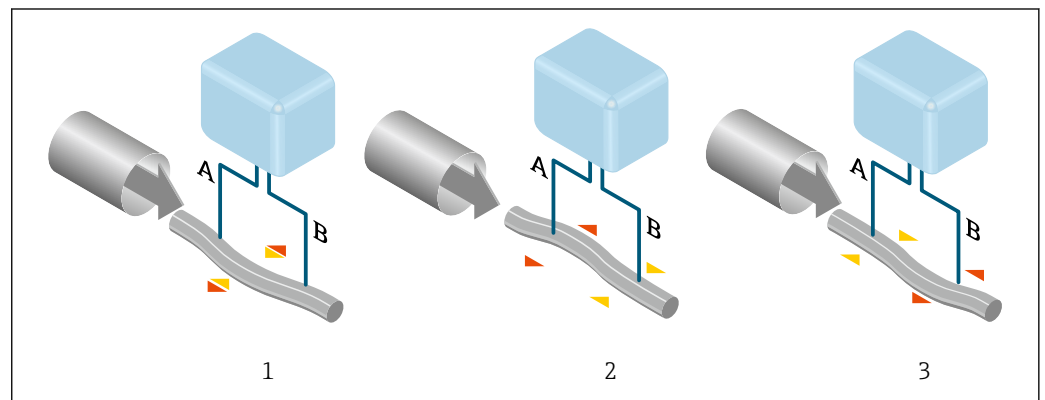
ω = rotational velocity

v = radial velocity in rotating or oscillating system

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

In the sensor, an oscillation is produced in the measuring tube. The Coriolis forces produced at the measuring tube cause a phase shift in the tube oscillations (see illustration):

- If there is zero flow (i.e. when the fluid stands still), the oscillation measured at points A and B has the same phase (no phase difference) (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 an eccentrically arranged swinging mass. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement

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

Volume measurement

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

Temperature measurement

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

Gas Fraction Handler (GFH)

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



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



For detailed information on the Gas Fraction Handler, see the Special Documentation for "Gas Fraction Handler" → 114

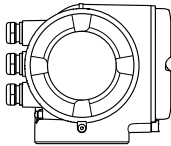
Measuring system

The device consists of a transmitter and a sensor.

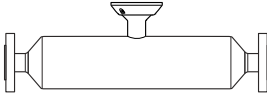
The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

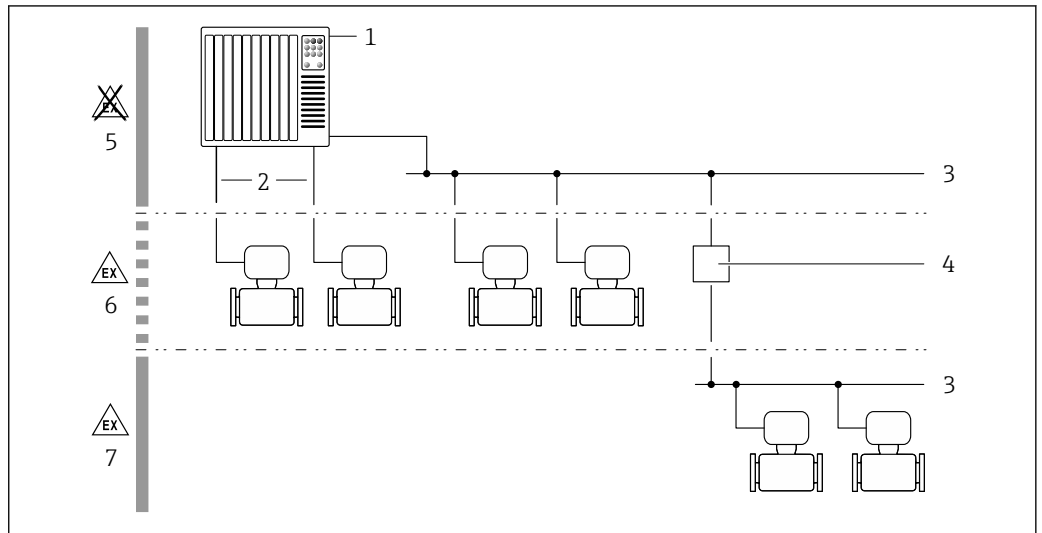
Transmitter

| | |
|---|---|
| <p>Proline 300</p>  <p>A0026708</p> | <p>Device versions and materials:</p> <ul style="list-style-type: none"> ▪ Transmitter housing <ul style="list-style-type: none"> ▪ Aluminum, coated: aluminum, AlSi10Mg, coated ▪ Stainless, hygienic: stainless steel, 1.4404 ▪ Cast, stainless: cast, stainless steel, 1.4409 (CF3M) similar to 316L ▪ Material of window in transmitter housing: <ul style="list-style-type: none"> ▪ Aluminum, coated: glass ▪ Stainless, hygienic: polycarbonate ▪ Cast, stainless: glass <p>Configuration:</p> <ul style="list-style-type: none"> ▪ External operation via 4-line, illuminated graphic local display (LCD) with touch control and guided menus ("Make-it-run" wizards) for application-specific commissioning. ▪ Via service interface or WLAN interface: <ul style="list-style-type: none"> ▪ Operating tools (e.g. FieldCare, DeviceCare) ▪ Web server (access via Web browser, e.g. Microsoft Internet Explorer, Microsoft Edge) |
|---|---|

Sensor

| | |
|---|---|
| <p>Promass I</p>  <p>A0026709</p> | <ul style="list-style-type: none"> ▪ Sensitive fluid handling thanks to straight single-tube system ▪ Simultaneous measurement of viscosity, flow, volume flow, density and temperature (multivariable) ▪ Immune to process influences ▪ Nominal diameter range: DN 8 to 80 (3/8 to 3") ▪ Materials: <ul style="list-style-type: none"> ▪ Sensor: stainless steel, 1.4301 (304) ▪ Measuring tubes: titanium Grade 9 ▪ Process connections: stainless steel, 1.4301 (304), wetted parts: titanium Grade 2 |
|---|---|

Equipment architecture



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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

Security

IT security

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

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

Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. 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 → 8 | Not enabled | On an individual basis following risk assessment |
| Access code (also applies for Web server login or FieldCare connection) → 8 | 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) → 8 | Serial number | Assign a customized WLAN passphrase during commissioning |
| WLAN mode | Access point | On an individual basis following risk assessment |
| Web server → 8 | Enabled | On an individual basis following risk assessment |
| CDI-RJ45 service interface → 9 | - | On an individual basis following risk assessment |

Protecting access via hardware write protection

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

Hardware write protection is disabled when the device is delivered.

Protecting access via a password

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

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

User-specific access code

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

WLAN passphrase: Operation as WLAN access point

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

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

Infrastructure mode

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

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- 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, PROFINET (RJ45 plug) or PROFINET with Ethernet-APL (two-wire).



The Web server is enabled when the device is delivered. The Web server can be disabled 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 → 114

Access via OPC-UA

 The "OPC UA Server" application package is available in the device version with the HART communication protocol →  110.

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 incorporated 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) .

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature
- Viscosity

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

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

FB = Full bore

Measuring 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:



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

- $\dot{m}_{\max(G)} = \text{minimum} (\dot{m}_{\max(F)} \cdot \rho_G : X)$
- $\dot{m}_{\max(G)} = \text{minimum} (\rho_G \cdot (c_G/2) \cdot d_i^2 \cdot (\pi/4) \cdot 3600 \cdot n)$

| | |
|---|---|
| $\dot{m}_{\max(G)}$ | Maximum full scale value for gas [kg/h] |
| $\dot{m}_{\max(F)}$ | Maximum full scale value for liquid [kg/h] |
| $\dot{m}_{\max(G)} < \dot{m}_{\max(F)}$ | $\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$ |
| ρ_G | Gas density in [kg/m ³] at operating conditions |
| x | Limitation constant for max. gas flow [kg/m ³] |
| c_G | Sound velocity (gas) [m/s] |
| d_i | Measuring tube internal diameter [m] |
| π | Pi |
| $n = 1$ | Number of measuring tubes |

| DN | | x |
|-------|-------------------|----------------------|
| [mm] | [in] | [kg/m ³] |
| 8 | $\frac{3}{8}$ | 60 |
| 15 | $\frac{1}{2}$ | 80 |
| 15 FB | $\frac{1}{2}$ FB | 90 |
| 25 | 1 | 90 |
| 25 FB | 1 FB | 90 |
| 40 | $1\frac{1}{2}$ | 90 |
| 40 FB | $1\frac{1}{2}$ FB | 90 |
| 50 | 2 | 90 |
| 50 FB | 2 FB | 110 |
| 80 | 3 | 110 |



FB = Full bore

 To calculate the measuring range, use the *Applicator* sizing tool →  112

If calculating the full scale value using the two formulas:

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

Recommended measuring range

 Flow limit →  64

Operable flow range

Over 1000 : 1.

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

Input signal

Output and input variants

→  13

External measured values

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

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

 Various pressure and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section →  113


It is recommended to read in external measured values to calculate the corrected volume flow.

HART protocol

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

- HART protocol
- Burst mode

Current input

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

Digital communication

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

- FOUNDATION Fieldbus
- PROFIBUS DP
- PROFIBUS PA
- Modbus RS485
- EtherNet/IP
- PROFINET
- PROFINET with Ethernet-APL

Current input 0/4 to 20 mA

| | |
|---------------------------------|---|
| Current input | 0/4 to 20 mA (active/passive) |
| Current span | <ul style="list-style-type: none"> ▪ 4 to 20 mA (active) ▪ 0/4 to 20 mA (passive) |
| Resolution | 1 μ A |
| 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 | <ul style="list-style-type: none"> ▪ Pressure ▪ Temperature ▪ Density |

Status input

| | |
|-----------------------------|--|
| Maximum input values | <ul style="list-style-type: none"> ▪ DC -3 to 30 V ▪ If status input is active (ON): $R_i > 3$ kΩ |
| Response time | Configurable: 5 to 200 ms |
| Input signal level | <ul style="list-style-type: none"> ▪ Low signal: DC -3 to +5 V ▪ High signal: DC 12 to 30 V |
| Assignable functions | <ul style="list-style-type: none"> ▪ Off ▪ Reset the individual totalizers separately ▪ Reset all totalizers ▪ 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 3. 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.

Output/input 1 and options for output/input 2

 Options for output/input 3 →  14

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

- 1) A specific input or output can be assigned to a user-configurable input/output →  20.
- 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


 Options for output/input 2 →  13

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

1) If double pulse output (F) is selected for output/input 2 (021), only the double pulse output (F) option is available for output/input 3 (022).


Output signal

Current output 4 to 20 mA HART

| | |
|--------------------------------------|--|
| Order code | "Output; input 1" (20): Option BA: current output 4 to 20 mA HART |
| Signal mode | Can be set to: <ul style="list-style-type: none"> ■ Active ■ Passive |
| Current range | Can be set to: <ul style="list-style-type: none"> ■ 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 |
| Open-circuit voltage | DC 28.8 V (active) |
| Maximum input voltage | DC 30 V (passive) |
| Load | 250 to 700 Ω |
| Resolution | 0.38 μ A |
| Damping | Configurable: 0 to 999.9 s |
| Assignable measured variables | <ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Electronics temperature ■ Oscillation frequency 0 ■ Oscillation damping 0 ■ Signal asymmetry ■ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p> |

Current output 4 to 20 mA HART Ex i

| | |
|------------------------------|---|
| Order code | "Output; input 1" (20) choose from: <ul style="list-style-type: none"> ■ Option CA: current output 4 to 20 mA HART Ex i passive ■ 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: <ul style="list-style-type: none"> ■ 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 |
| Open-circuit voltage | DC 21.8 V (active) |
| Maximum input voltage | DC 30 V (passive) |
| Load | <ul style="list-style-type: none"> ■ 250 to 400 Ω (active) ■ 250 to 700 Ω (passive) |
| Resolution | 0.38 μ A |

| | |
|--------------------------------------|--|
| Damping | Configurable: 0 to 999.9 s |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p> |

FOUNDATION Fieldbus

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

PROFIBUS DP

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

PROFIBUS PA

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

Modbus RS485

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

EtherNet/IP

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

PROFINET

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


PROFINET with Ethernet-APL

| | |
|---------------------------------|--|
| Device use | <p>Device connection to an APL field switch The device may only be operated according to the following APL port classifications:</p> <ul style="list-style-type: none"> ▪ If used in hazardous areas: SLAA or SLAC ¹⁾ ▪ If used in non-hazardous areas: SLAX <p>Connection values of APL field switch (corresponds to APL port classification SPCC or SPAA, for instance):</p> <ul style="list-style-type: none"> ▪ Maximum input voltage: 15 V_{DC} ▪ Minimum output values: 0.54 W <p>Device connection to an SPE switch The device may only be operated according to the following PoDL power class: If used in the non-hazardous area: PoDL power class 10</p> <p>Connection values of SPE switch (corresponds to PoDL power class 10, 11 or 12):</p> <ul style="list-style-type: none"> ▪ Maximum input voltage: 30 V_{DC} ▪ Minimum output values: 1.85 W |
| PROFINET | According to IEC 61158 and IEC 61784 |
| Ethernet-APL | According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated |
| Data transfer | 10 Mbit/s |
| Current consumption | <p>Transmitter</p> <ul style="list-style-type: none"> ▪ Max. 400 mA(24 V) ▪ Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz) |
| Permitted supply voltage | 9 to 30 V |
| Network connection | With integrated reverse polarity protection |


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

Current output 4 to 20 mA


| | |
|------------------------------|---|
| Order code | "Output; input 2" (21), "Output; input 3" (022): Option B: current output 4 to 20 mA |
| Signal mode | Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive |
| Current span | Can be set to: <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p> |

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: <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p> |

Pulse/frequency/switch output


| | |
|-----------------------------|--|
| Function | Can be configured as pulse, frequency or switch output |
| Version | Open collector Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive ▪ Passive NAMUR <p> Ex-i, passive</p> |
| Maximum input values | DC 30 V, 250 mA (passive) |
| Open-circuit voltage | DC 28.8 V (active) |
| Voltage drop | For 22.5 mA: ≤ DC 2 V |

| Pulse output | |
|-------------------------------|--|
| Maximum input values | DC 30 V, 250 mA (passive) |
| Maximum output current | 22.5 mA (active) |
| Open-circuit voltage | DC 28.8 V (active) |
| Pulse width | Configurable: 0.05 to 2 000 ms |
| Maximum pulse rate | 10 000 Impulse/s |
| Pulse value | Configurable |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ 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 | Configurable: end value frequency 2 to 10 000 Hz($f_{max} = 12\,500$ Hz) |
| Damping | Configurable: 0 to 999.9 s |
| Pulse/pause ratio | 1:1 |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p> |
| 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 style="list-style-type: none"> ▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit value <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1-3 ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> ▪ Partially filled pipe detection ▪ Low flow cut off <p> The range of options increases if the measuring device has one or more application packages.</p> |

Double pulse output

| | |
|--------------------------------------|--|
| Function | Double pulse |
| Version | Open collector Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive ▪ Passive NAMUR |
| Maximum input values | DC 30 V, 250 mA (passive) |
| Open-circuit voltage | DC 28.8 V (active) |
| Voltage drop | For 22.5 mA: ≤ DC 2 V |
| Output frequency | Configurable: 0 to 1 000 Hz |
| Damping | Configurable: 0 to 999 s |
| Pulse/pause ratio | 1:1 |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature <p> The range of options increases if the measuring device has one or more application packages.</p> |

Relay output

| | |
|---|--|
| Function | Switch output |
| Version | Relay output, galvanically isolated |
| Switching behavior | Can be set to: <ul style="list-style-type: none"> ▪ NO (normally open), factory setting ▪ NC (normally closed) |
| Maximum switching capacity (passive) | <ul style="list-style-type: none"> ▪ DC 30 V, 0.1 A ▪ AC 30 V, 0.5 A |
| Assignable functions | <ul style="list-style-type: none"> ▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit value <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1-3 ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> ▪ Partially filled pipe detection ▪ Low flow cut off <p> The range of options increases if the measuring device has one or more application packages.</p> |

User-configurable input/output

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

The following inputs and outputs are available for assignment:

- Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Pulse/frequency/switch output
- Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Status input

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

Signal on alarm

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

HART current output

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

PROFIBUS PA

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

PROFIBUS DP

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

EtherNet/IP

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

PROFINET

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

PROFINET with Ethernet-APL

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

FOUNDATION Fieldbus

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

Modbus RS485

| | |
|---------------------|---|
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ NaN value instead of current value ■ Last valid value |
|---------------------|---|

Current output 0/4 to 20 mA*4 to 20 mA*

| | |
|---------------------|--|
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ■ 4 to 20 mA in accordance with US ■ Min. value: 3.59 mA ■ Max. value: 22.5 mA ■ Freely definable value between: 3.59 to 22.5 mA ■ Actual value ■ Last valid value |
|---------------------|--|

0 to 20 mA

| | |
|---------------------|---|
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ Maximum alarm: 22 mA ■ Freely definable value between: 0 to 20.5 mA |
|---------------------|---|

Pulse/frequency/switch output

| Pulse output | |
|---------------------|---|
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ Actual value ■ No pulses |
| Frequency output | |
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ Actual value ■ 0 Hz ■ Defined value (f_{\max} 2 to 12 500 Hz) |
| Switch output | |
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ Closed |

Relay output

| | |
|---------------------|---|
| Failure mode | Choose from: <ul style="list-style-type: none"> ■ Current status ■ Open ■ 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
 - PROFINET with Ethernet-APL
- Via service interface
 - CDI-RJ45 service interface
 - WLAN interface

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

 Additional information on remote operation →  93

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: <ul style="list-style-type: none"> ■ Supply voltage active ■ Data transmission active ■ Device alarm/error has occurred ■ EtherNet/IP network available ■ EtherNet/IP connection established ■ PROFINET network available ■ PROFINET connection established ■ PROFINET blinking feature |
|---------------------------|--|

Load Output signal →  15

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 | $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$ | |
| Option GA | PROFIBUS PA | $U_N = 32 V_{DC}$ $U_M = 250 V_{AC}$ | |
| Option LA | PROFIBUS DP | $U_N = 32 V_{DC}$ $U_M = 250 V_{AC}$ | |
| Option MA | Modbus RS485 | $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$ | |
| Option SA | FOUNDATION Fieldbus | $U_N = 32 V_{DC}$ $U_M = 250 V_{AC}$ | |
| Option NA | EtherNet/IP | $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$ | |

| Order code for "Output; input 1" | Output type | Safety-related values "Output; input 1" | |
|-------------------------------------|--------------------------------|---|--------|
| | | 26 (+) | 27 (-) |
| Option RA | PROFINET | $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$ | |
| Option RB | PROFINET with Ethernet- APL | APL port profile SLAX SPE PoDL classes 10, 11, 12 $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$ | |

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

Intrinsically safe values

| Order code "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 | $U_i = 30 V$ $I_i = 100 mA$ $P_i = 1.25 W$ $L_i = 0 \mu H$ $C_i = 6 nF$ | |
| Option CC | Current output 4 to 20 mA HART Ex i active | Ex ia ¹⁾ $U_0 = 21.8 V$ $I_0 = 90 mA$ $P_0 = 491 mW$ $L_0 = 4.1 mH (IIC)/15 mH (IIB)$ $C_0 = 160 nF (IIC)/1160 nF (IIB)$ $U_i = 30 V$ $I_i = 10 mA$ $P_i = 0.3 W$ $L_i = 5 \mu H$ $C_i = 6 nF$ | Ex ic ²⁾ $U_0 = 21.8 V$ $I_0 = 90 mA$ $P_0 = 491 mW$ $L_0 = 9 mH (IIC)/39 mH (IIB)$ $C_0 = 600 nF (IIC)/4000 nF (IIB)$ |

| Order code "Output; input 1" | Output type | Intrinsically safe values "Output; input 1" | |
|---------------------------------|--|---|---|
| | | 26 (+) | 27 (-) |
| Option HA | PROFIBUS PA Ex i (FISCO Field Device) | Ex ia ¹⁾ U _i = 30 V I _i = 570 mA P _i = 8.5 W L _i = 10 µH C _i = 5 nF | Ex ic ²⁾ U _i = 32 V I _i = 570 mA P _i = 8.5 W L _i = 10 µH C _i = 5 nF |
| Option TA | FOUNDATION Fieldbus Ex i | Ex ia ¹⁾ U _i = 30 V I _i = 570 mA P _i = 8.5 W L _i = 10 µH C _i = 5 nF | Ex ic ²⁾ U _i = 32 V I _i = 570 mA P _i = 8.5 W L _i = 10 µH C _i = 5 nF |
| Option RC | PROFINET with Ethernet- APL Ex i | Ex ia ¹⁾ 2-WISE power load APL port profile SLAA | Ex ic ²⁾ 2-WISE power load APL port profile SLAC |

- 1) Only available for Proline 500 transmitter Zone 1; Class I, Division 1.
 2) Only available for transmitter Zone 2; Class I, Division 2.

| Order code for "Output; input 2"; "Output; input 3" | Output type | Intrinsically safe values or NIFW values | | | |
|---|---|---|--------|-----------------|--------|
| | | Output; input 2 | | Output; input 3 | |
| | | 24 (+) | 25 (-) | 22 (+) | 23 (-) |
| Option C | Current output 4 to 20 mA Ex i passive | U _i = 30 V I _i = 100 mA P _i = 1.25 W L _i = 0 C _i = 0 | | | |
| Option G | Pulse/frequency/switch output Ex i passive | U _i = 30 V I _i = 100 mA P _i = 1.25 W L _i = 0 C _i = 0 | | | |

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


Galvanic isolation The outputs are galvanically isolated:

- from the power supply
- from one another
- from the potential equalization (PE) terminal

Protocol-specific data HART




| | |
|---------------------------------------|--|
| Manufacturer ID | 0x11 |
| Device type ID | 0x3B |
| HART protocol revision | 7 |
| Device description files (DTM, DD) | Information and files under: www.endress.com |
| HART load | Min. 250 Ω |
| System integration | Information on system integration: Operating Instructions → 113. <ul style="list-style-type: none"> ▪ Measured variables via HART protocol ▪ Burst Mode functionality |

FOUNDATION Fieldbus

| | |
|---|--|
| Manufacturer ID | 0x452B48 (hex) |
| Ident number | 0x103B (hex) |
| Device revision | 1 |
| DD revision | Information and files under: |
| CFF revision | <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.fieldcommgroup.org |
| Interoperability Test Kit (ITK) | Version 6.2.0 |
| ITK Test Campaign Number | Information: <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.fieldcommgroup.org |
| Link Master capability (LAS) | Yes |
| Choice of "Link Master" and "Basic Device" | Yes Factory setting: Basic Device |
| Node address | Factory setting: 247 (0xF7) |
| Supported functions | The following methods are supported: <ul style="list-style-type: none"> ▪ Restart ▪ ENP Restart ▪ Diagnostic ▪ Set to OOS ▪ Set to AUTO ▪ Read trend data ▪ 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 →  113. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Description of the modules ▪ Execution times ▪ Methods |




PROFIBUS DP

| | |
|-----------------|--------|
| Manufacturer ID | 0x11 |
| Ident number | 0x156F |
| Profile version | 3.02 |


| | |
|--|--|
| Device description files (GSD, DTM, DD) | <p>Information and files under:</p> <ul style="list-style-type: none"> ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com |
| Supported functions | <ul style="list-style-type: none"> ▪ Identification & Maintenance Simplest device identification on the part of the control system and nameplate ▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download ▪ Condensed status Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur |
| Configuration of the device address | <ul style="list-style-type: none"> ▪ DIP switches on the I/O electronics module ▪ Via operating tools (e.g. FieldCare) |
| Compatibility with earlier model | <p>If the device is replaced, the measuring device Promass 300 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 300 GSD file.</p> <p>Previous model: Promass 83 PROFIBUS DP</p> <ul style="list-style-type: none"> ▪ ID No.: 1529 (hex) ▪ Extended GSD file: EH3x1529.gsd ▪ Standard GSD file: EH3_1529.gsd <p> Description of the function scope of compatibility: Operating Instructions →  113.</p> |
| System integration | <p>Information regarding system integration: Operating Instructions →  113.</p> <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Block model ▪ Description of the modules |




PROFIBUS PA

| | |
|--|--|
| Manufacturer ID | 0x11 |
| Ident number | 0x156D |
| Profile version | 3.02 |
| Device description files (GSD, DTM, DD) | <p>Information and files under:</p> <ul style="list-style-type: none"> ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com |
| Supported functions | <ul style="list-style-type: none"> ▪ Identification & Maintenance Simplest device identification on the part of the control system and nameplate ▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download ▪ Condensed status Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur |
| Configuration of the device address | <ul style="list-style-type: none"> ▪ DIP switches on the I/O electronics module ▪ Local display ▪ Via operating tools (e.g. FieldCare) |


| | |
|---|---|
| Compatibility with earlier model | <p>If the device is replaced, the measuring device Promass 300 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 300 GSD file.</p> <p>Earlier models:</p> <ul style="list-style-type: none"> ▪ Promass 80 PROFIBUS PA <ul style="list-style-type: none"> ▪ ID No.: 1528 (hex) ▪ Extended GSD file: EH3x1528.gsd ▪ Standard GSD file: EH3_1528.gsd ▪ Promass 83 PROFIBUS PA <ul style="list-style-type: none"> ▪ ID No.: 152A (hex) ▪ Extended GSD file: EH3x152A.gsd ▪ Standard GSD file: EH3_152A.gsd <p> Description of the function scope of compatibility: Operating Instructions →  113.</p> |
| System integration | <p>Information regarding system integration: Operating Instructions →  113.</p> <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Block model ▪ Description of the modules |

Modbus RS485

| | |
|--------------------------------|--|
| Protocol | Modbus Applications Protocol Specification V1.1 |
| Response times | <ul style="list-style-type: none"> ▪ Direct data access: typically 25 to 50 ms ▪ 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 | <ul style="list-style-type: none"> ▪ 03: Read holding register ▪ 04: Read input register ▪ 06: Write single registers ▪ 08: Diagnostics ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers |
| Broadcast messages | <p>Supported by the following function codes:</p> <ul style="list-style-type: none"> ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers |
| Supported baud rate | <ul style="list-style-type: none"> ▪ 1 200 BAUD ▪ 2 400 BAUD ▪ 4 800 BAUD ▪ 9 600 BAUD ▪ 19 200 BAUD ▪ 38 400 BAUD ▪ 57 600 BAUD ▪ 115 200 BAUD |
| Data transfer mode | <ul style="list-style-type: none"> ▪ ASCII ▪ RTU |
| Data access | <p>Each device parameter can be accessed via Modbus RS485.</p> <p> For Modbus register information</p> |


| | |
|---|--|
| Compatibility with earlier model | <p>If the device is replaced, the measuring device Promass 300 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.</p> <p> Description of the function scope of compatibility: Operating Instructions →  113.</p> |
| System integration | <p>Information on system integration: Operating Instructions →  113.</p> <ul style="list-style-type: none"> ▪ Modbus RS485 information ▪ Function codes ▪ Register information ▪ Response time ▪ Modbus data map |

EtherNet/IP

| | |
|---|--|
| Protocol | <ul style="list-style-type: none"> ▪ The CIP Networks Library Volume 1: Common Industrial Protocol ▪ The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP |
| Communication type | <ul style="list-style-type: none"> ▪ 10Base-T ▪ 100Base-TX |
| Device profile | Generic device (product type: 0x2B) |
| Manufacturer ID | 0x000049E |
| Device type ID | 0x103B |
| Baud rates | Automatic ¹⁰ / ₁₀₀ Mbit with half-duplex and full-duplex detection |
| Polarity | Auto-polarity for automatic correction of crossed Tx/D and Rx/D pairs |
| Supported CIP connections | Max. 3 connections |
| Explicit connections | Max. 6 connections |
| I/O connections | Max. 6 connections (scanner) |
| Configuration options for measuring device | <ul style="list-style-type: none"> ▪ DIP switches on the electronics module for IP addressing ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Electronic Data Sheet (EDS) integrated in the measuring device |
| Configuration of the EtherNet interface | <ul style="list-style-type: none"> ▪ Speed: 10 MBit, 100 MBit, auto (factory setting) ▪ Duplex: half-duplex, full-duplex, auto (factory setting) |
| Configuration of the device address | <ul style="list-style-type: none"> ▪ DIP switches on the electronics module for IP addressing (last octet) ▪ DHCP ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ EtherNet/IP tools, e.g. RSLinx (Rockwell Automation) |
| Device Level Ring (DLR) | Yes |
| System integration | <p>Information regarding system integration: Operating Instructions →  113.</p> <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Block model ▪ Input and output groups |


PROFINET

| | |
|---------------------------|---|
| Protocol | Application layer protocol for decentral device periphery and distributed automation, Version 2.3 |
| Communication type | 100 MBit/s |
| Conformance Class | Conformance Class B |
| Netload Class | Netload Class 2 0 Mbps |

| | |
|---|---|
| Baud rates | Automatic 100 Mbit/s with full-duplex detection |
| Cycle times | From 8 ms |
| Polarity | Auto-polarity for automatic correction of crossed TxD and RxD pairs |
| Media Redundancy Protocol (MRP) | Yes |
| System redundancy support | System redundancy S2 (2 AR with 1 NAP) |
| Device profile | Application interface identifier 0xF600 Generic device |
| Manufacturer ID | 0x11 |
| Device type ID | 0x843B |
| Device description files (GSD, DTM, DD) | Information and files under: <ul style="list-style-type: none"> ▪ www.endress.com On the product page for the device: Documents/Software → Device drivers ▪ www.profibus.com |
| Supported connections | <ul style="list-style-type: none"> ▪ 2 x AR (IO Controller AR) ▪ 1 x AR (IO-Supervisor Device AR connection allowed) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation) |
| Configuration options for measuring device | <ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server via Web browser and IP address ▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device. ▪ Onsite operation |
| Configuration of the device name | <ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server |
| Supported functions | <ul style="list-style-type: none"> ▪ Identification & Maintenance, simple device identifier via: <ul style="list-style-type: none"> ▪ Control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature via the local display for simple device identification and assignment ▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM) |
| System integration | Information regarding system integration: Operating Instructions →  113. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Overview and description of the modules ▪ Status coding ▪ Startup configuration ▪ Factory setting |

PROFINET with Ethernet-APL

| | |
|---------------------------|---|
| Protocol | Application layer protocol for decentral device periphery and distributed automation, Version 2.4 |
| Communication type | Ethernet Advanced Physical Layer 10BASE-T1L |
| Conformance Class | Conformance Class B (PA) |
| Netload Class | Netload Class 2 0 Mbps |
| Baud rates | 10 Mbit/s Full-duplex |
| Cycle times | 64 ms |

| | |
|---|--|
| Polarity | Automatic correction of crossed "APL signal +" and "APL signal -" signal lines |
| Media Redundancy Protocol (MRP) | Not possible (point-to-point connection to APL field switch) |
| System redundancy support | System redundancy S2 (2 AR with 1 NAP) |
| Device profile | PROFINET PA profile 4 (Application interface identifier API: 0x9700) |
| Manufacturer ID | 0x11 |
| Device type ID | 0xA43B |
| Device description files (GSD, DTM, FDI) | Information and files under: <ul style="list-style-type: none"> ▪ www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ www.profibus.com |
| Supported connections | <ul style="list-style-type: none"> ▪ 2x AR (IO Controller AR) ▪ 2x AR (IO Supervisor Device AR connection allowed) |
| Configuration options for measuring device | <ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server via Web browser and IP address ▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device. ▪ Onsite operation |
| Configuration of the device name | <ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server |
| Supported functions | <ul style="list-style-type: none"> ▪ Identification & Maintenance, simple device identifier via: <ul style="list-style-type: none"> ▪ Control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature via the local display for simple device identification and assignment ▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM with FDI package) |
| System integration | Information regarding system integration: Operating Instructions →  113. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Overview and description of the modules ▪ Status coding ▪ Startup configuration ▪ Factory setting |

Power supply

Terminal assignment

Transmitter: supply voltage, input/outputs

HART

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

FOUNDATION Fieldbus

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

PROFIBUS DP

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

PROFIBUS PA

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

Modbus RS485

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

PROFINET


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

PROFINET with Ethernet-APL


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

EtherNet/IP

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

 Terminal assignment of the remote display and operating module → 36.

Available device plugs

 Device plugs may not be used in hazardous areas!

Device plugs for fieldbus systems:

Order code for "Input; output 1"

- Option **SA** "FOUNDATION Fieldbus" → 33
- Option **GA** "PROFIBUS PA" → 33
- Option **NA** "EtherNet/IP" → 33
- Option **RA** "PROFINET" → 34
- Option **RB** "PROFINET with Ethernet-APL" → 34

Device plug for connecting to the service interface:

Order code for "Accessory mounted"

Option **NB**, adapter RJ45 M12 (service interface) → 47

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

| Order code for "Electrical connection" | Cable entry/connection → 35 | |
|---|-----------------------------|---|
| | 2 | 3 |
| M, 3, 4, 5 | 7/8" connector | - |

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

| Order code for "Electrical connection" | Cable entry/connection → 35 | |
|---|-----------------------------|---|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | - |

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

| Order code for "Electrical connection" | Cable entry/connection → 35 | |
|---|-----------------------------|-------------------|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | - |
| R ^{1) 2)} , S ^{1) 2)} , T ^{1) 2)} , V ^{1) 2)} | Connector M12 × 1 | Connector M12 × 1 |

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

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

| Order code for "Electrical connection" | Cable entry/connection → 35 | |
|---|-----------------------------|-------------------|
| | 2 | 3 |
| L, N, P, U | Connector M12 × 1 | - |
| R ^{1) 2)} , S ^{1) 2)} , T ^{1) 2)} , V ^{1) 2)} | Connector M12 × 1 | Connector M12 × 1 |

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

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

| Order code "Electrical connection" | Cable entry/connection → 35 | |
|---------------------------------------|-----------------------------|---|
| | 2 | 3 |
| L, N, P, U | M12 plug × 1 | - |

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

| Order code "Accessory mounted" | Cable entry/coupling → 35 | |
|-----------------------------------|---------------------------|------------------|
| | Cable entry 2 | Cable entry 3 |
| NB | Plug M12 × 1 | - |

Supply voltage

| Order code for "Power supply" | Terminal voltage | | Frequency range |
|----------------------------------|------------------|-------------|-----------------|
| | DC 24 V | ±20% | |
| 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.




Overcurrent protection element

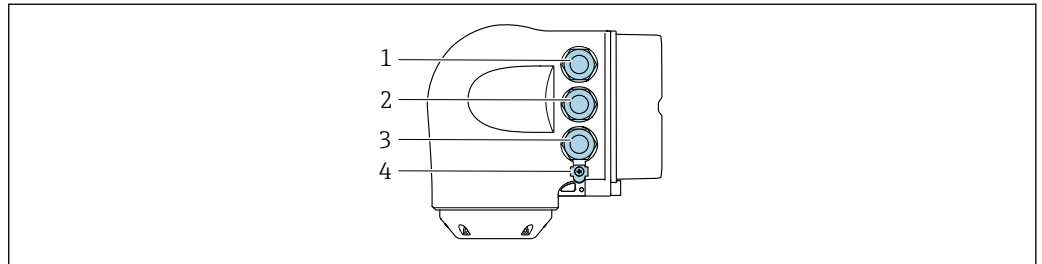
The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own.

- The circuit breaker must be easy to reach and labeled accordingly.
- Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.

Electrical connection


Transmitter connection

-  ■ Terminal assignment →  32
- Device plugs available →  33





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 via service interface (CDI-RJ45); Optional: terminal connection for external WLAN antenna or connection for remote display and operating module DKX001
- 4 Terminal connection for potential equalization (PE)


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

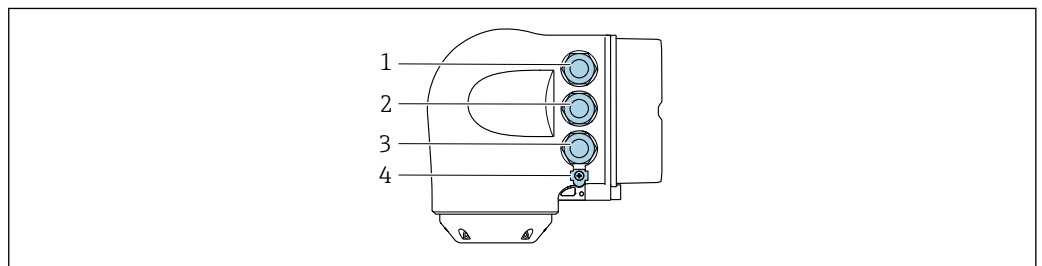
The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can therefore be established via an M12 plug without opening the device.

-  Network connection via service interface (CDI-RJ45) →  99

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).

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



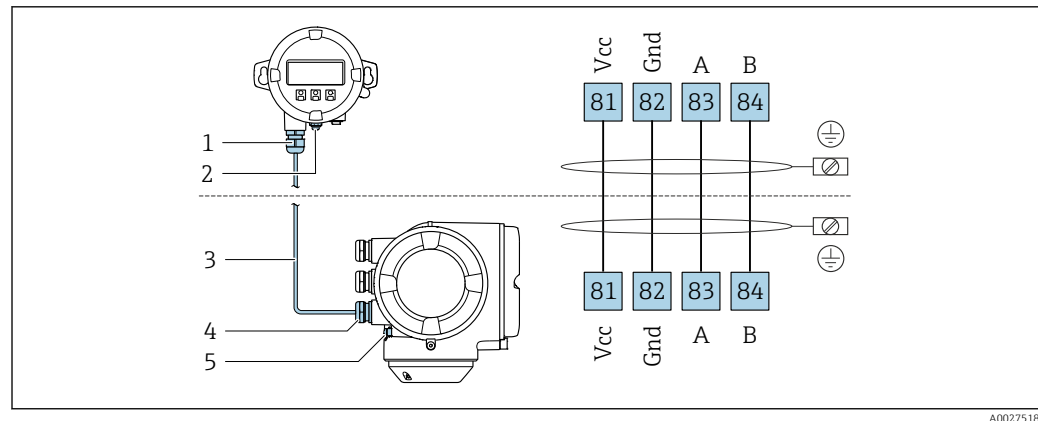
A0026781

- 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 Terminal connection for potential equalization (PE)

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

Connecting the remote display and operating module DKX001

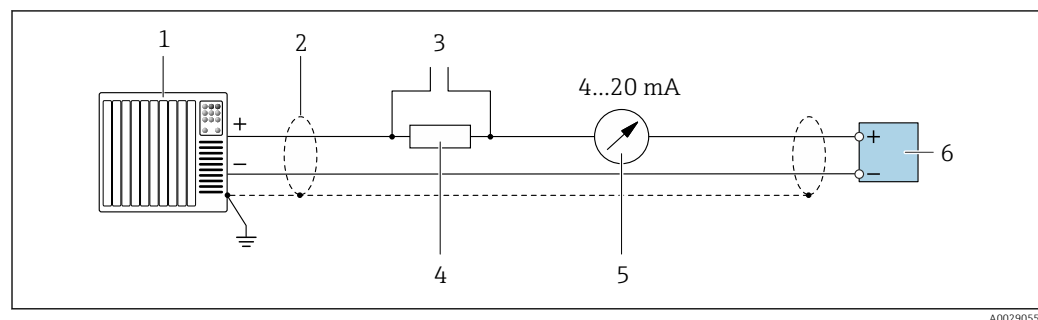
- i** The remote display and operating module DKX001 is available as an optional extra → 110.
- The remote display and operating module DKX001 is only available for the following housing versions, order code for "Housing":
 - Option A "Aluminum, coated"
 - Option L "Cast, stainless"
 - The measuring device is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring device. Display or operation at the transmitter is not possible in this case.
 - If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring device display module. Only one display or operation unit may be connected to the transmitter at any one time.



- 1 Remote display and operating module DKX001
- 2 Terminal connection for potential equalization (PE)
- 3 Connecting cable
- 4 Measuring device
- 5 Terminal connection for potential equalization (PE)

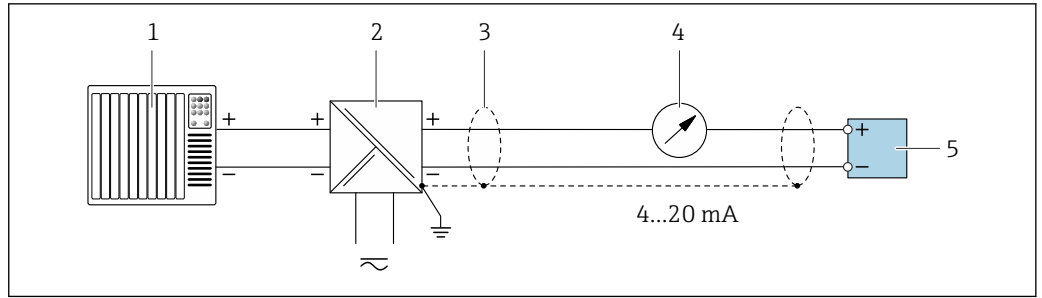
Connection examples

Current output 4 to 20 mA HART



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

- 1 Automation system with current input (e.g. PLC)
- 2 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 → 93
- 4 Resistor for HART communication ($\geq 250 \Omega$); observe maximum load → 15
- 5 Analog display unit; observe maximum load → 15
- 6 Transmitter

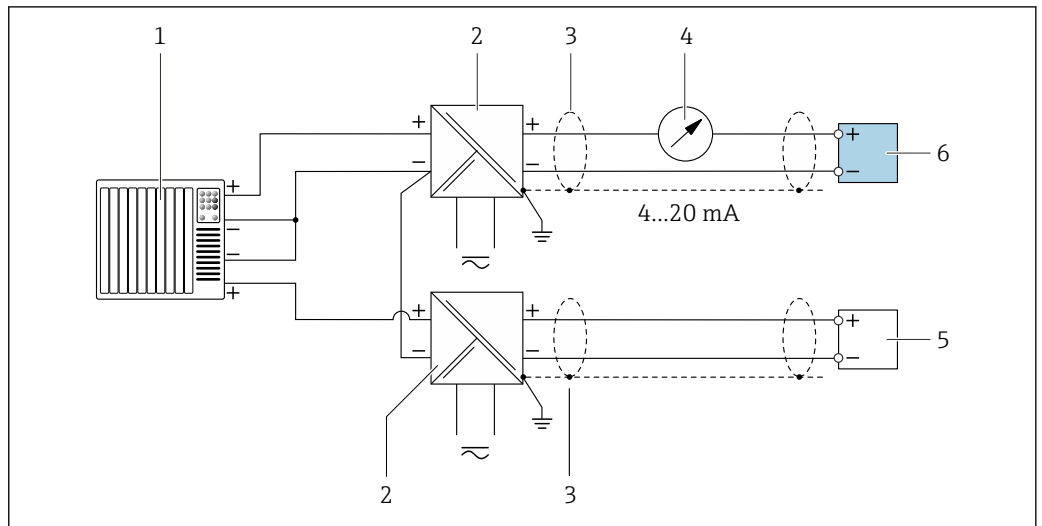


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3 Connection example for 4 to 20 mA HART current output (passive)

- 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 → 15
- 5 Transmitter

HART input

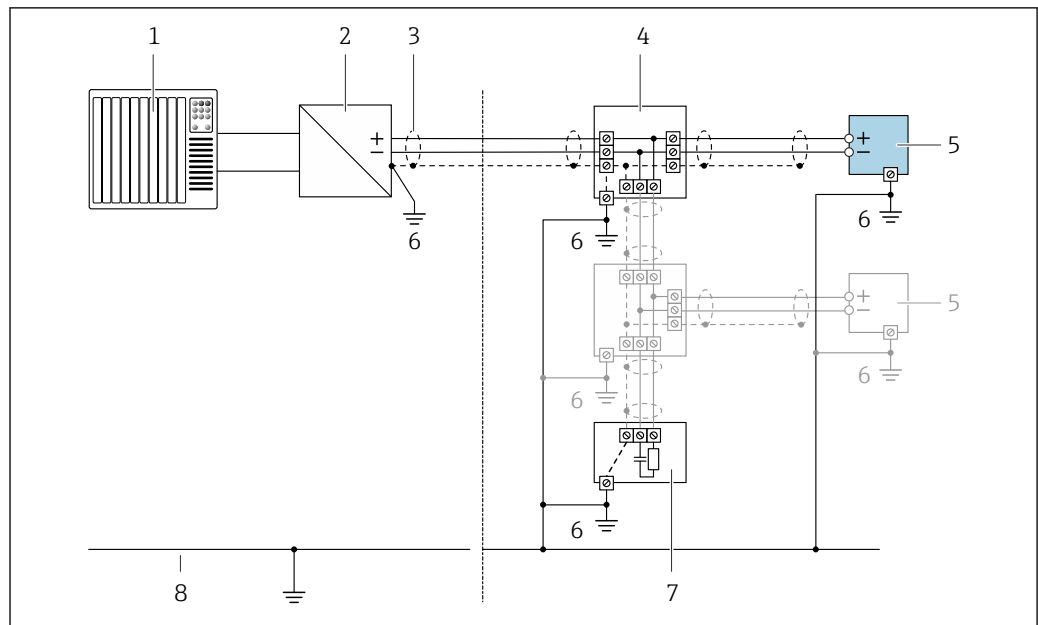


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4 Connection example for HART input with a common negative (passive)

- 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 → 15
- 5 Pressure transmitter (e.g. Cerabar M, Cerabar S): see requirements
- 6 Transmitter

PROFIBUS PA

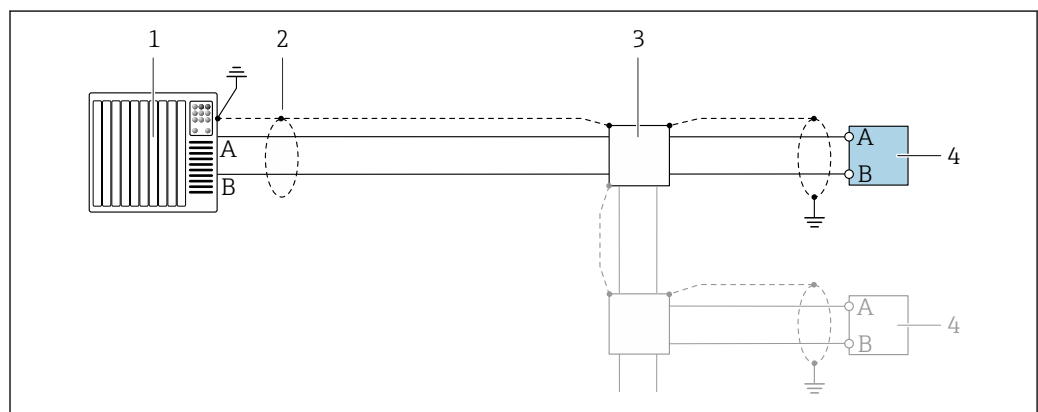


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5 Connection example for PROFIBUS PA

- 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



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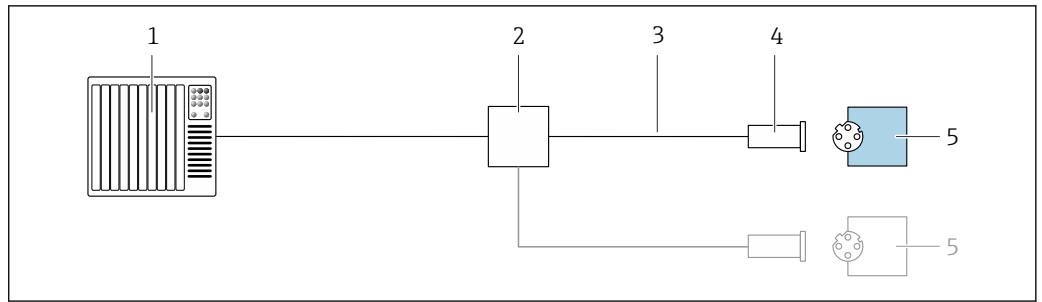
6 Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2

- 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

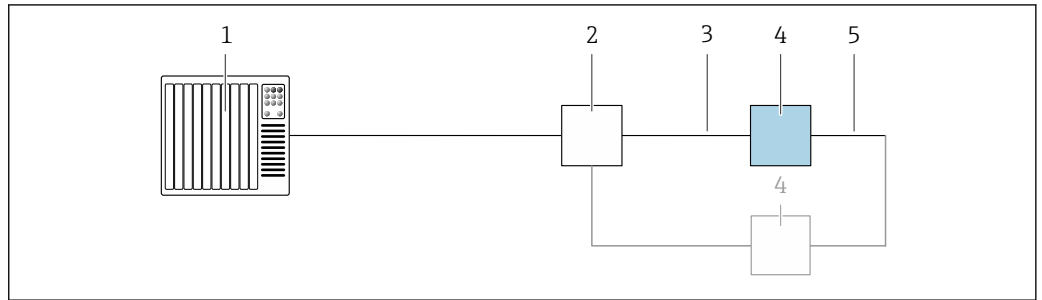


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7 Connection example for EtherNet/IP

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

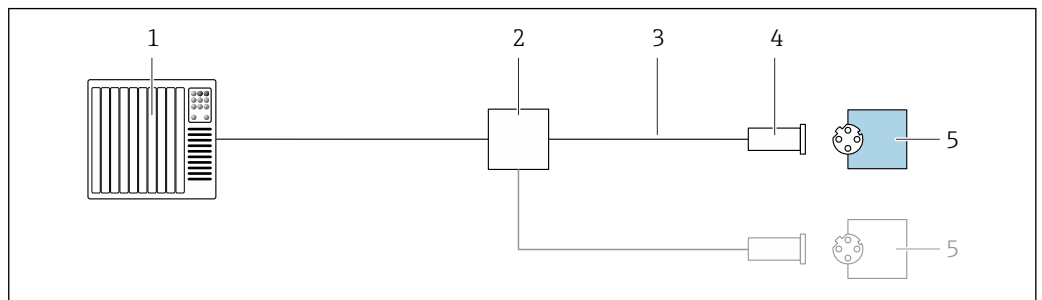
EtherNet/IP: DLR (Device Level Ring)



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

PROFINET

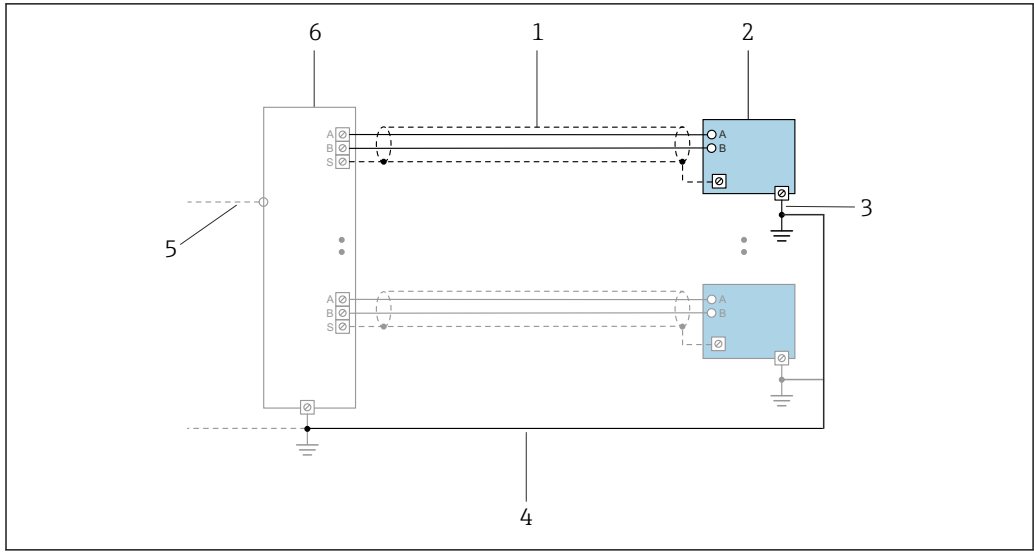


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8 Connection example for PROFINET

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

PROFINET with Ethernet-APL

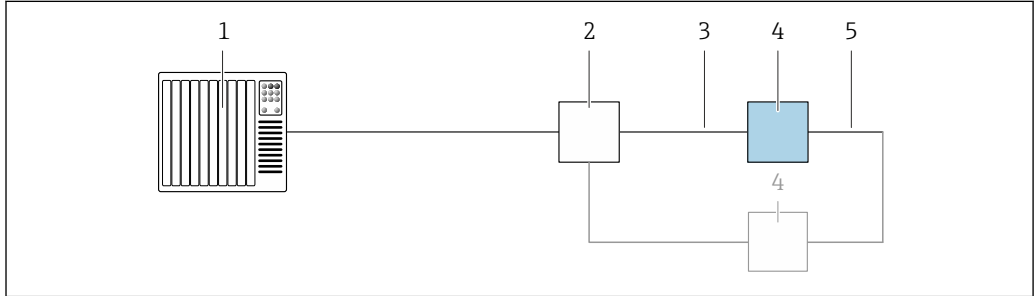


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9 Connection example for PROFINET with Ethernet-APL

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

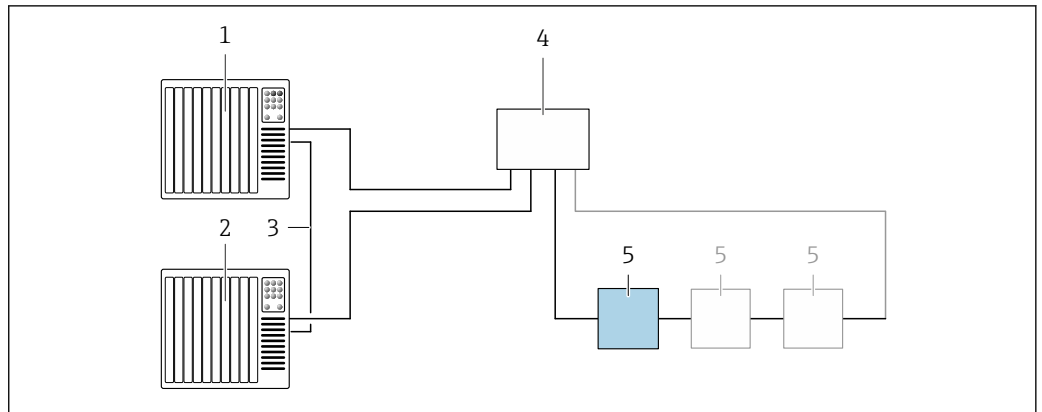
PROFINET: MRP (Media Redundancy Protocol)



A0027544

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

PROFINET: system redundancy S2

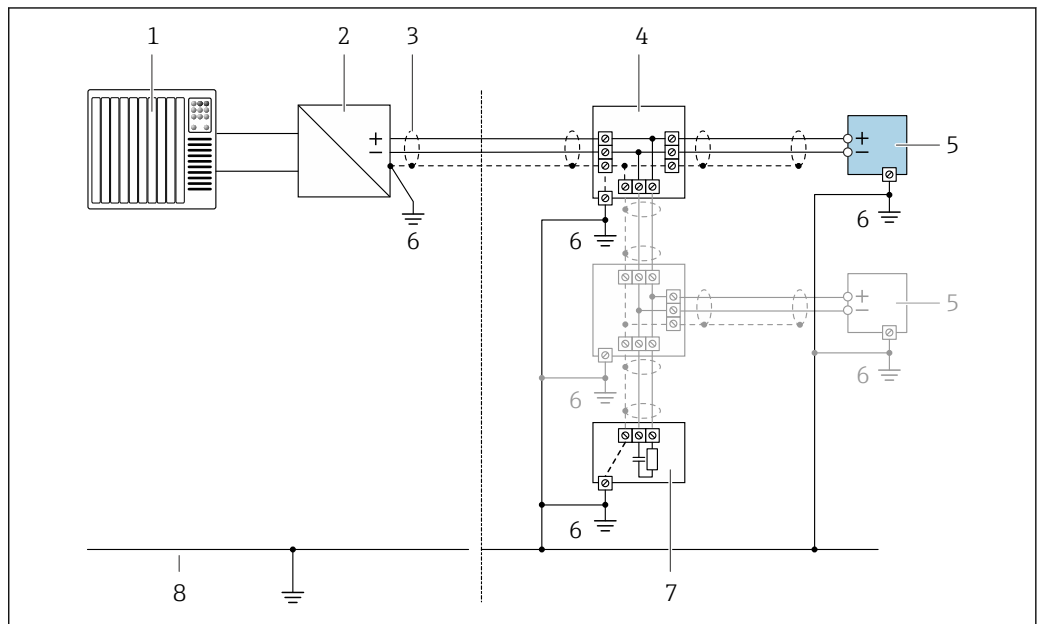


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10 Connection example for system redundancy S2

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

FOUNDATION Fieldbus

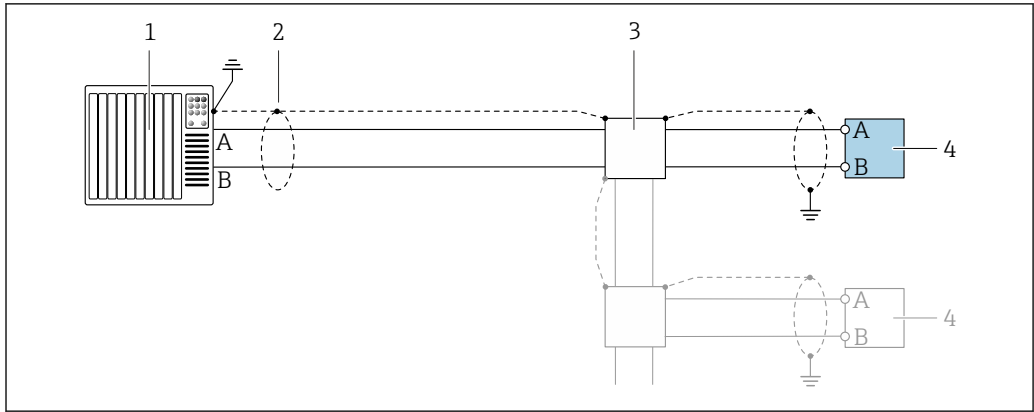


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11 Connection example for FOUNDATION Fieldbus

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

Modbus RS485

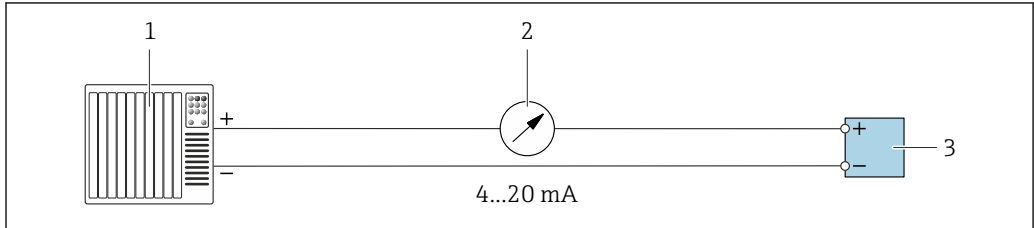


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12 Connection example for Modbus RS485, non-hazardous area and Zone 2; Class I, Division 2

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

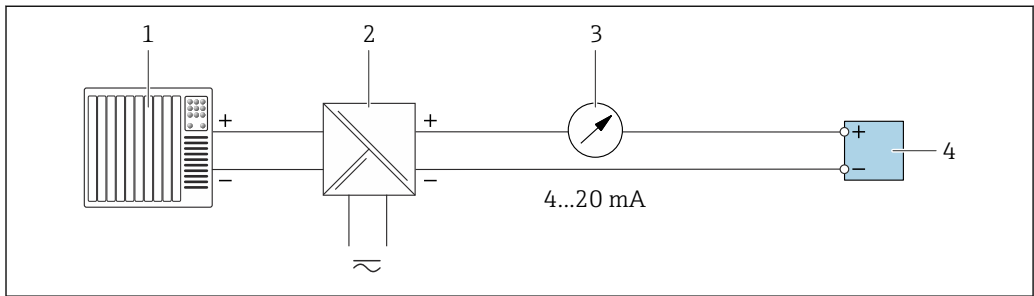
Current output 4-20 mA



A0028758

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

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

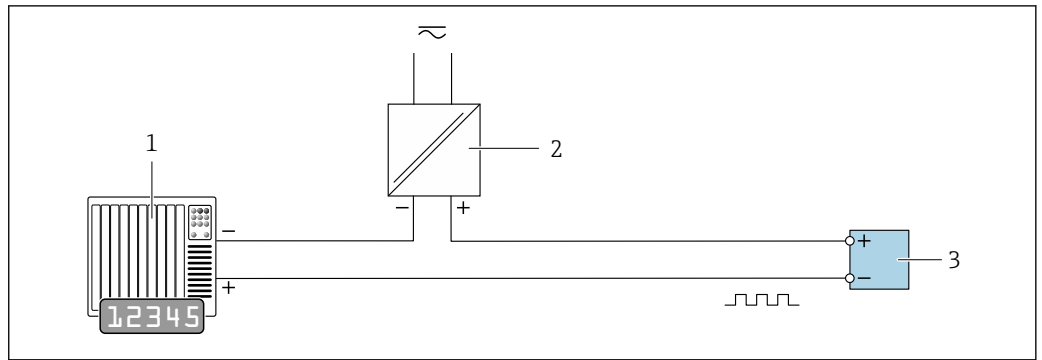


A0028759

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

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

Pulse/frequency output

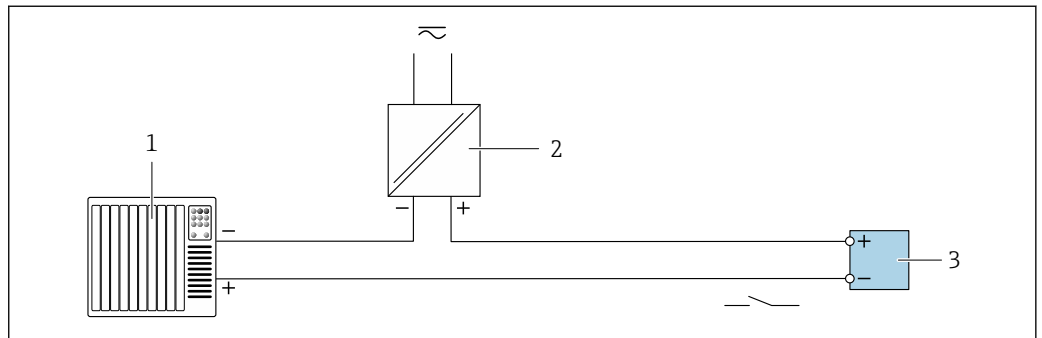


A0028761

15 Connection example for pulse/frequency output (passive)

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

Switch output

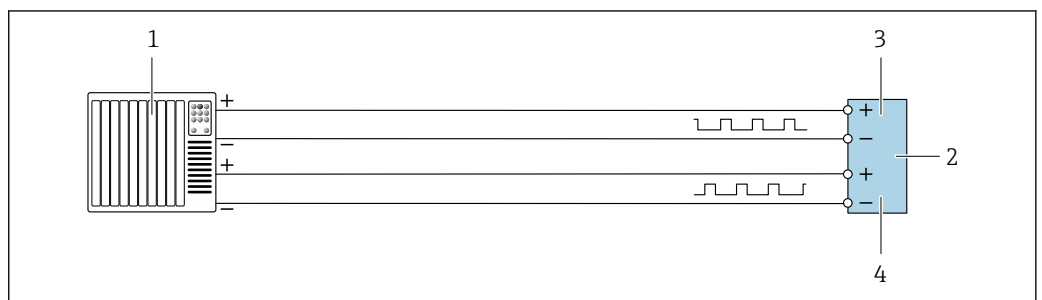


A0028760

16 Connection example for switch output (passive)

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

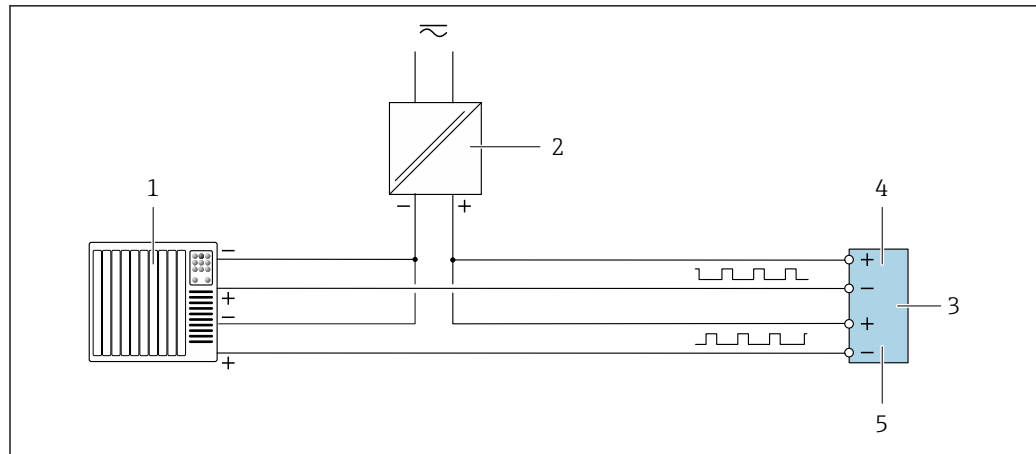
Double pulse output



A0029280

17 Connection example for double pulse output (active)

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

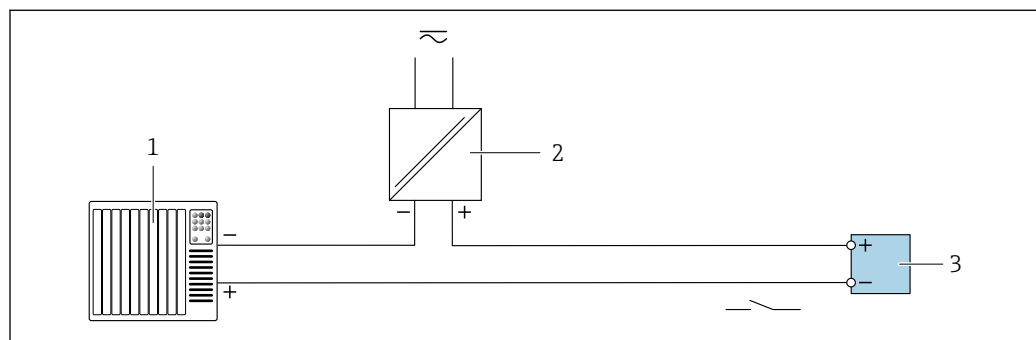


A0029279

18 Connection example for double pulse output (passive)

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

Relay output

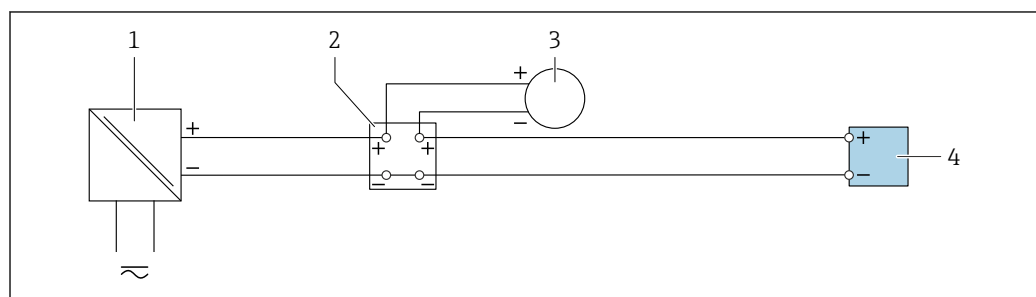


A0028760

19 Connection example for relay output (passive)

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

Current input

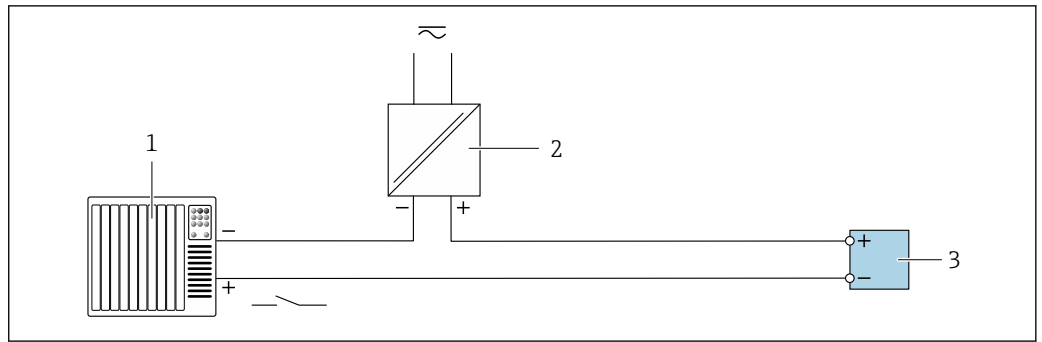


A0028915

20 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



21 Connection example for status input

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

A0028764

Potential equalization

Requirements

For potential equalization:

- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electrical potential
- Use a ground cable with a minimum cross-section of 6 mm² (0.0093 in²) and a cable lug for potential equalization connections

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

Terminals

Spring-loaded terminals: Suitable for strands and strands with ferrules.
 Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

Cable entries

- Cable gland: M20 × 1.5 with cable \varnothing 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
 - NPT 1/2"
 - G 1/2"
 - M20
- Device plug for digital communication: M12
 Only available for certain device versions → 33.

Pin assignment, device plug

FOUNDATION Fieldbus

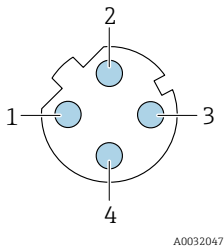
| | Pin | Assignment | | Coding | Plug/socket |
|---|-----|--------------|-----------|--------|-------------|
| | 1 | + | Signal + | A | Plug |
| | 2 | - | Signal - | | |
| | 3 | | Grounding | | |
| 4 | | Not assigned | | | |

PROFIBUS PA

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

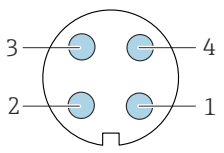
- i** Recommended plug:
- Binder, series 713, part no. 99 1430 814 04
 - Phoenix, part no. 1413934 SACC-FS-4QO SH PBPA SCO

PROFINET

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

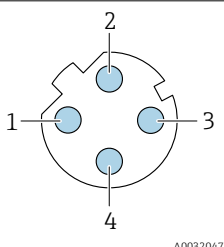
- i** Recommended plug:
- Binder, series 825, part no. 99 3729 810 04
 - Phoenix, part no. 1543223 SACC-M12MSD-4Q

PROFINET with Ethernet-APL

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

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

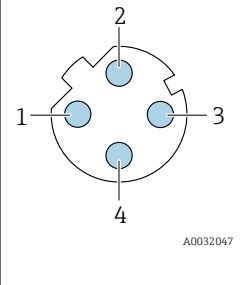
EtherNet/IP

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

- 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

Cable specification

Permitted temperature range

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

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

Standard installation cable is sufficient.

Protective grounding cable for the outer ground terminal

Conductor cross-section < 2.1 mm² (14 AWG)

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

The grounding impedance must be less than 2 Ω.

Signal cable

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

PROFINET with Ethernet-APL

The reference cable type for APL segments is fieldbus cable type A, MAU type 1 and 3 (specified in IEC 61158-2). This cable meets the requirements for intrinsically safe applications according to IEC TS 60079-47 and can also be used in non-intrinsically safe applications.

| | |
|--------------------------|-----------------|
| Cable type | A |
| Cable capacitance | 45 to 200 nF/km |
| Loop resistance | 15 to 150 Ω/km |
| Cable inductance | 0.4 to 1 mH/km |

Further details are provided in the Ethernet-APL Engineering Guideline (<https://www.ethernet-apl.org>).

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 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. |

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

Connecting cable for transmitter - remote display and operating module DKX001

Standard cable

A standard cable can be used as the connecting cable.

| | |
|---------------------------------|---|
| Standard cable | 4 cores (2 pairs); pair-stranded with common shield |
| Shielding | Tin-plated copper-braid, optical cover $\geq 85\%$ |
| Capacitance: core/shield | Maximum 1 000 nF for Zone 1; Class I, Division 1 |
| L/R | Maximum 24 $\mu\text{H}/\Omega$ for Zone 1; Class I, Division 1 |
| Cable length | Maximum 300 m (1 000 ft), see the following table |

| Cross-section | Cable length for use in: <ul style="list-style-type: none"> ▪ Non-hazardous area ▪ Hazardous area: Zone 2; Class I, Division 2 ▪ Hazardous area: Zone 1; Class I, Division 1 |
|-------------------------------|--|
| 0.34 mm ² (22 AWG) | 80 m (270 ft) |
| 0.50 mm ² (20 AWG) | 120 m (400 ft) |
| 0.75 mm ² (18 AWG) | 180 m (600 ft) |
| 1.00 mm ² (17 AWG) | 240 m (800 ft) |
| 1.50 mm ² (15 AWG) | 300 m (1 000 ft) |


Optionally available connecting cable

| | |
|---------------------------------|---|
| Standard cable | 2 × 2 × 0.34 mm ² (22 AWG) 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 $\geq 85\%$ |
| Capacitance: core/shield | ≤ 200 pF/m |

| | |
|------------------------|--|
| L/R | ≤24 μH/Ω |
| Available cable length | 10 m (35 ft) |
| 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) |

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

Overvoltage protection


| | |
|-----------------------------------|--|
| Mains voltage fluctuations | →  34 |
| Overvoltage category | Overvoltage category II |
| Short-term, temporary overvoltage | Up to 1200 V between cable and ground, for max. 5 s |
| Long-term, temporary overvoltage | Up to 500 V between cable and ground |

Performance characteristics

Reference operating conditions

- Error limits based on ISO 11631
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.



To obtain measured errors, use the *Applicator* sizing tool →  112

Maximum measured error

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

Base accuracy



Design fundamentals →  54

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/cm ³] | [g/cm ³] | [g/cm ³] |
| ±0.0005 | ±0.02 | ±0.004 |

1) Valid over the entire temperature and density range

2) Valid range for special density calibration: 0 to 2 g/cm³, +10 to +80 °C (+50 to +176 °F)

3) order code for "Application package", option EE "Special density"

Temperature

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

Zero point stability

| DN | | Zero point stability | |
|-------|-------------------|----------------------|----------|
| [mm] | [in] | [kg/h] | [lb/min] |
| 8 | $\frac{3}{8}$ | 0.150 | 0.0055 |
| 15 | $\frac{1}{2}$ | 0.488 | 0.0179 |
| 15 FB | $\frac{1}{2}$ FB | 1.350 | 0.0496 |
| 25 | 1 | 1.350 | 0.0496 |
| 25 FB | 1 FB | 3.375 | 0.124 |
| 40 | $1\frac{1}{2}$ | 3.375 | 0.124 |
| 40 FB | $1\frac{1}{2}$ FB | 5.25 | 0.193 |
| 50 | 2 | 5.25 | 0.193 |
| 50 FB | 2 FB | 13.5 | 0.496 |
| 80 | 3 | 13.5 | 0.496 |

FB = Full bore

Flow values

Flow values as turndown parameters depending on the nominal diameter.

SI units

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

FB = Full bore

US units

| DN | 1:1 | 1:10 | 1:20 | 1:50 | 1:100 | 1:500 |
|-------------------|----------|----------|----------|----------|----------|----------|
| | [lb/min] | [lb/min] | [lb/min] | [lb/min] | [lb/min] | [lb/min] |
| $\frac{3}{8}$ | 73.50 | 7.350 | 3.675 | 1.470 | 0.735 | 0.147 |
| $\frac{1}{2}$ | 238.9 | 23.89 | 11.95 | 4.778 | 2.389 | 0.478 |
| $\frac{1}{2}$ FB | 661.5 | 66.15 | 33.08 | 13.23 | 6.615 | 1.323 |
| 1 | 661.5 | 66.15 | 33.08 | 13.23 | 6.615 | 1.323 |
| 1 FB | 1 654 | 165.4 | 82.70 | 33.08 | 16.54 | 3.308 |
| $1\frac{1}{2}$ | 1 654 | 165.4 | 82.70 | 33.08 | 16.54 | 3.308 |
| $1\frac{1}{2}$ FB | 2 573 | 257.3 | 128.7 | 51.46 | 25.73 | 5.146 |

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

FB = Full bore

Accuracy of outputs

The outputs have the following base accuracy specifications.

Current output

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

Pulse/frequency output

o.r. = of reading

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

Repeatability

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

Base repeatability

 Design fundamentals →  54

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

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

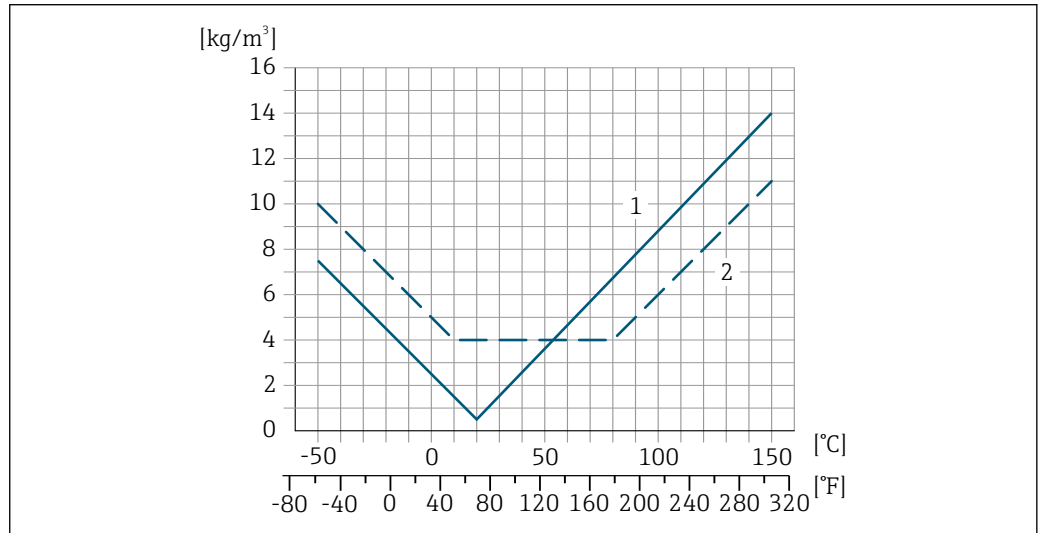
The influence is reduced when the zero adjustment is performed at process temperature.

Density

If there is a difference between the density calibration temperature and the process temperature, the measured error of the sensors is typically $\pm 0.0001 \text{ g/cm}^3 / ^\circ\text{C}$ ($\pm 0.00005 \text{ g/cm}^3 / ^\circ\text{F}$). Field density adjustment is possible.

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range (\rightarrow 50) the measured error is $\pm 0.0001 \text{ g/cm}^3 / ^\circ\text{C}$ ($\pm 0.00005 \text{ g/cm}^3 / ^\circ\text{F}$)



A0016614

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

Temperature

$\pm 0.005 \cdot T \text{ } ^\circ\text{C}$ ($\pm 0.005 \cdot (T - 32) \text{ } ^\circ\text{F}$)

Influence of medium pressure

The tables below show the effect that a difference in pressure between the calibration pressure and the process pressure has on the accuracy in the case of the mass flow and density.

o.r. = of reading

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

Operating Instructions \rightarrow 113.

| DN | | [% o.r./bar] | [% o.r./psi] |
|-------|----------|--------------|--------------|
| [mm] | [in] | | |
| 8 | 3/8 | no influence | no influence |
| 15 | 1/2 | no influence | no influence |
| 15 FB | 1/2 FB | +0.003 | +0.0002 |
| 25 | 1 | +0.003 | +0.0002 |
| 25 FB | 1 FB | no influence | no influence |
| 40 | 1 1/2 | no influence | no influence |
| 40 FB | 1 1/2 FB | no influence | no influence |
| 50 | 2 | no influence | no influence |
| 50 FB | 2 FB | no influence | no influence |

| DN | | [% o.r./bar] | [% o.r./psi] |
|----------------|------|--------------|--------------|
| [mm] | [in] | | |
| 80 | 3 | no influence | no influence |
| FB = Full bore | | | |

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

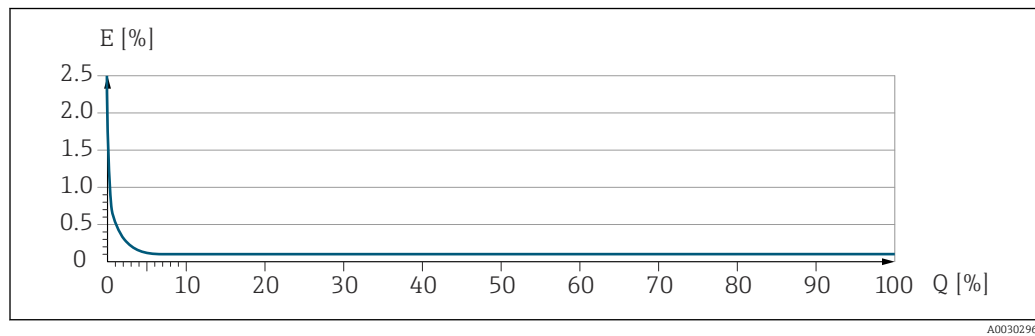
Calculation of the maximum measured error as a function of the flow rate

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

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

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

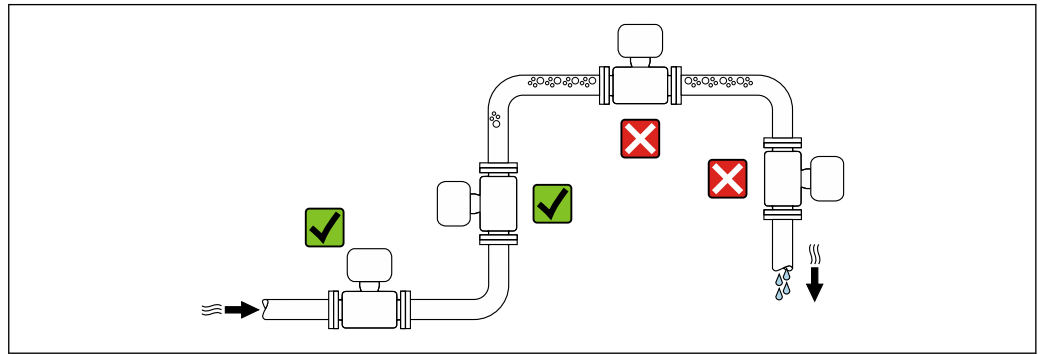
Example of maximum measured error



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

Installation

Mounting location



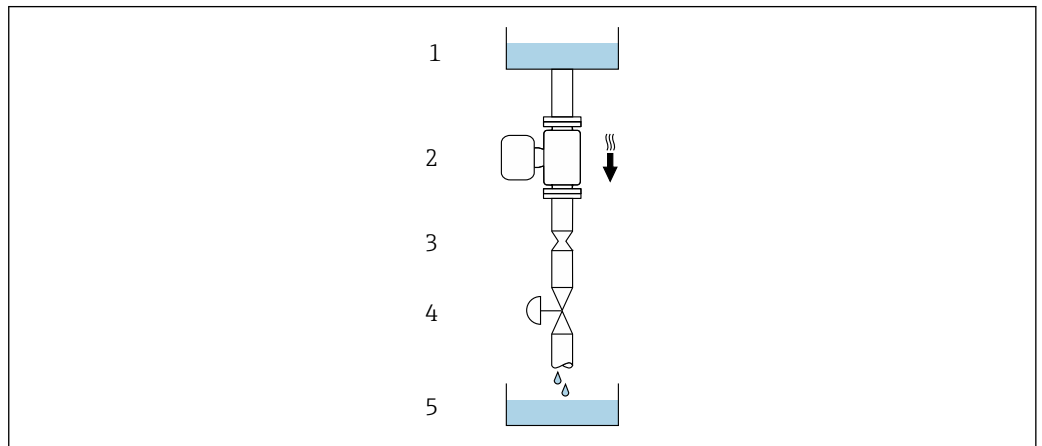
A0028772

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

- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

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



A0028773

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

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

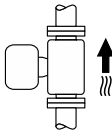
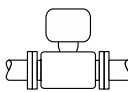
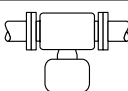
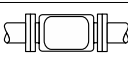
| DN | | Ø orifice plate, pipe restriction | |
|-------|----------|-----------------------------------|------|
| [mm] | [in] | [mm] | [in] |
| 8 | 3/8 | 6 | 0.24 |
| 15 | 1/2 | 10 | 0.40 |
| 15 FB | 1/2 FB | 15 | 0.60 |
| 25 | 1 | 14 | 0.55 |
| 25 FB | 1 FB | 24 | 0.95 |
| 40 | 1 1/2 | 22 | 0.87 |
| 40 FB | 1 1/2 FB | 35 | 1.38 |

| DN | | Ø orifice plate, pipe restriction | |
|-------|------|-----------------------------------|------|
| [mm] | [in] | [mm] | [in] |
| 50 | 2 | 28 | 1.10 |
| 50 FB | 2 FB | 54 | 2.13 |
| 80 | 3 | 50 | 1.97 |

FB = Full bore

Orientation

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

| Orientation | | Recommendation |
|-------------|--|-------------------------|
| A | Vertical orientation  A0015591 | ☑☑☑ ¹⁾ ☑☑ |
| B | Horizontal orientation, transmitter at top  A0015589 | ☑☑☑ ²⁾ |
| C | Horizontal orientation, transmitter at bottom  A0015590 | ☑☑☑ ³⁾ |
| D | Horizontal orientation, transmitter at side  A0015592 | ☑☑ |

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

Inlet and outlet runs

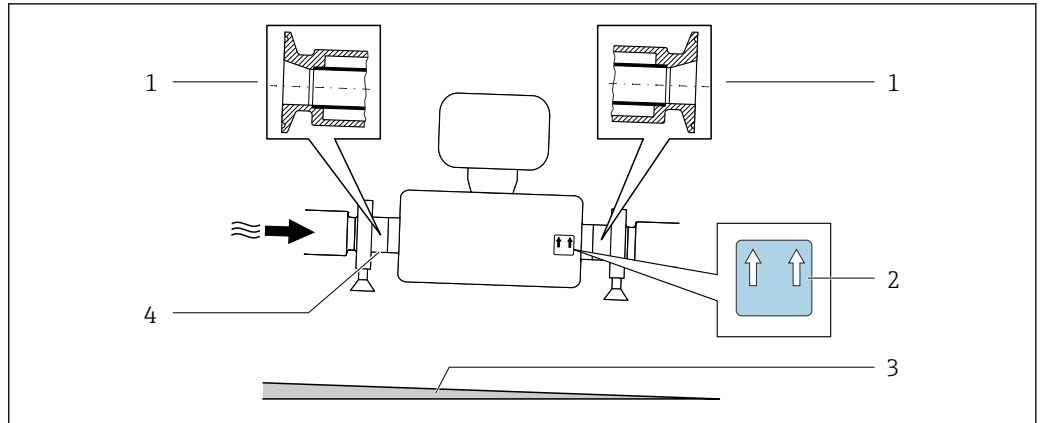
No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 65.

Special mounting instructions

Drainability

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


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



A0030297

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

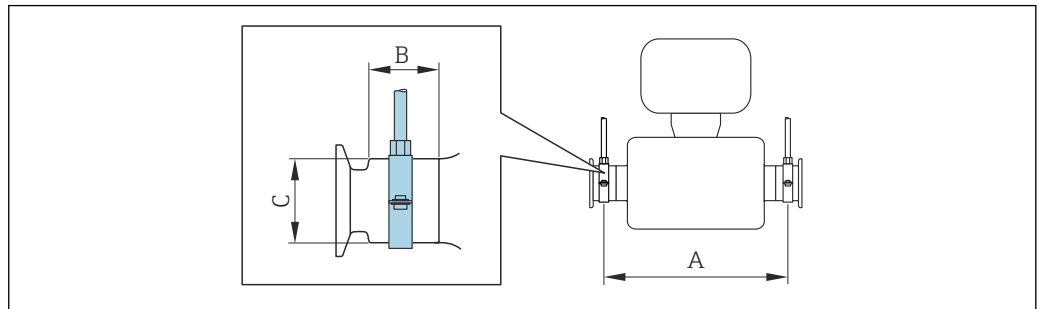
Hygienic compatibility

-  When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 106
- In the case of measuring devices with the order code for "Housing", option B "Stainless, hygienic", to seal the connection compartment cover, screw it closed finger-tight and tighten it by another 45° (corresponds to 15 Nm).

Securing with mounting clamp in the case of hygiene connections

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

Use mounting clamp with lining between clamp and measuring instrument.

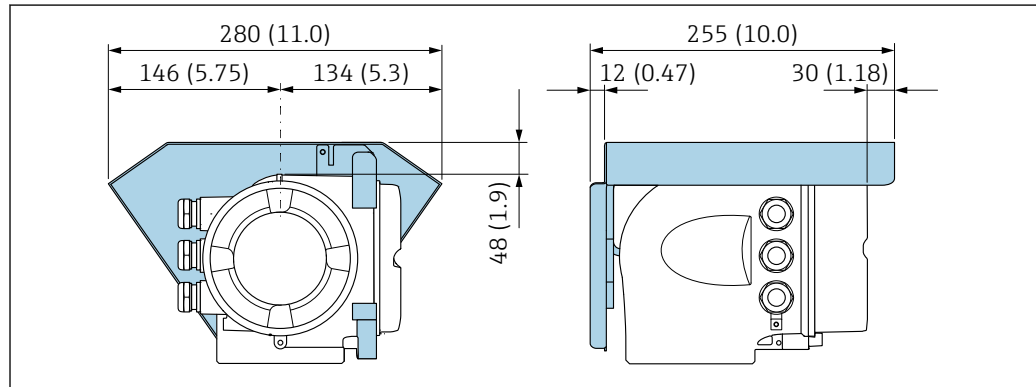


A0030298

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

| DN | | A | | B | | C | |
|-------|-------|------|-------|------|------|------|------|
| [mm] | [in] | [mm] | [in] | [mm] | [in] | [mm] | [in] |
| 50 FB | 50 FB | 1152 | 45.35 | 57 | 2.24 | 90 | 3.54 |
| 80 | 80 | 1152 | 45.35 | 57 | 2.24 | 90 | 3.54 |

Weather protection cover



23 Engineering unit mm (in)

A0029553

Environment

Ambient temperature range

| | |
|---|---|
| Measuring device | <ul style="list-style-type: none"> ■ -40 to +60 °C (-40 to +140 °F) ■ Order code for "Test, certificate", option JP: -50 to +60 °C (-58 to +140 °F) |
| Readability of the local display | -20 to +60 °C (-4 to +140 °F) The readability of the display may be impaired at temperatures outside the temperature range. |

i Dependency of ambient temperature on medium temperature → 59

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

i You can order a weather protection cover from Endress+Hauser. → 110.

Storage temperature

-50 to +80 °C (-58 to +176 °F)

Climate class

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

Relative humidity

The device is suitable for use in outdoor and indoor areas with a relative humidity of 4 to 95%.

Operating height

According to EN 61010-1

- ≤ 2 000 m (6 562 ft)
- > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

Degree of protection

Transmitter

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

Optional

Order code for "Sensor options", option CM "IP69

External WLAN antenna

IP67

Vibration- and shock-resistance

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

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

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

- 10 to 200 Hz, 0.003 g²/Hz
- 200 to 2 000 Hz, 0.001 g²/Hz
- Total: 1.54 g rms

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

6 ms 30 g

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

Interior cleaning

- Cleaning in place (CIP)
- Sterilization in place (SIP)
- Cleaning with pigs

Options

Oil- and grease-free version for wetted parts, without declaration
 Order code for "Service", option HA


Mechanical load


Transmitter housing:


- Protect against mechanical effects, such as shock or impact
- Do not use as a ladder or climbing aid

Electromagnetic compatibility (EMC)

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

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

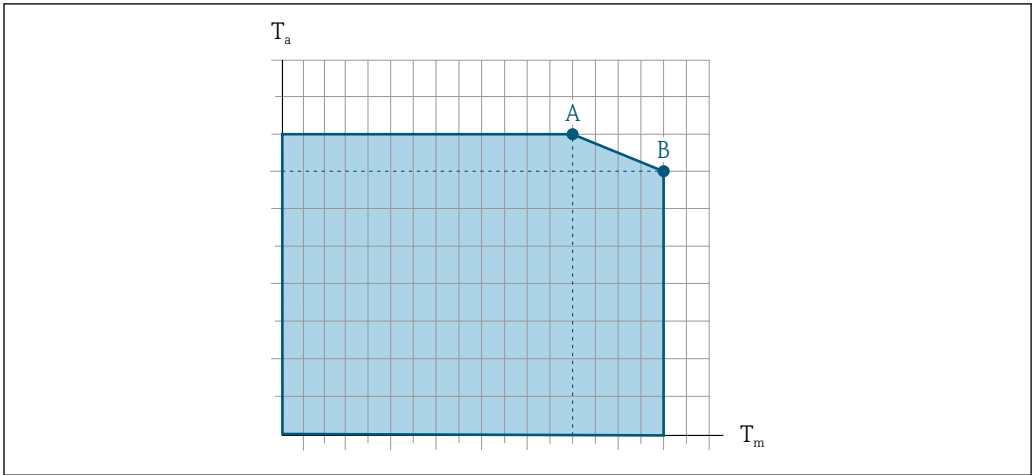
 Details are provided in the Declaration of Conformity.

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

Process

Medium temperature range -50 to +150 °C (-58 to +302 °F)

Dependency of ambient temperature on medium temperature



A0031121

24 Exemplary representation, values in the table below.

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

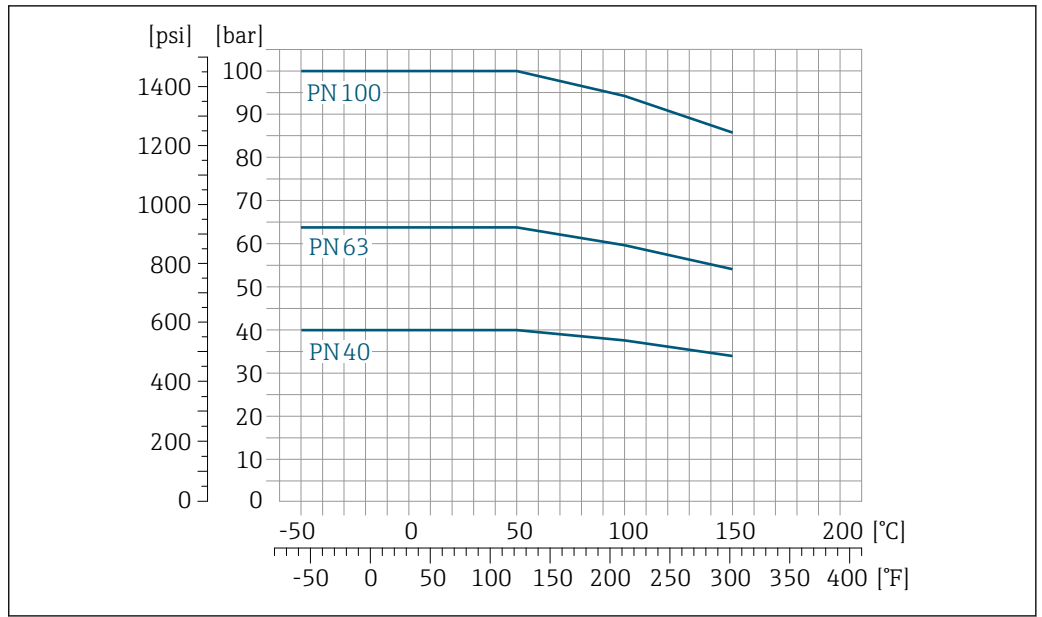
i Values for devices that are used in the hazardous area:
 Separate Ex documentation (XA) for the device → 114.

| Not insulated | | | | Insulated | | | |
|----------------|-----------------|-------|-------|----------------|-----------------|----------------|-----------------|
| A | | B | | A | | B | |
| T_a | T_m | T_a | T_m | T_a | T_m | T_a | T_m |
| 60 °C (140 °F) | 150 °C (302 °F) | - | - | 60 °C (140 °F) | 120 °C (248 °F) | 55 °C (131 °F) | 150 °C (302 °F) |

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

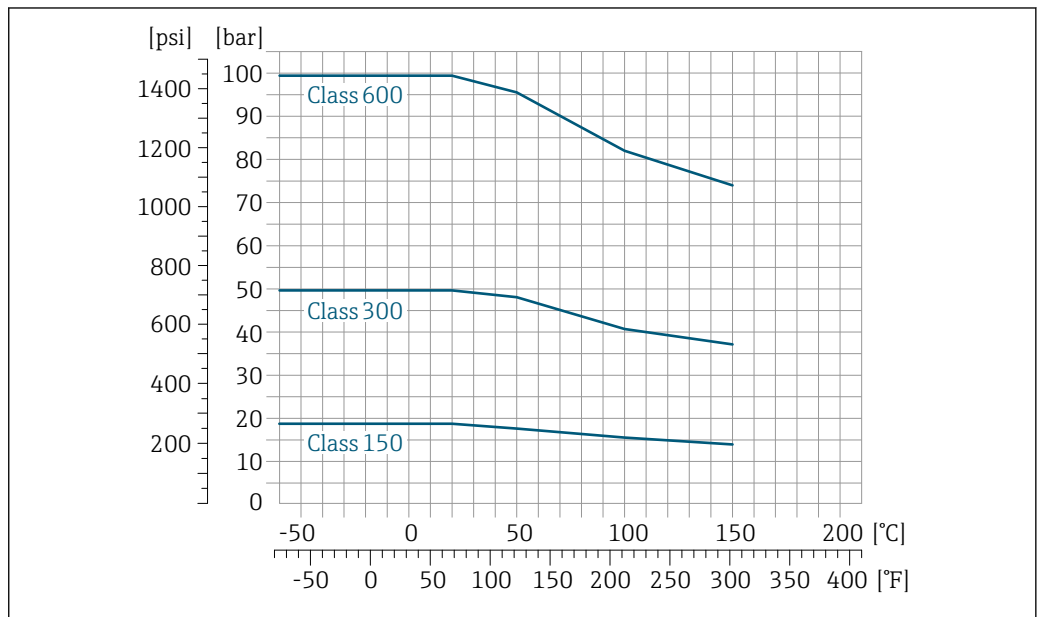
Pressure-temperature ratings The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

Flange according to EN 1092-1 (DIN 2501)



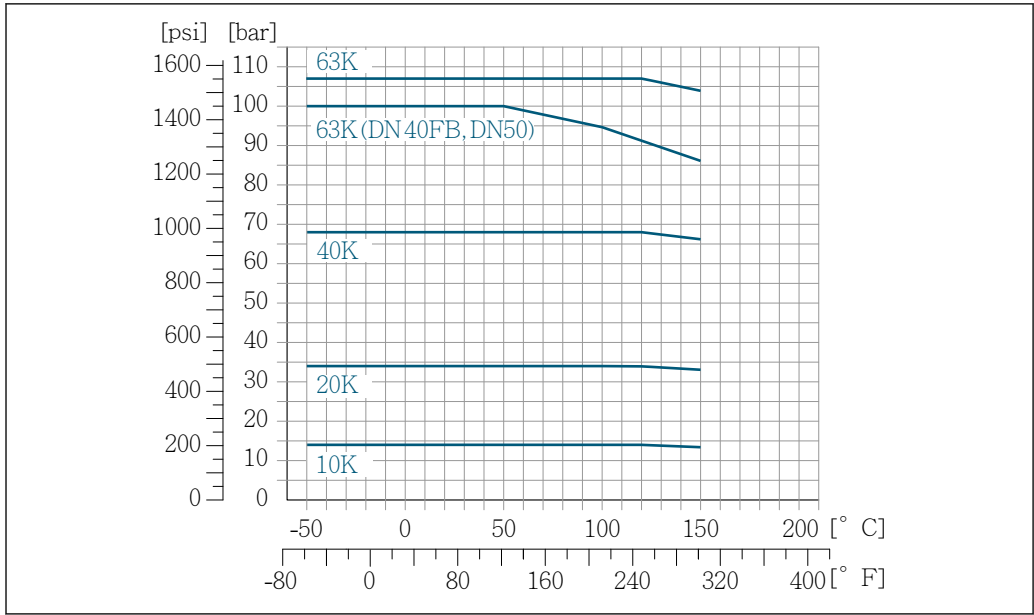
25 With flange material 1.4301 (304); wetted parts: titanium

Flange according to ASME B16.5



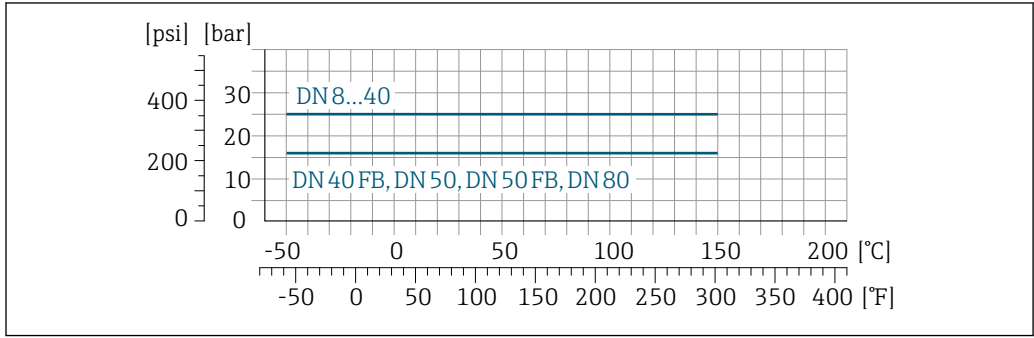
26 With flange material 1.4301 (304); wetted parts: titanium

Flange JIS B2220



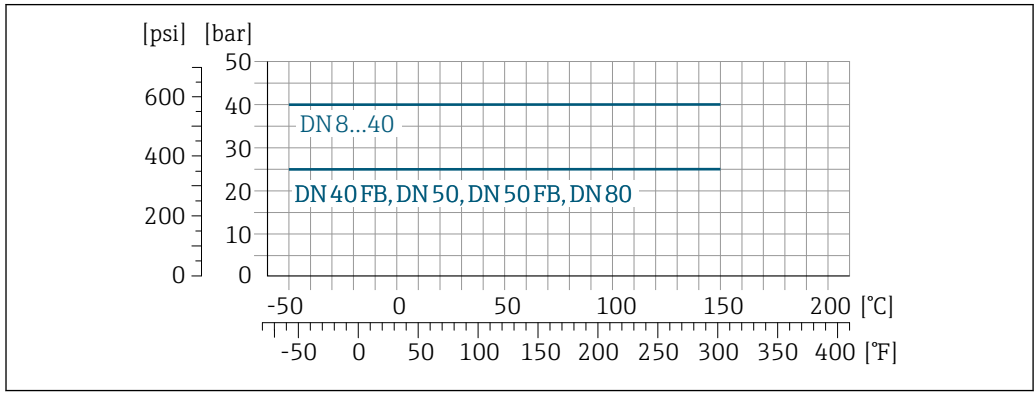
27 With flange material 1.4301 (304). Wetted parts: titanium.

Flange DIN 11864-2 Form A



28 With flange material Grade 2 titanium

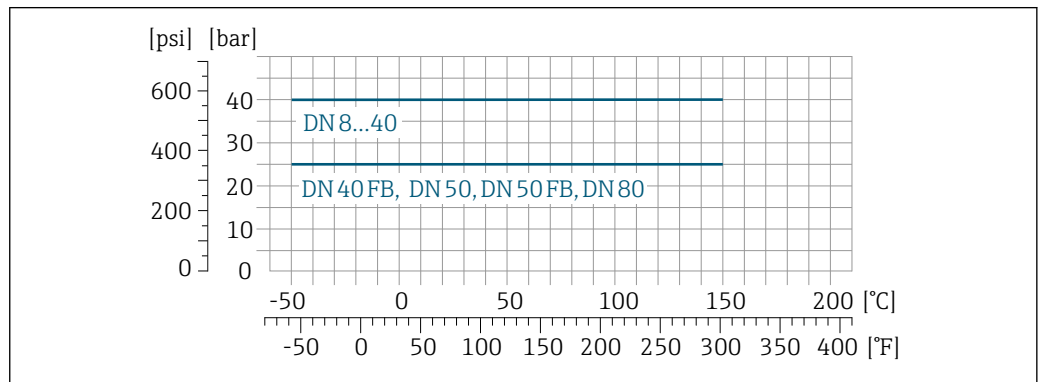
Thread DIN 11851



29 With connection material Grade 2 titanium

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

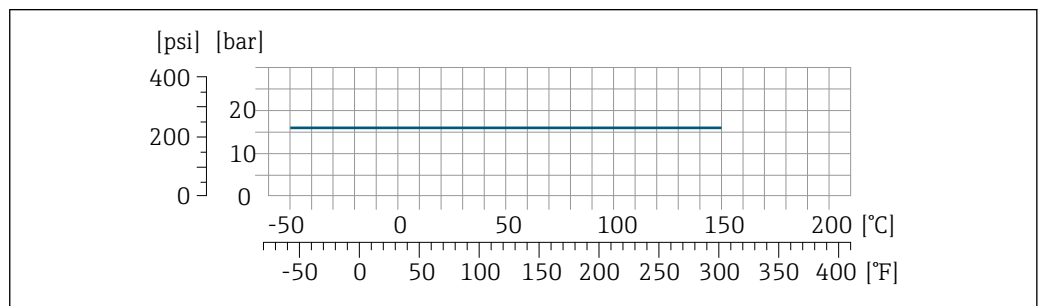
Thread DIN 11864-1 Form A



A0029887-EN

30 With connection material Grade 2 titanium

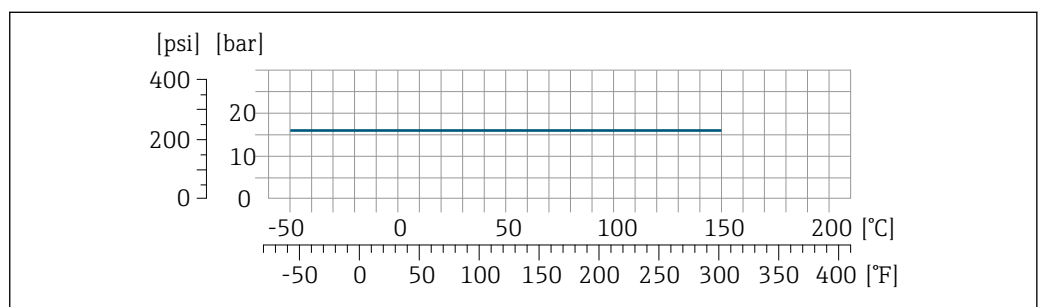
Thread ISO 2853



A0029888-EN

31 With connection material Grade 2 titanium

Thread SMS 1145



A0029888-EN

32 With connection material Grade 2 titanium

SMS 1145 allows for applications up to 16 bar (232 psi) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

Tri-Clamp

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

Sensor housing

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

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

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

i Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge.

Maximum pressure: 5 bar (72.5 psi)

Burst pressure of the sensor housing


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

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

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


| DN | | Sensor housing burst pressure | |
|-------|-------------------|-------------------------------|-------|
| [mm] | [in] | [bar] | [psi] |
| 8 | $\frac{3}{8}$ | 220 | 3 190 |
| 15 | $\frac{1}{2}$ | 220 | 3 190 |
| 15 FB | $\frac{1}{2}$ FB | 235 | 3 408 |
| 25 | 1 | 235 | 3 408 |
| 25 FB | 1 FB | 220 | 3 190 |
| 40 | $1\frac{1}{2}$ | 220 | 3 190 |
| 40 FB | $1\frac{1}{2}$ FB | 235 | 3 408 |
| 50 | 2 | 235 | 3 408 |
| 50 FB | 2 FB | 460 | 6 670 |
| 80 | 3 | 460 | 6 670 |


FB = Full bore


For information on the dimensions: see the "Mechanical construction" section →  67

Flow limit


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

i For an overview of the full scale values for the measuring range, see the "Measuring range" section →  10

- 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 →  10

i To calculate the flow limit, use the *Applicator* sizing tool →  112

Pressure loss

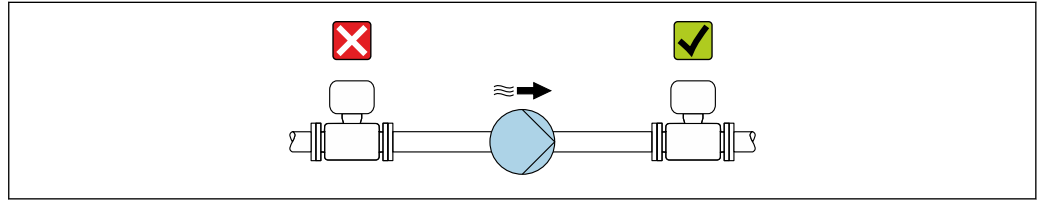
i To calculate the pressure loss, use the *Applicator* sizing tool →  112

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)



A0028777

Thermal insulation

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

The following device versions are recommended for versions with thermal insulation:

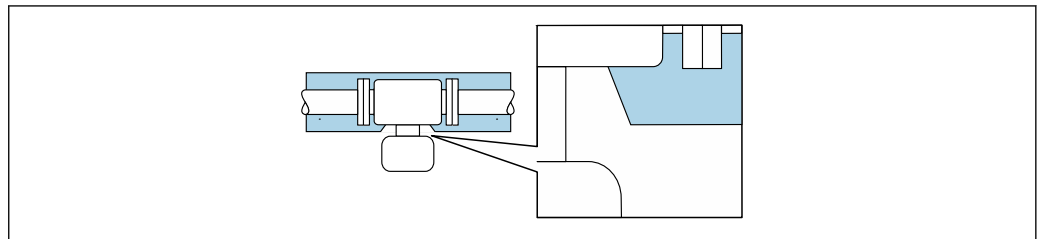
Version with extended neck for insulation:

Order code for "Sensor option", option CG with an extended neck length of 105 mm (4.13 in).

NOTICE

Electronics overheating on account of thermal insulation!

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



A0034391



33 Thermal insulation with not isolated extended neck

Heating

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

Heating options


- Electrical heating, e.g. with electric band heaters ¹⁾
- Via pipes carrying hot water or steam
- Via heating jackets

 Heating jackets for the sensors can be ordered as accessories from Endress+Hauser →  111.

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.

1) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" →  115

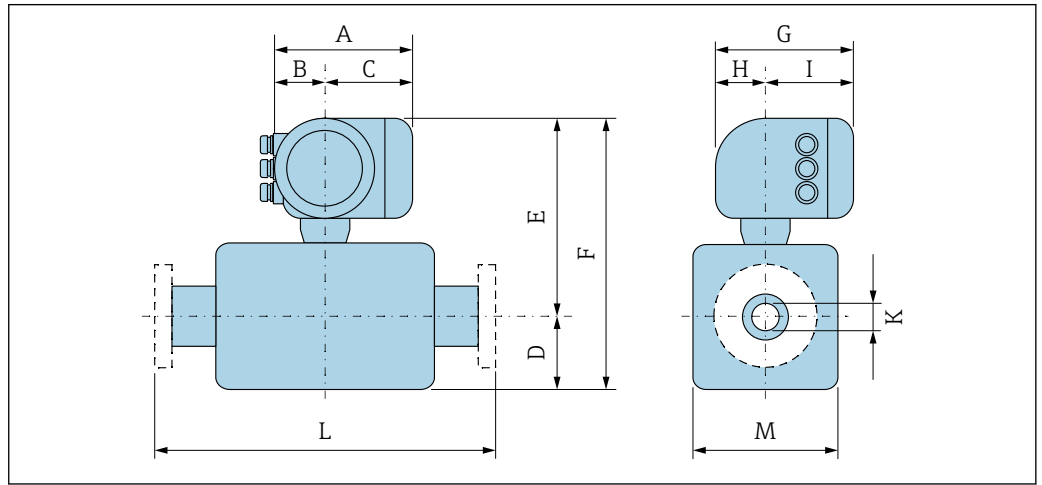
Vibrations

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

Mechanical construction

Dimensions in SI units

Compact version



A0033783

Order code for "Housing", option A "Aluminum, coated"

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G ³⁾ | H | I ³⁾ | K | L | M |
|-------|-----------------|-----------------|------|-------|-----------------|-----------------|-----------------|------|-----------------|------|---------------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 8 | 169 | 68 | 101 | 57.2 | 282 | 339.2 | 200 | 59 | 141 | 8.56 | ⁴⁾ | 115 |
| 15 | 169 | 68 | 101 | 57.2 | 282 | 339.2 | 200 | 59 | 141 | 11.4 | ⁴⁾ | 115 |
| 15 FB | 169 | 68 | 101 | 57.2 | 282 | 339.2 | 200 | 59 | 141 | 17.1 | ⁴⁾ | 115 |
| 25 | 169 | 68 | 101 | 57.2 | 282 | 339.2 | 200 | 59 | 141 | 17.1 | ⁴⁾ | 115 |
| 25 FB | 169 | 68 | 101 | 70.7 | 292 | 362.7 | 200 | 59 | 141 | 26.4 | ⁴⁾ | 142 |
| 40 | 169 | 68 | 101 | 70.7 | 292 | 362.7 | 200 | 59 | 141 | 26.4 | ⁴⁾ | 142 |
| 40 FB | 169 | 68 | 101 | 84.2 | 306 | 390.2 | 200 | 59 | 141 | 35.6 | ⁴⁾ | 169 |
| 50 | 169 | 68 | 101 | 84.2 | 306 | 390.2 | 200 | 59 | 141 | 35.6 | ⁴⁾ | 169 |
| 50 FB | 169 | 68 | 101 | 109.6 | 331.5 | 441.1 | 200 | 59 | 141 | 54.8 | ⁴⁾ | 220 |
| 80 | 169 | 68 | 101 | 109.6 | 331.5 | 441.1 | 200 | 59 | 141 | 54.8 | ⁴⁾ | 220 |

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) For version without local display: values - 30 mm
- 4) Depending on the process connection

Order code for "Housing", option A "Aluminum, coated"; Ex d

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G ³⁾ | H | I ³⁾ | K | L | M |
|-------|-----------------|-----------------|------|------|-----------------|-----------------|-----------------|------|-----------------|------|---------------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 8 | 188 | 85 | 103 | 57.2 | 283 | 340.2 | 217 | 58 | 159 | 8.56 | ⁴⁾ | 115 |
| 15 | 188 | 85 | 103 | 57.2 | 283 | 340.2 | 217 | 58 | 159 | 11.4 | ⁴⁾ | 115 |
| 15 FB | 188 | 85 | 103 | 57.2 | 283 | 340.2 | 217 | 58 | 159 | 17.1 | ⁴⁾ | 115 |
| 25 | 188 | 85 | 103 | 57.2 | 283 | 340.2 | 217 | 58 | 159 | 17.1 | ⁴⁾ | 115 |
| 25 FB | 188 | 85 | 103 | 70.7 | 293 | 363.7 | 217 | 58 | 159 | 26.4 | ⁴⁾ | 142 |
| 40 | 188 | 85 | 103 | 70.7 | 293 | 363.7 | 217 | 58 | 159 | 26.4 | ⁴⁾ | 142 |
| 40 FB | 188 | 85 | 103 | 84.2 | 307 | 391.2 | 217 | 58 | 159 | 35.6 | ⁴⁾ | 169 |
| 50 | 188 | 85 | 103 | 84.2 | 307 | 391.2 | 217 | 58 | 159 | 35.6 | ⁴⁾ | 169 |

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G ³⁾ | H | I ³⁾ | K | L | M |
|-------|-----------------|-----------------|------|-------|-----------------|-----------------|-----------------|------|-----------------|------|---------------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 50 FB | 188 | 85 | 103 | 109.6 | 332 | 441.6 | 217 | 58 | 159 | 54.8 | ⁴⁾ | 220 |
| 80 | 188 | 85 | 103 | 109.6 | 332 | 441.6 | 217 | 58 | 159 | 54.8 | ⁴⁾ | 220 |

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) For version without local display: values - 40 mm
- 4) Depending on the process connection

Order code for "Housing", option B "Stainless, hygienic"

| DN | A ¹⁾ | B | C | D | E ²⁾ | F | G ³⁾ | H | I | K | L | M |
|-------|-----------------|------|------|-------|-----------------|-------|-----------------|------|------|------|---------------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 8 | 183 | 73 | 110 | 57.2 | 282 | 339.2 | 200 | 65 | 135 | 8.56 | ⁴⁾ | 115 |
| 15 | 183 | 73 | 110 | 57.2 | 282 | 339.2 | 200 | 65 | 135 | 11.4 | ⁴⁾ | 115 |
| 15 FB | 183 | 73 | 110 | 57.2 | 282 | 339.2 | 200 | 65 | 135 | 17.1 | ⁴⁾ | 115 |
| 25 | 183 | 73 | 110 | 57.2 | 282 | 339.2 | 200 | 65 | 135 | 17.1 | ⁴⁾ | 115 |
| 25 FB | 183 | 73 | 110 | 70.7 | 292 | 362.7 | 200 | 65 | 135 | 26.4 | ⁴⁾ | 142 |
| 40 | 183 | 73 | 110 | 70.7 | 292 | 362.7 | 200 | 65 | 135 | 26.4 | ⁴⁾ | 142 |
| 40 FB | 183 | 73 | 110 | 84.2 | 306 | 390.2 | 200 | 65 | 135 | 35.6 | ⁴⁾ | 169 |
| 50 | 183 | 73 | 110 | 84.2 | 306 | 390.2 | 200 | 65 | 135 | 35.6 | ⁴⁾ | 169 |
| 50 FB | 183 | 73 | 110 | 109.6 | 331.5 | 441.1 | 200 | 65 | 135 | 54.8 | ⁴⁾ | 220 |
| 80 | 183 | 73 | 110 | 109.6 | 331.5 | 441.1 | 200 | 65 | 135 | 54.8 | ⁴⁾ | 220 |

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) For version without local display: values - 13 mm
- 4) Depending on the process connection

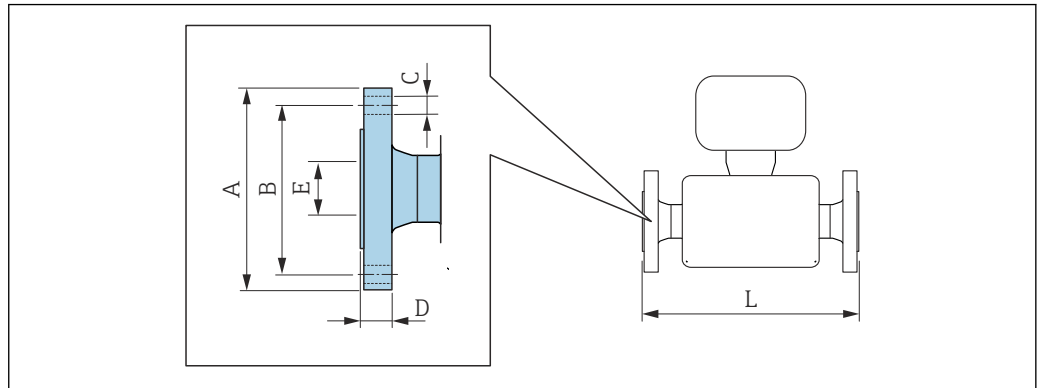
Order code for "Housing", option L "Cast, stainless"

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G | H | I | K | L | M |
|-------|-----------------|-----------------|------|-------|-----------------|-----------------|------|------|------|------|---------------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 8 | 186 | 85 | 101 | 57.2 | 283 | 340.2 | 217 | 60 | 157 | 8.56 | ³⁾ | 115 |
| 15 | 186 | 85 | 101 | 57.2 | 283 | 340.2 | 217 | 60 | 157 | 11.4 | ³⁾ | 115 |
| 15 FB | 186 | 85 | 101 | 57.2 | 283 | 340.2 | 217 | 60 | 157 | 17.1 | ³⁾ | 115 |
| 25 | 186 | 85 | 101 | 57.2 | 283 | 340.2 | 217 | 60 | 157 | 17.1 | ³⁾ | 115 |
| 25 FB | 186 | 85 | 101 | 70.7 | 293 | 363.7 | 217 | 60 | 157 | 26.4 | ³⁾ | 142 |
| 40 | 186 | 85 | 101 | 70.7 | 293 | 363.7 | 217 | 60 | 157 | 26.4 | ³⁾ | 142 |
| 40 FB | 186 | 85 | 101 | 84.2 | 306 | 390.2 | 217 | 60 | 157 | 35.6 | ³⁾ | 169 |
| 50 | 186 | 85 | 101 | 84.2 | 306 | 390.2 | 217 | 60 | 157 | 35.6 | ³⁾ | 169 |
| 50 FB | 186 | 85 | 101 | 109.6 | 332 | 441.6 | 217 | 60 | 157 | 54.8 | ³⁾ | 220 |
| 80 | 186 | 85 | 101 | 109.6 | 332 | 441.6 | 217 | 60 | 157 | 54.8 | ³⁾ | 220 |

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) Depending on the process connection

Flange connections

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



A0015621

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

| Flange according to EN 1092-1 (DIN 2501) Form B1 (DIN 2526 Form C): PN 40 1.4301 (304), wetted parts: titanium Order code for "Process connection", option D2W | | | | | | |
|--|--------|--------|---------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 95 | 65 | 4 × Ø14 | 16 | 17.30 | 403 |
| 15 | 95 | 65 | 4 × Ø14 | 16 | 17.30 | 439 |
| 15 FB | 95 | 65 | 4 × Ø14 | 15 | 17.07 | 573 |
| 25 | 115 | 85 | 4 × Ø14 | 19 | 28.50 | 579 |
| 25 FB | 115 | 85 | 4 × Ø14 | 18 | 26.40 | 702 |
| 40 | 150 | 110 | 4 × Ø18 | 22 | 43.10 | 707.5 |
| 40 FB | 150 | 110 | 4 × Ø18 | 20 | 35.62 | 821 |
| 50 | 165 | 125 | 4 × Ø18 | 24 | 54.50 | 829 |
| 50 FB | 165 | 125 | 4 × Ø18 | 36 | 54.8 | 1211.5 |
| 80 | 200 | 160 | 8 × Ø18 | 33 | 82.5 | 1211 |

FB = Full bore
Surface roughness: Ra 3.2 to 12.5 µm

1) DN 8 with DN 15 flanges as standard

| Flange according to EN 1092-1 (DIN 2501) Form B2 (DIN 2526 Form E): PN 63 1.4301 (304), wetted parts: titanium Order code for "Process connection", option D3W | | | | | | |
|--|--------|--------|---------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 50 | 180 | 135 | 4 × Ø22 | 34 | 54.5 | 833 |
| 50 FB | 180 | 135 | 4 × Ø22 | 45 | 54.8 | 1211.5 |
| 80 | 215 | 170 | 8 × Ø22 | 41 | 81.7 | 1211 |

FB = Full bore
Surface roughness (flange): Ra 0.8 to 3.2 µm

| Flange according to EN 1092-1 (DIN 2501) Form B2 (DIN 2526 Form E): PN 100 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option D4W</i> | | | | | | |
|--|--------|--------|---------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 105 | 75 | 4 × Ø14 | 25 | 17.30 | 403 |
| 15 | 105 | 75 | 4 × Ø14 | 25 | 17.30 | 439 |
| 15 FB | 105 | 75 | 4 × Ø14 | 26 | 17.07 | 573 |
| 25 | 140 | 100 | 4 × Ø18 | 29 | 28.50 | 579 |
| 25 FB | 140 | 100 | 4 × Ø18 | 31 | 26.40 | 702 |
| 40 | 170 | 125 | 4 × Ø22 | 32 | 42.50 | 707.5 |
| 40 FB | 170 | 125 | 4 × Ø22 | 33 | 35.62 | 821 |
| 50 | 195 | 145 | 4 × Ø26 | 36 | 53.90 | 833 |
| 50 FB | 195 | 145 | 4 × Ø26 | 48 | 54.8 | 1211.5 |
| 80 | 230 | 180 | 8 × Ø26 | 58 | 80.9 | 1236.5 |

FB = Full bore
Surface roughness (flange): Ra 0.8 to 3.2 µm

1) DN 8 with DN 15 flanges as standard

| Flange according to ASME B16.5: Class 150 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option AAW</i> | | | | | | |
|---|--------|--------|-----------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 90 | 60.3 | 4 × Ø15.7 | 20 | 15.70 | 403 |
| 15 | 90 | 60.3 | 4 × Ø15.7 | 20 | 15.70 | 439 |
| 15 FB | 90 | 60.3 | 4 × Ø15.7 | 19 | 17.07 | 573 |
| 25 | 110 | 79.4 | 4 × Ø15.7 | 23 | 26.70 | 579 |
| 25 FB | 110 | 79.4 | 4 × Ø15.7 | 22 | 26.40 | 702 |
| 40 | 125 | 98.4 | 4 × Ø15.7 | 26 | 40.90 | 707.5 |
| 40 FB | 125 | 98.4 | 4 × Ø15.7 | 24 | 35.62 | 821 |
| 50 | 150 | 120.7 | 4 × Ø19.1 | 28 | 52.60 | 829 |
| 50 FB | 150 | 120.7 | 4 × Ø19.1 | 40 | 54.8 | 1211.5 |
| 80 | 190 | 152.4 | 4 × Ø19.1 | 37 | 78 | 1211 |

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

1) DN 8 with DN 15 flanges as standard

| Flange according to ASME B16.5: Class 300 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option ABW</i> | | | | | | |
|---|--------|--------|-----------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 95 | 66.7 | 4 × Ø15.7 | 20 | 15.70 | 403 |
| 15 | 95 | 66.7 | 4 × Ø15.7 | 20 | 15.70 | 439 |
| 15 FB | 95 | 66.7 | 4 × Ø15.7 | 19 | 17.07 | 573 |
| 25 | 125 | 88.9 | 4 × Ø19.1 | 23 | 26.70 | 579 |

| Flange according to ASME B16.5: Class 300 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option ABW</i> | | | | | | |
|---|--------|--------|-----------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 25 FB | 125 | 88.9 | 4 × Ø19.1 | 22 | 26.40 | 702 |
| 40 | 155 | 114.3 | 4 × Ø22.4 | 26 | 40.90 | 707.5 |
| 40 FB | 155 | 114.3 | 4 × Ø22.4 | 24 | 35.62 | 821 |
| 50 | 165 | 127.0 | 8 × Ø19.1 | 28 | 52.60 | 829 |
| 50 FB | 165 | 127.0 | 8 × Ø19.1 | 43 | 54.8 | 1211.5 |
| 80 | 210 | 168.3 | 8 × Ø22.3 | 42 | 78 | 1211 |

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

1) DN 8 with DN 15 flanges as standard

| Flange according to ASME B16.5: Class 600 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option ACW</i> | | | | | | |
|---|--------|--------|-----------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 95 | 66.7 | 4 × Ø15.7 | 20 | 13.80 | 403 |
| 15 | 95 | 66.7 | 4 × Ø15.7 | 20 | 13.80 | 439 |
| 15 FB | 95 | 66.7 | 4 × Ø15.7 | 22 | 17.07 | 573 |
| 25 | 125 | 88.9 | 4 × Ø19.1 | 23 | 24.40 | 579 |
| 25 FB | 125 | 88.9 | 4 × Ø19.1 | 25 | 26.40 | 702 |
| 40 | 155 | 114.3 | 4 × Ø22.4 | 28 | 38.10 | 707.5 |
| 40 FB | 155 | 114.3 | 4 × Ø22.4 | 29 | 35.62 | 821 |
| 50 | 165 | 127.0 | 8 × Ø19.1 | 33 | 49.30 | 833 |
| 50 FB | 165 | 127.0 | 8 × Ø19.1 | 46 | 54.8 | 1211.5 |
| 80 | 210 | 168.3 | 8 × Ø22.3 | 53 | 73.7 | 1223 |

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

1) DN 8 with DN 15 flanges as standard

| Flange JIS B2220: 10K 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option NDW</i> | | | | | | |
|---|--------|--------|---------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 50 | 155 | 120 | 4 × Ø19 | 28 | 50 | 829 |
| 50 FB | 155 | 120 | 4 × Ø19 | 40 | 54.8 | 1211.5 |
| 80 | 185 | 150 | 8 × Ø19 | 33 | 80 | 1211 |

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

| Flange JIS B2220: 20K 1.4301 (304), wetted parts: titanium Order code for "Process connection", option NEW | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 95 | 70 | 4 × Ø15 | 20 | 15.00 | 403 |
| 15 | 95 | 70 | 4 × Ø15 | 20 | 15.00 | 439 |
| 15 FB | 95 | 70 | 4 × Ø15 | 19 | 17.07 | 573 |
| 25 | 125 | 90 | 4 × Ø19 | 23 | 25.00 | 579 |
| 25 FB | 125 | 90 | 4 × Ø19 | 22 | 26.40 | 702 |
| 40 | 140 | 105 | 4 × Ø19 | 26 | 40.00 | 707.5 |
| 40 FB | 140 | 105 | 4 × Ø19 | 24 | 35.62 | 821 |
| 50 | 155 | 120 | 8 × Ø19 | 28 | 50.00 | 829 |
| 50 FB | 155 | 120 | 8 × Ø19 | 42 | 54.8 | 1211.5 |
| 80 | 200 | 160 | 8 × Ø23 | 36 | 80 | 1211 |

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

1) DN 8 with DN 15 flanges as standard

| Flange JIS B2220: 40K 1.4301 (304), wetted parts: titanium Order code for "Process connection", option NFW | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 115 | 80 | 4 × Ø19 | 25 | 15.00 | 403 |
| 15 | 115 | 80 | 4 × Ø19 | 25 | 15.00 | 439 |
| 15 FB | 115 | 80 | 4 × Ø19 | 26 | 17.07 | 573 |
| 25 | 130 | 95 | 4 × Ø19 | 27 | 25.00 | 579 |
| 25 FB | 130 | 95 | 4 × Ø19 | 29 | 26.40 | 702 |
| 40 | 160 | 120 | 4 × Ø23 | 30 | 38.00 | 707.5 |
| 40 FB | 160 | 120 | 4 × Ø23 | 31 | 35.62 | 821 |
| 50 | 165 | 130 | 8 × Ø19 | 32 | 50.00 | 829 |
| 50 FB | 165 | 130 | 8 × Ø19 | 43 | 54.8 | 1211.5 |
| 80 | 210 | 170 | 8 × Ø23 | 46 | 75 | 1211 |

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

1) DN 8 with DN 15 flanges as standard

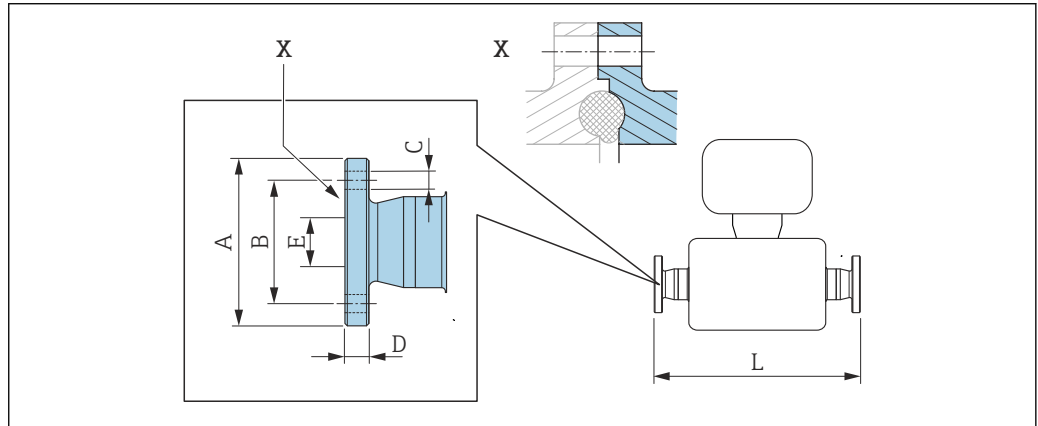
| Flange JIS B2220: 63K 1.4301 (304), wetted parts: titanium Order code for "Process connection", option NHW | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 120 | 85 | 4 × Ø19 | 28 | 12.00 | 403 |
| 15 | 120 | 85 | 4 × Ø19 | 28 | 12.80 | 439 |
| 15 FB | 120 | 85 | 4 × Ø19 | 29 | 17.07 | 573 |
| 25 | 140 | 100 | 4 × Ø23 | 30 | 22.00 | 579 |

| Flange JIS B2220: 63K 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option NHW</i> | | | | | | |
|---|--------|--------|---------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 25 FB | 140 | 100 | 4 × Ø23 | 32 | 26.40 | 702 |
| 40 | 175 | 130 | 4 × Ø25 | 36 | 35.00 | 707.5 |
| 40 FB | 175 | 130 | 4 × Ø25 | 37 | 35.62 | 821 |
| 50 | 185 | 145 | 8 × Ø23 | 40 | 48.00 | 833 |
| 50 FB | 185 | 145 | 8 × Ø23 | 47 | 54.8 | 1211.5 |
| 80 | 230 | 185 | 8 × Ø25 | 55 | 73 | 1226.5 |

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

1) DN 8 with DN 15 flanges as standard

Fixed flange DIN 11864-2



A0015627

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

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

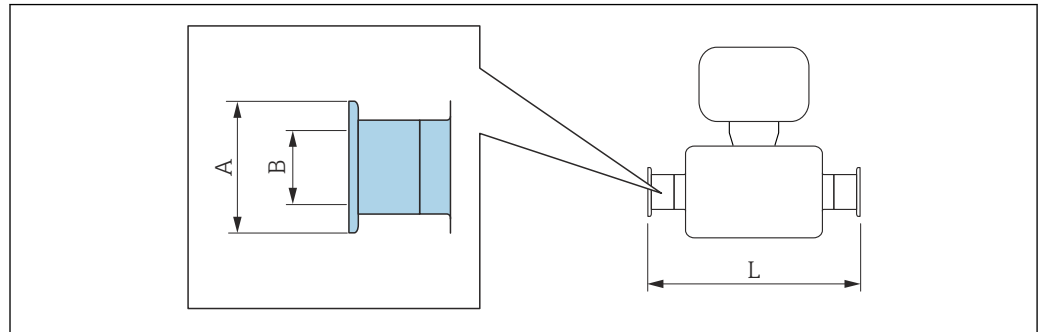
| Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flange with notch Titanium <i>Order code for "Process connection", option KFW</i> | | | | | | |
|--|--------|--------|---------|--------|--------|--------|
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | L [mm] |
| 8 ¹⁾ | 54 | 37 | 4 × Ø9 | 10 | 10 | 448 |
| 15 | 59 | 42 | 4 × Ø9 | 10 | 16 | 484 |
| 25 | 70 | 53 | 4 × Ø9 | 10 | 26 | 622 |
| 40 | 82 | 65 | 4 × Ø9 | 10 | 38 | 750 |
| 50 | 94 | 77 | 4 × Ø9 | 10 | 50 | 872 |
| 80 | 133 | 112 | 8 × Ø11 | 12 | 81 | 1269 |

3A version available: order code for "Additional approval", option LP in conjunction with
 Ra_{max} = 0.76 µm: order code for "Measuring tube material", option CB or
 Ra_{max} = 0.38 µm: order code for "Measuring tube material", option CD

1) DN 8 with DN 10 flanges

Clamp connections

Tri-Clamp



A0015625

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

| Tri-Clamp (≥ 1"), DIN 11866 series C Titanium Order code for "Process connection", option FTW | | | | |
|--|-----------------------------|-----------|-----------|-----------|
| DN [mm] | Clamp [in] | A [mm] | B [mm] | L [mm] |
| 8 | 1 | 50.4 | 22.1 | 426 |
| 15 | 1 | 50.4 | 22.1 | 462 |
| 15 FB | see ¾" Tri-Clamp connection | | | |
| 25 | 1 | 50.4 | 22.1 | 602 |
| 25 FB | 1 | 50.4 | 22.1 | 730.5 |
| 40 | 1 ½ | 50.4 | 34.8 | 730.5 |
| 40 FB | 1 ½ | 50.4 | 34.8 | 850 |
| 50 | 2 | 63.9 | 47.5 | 850 |
| 50 FB ¹⁾ | 2 ½ | 77.4 | 60.3 | 1268.5 |
| 80 | 3 | 90.9 | 72.9 | 1268.5 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra_{max} = 0.76 µm: order code for "Measuring tube material", option CB or
Ra_{max} = 0.38 µm: order code for "Measuring tube material", option CD

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

| ¾" Tri-Clamp, DIN 11866 series C Titanium Order code for "Process connection", option FEW | | | | |
|---|---------------|-----------|-----------|-----------|
| DN [mm] | Clamp [in] | A [mm] | B [mm] | L [mm] |
| 8 | ¾ | 25.0 | 16.0 | 426 |
| 15 | ¾ | 25.0 | 16.0 | 462 |
| 15 FB | ¾ | 25.0 | 16.0 | 602 |

FB = Full bore
3A version available: order code for "Additional approval", option LP in conjunction with
Ra_{max} = 0.76 µm: order code for "Measuring tube material", option CB or
Ra_{max} = 0.38 µm: order code for "Measuring tube material", option CD

| ½" Tri-Clamp, DIN 11866 series C Titanium | | | | |
|--|------------|--------|--------|--------|
| Order code for "Process connection", option FBW | | | | |
| DN [mm] | Clamp [in] | A [mm] | B [mm] | L [mm] |
| 8 | ½ | 25.0 | 9.5 | 426 |
| 15 | ½ | 25.0 | 9.5 | 462 |

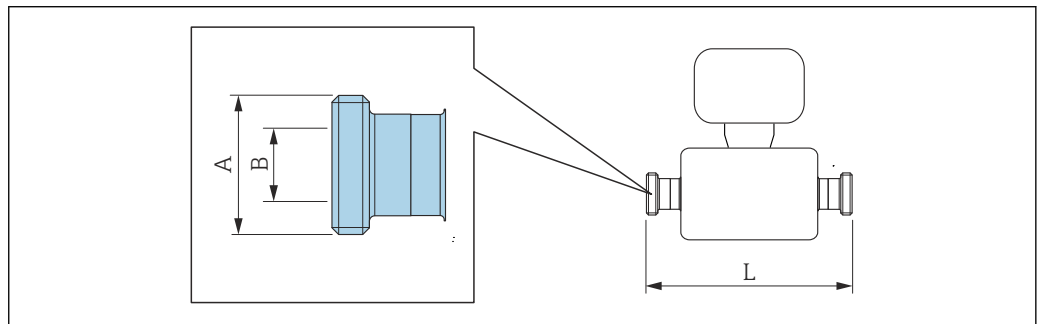
3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 0.76 \mu\text{m}$: order code for "Measuring tube material", option CB or
 $Ra_{max} = 0.38 \mu\text{m}$: order code for "Measuring tube material", option CD

| Eccentric Tri-Clamp, DIN 11866 series C Titanium | | | | | |
|---|---|------------|--------|--------|--------|
| DN [mm] | Order code for "Process connection", option | Clamp [in] | A [mm] | B [mm] | L [mm] |
| 8 | FEA | ½ | 25 | 9.5 | 426 |
| 15 | FEC | ¾ | 25 | 15.75 | 462 |
| 15 FB | FEE | 1 | 50.5 | 22.1 | 602 |
| 25 | FEE | 1 | 50.5 | 22.1 | 602 |
| 25 FB | FEG | 1½ | 50.5 | 34.8 | 730.5 |
| 40 | FEG | 1½ | 50.5 | 34.8 | 730.5 |
| 40 FB | FEJ | 2 | 64 | 47.5 | 850 |
| 50 | FEJ | 2 | 64 | 47.5 | 850 |
| 50 FB | FEL | 2 ½ | 77.5 | 60.3 | 1268.5 |
| 50 FB | FEM | 3 | 91 | 72.9 | 1268.5 |
| 80 | FEL | 2 ½ | 77.5 | 60.3 | 1268.5 |
| 80 | FEM | 3 | 91 | 72.9 | 1268.5 |

FB = Full bore
 3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 0.76 \mu\text{m}$: order code for "Measuring tube material", option CB or
 $Ra_{max} = 0.38 \mu\text{m}$: order code for "Measuring tube material", option CD
 Additional information regarding "Eccentric clamps"

Couplings

Thread DIN 11851



A0015628

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

| Thread DIN 11851, for pipe according to DIN11866 series A | | | |
|--|-------------------|-------------------|-------------------|
| Titanium | | | |
| <i>Order code for "Process connection", option KCW</i> | | | |
| DN [mm] | A [in] | B [mm] | L [mm] |
| 8 | Rd 34 × 1/8 | 16 | 426 |
| 15 | Rd 34 × 1/8 | 16 | 462 |
| 15 FB | Rd 34 × 1/8 | 16 | 602 |
| 25 | Rd 52 × 1/6 | 26 | 602 |
| 25 FB | Rd 52 × 1/6 | 26 | 737 |
| 40 | Rd 65 × 1/6 | 38 | 730.5 |
| 40 FB | Rd 65 × 1/6 | 38 | 856 |
| 50 | Rd 78 × 1/6 | 50 | 856 |
| 50 FB | Rd 78 × 1/6 | 50 | 1268.5 |
| 80 | Rd 110 × 1/4 | 81 | 1268.5 |

FB = Full bore
 3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 0.76 \mu\text{m}$: order code for "Measuring tube material", option CB

| Thread Rd 28 × 1/8" DIN 11851, for pipe according to DIN11866 series A | | | |
|---|-------------------|-------------------|-------------------|
| Titanium | | | |
| <i>Order code for "Process connection", option KAW</i> | | | |
| DN [mm] | A [in] | B [mm] | L [mm] |
| 8 | Rd 28 × 1/8 | 10 | 426 |
| 15 | Rd 28 × 1/8 | 10 | 462 |

3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 0.76 \mu\text{m}$: order code for "Measuring tube material", option CB

| Thread DIN11864-1 Form A, for pipe according to DIN11866 series A | | | |
|--|-------------------|-------------------|-------------------|
| Titanium | | | |
| <i>Order code for "Process connection", option KEW</i> | | | |
| DN [mm] | A [in] | B [mm] | L [mm] |
| 8 ¹⁾ | Rd 28 × 1/8 | 10 | 426 |
| 15 | Rd 34 × 1/8 | 16 | 462 |
| 15 FB | Rd 34 × 1/8 | 16 | 602 |
| 25 | Rd 52 × 1/6 | 26 | 602 |
| 25 FB | Rd 52 × 1/6 | 26 | 735 |
| 40 | Rd 65 × 1/6 | 38 | 730.5 |
| 40 FB | Rd 65 × 1/6 | 38 | 856 |
| 50 | Rd 78 × 1/6 | 50 | 856 |
| 50 FB | Rd 78 × 1/6 | 50 | 1268.5 |
| 80 | Rd 110 × 1/4 | 81 | 1268.5 |

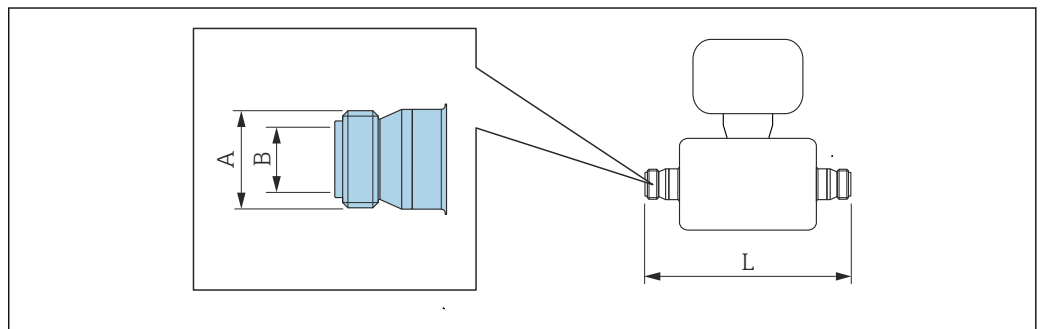
FB = Full bore
 3A version available (order code for "Additional approval", option LP) in combination with $Ra_{max} = 0.76 \mu\text{m}$,
 $Ra_{max} = 0.38 \mu\text{m}$ (order code for "Measuring tube material", option CB, CD)

1) DN 8 with DN 10 thread as standard

| Thread SMS 1145 Titanium Order code for "Process connection", option SAW | | | |
|--|-------------|--------|--------|
| DN [mm] | A [in] | B [mm] | L [mm] |
| 8 | Rd 40 × 1/6 | 22.5 | 426 |
| 15 | Rd 40 × 1/6 | 22.5 | 462 |
| 25 | Rd 40 × 1/6 | 22.5 | 602 |
| 25 FB | Rd 40 × 1/6 | 22.5 | 737 |
| 40 | Rd 60 × 1/6 | 35.5 | 738.5 |
| 40 FB | Rd 60 × 1/6 | 35.5 | 858 |
| 50 | Rd 70 × 1/6 | 48.5 | 858 |
| 50 FB | Rd 70 × 1/6 | 48.5 | 1258.5 |
| 80 | Rd 98 × 1/6 | 72 | 1268.5 |

FB = Full bore
3A version available ($Ra_{max} = 0.76 \mu m$) (order code for "Additional approval", option LP)

Thread ISO 2853



A0015623

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

| Thread ISO 2853, for pipe according to ISO 2037 Titanium Order code for "Process connection", option JSE | | | |
|--|--------|--------|--------|
| DN [mm] | A [in] | B [mm] | L [mm] |
| 8 ¹⁾ | 37.13 | 22.6 | 434 |
| 15 | 37.13 | 22.6 | 470 |
| 15 FB | 37.13 | 22.6 | 610 |
| 25 FB | 37.13 | 22.6 | 745 |
| 40 | 50.65 | 35.6 | 736.5 |
| 40 FB | 50.65 | 35.6 | 861 |
| 50 | 64.16 | 48.6 | 858 |
| 50 FB | 64.1 | 48.6 | 1268.5 |

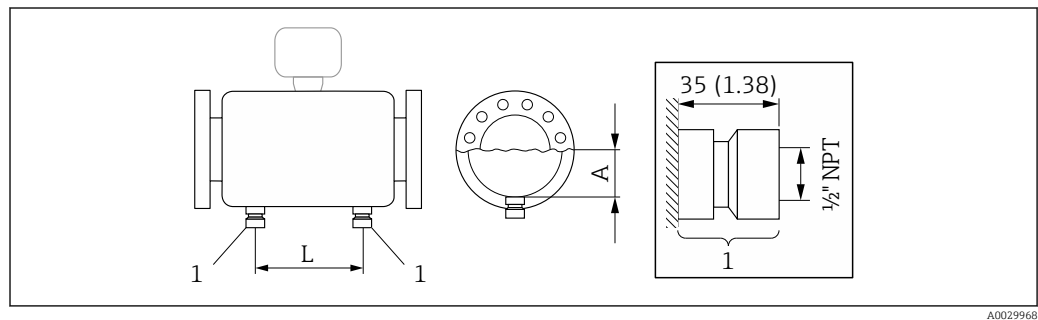
| Thread ISO 2853, for pipe according to ISO 2037 Titanium Order code for "Process connection", option JSE | | | |
|--|-----------|-----------|-----------|
| DN [mm] | A [in] | B [mm] | L [mm] |
| 80 | 91.19 | 72.9 | 1268.5 |

FB = Full bore
3A version available (order code for "Additional approval", option LP) in combination with $Ra_{max} = 0.76 \mu m$,
 $Ra_{max} = 0.38 \mu m$ (order code for "Measuring tube material", option CB, CD)

- 1) DN 8 with DN 15 thread as standard

Accessories

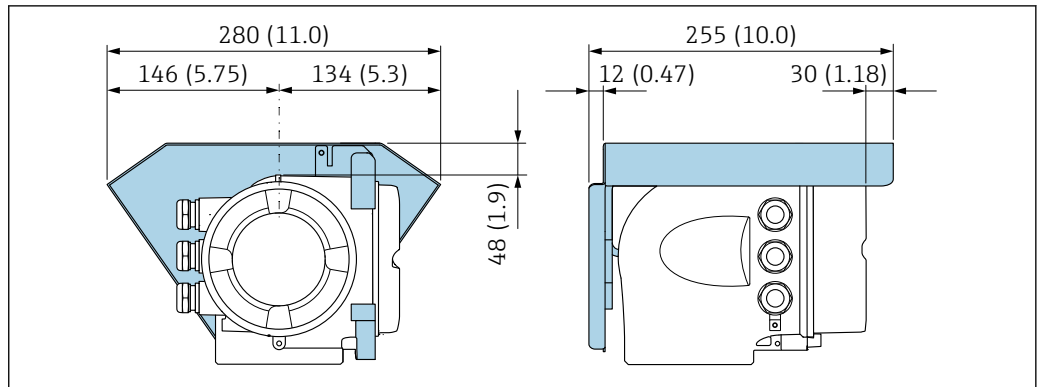
Rinse connections



- 1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"

| DN [mm] | A [mm] | L [mm] |
|------------|-----------|-----------|
| 8 | 90.65 | 122 |
| 15 | 90.65 | 158 |
| 15 FB | 90.65 | 158 |
| 25 | 90.65 | 296 |
| 25 FB | 90.65 | 296 |
| 40 | 103.35 | 392 |
| 40 FB | 103.35 | 392 |
| 50 | 117.75 | 488 |
| 50 FB | 145.5 | 814 |
| 80 | 145.5 | 814 |

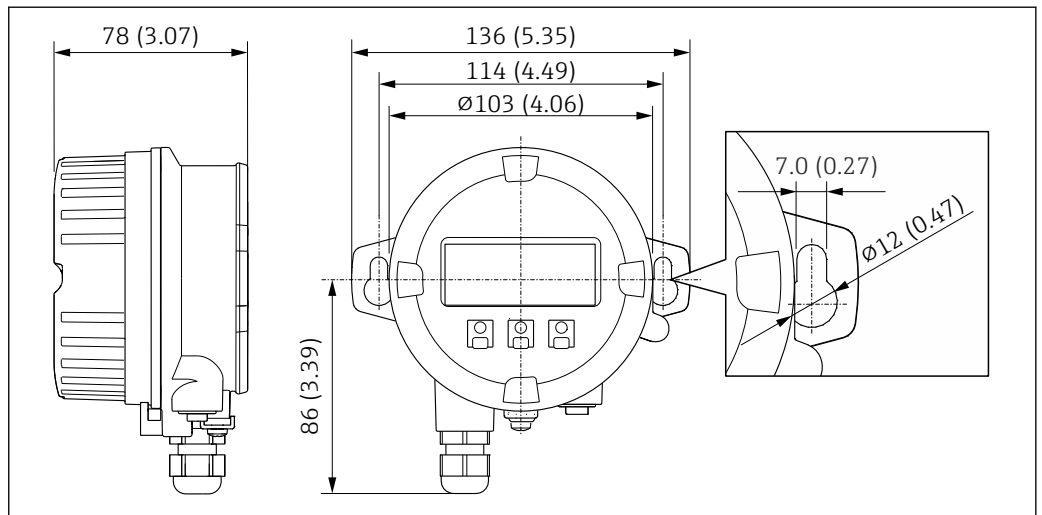
Weather protection cover



A0029553

35 Engineering unit mm (in)

Remote display and operating module DKX001



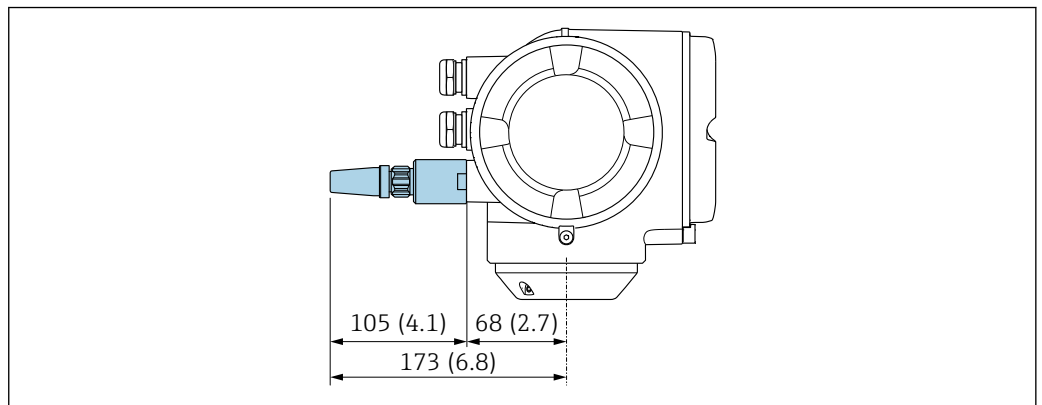
A0028921

36 Engineering unit mm (in)

External WLAN antenna

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

External WLAN antenna mounted on device

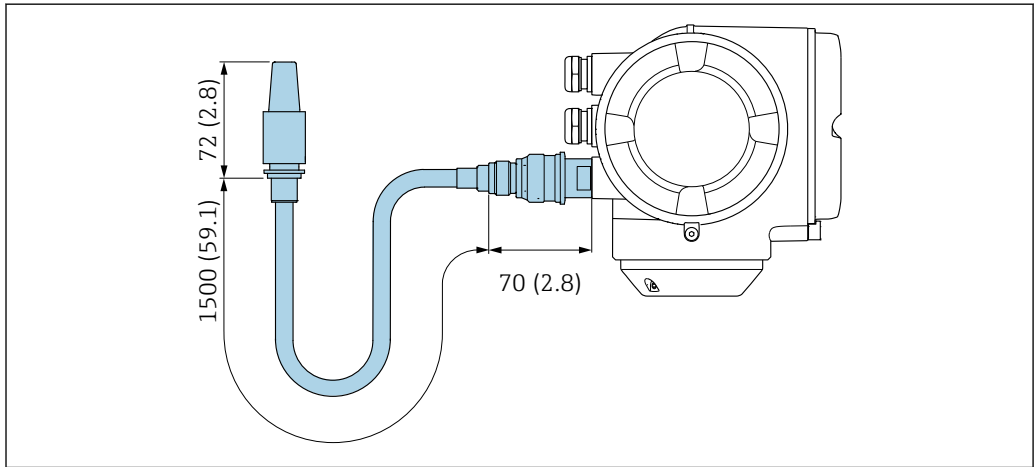


A0028923

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.

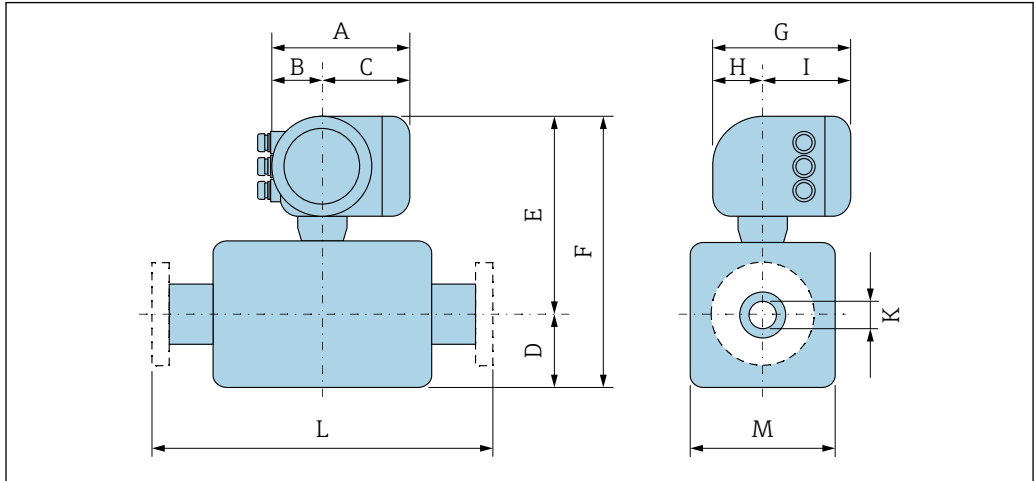


A0033597

38 Engineering unit mm (in)

Dimensions in US units

Compact version



A0033783

Order code for "Housing", option A "Aluminum, coated"

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G ³⁾ | H | I ³⁾ | K | L | M |
|----------------------------------|-----------------|-----------------|------|------|-----------------|-----------------|-----------------|------|-----------------|------|---------------|------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| ³ / ₈ | 6.65 | 2.68 | 3.98 | 2.25 | 11.1 | 13.35 | 7.87 | 2.32 | 5.55 | 0.34 | ⁴⁾ | 4.53 |
| ¹ / ₂ | 6.65 | 2.68 | 3.98 | 2.25 | 11.1 | 13.35 | 7.87 | 2.32 | 5.55 | 0.45 | ⁴⁾ | 4.53 |
| ¹ / ₂ FB | 6.65 | 2.68 | 3.98 | 2.25 | 11.1 | 13.35 | 7.87 | 2.32 | 5.55 | 0.67 | ⁴⁾ | 4.53 |
| 1 | 6.65 | 2.68 | 3.98 | 2.25 | 11.1 | 13.35 | 7.87 | 2.32 | 5.55 | 0.67 | ⁴⁾ | 4.53 |
| 1 FB | 6.65 | 2.68 | 3.98 | 2.78 | 11.5 | 14.28 | 7.87 | 2.32 | 5.55 | 1.04 | ⁴⁾ | 5.59 |
| 1 ¹ / ₂ | 6.65 | 2.68 | 3.98 | 2.78 | 11.5 | 14.28 | 7.87 | 2.32 | 5.55 | 1.04 | ⁴⁾ | 5.59 |
| 1 ¹ / ₂ FB | 6.65 | 2.68 | 3.98 | 3.31 | 12.05 | 15.36 | 7.87 | 2.32 | 5.55 | 1.40 | ⁴⁾ | 6.65 |
| 2 | 6.65 | 2.68 | 3.98 | 3.31 | 12.05 | 15.36 | 7.87 | 2.32 | 5.55 | 1.40 | ⁴⁾ | 6.65 |

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G ³⁾ | H | I ³⁾ | K | L | M |
|------|-----------------|-----------------|------|------|-----------------|-----------------|-----------------|------|-----------------|------|---------------|------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| 2 FB | 6.65 | 2.68 | 3.98 | 4.31 | 13.05 | 17.37 | 7.87 | 2.32 | 5.55 | 2.16 | ⁴⁾ | 8.66 |
| 3 | 6.65 | 2.68 | 3.98 | 4.31 | 13.05 | 17.37 | 7.87 | 2.32 | 5.55 | 2.16 | ⁴⁾ | 8.66 |

- 1) Depending on the cable gland used: values up to + 1.18 in
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) For version without local display: values - 1.18 in
- 4) Depending on the process connection

Order code for "Housing", option A "Aluminum, coated"; Ex d

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G ³⁾ | H | I ³⁾ | K | L | M |
|-------------------|-----------------|-----------------|------|------|-----------------|-----------------|-----------------|------|-----------------|------|---------------|------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| $\frac{3}{8}$ | 7.40 | 3.35 | 4.06 | 2.25 | 11.14 | 13.39 | 8.54 | 2.28 | 6.26 | 0.34 | ⁴⁾ | 4.53 |
| $\frac{1}{2}$ | 7.40 | 3.35 | 4.06 | 2.25 | 11.14 | 13.39 | 8.54 | 2.28 | 6.26 | 0.45 | ⁴⁾ | 4.53 |
| $\frac{1}{2}$ FB | 7.40 | 3.35 | 4.06 | 2.25 | 11.14 | 13.39 | 8.54 | 2.28 | 6.26 | 0.67 | ⁴⁾ | 4.53 |
| 1 | 7.40 | 3.35 | 4.06 | 2.25 | 11.14 | 13.39 | 8.54 | 2.28 | 6.26 | 0.67 | ⁴⁾ | 4.53 |
| 1 FB | 7.40 | 3.35 | 4.06 | 2.78 | 11.54 | 14.32 | 8.54 | 2.28 | 6.26 | 1.04 | ⁴⁾ | 5.59 |
| $1\frac{1}{2}$ | 7.40 | 3.35 | 4.06 | 2.78 | 11.54 | 14.32 | 8.54 | 2.28 | 6.26 | 1.04 | ⁴⁾ | 5.59 |
| $1\frac{1}{2}$ FB | 7.40 | 3.35 | 4.06 | 3.31 | 12.09 | 15.4 | 8.54 | 2.28 | 6.26 | 1.40 | ⁴⁾ | 6.65 |
| 2 | 7.40 | 3.35 | 4.06 | 3.31 | 12.09 | 15.4 | 8.54 | 2.28 | 6.26 | 1.40 | ⁴⁾ | 6.65 |
| 2 FB | 7.40 | 3.35 | 4.06 | 4.31 | 13.07 | 17.39 | 8.54 | 2.28 | 6.26 | 2.16 | ⁴⁾ | 8.66 |
| 3 | 7.40 | 3.35 | 4.06 | 4.31 | 13.07 | 17.39 | 8.54 | 2.28 | 6.26 | 2.16 | ⁴⁾ | 8.66 |

- 1) Depending on the cable gland used: values up to + 1.18 in
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) For version without local display: values - 1.57 in
- 4) Depending on the process connection

Order code for "Housing", option B "Stainless, hygienic"

| DN | A ¹⁾ | B | C | D | E ²⁾ | F | G ³⁾ | H | I | K | L | M |
|-------------------|-----------------|------|------|------|-----------------|-------|-----------------|------|------|------|---------------|------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| $\frac{3}{8}$ | 7.20 | 2.87 | 4.33 | 2.25 | 11.1 | 13.35 | 7.87 | 2.56 | 5.31 | 0.34 | ⁴⁾ | 4.53 |
| $\frac{1}{2}$ | 7.20 | 2.87 | 4.33 | 2.25 | 11.1 | 13.35 | 7.87 | 2.56 | 5.31 | 0.45 | ⁴⁾ | 4.53 |
| $\frac{1}{2}$ FB | 7.20 | 2.87 | 4.33 | 2.25 | 11.1 | 13.35 | 7.87 | 2.56 | 5.31 | 0.67 | ⁴⁾ | 4.53 |
| 1 | 7.20 | 2.87 | 4.33 | 2.25 | 11.1 | 13.35 | 7.87 | 2.56 | 5.31 | 0.67 | ⁴⁾ | 4.53 |
| 1 FB | 7.20 | 2.87 | 4.33 | 2.78 | 11.5 | 14.28 | 7.87 | 2.56 | 5.31 | 1.04 | ⁴⁾ | 5.59 |
| $1\frac{1}{2}$ | 7.20 | 2.87 | 4.33 | 2.78 | 11.5 | 14.28 | 7.87 | 2.56 | 5.31 | 1.04 | ⁴⁾ | 5.59 |
| $1\frac{1}{2}$ FB | 7.20 | 2.87 | 4.33 | 3.31 | 12.05 | 15.36 | 7.87 | 2.56 | 5.31 | 1.40 | ⁴⁾ | 6.65 |
| 2 | 7.20 | 2.87 | 4.33 | 3.31 | 12.05 | 15.36 | 7.87 | 2.56 | 5.31 | 1.40 | ⁴⁾ | 6.65 |
| 2 FB | 7.20 | 2.87 | 4.33 | 4.31 | 13.05 | 17.37 | 7.87 | 2.56 | 5.31 | 2.16 | ⁴⁾ | 8.66 |
| 3 | 7.20 | 2.87 | 4.33 | 4.31 | 13.05 | 17.37 | 7.87 | 2.56 | 5.31 | 2.16 | ⁴⁾ | 8.66 |

- 1) Depending on the cable gland used: values up to + 1.18 in
- 2) With order code for "Sensor option", option CG: values +70 mm
- 3) For version without local display: values - 0.51 in
- 4) Depending on the process connection

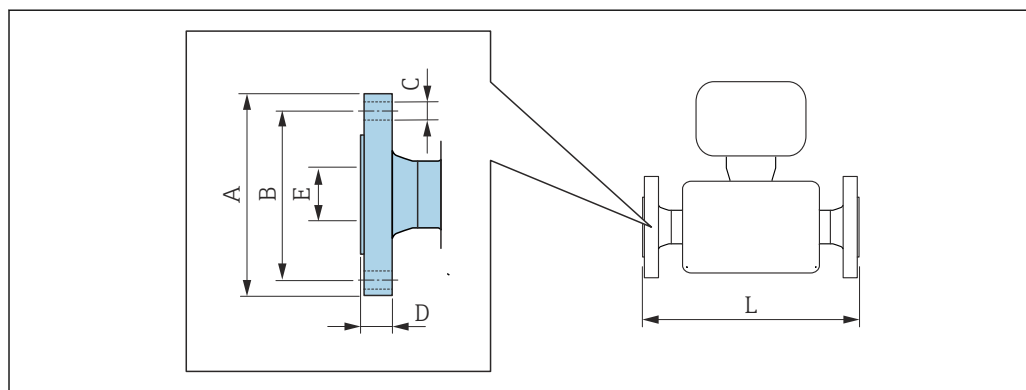
Order code for "Housing", option L "Cast, stainless"

| DN | A ¹⁾ | B ¹⁾ | C | D | E ²⁾ | F ²⁾ | G | H | I | K | L | M |
|-------------------|-----------------|-----------------|------|------|-----------------|-----------------|------|------|------|------|---------------|------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| $\frac{3}{8}$ | 7.32 | 3.35 | 3.98 | 2.25 | 11.14 | 13.39 | 8.54 | 2.36 | 6.18 | 0.34 | ³⁾ | 4.53 |
| $\frac{1}{2}$ | 7.32 | 3.35 | 3.98 | 2.25 | 11.14 | 13.39 | 8.54 | 2.36 | 6.18 | 0.45 | ³⁾ | 4.53 |
| $\frac{1}{2}$ FB | 7.32 | 3.35 | 3.98 | 2.25 | 11.14 | 13.39 | 8.54 | 2.36 | 6.18 | 0.67 | ³⁾ | 4.53 |
| 1 | 7.32 | 3.35 | 3.98 | 2.25 | 11.14 | 13.39 | 8.54 | 2.36 | 6.18 | 0.67 | ³⁾ | 4.53 |
| 1 FB | 7.32 | 3.35 | 3.98 | 2.78 | 11.54 | 14.32 | 8.54 | 2.36 | 6.18 | 1.04 | ³⁾ | 5.59 |
| $1\frac{1}{2}$ | 7.32 | 3.35 | 3.98 | 2.78 | 11.54 | 14.32 | 8.54 | 2.36 | 6.18 | 1.04 | ³⁾ | 5.59 |
| $1\frac{1}{2}$ FB | 7.32 | 3.35 | 3.98 | 3.31 | 12.05 | 15.36 | 8.54 | 2.36 | 6.18 | 1.40 | ³⁾ | 6.65 |
| 2 | 7.32 | 3.35 | 3.98 | 3.31 | 12.05 | 15.36 | 8.54 | 2.36 | 6.18 | 1.40 | ³⁾ | 6.65 |
| 2 FB | 7.32 | 3.35 | 3.98 | 4.31 | 13.07 | 17.39 | 8.54 | 2.36 | 6.18 | 2.16 | ³⁾ | 8.66 |
| 3 | 7.32 | 3.35 | 3.98 | 4.31 | 13.07 | 17.39 | 8.54 | 2.36 | 6.18 | 2.16 | ³⁾ | 8.66 |

- 1) Depending on the cable gland used: values up to + 1.18 in
 2) With order code for "Sensor option", option CG: values +70 mm
 3) Depending on the process connection

Flange connections

Fixed flange ASME B16.5



A0015621

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

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

| DN | A | B | C | D | E | L |
|-----------------------------|------|------|-----------|------|------|-------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| $\frac{3}{8}$ ¹⁾ | 3.54 | 2.37 | 4 × Ø0.62 | 0.79 | 0.62 | 15.87 |
| $\frac{1}{2}$ | 3.54 | 2.37 | 4 × Ø0.62 | 0.79 | 0.62 | 17.28 |
| $\frac{1}{2}$ FB | 3.54 | 2.37 | 4 × Ø0.62 | 0.75 | 0.67 | 22.56 |
| 1 | 4.33 | 3.13 | 4 × Ø0.62 | 0.91 | 1.05 | 22.8 |
| 1 FB | 4.33 | 3.13 | 4 × Ø0.62 | 0.87 | 1.04 | 27.64 |
| $1\frac{1}{2}$ | 4.92 | 3.87 | 4 × Ø0.62 | 1.02 | 1.61 | 27.85 |
| $1\frac{1}{2}$ FB | 4.92 | 3.87 | 4 × Ø0.62 | 0.94 | 1.4 | 32.32 |
| 2 | 5.91 | 4.75 | 4 × Ø0.75 | 1.1 | 2.07 | 32.64 |

| Flange according to ASME B16.5: Class 150 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option AAW</i> | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
| 2 FB | 5.91 | 4.75 | 4 × Ø0.75 | 1.57 | 2.16 | 47.7 |
| 3 | 7.48 | 6.00 | 4 × Ø0.75 | 1.46 | 3.07 | 47.68 |

FB = Full bore
Surface roughness (flange): Ra 126 to 248 µin

- 1) DN 3/8" with DN 1/2" flanges as standard;

| Flange according to ASME B16.5: Class 300 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option ABW</i> | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
| 3/8 ¹⁾ | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.62 | 15.87 |
| 1/2 | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.62 | 17.28 |
| 1/2 FB | 3.74 | 2.63 | 4 × Ø0.62 | 0.75 | 0.67 | 22.56 |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.91 | 1.05 | 22.8 |
| 1 FB | 4.92 | 3.50 | 4 × Ø0.75 | 0.87 | 1.04 | 27.64 |
| 1 1/2 | 6.10 | 4.50 | 4 × Ø0.88 | 1.02 | 1.61 | 27.85 |
| 1 1/2 FB | 6.10 | 4.50 | 4 × Ø0.88 | 0.94 | 1.4 | 32.32 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 1.1 | 2.07 | 32.64 |
| 2 FB | 6.50 | 5.00 | 8 × Ø0.75 | 1.69 | 2.16 | 47.7 |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 1.65 | 3.07 | 47.68 |

FB = Full bore
Surface roughness (flange): Ra 126 to 248 µin

- 1) DN 3/8" with DN 1/2" flanges as standard;

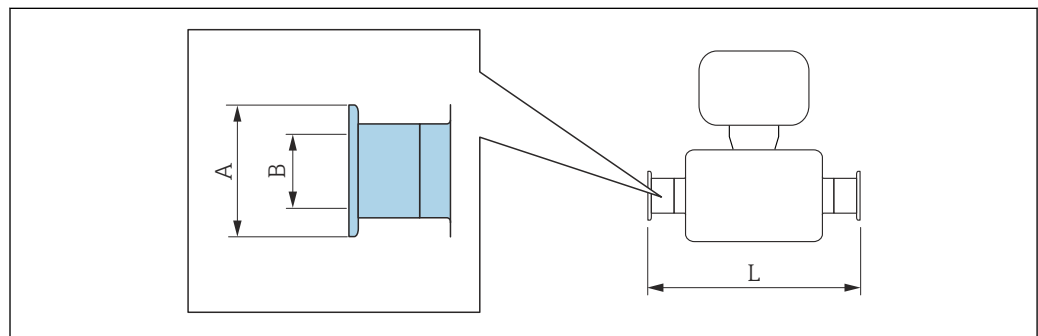
| Flange according to ASME B16.5: Class 600 1.4301 (304), wetted parts: titanium <i>Order code for "Process connection", option ACW</i> | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
| 3/8 ¹⁾ | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.54 | 15.87 |
| 1/2 | 3.74 | 2.63 | 4 × Ø0.62 | 0.79 | 0.54 | 17.28 |
| 1/2 FB | 3.74 | 2.63 | 4 × Ø0.62 | 0.87 | 0.67 | 22.56 |
| 1 | 4.92 | 3.50 | 4 × Ø0.75 | 0.91 | 0.96 | 22.8 |
| 1 FB | 4.92 | 3.50 | 4 × Ø0.75 | 0.98 | 1.04 | 27.64 |
| 1 1/2 | 6.10 | 4.50 | 4 × Ø0.88 | 1.1 | 1.5 | 27.85 |
| 1 1/2 FB | 6.10 | 4.50 | 4 × Ø0.88 | 1.14 | 1.4 | 32.32 |
| 2 | 6.50 | 5.00 | 8 × Ø0.75 | 1.3 | 1.94 | 32.8 |
| 2 FB | 6.50 | 5.00 | 8 × Ø0.75 | 1.81 | 2.16 | 47.7 |

| Flange according to ASME B16.5: Class 600 1.4301 (304), wetted parts: titanium Order code for "Process connection", option ACW | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] | L [in] |
| 3 | 8.27 | 6.63 | 8 × Ø0.88 | 2.09 | 2.9 | 48.15 |
| FB = Full bore Surface roughness (flange): Ra 126 to 248 µin | | | | | | |

- 1) DN 3/8" with DN 1/2" flanges as standard;

Clamp connections

Tri-Clamp



A0015625

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

| Tri-Clamp (≥ 1"), DIN 11866 series C Titanium Order code for "Process connection", option FTW | | | | |
|--|-------------------------------|-----------|-----------|-----------|
| DN [in] | Clamp [in] | A [in] | B [in] | L [in] |
| 3/8 | 1 | 1.98 | 0.87 | 16.77 |
| 1/2 | 1 | 1.98 | 0.87 | 18.19 |
| 1/2 FB | see 3/4" Tri-Clamp connection | | | |
| 1 | 1 | 1.98 | 0.87 | 23.7 |
| 1 FB | 1 | 1.98 | 0.87 | 28.76 |
| 1 1/2 | 1 1/2 | 1.98 | 1.37 | 28.76 |
| 1 1/2 FB | 1 1/2 | 1.98 | 1.37 | 33.46 |
| 2 | 2 | 2.52 | 1.87 | 33.46 |
| 2 FB ¹⁾ | 2 1/2 | 3.05 | 2.37 | 49.92 |
| 3 | 3 | 3.58 | 2.87 | 49.92 |
| FB = Full bore 3A version available: order code for "Additional approval", option LP in conjunction with Ra _{max} = 30 µin: order code for "Measuring tube material", option CB or Ra _{max} = 15 µin: order code for "Measuring tube material", option CD | | | | |

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

| ¾" Tri-Clamp, DIN 11866 series C | | | | |
|--|-----------------------|-------------------|-------------------|-------------------|
| Titanium | | | | |
| <i>Order code for "Process connection", option FEW</i> | | | | |
| DN [in] | Clamp [in] | A [in] | B [in] | L [in] |
| ¾ | ¾ | 0.98 | 0.63 | 16.77 |
| ½ | ¾ | 0.98 | 0.63 | 18.19 |
| ½ FB | ¾ | 0.98 | 0.63 | 23.7 |

FB = Full bore
 3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 30 \mu\text{in}$: order code for "Measuring tube material", option CB or
 $Ra_{max} = 15 \mu\text{in}$: order code for "Measuring tube material", option CD

| ½" Tri-Clamp, DIN 11866 series C | | | | |
|--|-----------------------|-------------------|-------------------|-------------------|
| Titanium | | | | |
| <i>Order code for "Process connection", option FBW</i> | | | | |
| DN [in] | Clamp [in] | A [in] | B [in] | L [in] |
| ¾ | ½ | 0.98 | 0.37 | 16.77 |
| ½ | ½ | 0.98 | 0.37 | 18.19 |

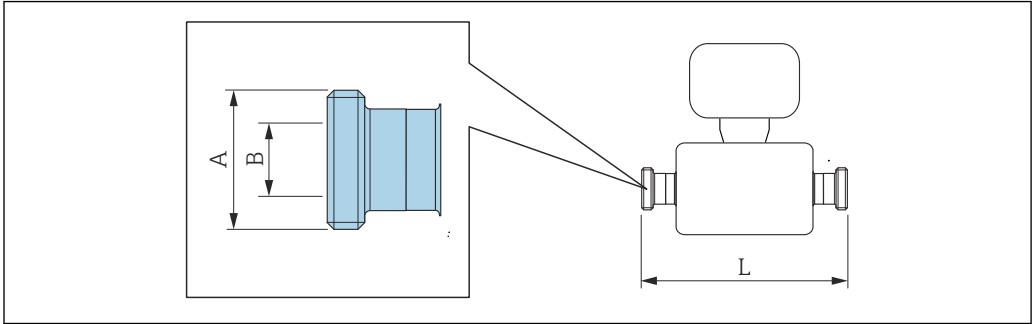
3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 30 \mu\text{in}$: order code for "Measuring tube material", option CB or
 $Ra_{max} = 15 \mu\text{in}$: order code for "Measuring tube material", option CD

| Eccentric Tri-Clamp, DIN 11866 series C | | | | | |
|--|--|-----------------------|-------------------|-------------------|-------------------|
| Titanium | | | | | |
| DN [in] | Order code for "Process connection", option | Clamp [in] | A [in] | B [in] | L [in] |
| ¾ | FEA | ½ | 0.98 | 0.37 | 16.77 |
| ½ | FEC | ¾ | 0.98 | 0.62 | 18.19 |
| ½ FB | FEE | 1 | 1.99 | 0.87 | 23.7 |
| 1 | FEE | 1 | 1.99 | 0.87 | 23.7 |
| 1 FB | FEG | 1½ | 1.99 | 1.37 | 28.76 |
| 1½ | FEG | 1½ | 1.99 | 1.37 | 28.76 |
| 1½ FB | FEJ | 2 | 2.52 | 1.87 | 33.46 |
| 2 | FEJ | 2 | 2.52 | 1.87 | 33.46 |
| 2 FB | FEL | 2 ½ | 3.05 | 2.37 | 49.94 |
| 2 FB | FEM | 3 | 3.58 | 2.87 | 49.94 |
| 3 | FEL | 2 ½ | 3.05 | 2.37 | 49.94 |
| 3 | FEM | 3 | 3.58 | 2.87 | 49.94 |

FB = Full bore
 3A version available: order code for "Additional approval", option LP in conjunction with
 $Ra_{max} = 30 \mu\text{in}$: order code for "Measuring tube material", option CB or
 $Ra_{max} = 15 \mu\text{in}$: order code for "Measuring tube material", option CD
 Additional information regarding "Eccentric clamps"

Couplings

Thread SMS 1145



A0015628

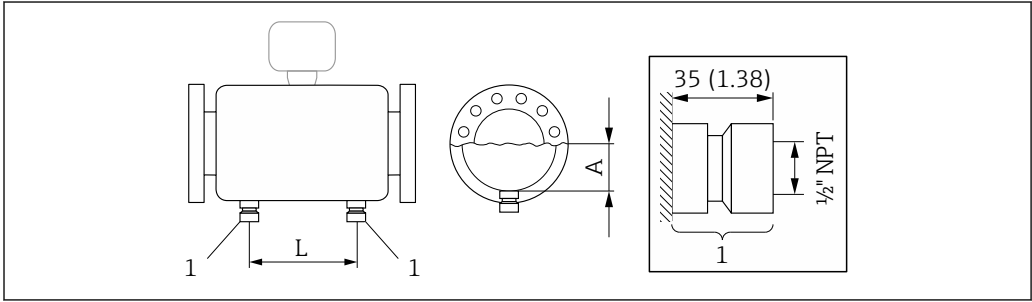
i Length tolerance for dimension L in inch:
+0.06 / -0.08

| Thread SMS 1145 Titanium Order code for "Process connection", option SAW | | | |
|--|-------------|--------|--------|
| DN [in] | A [in] | B [in] | L [in] |
| 3/8 | Rd 40 × 1/6 | 0.89 | 16.77 |
| 1/2 | Rd 40 × 1/6 | 0.89 | 18.19 |
| 1 | Rd 40 × 1/6 | 0.89 | 23.7 |
| 1 FB | Rd 40 × 1/6 | 0.89 | 29.02 |
| 1 1/2 | Rd 60 × 1/6 | 1.4 | 29.07 |
| 1 1/2 FB | Rd 60 × 1/6 | 1.4 | 33.78 |
| 2 | Rd 70 × 1/6 | 1.91 | 33.78 |
| 2 FB | Rd 70 × 1/6 | 1.91 | 49.55 |
| 3 | Rd 98 × 1/6 | 2.83 | 49.94 |

FB = Full bore
Ra_{max} = 30 µin: order code for "Measuring tube material", option CB or

Accessories

Rinse connections

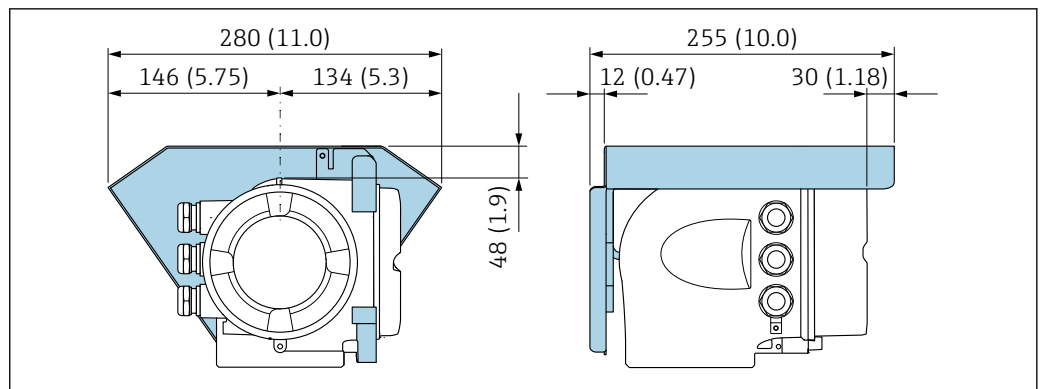


A0029968

1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"

| DN | A | L |
|----------|-------|-------|
| [in] | [in] | [in] |
| 3/8 | 3.569 | 4.8 |
| 1/2 | 3.569 | 6.22 |
| 1/2 FB | 3.569 | 6.22 |
| 1 | 3.569 | 11.65 |
| 1 FB | 3.569 | 11.65 |
| 1 1/2 | 4.069 | 15.43 |
| 1 1/2 FB | 4.069 | 15.43 |
| 2 | 4.636 | 19.21 |
| 2 FB | 5.73 | 32.05 |
| 3 | 5.73 | 32.05 |

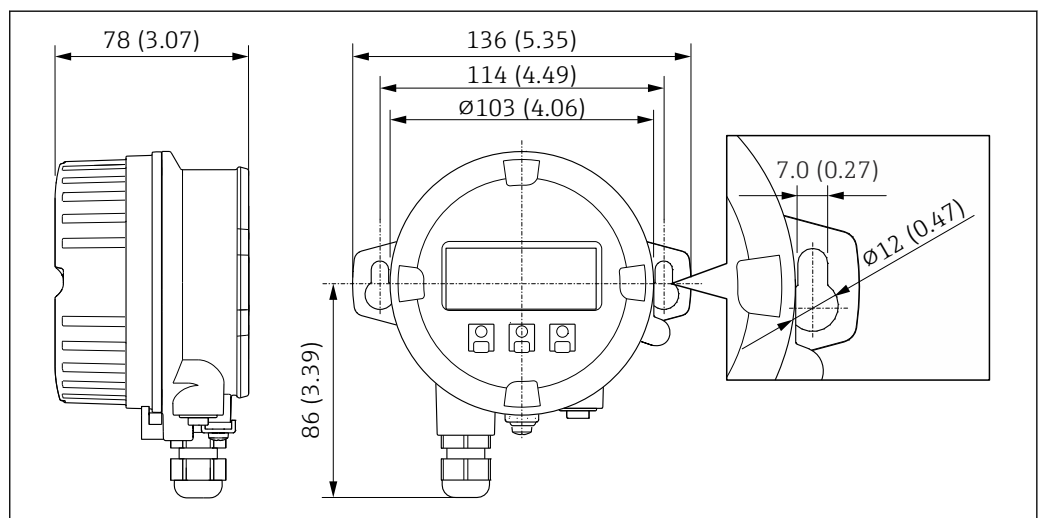
Weather protection cover



A0029553

39 Engineering unit mm (in)


Remote display and operating module DKX001

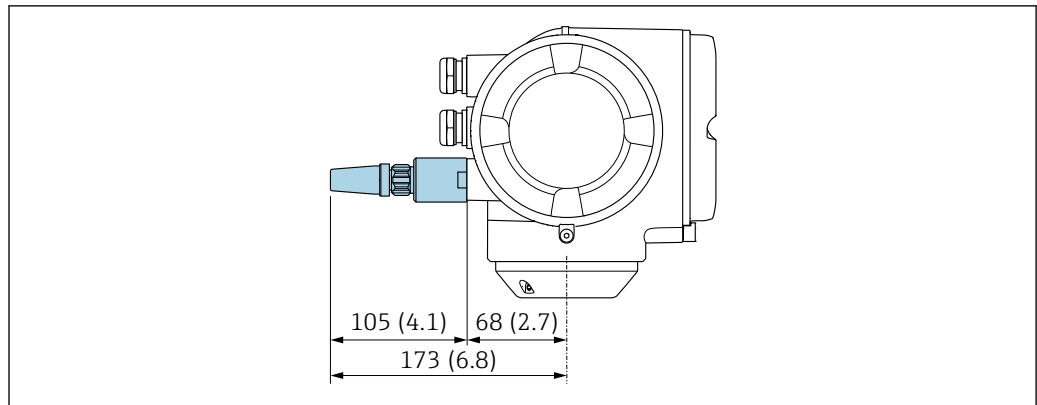


A0028921

40 Engineering unit mm (in)

External WLAN antenna

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

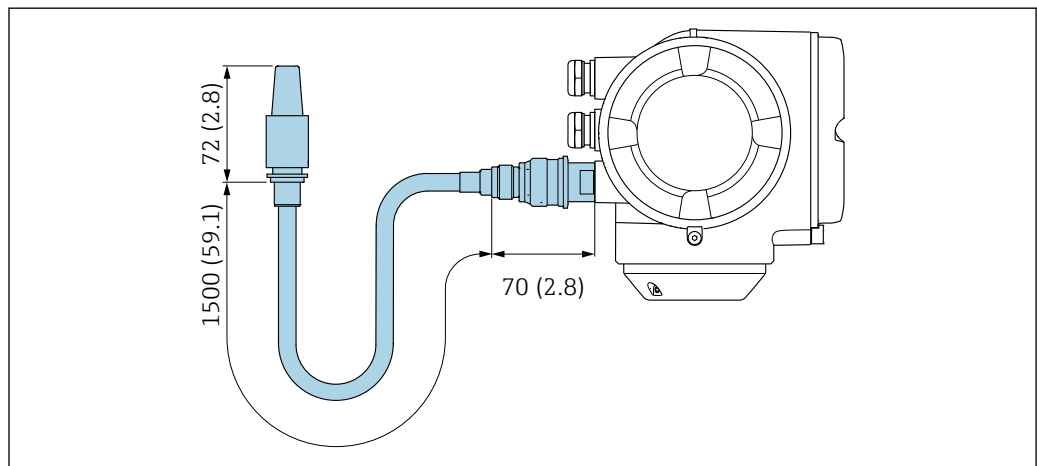
External WLAN antenna mounted on device

A0028923

41 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.



A0033597

42 Engineering unit mm (in)

Weight

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

Different values due to different transmitter versions:

- Transmitter version for the hazardous area
(Order code for "Housing", option A "Aluminum, coated"; Ex d): +2 kg (+4.4 lbs)
- Cast transmitter version, stainless
(Order code for "Housing", option L "Cast, stainless"): +6 kg (+13 lbs)
- Transmitter version for hygienic area
(Order code for "Housing", option B "Stainless, hygienic"): +0.2 kg (+0.44 lbs)

Weight in SI units

| DN [mm] | Weight [kg] |
|---------|-------------|
| 8 | 11 |
| 15 | 13 |
| 15 FB | 19 |
| 25 | 20 |

| DN [mm] | Weight [kg] |
|----------------|-------------|
| 25 FB | 39 |
| 40 | 40 |
| 40 FB | 65 |
| 50 | 67 |
| 50 FB | 118 |
| 80 | 122 |
| FB = Full bore | |

Weight in US units

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

Materials

Transmitter housing

Order code for "Housing":

- Option **A** "Aluminum, coated": aluminum, AlSi10Mg, coated
- Option **B** "Stainless, hygienic": stainless steel, 1.4404 (316L)
- Option **L** "Cast, stainless": cast, stainless steel, 1.4409 (CF3M) similar to 316L

Window material

Order code for "Housing":

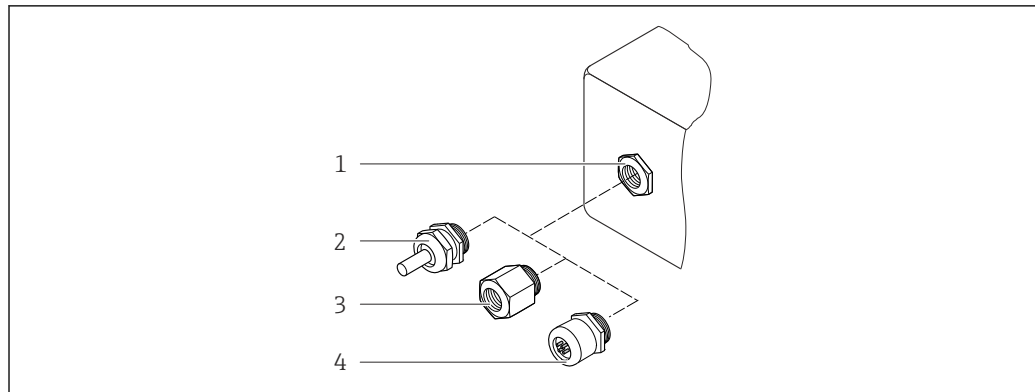
- Option **A** "Aluminum, coated": glass
- Option **B** "Stainless, hygienic": polycarbonate
- Option **L** "Cast, stainless": glass

Seals

Order code for "Housing":

- Option **B** "Stainless, hygienic": EPDM and silicone

Cable entries/cable glands



A0028352

43 Possible cable entries/cable glands

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

Order code for "Housing", option A "Aluminum, coated"

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

| Cable entry/cable gland | Material |
|---|-------------------------------------|
| Compression fitting M20 × 1.5 | Non-Ex: plastic |
| | Z2, D2, Ex d/de: brass with plastic |
| Adapter for cable entry with female thread G ½" | Nickel-plated brass |
| Adapter for cable entry with female thread NPT ½" | |

Order code for "Housing", option B "Stainless, hygienic"

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

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

Order code for "Housing", option L "Cast, stainless"

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

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

Device plug

| Electrical connection | Material |
|-----------------------|---|
| Plug M12x1 | <ul style="list-style-type: none"> ■ Socket: Stainless steel, 1.4404 (316L) ■ Contact housing: Polyamide ■ Contacts: Gold-plated brass |

Sensor housing

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

Measuring tubes

Grade 9 titanium

Process connections

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



Available process connections → 91

Seals

Welded process connections without internal seals

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:
 - EN 1092-1 (DIN 2501) flange
 - EN 1092-1 (DIN 2512N) flange
 - ASME B16.5 flange
 - JIS B2220 flange
 - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
- Clamp connections: Tri-Clamp (OD tubes), DIN 11866 series C
- Eccentric clamp connection: Eccen. Tri-Clamp, DIN 11866 series C
- Thread:
 - DIN 11851 thread, DIN 11866 series A
 - SMS 1145 thread
 - ISO 2853 thread, ISO 2037
 - DIN 11864-1 Form A thread, DIN 11866 series A



Process connection materials → 91

Surface roughness

All data refer to parts in contact with the medium. The following surface roughness categories can be ordered.

- Not polished
- $Ra_{max} = 0.76 \mu m$ (30 μin)
- $Ra_{max} = 0.38 \mu m$ (15 μin)

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Fast and safe commissioning

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

Reliable operation

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

Efficient diagnostic behavior increases measurement availability

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

Languages

Can be operated in the following languages:

- Via local operation
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish
- Via Web browser
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

Local operation

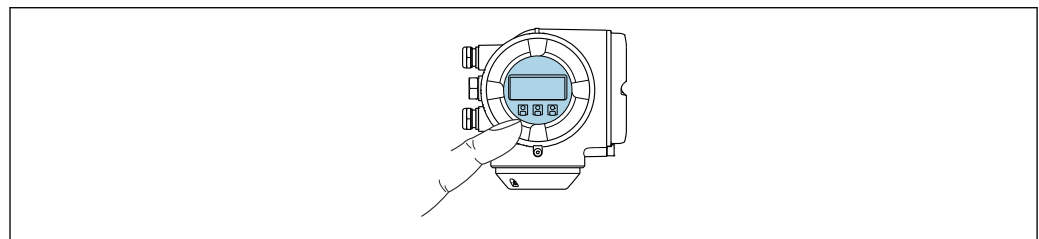
Via display module

Equipment:

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



Information about WLAN interface → 100



A0026785

44 Operation with touch control

Display elements

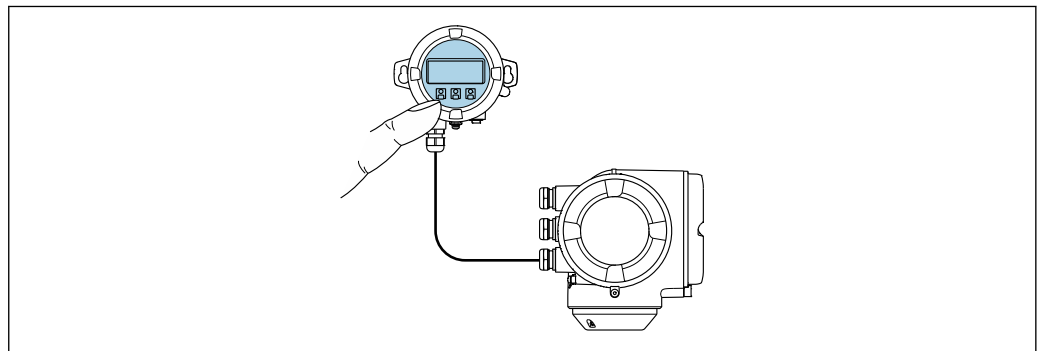
- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured
- Permitted ambient temperature for the display: -20 to $+60$ °C (-4 to $+140$ °F)
The readability 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: ⊕, ⊖, ⊞
- Operating elements also accessible in the various zones of the hazardous area

Via remote display and operating module DKX001

- i The remote display and operating module DKX001 is available as an optional extra → 110.
 - The remote display and operating module DKX001 is only available for the following housing versions, order code for "Housing":
 - Option A "Aluminum, coated"
 - Option L "Cast, stainless"
 - The measuring device is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring device. Display or operation at the transmitter is not possible in this case.
 - If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring device display module. Only one display or operation unit may be connected to the transmitter at any one time.



A0026786

45 Operation via remote display and operating module DKX001

Display and operating elements

The display and operating elements correspond to those of the display module → 92.

Housing material

The housing material of the display and operating module DKX001 depends on the choice of transmitter housing material.

| Transmitter housing | | Remote display and operating module |
|-----------------------------|---|-------------------------------------|
| Order code for "Housing" | Material | Material |
| Option A "Aluminum, coated" | AlSi10Mg, coated | AlSi10Mg, coated |
| Option L "Cast, stainless" | Cast stainless steel, 1.4409 (CF3M) similar to 316L | 1.4409 (CF3M) |

Cable entry

Corresponds to the choice of transmitter housing, order code for "Electrical connection".

Connecting cable

→ 49

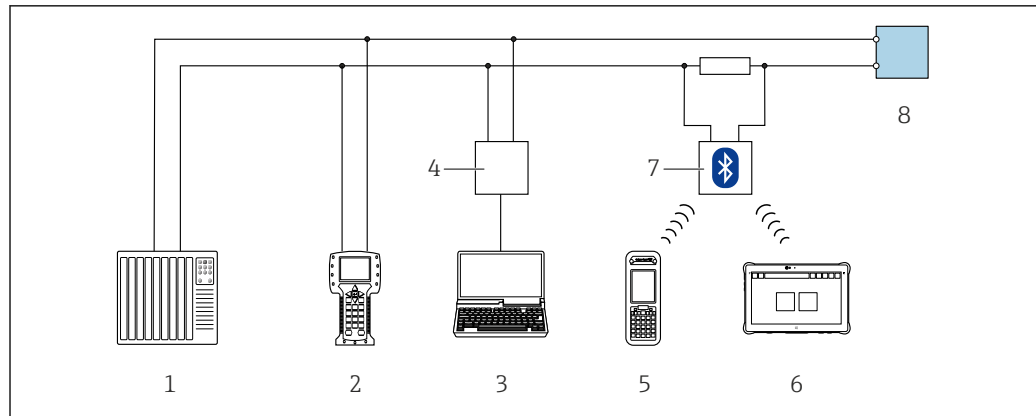
Dimensions

→ 79

Remote operation

Via HART protocol

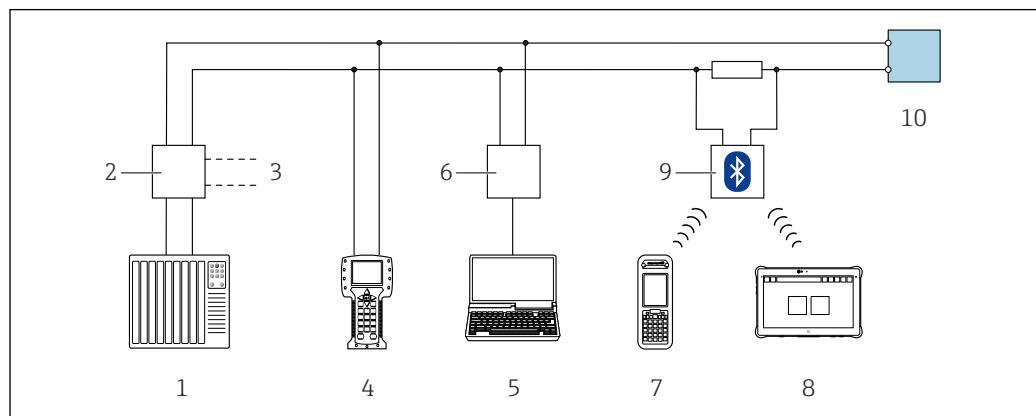
This communication interface is available in device versions with a HART output.



A0028747

46 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 accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 Field Xpert SMT70
- 7 VIATOR Bluetooth modem with connecting cable
- 8 Transmitter



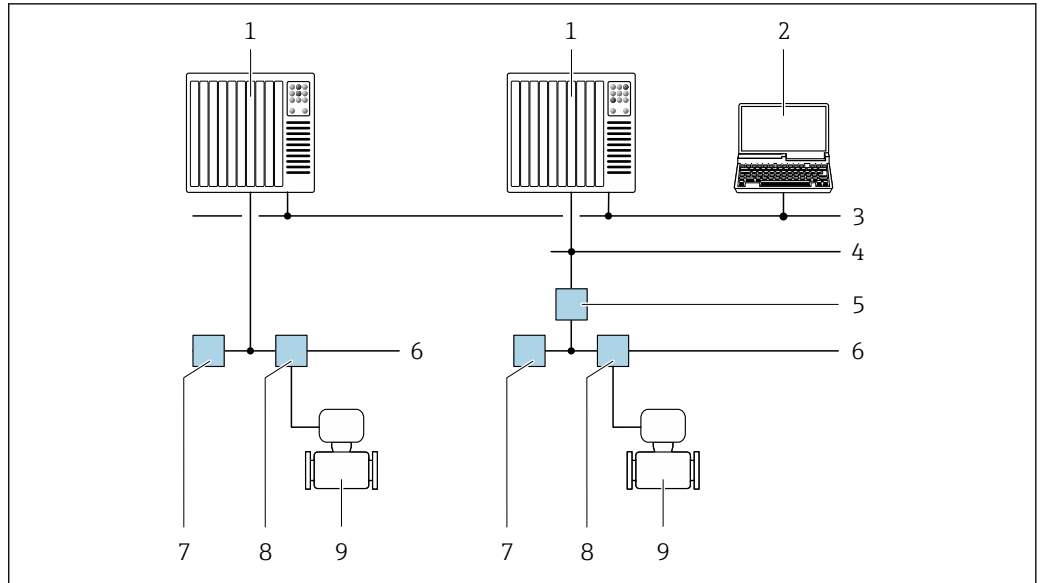
A0028746

47 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 accessing the integrated device Web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 6 Commubox FXA195 (USB)
- 7 Field Xpert SFX350 or SFX370
- 8 Field Xpert SMT70
- 9 VIATOR Bluetooth modem with connecting cable
- 10 Transmitter

Via FOUNDATION Fieldbus network

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



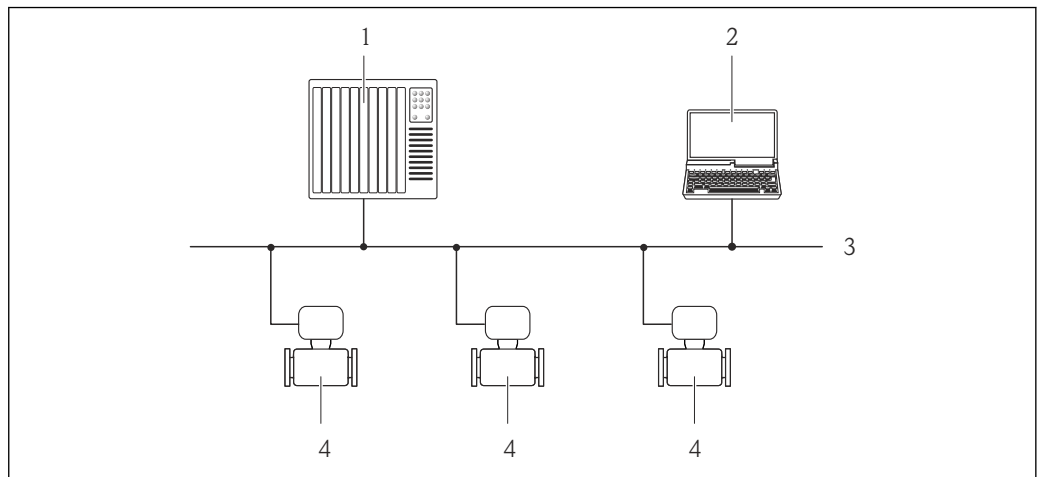
A0028837

48 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.



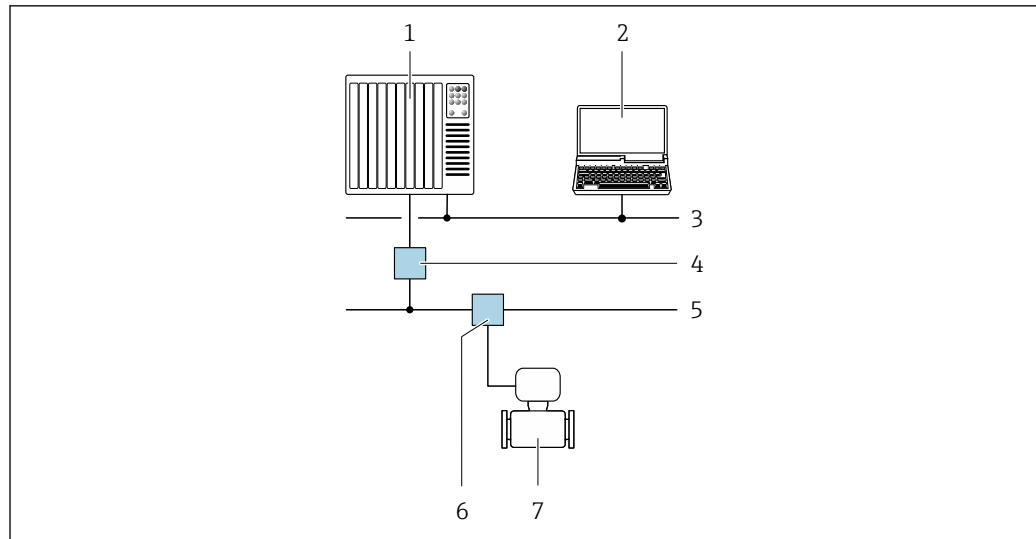
A0020903

49 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.



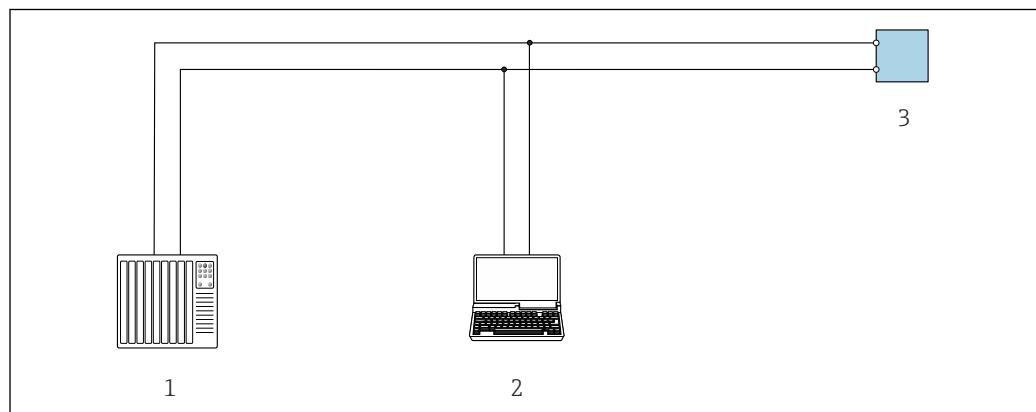
A0028838

50 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

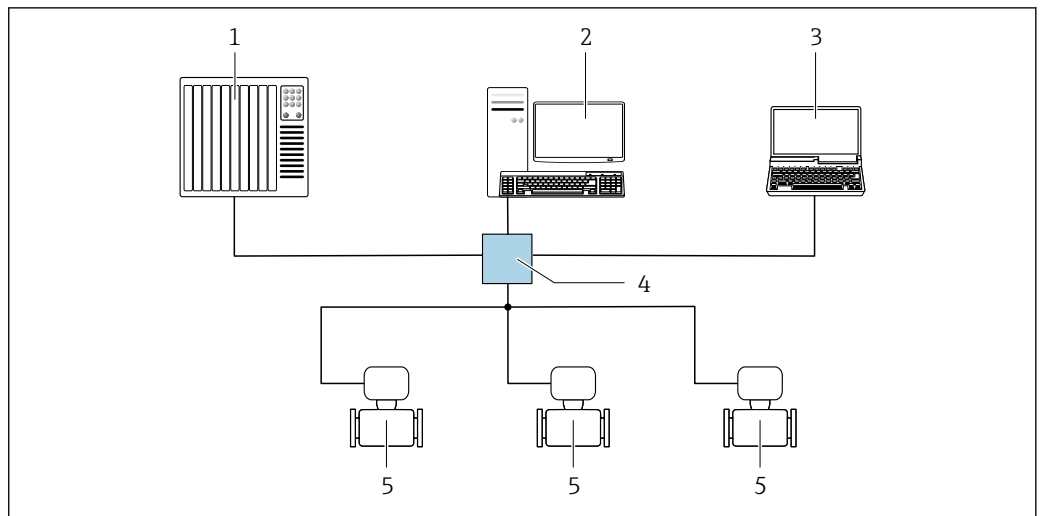
51 Options for remote operation via Modbus-RS485 protocol (active)

- 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



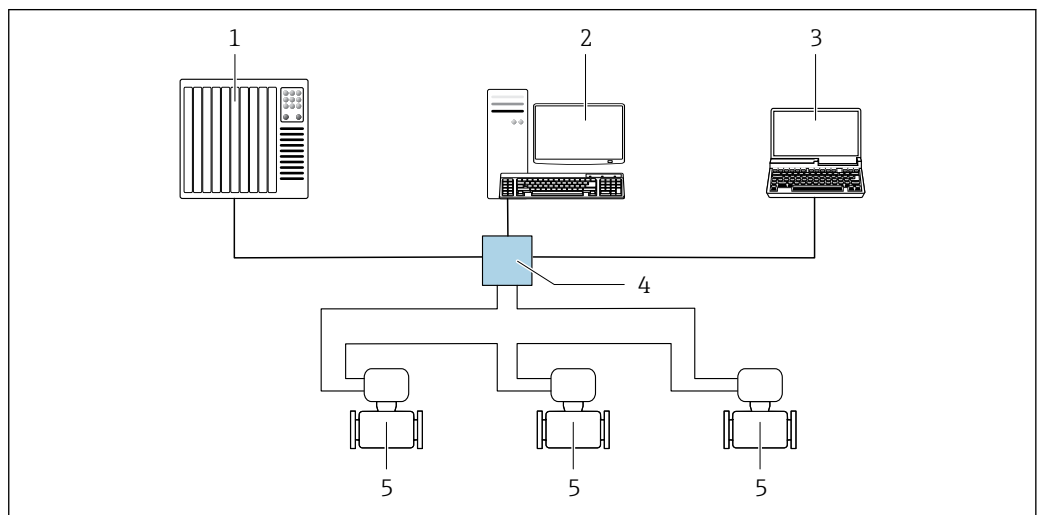
A0032078

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

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

Ring topology

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



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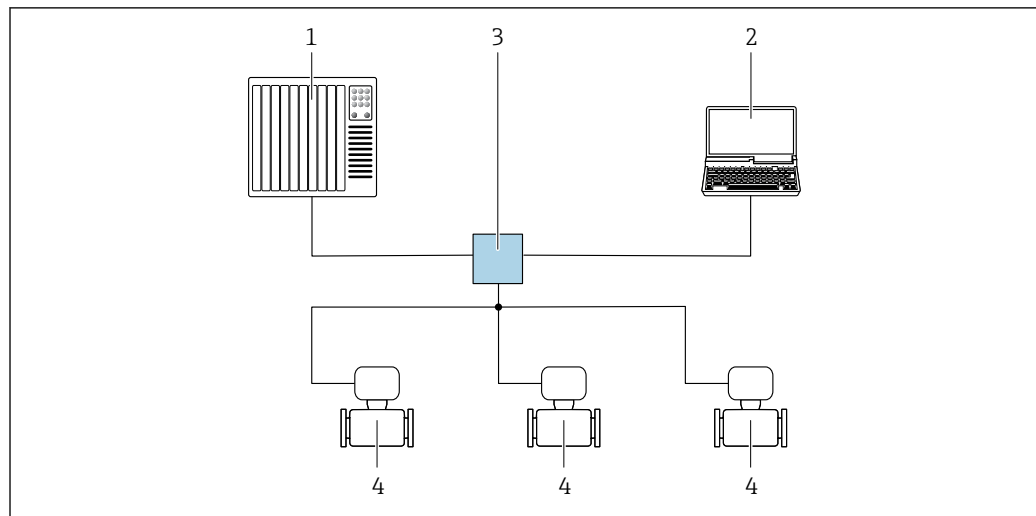
53 Options for remote operation via EtherNet/IP network: ring topology

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

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



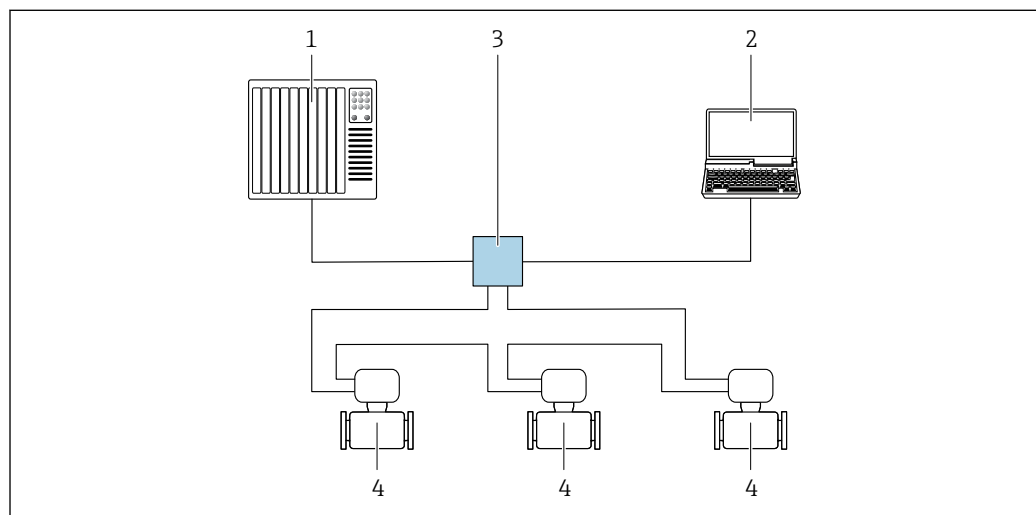
A0026545

54 Options for remote operation via PROFINET network: star topology

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

Ring topology

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

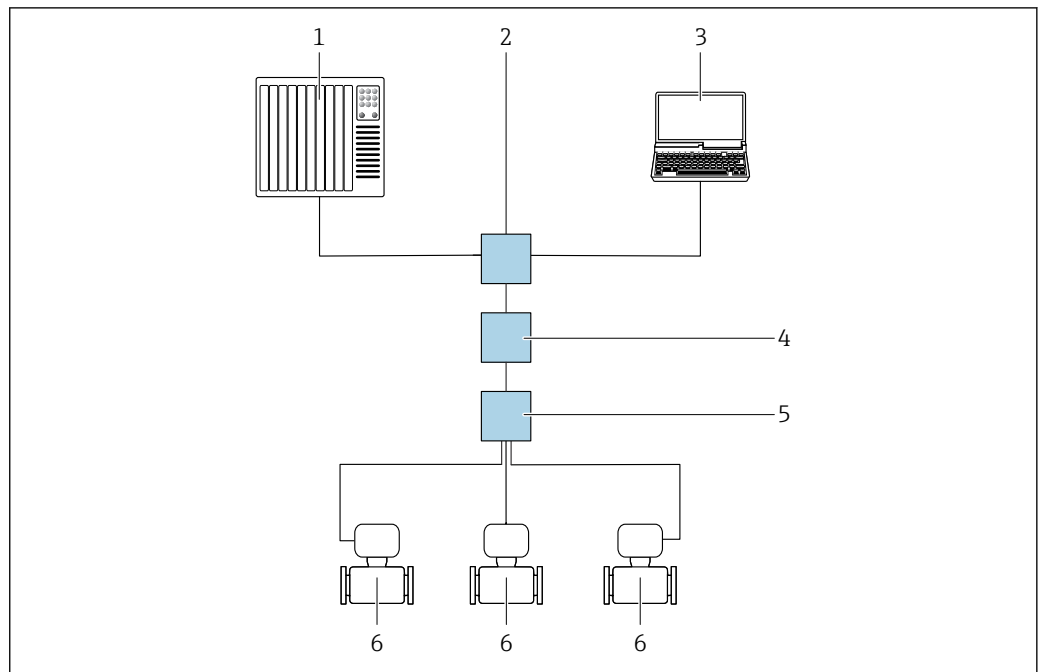


A0033719

55 Options for remote operation via PROFINET network: ring topology

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

Via APL network



A0046117

56 Options for remote operation via APL network

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

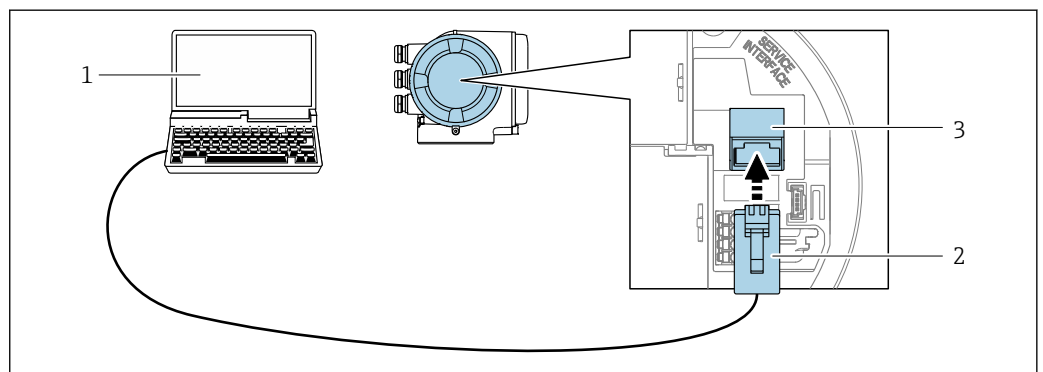
Service interface

Via service interface (CDI-RJ45)

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

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

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



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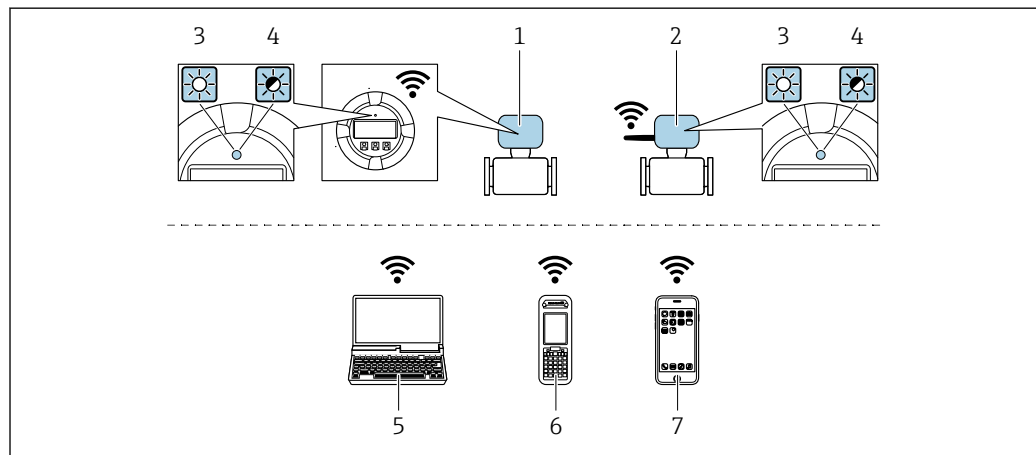
57 Connection via service interface (CDI-RJ45)

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

Via WLAN interface

The optional WLAN interface is available on the following device version:

Order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN"



A0034570

- 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) <ul style="list-style-type: none"> ▪ Access Point with DHCP server (factory setting) ▪ Network |
| Encryption | WPA2-PSK AES-128 (in accordance with IEEE 802.11i) |
| Configurable WLAN channels | 1 to 11 |
| Degree of protection | IP67 |
| Available antennas | <ul style="list-style-type: none"> ▪ Internal antenna ▪ External antenna (optional) <p>In the event of poor transmission/reception conditions at the place of installation. Available as an accessory .</p> <p>i Only 1 antenna is active at any one time!</p> |
| Range | <ul style="list-style-type: none"> ▪ Internal antenna: typically 10 m (32 ft) ▪ External antenna: typically 50 m (164 ft) |
| Materials (external antenna) | <ul style="list-style-type: none"> ▪ 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 |

Network integration



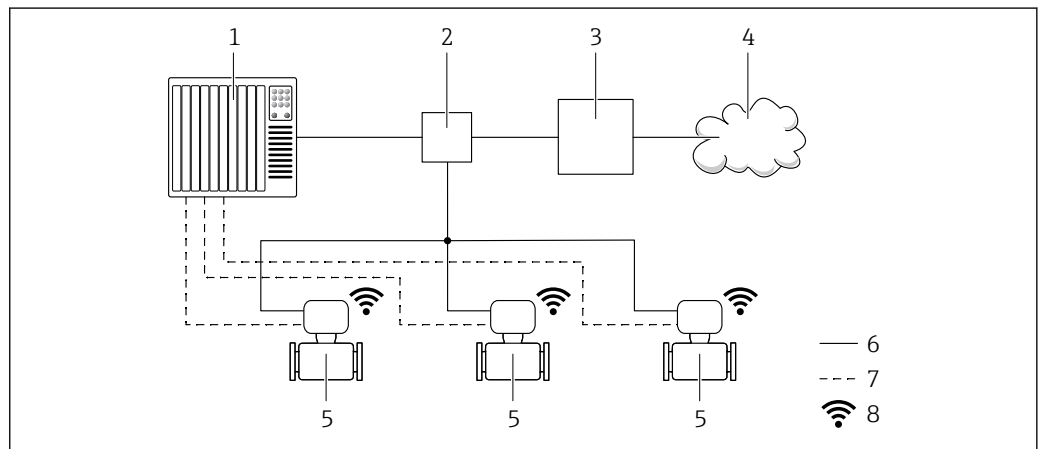
Network integration is only available for the HART communication protocol.

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




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

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






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

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


 Special Documentation for the OPC-UA Server application package →  114.

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 | <ul style="list-style-type: none"> ▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Ethernet-based fieldbus (EtherNet/IP, PROFINET) | Special Documentation for the device →  114 |
| DeviceCare SFE100 | Notebook, PC or tablet with Microsoft Windows system | <ul style="list-style-type: none"> ▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Fieldbus protocol | →  112 |
| FieldCare SFE500 | Notebook, PC or tablet with Microsoft Windows system | <ul style="list-style-type: none"> ▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Fieldbus protocol | →  112 |

| Supported operating tools | Operating unit | Interface | Additional information |
|---------------------------|---|---|--|
| Field Xpert | SMT70/77/50 | <ul style="list-style-type: none"> ▪ All fieldbus protocols ▪ WLAN interface ▪ Bluetooth ▪ CDI-RJ45 service interface | Operating Instructions BA01202S Device description files: Use update function of handheld terminal |
| SmartBlue app | Smart phone or tablet with iOS or Android | WLAN | → 📖 112 |

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

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

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

Web server

Thanks to the integrated Web server the device can be operated and configured via a Web browser and via the service interface (CDI-RJ45) or via the WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, device status information is also displayed and allows users 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 → 📖 109)

 Web server special documentation → 📖 114

HistoROM data management

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

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

Additional information on the data storage concept

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

| | HistoROM backup | T-DAT | S-DAT |
|-------------------------|---|--|---|
| Available data | <ul style="list-style-type: none"> ▪ Event logbook such as diagnostic events for example ▪ Parameter data record backup ▪ Device firmware package ▪ Driver for system integration for exporting via Web server, e.g: <ul style="list-style-type: none"> ▪ GSD for PROFIBUS DP ▪ GSD for PROFIBUS PA ▪ GSDML for PROFINET ▪ EDS for EtherNet/IP ▪ DD for FOUNDATION Fieldbus | <ul style="list-style-type: none"> ▪ Measured value logging ("Extended HistoROM" order option) ▪ Current parameter data record (used by firmware at run time) ▪ Maximum indicators (min/max values) ▪ Totalizer values | <ul style="list-style-type: none"> ▪ Sensor data: nominal diameter etc. ▪ Serial number ▪ Calibration data ▪ 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 transmission

Manual

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

Event list**Automatic**

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

Data logging**Manual**


If the **Extended HistoROM** application package (order option) is enabled:

- 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

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:

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

| | |
|---------------------|---|
| CE mark | <p>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.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p> |
| UKCA marking | <p>The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.</p> <p>Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com</p> |
| RCM mark | <p>The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".</p> |
| Ex approval | <p>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.</p> <p>Devices with the order code for "Approval; transmitter + sensor", option BA, BB, BC or BD have equipment protection level (EPL) Gb (Zone 1 in the measuring tube).</p> <p> The separate Ex documentation (XA) containing all the relevant explosion protection data is available from your Endress+Hauser sales center.</p> <p>ATEX/IECEX</p> <p>Currently, the following versions for use in hazardous areas are available:</p> |

Ex db eb

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

Ex db

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

Ex ec

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

Ex tb

| Category | Type of protection |
|----------|----------------------|
| II2D | Ex tb IIIC T** °C Db |

cCSA_{US}

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

IS (Ex i) and XP (Ex d)

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

NI (Ex ec)

Class I Division 2 Groups A - D

Ex db eb

- Class I, Zone 1 AEx/Ex db eb ia IIC T6...T1 Gb
Class I, Zone 1 AEx/Ex db eb ia IIB T6...T1 Gb
- Class I, Zone 1 AEx/Ex db eb ia IIC T6...T1 Gb
Class I, Zone 1 AEx/Ex db eb ia IIB T6...T1 Gb

Ex db

- Class I, Zone 1 AEx/ Ex db ia IIC T6...T1 Gb
Class I, Zone 1 AEx/ Ex db ia IIB T6...T1 Gb
- Class I, Zone 1 AEx/ Ex db ia IIC T6...T1 Gb
Class I, Zone 1 AEx/ Ex db ia IIB T6...T1 Gb

Ex ec

Class I, Zone 2 AEx/ Ex ec IIC T5...T1 Gc

Ex tb

Zone 2 I AEx/ Ex tb IIIC T** °C Db

Hygienic compatibility

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

Pharmaceutical compatibility

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

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 (multi-channel architecture with homogeneous redundancy) and is independently evaluated and certified 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 → 114

HART certification**HART interface**

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:

- Certified according to HART 7
- The device can also be operated with certified devices of other manufacturers (interoperability)

FOUNDATION Fieldbus certification**FOUNDATION Fieldbus interface**



The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:

- Certified in accordance with FOUNDATION Fieldbus H1
- Interoperability Test Kit (ITK), revision version 6.2.0 (certificate available on request)
- Physical Layer Conformance Test
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFIBUS**PROFIBUS interface**

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:

- Certified according to PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

| | |
|---|--|
| EtherNet/IP certification | <p>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:</p> <ul style="list-style-type: none"> ▪ 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 | <p>PROFINET interface</p> <p>The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified according to: <ul style="list-style-type: none"> ▪ Test specification for PROFINET devices ▪ PROFINET Security Level 2– Netload Class 2 0 Mbps ▪ The device can also be operated with certified devices of other manufacturers (interoperability) ▪ The device supports PROFINET S2 system redundancy. |
| Certification PROFINET with Ethernet-APL | <p>PROFINET interface</p> <p>The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified according to: <ul style="list-style-type: none"> ▪ Test specification for PROFINET devices ▪ PROFINET PA Profile 4 ▪ PROFINET Security Level 2– Netload Class 2 0 Mbps ▪ APL conformance test ▪ The device can also be operated with certified devices of other manufacturers (interoperability) ▪ The device supports PROFINET S2 system redundancy. |
| Pressure Equipment Directive | <p>The devices can be ordered with or without a PED or UKCA approval. If a device with a PED or UKCA approval is required, this must be explicitly stated in the order. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary. A UK Ex approval must be selected for UKCA.</p> <ul style="list-style-type: none"> ▪ With the marking: <ol style="list-style-type: none"> a) PED/G1/x (x = category) or b) UK/G1/x (x = category) <p>on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"</p> <ol style="list-style-type: none"> a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or b) Schedule 2 of Statutory Instruments 2016 No. 1105. ▪ Devices bearing this marking (PED or UKCA) are suitable for the following types of medium: <ul style="list-style-type: none"> ▪ Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi) ▪ Unstable gases ▪ Devices not bearing this marking (without PED or UKCA) are designed and manufactured according to sound engineering practice. They meet the requirements of <ol style="list-style-type: none"> a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105. <p>The scope of application is indicated</p> <ol style="list-style-type: none"> a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105. |
| Radio approval | <p>The measuring device has radio approval.</p> <p> For detailed information on the radio approval, see the Special Documentation →  114</p> |
| Additional certification | <p>CRN approval</p> <p>Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.</p> |

Tests and certificates

- EN10204-3.1 material certificate, wetted parts and sensor housing
- Pressure test, internal process, inspection certificate
- Compliance with requirements derived from cGMP, Declaration
- EN10204-2.1 confirmation of compliance with the order and EN10204-2.2 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 61326-2-3
Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
The application of the pressure equipment directive to process control devices
- NAMUR NE 105
Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
Self-monitoring and diagnosis of field devices
- NAMUR NE 131
Requirements for field devices for standard applications
- NAMUR NE 132
Coriolis mass meter
- ETSI EN 300 328
Guidelines for 2.4 GHz radio components.
- EN 301489
Electromagnetic compatibility and radio spectrum matters (ERM).

Ordering information

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

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



**Product Configurator - the tool for individual product configuration**

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

Application packages

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

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

 Detailed information on the application packages:
Special Documentation for the device →  114

Diagnostic functionality

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

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

Event log:

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

Data logging (line recorder):

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

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

Heartbeat Technology

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

Heartbeat Verification

Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".

- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

Heartbeat Monitoring

Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:

- Draw conclusions - using these data and other information - about the impact the process influences (e.g. corrosion, abrasion, formation of buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.g. gas pockets.

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

Concentration measurement

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

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:

- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.).
- Common or user-defined units (°Brix, °Plato, % mass, % volume, mol/l etc.) for standard applications.
- Concentration calculation from user-defined tables.

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

Viscosity

Order code for "Application package", option EG "Viscosity"

In-line and real-time viscosity measurement

Promass I with the "Viscosity" application package also measures the real-time viscosity of the fluid directly in the process, in addition to measuring the mass flow/volume flow/ temperature and density.

The following viscosity measurements are performed on liquids:

- Dynamic viscosity
- Kinematic viscosity
- Temperature-compensated viscosity (kinematic and dynamic) in relation to the reference temperature

Viscosity measurement can be used for Newtonian and non-Newtonian applications and supplies accurate measured data irrespective of the flow, even under difficult conditions.



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

Special density

Order code for "Application package", option EE "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.

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.



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

OPC-UA Server

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

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



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



Accessories










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

www.endress.com.



Device-specific accessories

For the transmitter




| Accessories | Description |
|-------------------------|--|
| Proline 300 transmitter | <p>Transmitter for replacement or storage. Use the order code to define the following specifications:</p> <ul style="list-style-type: none"> ▪ Approvals ▪ Output ▪ Input ▪ Display/operation ▪ Housing ▪ Software <p> Order code: 8X3BXX</p> <p> Installation Instructions EA01200D</p> |




| | |
|---|---|
| <p>Remote display and operating module DKX001</p> | <ul style="list-style-type: none"> ▪ If ordered directly with the measuring device: Order code for "Display; operation", option O "Remote display 4-line, illuminated; 10 m (30 ft) cable; touch control" ▪ If ordered separately: <ul style="list-style-type: none"> ▪ Measuring device: order code for "Display; operation", option M "W/o, prepared for remote display" ▪ DKX001: Via the separate product structure DKX001 ▪ If ordered subsequently: DKX001: Via the separate product structure DKX001 <p>Mounting bracket for DKX001</p> <ul style="list-style-type: none"> ▪ If ordered directly: order code for "Accessory enclosed", option RA "Mounting bracket, pipe 1/2" ▪ If ordered subsequently: order number: 71340960 <p>Connecting cable (replacement cable) Via the separate product structure: DKX002</p> <p> Further information on display and operating module DKX001 →  93.</p> <p> Special Documentation SD01763D</p> |
| <p>External WLAN antenna</p> | <p>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".</p> <p> <ul style="list-style-type: none"> ▪ The external WLAN antenna is not suitable for use in hygienic applications. ▪ Additional information regarding the WLAN interface →  100. </p> <p> Order number: 71351317</p> <p> Installation Instructions EA01238D</p> |
| <p>Weather protection cover</p> | <p>Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.</p> <p> Order number: 71343505</p> <p> Installation Instructions EA01160D</p> |

For the sensor



| Accessories | Description |
|-----------------------|---|
| <p>Heating jacket</p> | <p>Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.</p> <p> If using oil as a heating medium, please consult with Endress+Hauser.</p> <p>Use the order code with the product root DK8003.</p> <p> Special Documentation SD02158D</p> |





Communication-specific accessories

| Accessories | Description |
|--------------------------------------|--|
| <p>Commubox FXA195 HART</p> | <p>For intrinsically safe HART communication with FieldCare via the USB interface.</p> <p> Technical Information TI00404F</p> |
| <p>HART Loop Converter HMX50</p> | <p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.</p> <p> <ul style="list-style-type: none"> ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F </p> |
| <p>Fieldgate FXA42</p> | <p>Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices</p> <p> <ul style="list-style-type: none"> ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42 </p> |


| | |
|-------------------|--|
| Field Xpert SMT50 | <p>The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.</p> <p>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.</p>  <ul style="list-style-type: none"> ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt50 |
| Field Xpert SMT70 | <p>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.</p> <p>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.</p>  <ul style="list-style-type: none"> ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt70 |
| Field Xpert SMT77 | <p>The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.</p>  <ul style="list-style-type: none"> ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77 |

Service-specific accessories

| Accessory | Description |
|------------|---|
| Applicator | <p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> ▪ Choice of measuring devices with industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. ▪ Graphic illustration of the calculation results ▪ 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. <p>Applicator is available:</p> <ul style="list-style-type: none"> ▪ Via the Internet: https://portal.endress.com/webapp/applicator ▪ As a downloadable DVD for local PC installation. |
| W@M | <p>W@M Life Cycle Management</p> <p>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.</p> <p>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.</p> <p>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, see: www.endress.com/lifecyclemanagement</p> |
| FieldCare | <p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>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.</p>  <p>Operating Instructions BA00027S and BA00059S</p> |
| DeviceCare | <p>Tool for connecting and configuring Endress+Hauser field devices.</p>  <p>Innovation brochure IN01047S</p> |

| 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.  <ul style="list-style-type: none"> ▪ Technical Information TI00133R ▪ 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.  <ul style="list-style-type: none"> ▪ Technical Information TI00426P and TI00436P ▪ 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.  <ul style="list-style-type: none"> ▪ Technical Information TI00383P ▪ 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.  "Fields of Activity" document FA00006T |

Documentation

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

Standard documentation Brief Operating Instructions

Brief Operating Instructions for the sensor

| Measuring device | Documentation code |
|-------------------|--------------------|
| Proline Promass I | KA01284D |

Brief Operating Instructions for the transmitter

| Measuring device | Documentation code | | | | | | | PROFINET with Ethernet-APL |
|------------------|--------------------|---------------------|-------------|-------------|--------------|-------------|----------|----------------------------|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET | |
| Proline 300 | KA01309D | KA01229D | KA01227D | KA01386D | KA01311D | KA01339D | KA01341D | KA01517D |

Operating Instructions

| Measuring device | Documentation code | | | | | | | PROFINET with Ethernet-APL |
|------------------|--------------------|---------------------|-------------|-------------|--------------|-------------|----------|----------------------------|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET | |
| Promass I 300 | BA01487D | BA01520D | BA01509D | BA01859D | BA01498D | BA01730D | BA01741D | BA02112D |

Description of Device Parameters

| Measuring device | Documentation code | | | | | | | PROFINET with Ethernet-APL |
|------------------|--------------------|---------------------|-------------|-------------|--------------|-------------|----------|----------------------------|
| | HART | FOUNDATION Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET | |
| Promass 300 | GP01057D | GP01094D | GP01058D | GP01134D | GP01059D | GP01114D | GP01115D | GP01168D |

Supplementary device-dependent documentation

Safety instructions

Safety instructions for electrical equipment for hazardous areas.

| Contents | Documentation code |
|-----------------------|--------------------|
| ATEX/IECEX Ex d/Ex de | XA01405D |
| ATEX/IECEX Ex ec | XA01439D |
| cCSAus XP | XA01373D |
| cCSAus Ex d/ Ex de | XA01372D |
| cCSAus Ex nA | XA01507D |
| INMETRO Ex d/Ex de | XA01468D |
| INMETRO Ex ec | XA01470D |
| NEPSI Ex d/Ex de | XA01469D |
| NEPSI Ex nA | XA01471D |
| EAC Ex d/Ex de | XA01656D |
| EAC Ex nA | XA01657D |
| JPN Ex d | XA01778D |

Remote display and operating module DKX001

| Contents | Documentation code |
|------------------|--------------------|
| ATEX/IECEX Ex i | XA01494D |
| ATEX/IECEX Ex ec | XA01498D |
| cCSAus IS | XA01499D |
| cCSAus Ex nA | XA01513D |
| INMETRO Ex i | XA01500D |
| INMETRO Ex ec | XA01501D |
| NEPSI Ex i | XA01502D |
| NEPSI Ex nA | XA01503D |

Functional Safety Manual

| Contents | Documentation code |
|---------------------|--------------------|
| Proline Promass 300 | SD01727D |

Special Documentation

| Contents | Documentation code |
|---|--------------------|
| Information on the Pressure Equipment Directive | SD01614D |
| Remote display and operating module DKX001 | SD01763D |

| Contents | Documentation code |
|---|--------------------|
| Radio approvals for WLAN interface for A309/A310 display module | SD01793D |
| OPC-UA server ¹⁾ | SD02039D |

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

| Contents | Documentation code | | | | | | | |
|---------------------------|--------------------|-------------------------|----------------|----------------|-----------------|----------|-------------|--------------------------------------|
| | HART | FOUNDATIO N Fieldbus | PROFIBUS PA | PROFIBUS DP | Modbus RS485 | PROFINET | EtherNet/IP | PROFINET with Ethernet- APL |
| Web server | SD01662D | SD01665D | SD01664D | SD02226D | SD01663D | SD01969D | SD01968D | SD02762D |
| Heartbeat Technology | SD01642D | SD01696D | SD01698D | SD02202D | SD01697D | SD01988D | SD01982 | SD02731D |
| Concentration measurement | SD01644D | SD01706D | SD01708D | SD02212D | SD01707D | SD02005D | SD02004D | SD02735D |
| Viscosity measurement | SD01646D | SD01720D | SD01722D | SD02210D | SD01721D | SD01993D | SD01992D | SD02741D |
| Gas Fraction Handler | SD02584D | - | - | - | SD02584D | SD02584D | - | SD02584D |

Installation Instructions

| Contents | Comment |
|---|--|
| Installation instructions for spare part sets and accessories | Documentation code: specified for each individual accessory → 110. |

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