

Technical Information

Proline Promag E 100

Electromagnetic flowmeter



The economical flowmeter with an ultra-compact transmitter

Application

- The bidirectional measuring principle is virtually independent of pressure, density, temperature and viscosity
- Fully suitable for basic applications in the chemical and process industry

Device properties

- Nominal diameter: max. DN 600 (24")
- Ex approvals for Zone 2
- Liner made of PTFE
- Robust, ultra-compact transmitter housing
- Local display available

Your benefits

- Low-cost sensor – ideal solution for basic requirements
- Energy-saving flow measurement – no pressure loss due to cross-section constriction
- Maintenance-free – no moving parts
- Space-saving transmitter – full functionality on smallest footprint
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology

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About this document

Symbols used

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. |
| | Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: <ul style="list-style-type: none"> ▪ Inner ground terminal: Connects the protective earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system. |

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. |

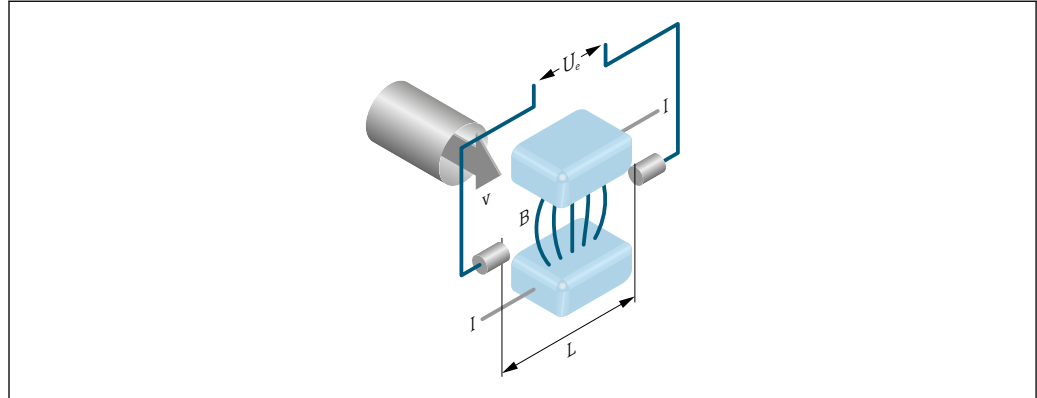
Symbols in graphics

| Symbol | Meaning |
|--------------------|--------------------------------|
| 1, 2, 3, ... | Item numbers |
| | 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

Following *Faraday's law of magnetic induction*, a voltage is induced in a conductor moving through a magnetic field.



U_e Induced voltage
 B Magnetic induction (magnetic field)
 L Electrode spacing
 I Current
 v Flow velocity

In the electromagnetic measuring principle, the flowing medium is the moving conductor. The voltage induced (U_e) is proportional to the flow velocity (v) and is supplied to the amplifier by means of two measuring electrodes. The flow volume (Q) is calculated via the pipe cross-section (A). The DC magnetic field is created through a switched direct current of alternating polarity.

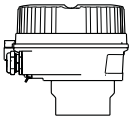
Formulae for calculation

- Induced voltage $U_e = B \cdot L \cdot v$
- Volume flow $Q = A \cdot v$

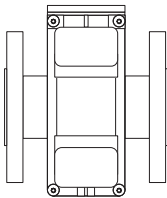
Measuring system

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

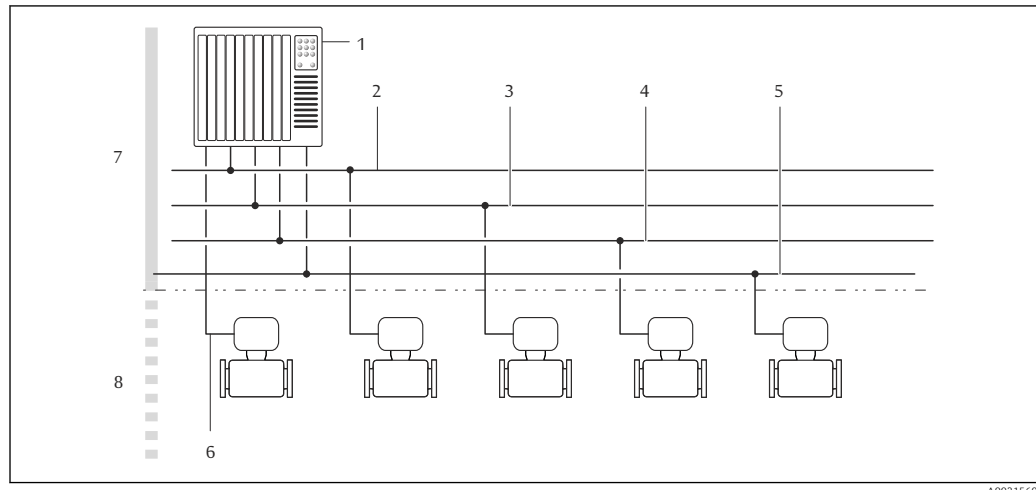
| | |
|--|--|
| <p>Promag 100</p>  <p>A0016693</p> | <p>Device versions and materials: Compact, aluminum, coated: Aluminum, AlSi10Mg, coated</p> <p>Configuration:</p> <ul style="list-style-type: none"> ■ Via operating tools (e.g. FieldCare, DeviceCare) ■ Also for device version with 4-20 mA HART, pulse/frequency/switch output: <ul style="list-style-type: none"> - Via Web browser (e.g. Microsoft Internet Explorer) ■ Also for device version with EtherNet/IP output: <ul style="list-style-type: none"> - Via Web browser (e.g. Microsoft Internet Explorer) - Via Add-on Profile Level 3 for automation system from Rockwell Automation - Via Electronic Data Sheet (EDS) ■ Also for device version with PROFINET output: <ul style="list-style-type: none"> - Via Web browser (e.g. Microsoft Internet Explorer) - Via device master file (GSD) |
|--|--|

Sensor

| | |
|--|---|
| <p>Promag E</p>  <p>A0017703</p> | <p>Nominal diameter range: DN 15 to 600 (½ to 24")</p> <p>Materials:</p> <ul style="list-style-type: none"> ■ Sensor housing: <ul style="list-style-type: none"> - Aluminum, AlSi10Mg, coated - DN 15 to 300 (½ to 12"): aluminum, AlSi10Mg, coated - DN 350 to 600 (14 to 24"): carbon steel with protective varnish ■ Measuring tubes ¹⁾: stainless steel, 1.4301/1.4306 ■ Liner: PTFE ■ Electrodes: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum ■ Process connections: carbon steel, A105/E250C ²⁾/S235JRG2/S275JR ■ Seals: as per DIN EN 1514-1 ■ Ground disks: stainless steel, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum; titanium |
|--|---|

- 1) For flanges made of carbon steel with Al/Zn protective coating (DN 15 to 300 (½ to 12")) or protective varnish (DN 350 to 600 (14 to 24"))
- 2) With Al/Zn protective coating (DN 15 to 300 (½ to 12")) or protective varnish (DN 350 to 600 (14 to 24"))

Equipment architecture



1 Possibilities for integrating measuring devices into a system

- 1 Control system (e.g. PLC)
- 2 EtherNet/IP
- 3 PROFIBUS DP
- 4 PROFINET
- 5 Modbus RS485
- 6 4-20 mA HART, pulse/frequency/switch output
- 7 Non-hazardous area
- 8 Non-hazardous area and Zone 2/Div. 2

Safety

IT security

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

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

Input

Measured variable

Direct measured variables

- Volume flow (proportional to induced voltage)
- Electrical conductivity

Calculated measured variables

- Mass flow
- Corrected volume flow

Measuring range

Typically $v = 0.01$ to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Electrical conductivity: ≥ 5 $\mu\text{S}/\text{cm}$ for liquids in general

Flow characteristic values in SI units

| Nominal diameter | | Recommended flow min./max. full scale value ($v \sim 0.3/10$ m/s) | Factory settings | | |
|------------------|------|--|--|--|--|
| [mm] | [in] | | Current output full scale value ¹⁾ ($v \sim 2.5$ m/s) | Pulse value ¹⁾ (~ 2 pulse/s) | Low flow cut off ($v \sim 0.04$ m/s) |
| | | [dm ³ /min] | [dm ³ /min] | [dm ³] | [dm ³ /min] |
| 15 | ½ | 4 to 100 | 25 | 0.2 | 0.5 |
| 25 | 1 | 9 to 300 | 75 | 0.5 | 1 |

| Nominal diameter | | Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) | Factory settings | | |
|------------------|------|--|--|--|------------------------------------|
| [mm] | [in] | | Current output full scale value ¹⁾ (v ~ 2.5 m/s) | Pulse value ¹⁾ (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| | | [dm ³ /min] | [dm ³ /min] | [dm ³] | [dm ³ /min] |
| 32 | - | 15 to 500 | 125 | 1 | 2 |
| 40 | 1 ½ | 25 to 700 | 200 | 1.5 | 3 |
| 50 | 2 | 35 to 1 100 | 300 | 2.5 | 5 |
| 65 | - | 60 to 2 000 | 500 | 5 | 8 |
| 80 | 3 | 90 to 3 000 | 750 | 5 | 12 |
| 100 | 4 | 145 to 4 700 | 1 200 | 10 | 20 |
| 125 | - | 220 to 7 500 | 1 850 | 15 | 30 |
| 150 | 6 | 20 to 600 m ³ /h | 150 m ³ /h | 0.03 m ³ | 2.5 m ³ /h |
| 200 | 8 | 35 to 1 100 m ³ /h | 300 m ³ /h | 0.05 m ³ | 5 m ³ /h |
| 250 | 10 | 55 to 1 700 m ³ /h | 500 m ³ /h | 0.05 m ³ | 7.5 m ³ /h |
| 300 | 12 | 80 to 2 400 m ³ /h | 750 m ³ /h | 0.1 m ³ | 10 m ³ /h |
| 350 | 14 | 110 to 3 300 m ³ /h | 1 000 m ³ /h | 0.1 m ³ | 15 m ³ /h |
| 400 | 16 | 140 to 4 200 m ³ /h | 1 200 m ³ /h | 0.15 m ³ | 20 m ³ /h |
| 450 | 18 | 180 to 5 400 m ³ /h | 1 500 m ³ /h | 0.25 m ³ | 25 m ³ /h |
| 500 | 20 | 220 to 6 600 m ³ /h | 2 000 m ³ /h | 0.25 m ³ | 30 m ³ /h |
| 600 | 24 | 310 to 9 600 m ³ /h | 2 500 m ³ /h | 0.3 m ³ | 40 m ³ /h |



1) HART only

Flow characteristic values in US units

| Nominal diameter | | Recommended flow min./max. full scale value (v ~ 0.3/10 m/s) | Factory settings | | |
|------------------|------|--|--|--|------------------------------------|
| [in] | [mm] | | Current output full scale value ¹⁾ (v ~ 2.5 m/s) | Pulse value ¹⁾ (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| | | [gal/min] | [gal/min] | [gal] | [gal/min] |
| ½ | 15 | 1.0 to 27 | 6 | 0.1 | 0.15 |
| 1 | 25 | 2.5 to 80 | 18 | 0.2 | 0.25 |
| 1 ½ | 40 | 7 to 190 | 50 | 0.5 | 0.75 |
| 2 | 50 | 10 to 300 | 75 | 0.5 | 1.25 |
| 3 | 80 | 24 to 800 | 200 | 2 | 2.5 |
| 4 | 100 | 40 to 1 250 | 300 | 2 | 4 |
| 6 | 150 | 90 to 2 650 | 600 | 5 | 12 |
| 8 | 200 | 155 to 4 850 | 1 200 | 10 | 15 |
| 10 | 250 | 250 to 7 500 | 1 500 | 15 | 30 |
| 12 | 300 | 350 to 10 600 | 2 400 | 25 | 45 |
| 14 | 350 | 500 to 15 000 | 3 600 | 30 | 60 |
| 16 | 400 | 600 to 19 000 | 4 800 | 50 | 60 |
| 18 | 450 | 800 to 24 000 | 6 000 | 50 | 90 |

| Nominal diameter | | Recommended flow min./max. full scale value ($v \sim 0.3/10$ m/s) | Factory settings | | |
|------------------|------|--|--|--|--|
| | | | Current output full scale value ¹⁾ ($v \sim 2.5$ m/s) | Pulse value ¹⁾ (~ 2 pulse/s) | Low flow cut off ($v \sim 0.04$ m/s) |
| [in] | [mm] | [gal/min] | [gal/min] | [gal] | [gal/min] |
| 20 | 500 | 1 000 to 30 000 | 7500 | 75 | 120 |
| 24 | 600 | 1 400 to 44 000 | 10500 | 100 | 180 |

1) HART only

 To calculate the measuring range, use the *Applicator* sizing tool →  62

Recommended measuring range

"Flow limit" section →  42

Operable flow range


Over 1000 : 1

Input signal

External measured values

To increase the accuracy of certain measured variables or to calculate the corrected volume flow, 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

 Various pressure transmitters and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section →  63

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

HART protocol

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

- HART protocol
- Burst mode

Digital communication

The measured values can be written from the automation system to the measuring via:

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

Output

Output signal

HART current output

| | |
|-----------------------|--|
| Current output | 4-20 mA HART (active) |
| Maximum output values | <ul style="list-style-type: none"> ▪ DC 24 V (no flow) ▪ 22.5 mA |
| Load | 0 to 700 Ω |
| Resolution | 0.38 μ A |

| | |
|--------------------------------------|--|
| Damping | Adjustable: 0.07 to 999 s |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Electronic temperature |

Pulse/frequency/switch output

| | |
|--------------------------------------|---|
| Function | Can be set to pulse, frequency or switch output |
| Version | Passive, open collector |
| Maximum input values | <ul style="list-style-type: none"> ▪ DC 30 V ▪ 25 mA |
| Voltage drop | For 25 mA: ≤ DC 2 V |
| Pulse output | |
| Pulse width | Adjustable: 0.05 to 2 000 ms |
| Maximum pulse rate | 10 000 Impulse/s |
| Pulse value | Adjustable |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow |
| Frequency output | |
| Output frequency | Adjustable: 0 to 10 000 Hz |
| Damping | Adjustable: 0 to 999 s |
| Pulse/pause ratio | 1:1 |
| Assignable measured variables | <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature |
| Switch output | |
| Switching behavior | Binary, conductive or non-conductive |
| Switching delay | Adjustable: 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"> - Off - Volume flow - Mass flow - Corrected volume flow - Flow velocity - Conductivity - Corrected conductivity - Totalizer 1-3 - Temperature - Electronic temperature ■ Flow direction monitoring ■ Status <ul style="list-style-type: none"> - Empty pipe detection - Low flow cut off |

PROFIBUS DP

| | |
|------------------------|----------------------|
| Signal encoding | NRZ code |
| Data transfer | 9.6 kBaud...12 MBaud |

Modbus RS485

| | |
|-----------------------------|---|
| Physical interface | In accordance with EIA/TIA-485-A standard |
| Terminating resistor | Integrated, can be activated via DIP switch on the transmitter electronics module |

EtherNet/IP

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

PROFINET

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

Signal on alarm

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

Current output 4 to 20 mA

4 to 20 mA

| | |
|---------------------|---|
| Failure mode | <p>Choose from:</p> <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 |
|---------------------|---|

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: 0 to 12 500 Hz |
| Switch output | |
| Failure mode | Choose from: <ul style="list-style-type: none"> ▪ Current status ▪ Open ▪ Closed |

PROFIBUS DP

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

Modbus RS485

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

EtherNet/IP

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

PROFINET

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

Local display



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

 Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
 - HART protocol
 - PROFIBUS DP
 - Modbus RS485
 - EtherNet/IP
 - PROFINET
- Via service interface
 - CDI-RJ45 service interface

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

 Additional information on remote operation →  54

Web server

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

Light emitting diodes (LED)

| | |
|---------------------------|---|
| Status information | <p>Status indicated by various light emitting diodes</p> <p>The following information is displayed depending on the device version:</p> <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 |
|---------------------------|---|

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

Protocol-specific data

HART

| | |
|------------------------------------|--|
| Manufacturer ID | 0x11 |
| Device type ID | 0x3A |
| HART protocol revision | 7 |
| Device description files (DTM, DD) | Information and files under: www.endress.com |
| HART load | Min. 250 Ω |


| | |
|---------------------------------|--|
| <p>Dynamic variables</p> | <p>Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables.</p> <p>Measured variables for PV (primary dynamic variable)</p> <ul style="list-style-type: none"> ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Temperature ▪ Electronic temperature <p>Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)</p> <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Temperature ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 |
| <p>Device variables</p> | <p>Read out the device variables: HART command 9 The device variables are permanently assigned.</p> <p>A maximum of 8 device variables can be transmitted:</p> <ul style="list-style-type: none"> ▪ 0 = volume flow ▪ 1 = mass flow ▪ 2 = corrected volume flow ▪ 3 = flow velocity ▪ 4 = conductivity ▪ 5 = corrected conductivity ▪ 6 = temperature ▪ 7 = electronic temperature ▪ 8 = totalizer 1 ▪ 9 = totalizer 2 ▪ 10 = totalizer 3 |

PROFIBUS DP

| | |
|--|---|
| <p>Manufacturer ID</p> | <p>0x11</p> |
| <p>Ident number</p> | <p>0x1561</p> |
| <p>Profile version</p> | <p>3.02</p> |
| <p>Device description files (GSD, DTM, DD)</p> | <p>Information and files under:</p> <ul style="list-style-type: none"> ▪ www.endress.com On the product page for the device: Documents/Software → Device drivers ▪ www.profibus.org |
| <p>Output values (from measuring device to automation system)</p> | <p>Analog input 1 to 4</p> <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature <p>Digital input 1 to 2</p> <ul style="list-style-type: none"> ▪ Empty pipe detection ▪ Low flow cut off ▪ Verification status <p>Totalizer 1 to 3</p> <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow |


| | |
|---|---|
| Input values (from automation system to measuring device) | Analog output 1 to 2 (fixed assignment) <ul style="list-style-type: none"> ▪ External temperature ▪ External density Digital output 1 to 2 (fixed assignment) <ul style="list-style-type: none"> ▪ Digital output 1: switch positive zero return on/off ▪ Digital output 2: start verification Totalizer 1 to 3 <ul style="list-style-type: none"> ▪ Totalize ▪ Reset and hold ▪ Preset and hold ▪ Stop ▪ Operating mode configuration: <ul style="list-style-type: none"> - Net flow total - Forward flow total - Reverse flow total |
| 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) |

Modbus RS485

| | |
|--------------------------------|--|
| Protocol | Modbus Applications Protocol Specification V1.1 |
| 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 | Supported by the following function codes: <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 | Each device parameter can be accessed via Modbus RS485.  For Modbus register information, see "Description of device parameters" documentation |

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 | 0x49E | | |
| Device type ID | 0x103A | | |
| Baud rates | Automatic 10 ¹⁰⁰ Mbit with half-duplex and full-duplex detection | | |
| Polarity | Auto-polarity for automatic correction of crossed TxD and RxD pairs | | |
| Supported CIP connections | Max. 3 connections | | |
| Explicit connections | Max. 6 connections | | |
| I/O connections | Max. 6 connections (scanner) | | |
| Configuration options for measuring device | <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) | No | | |
| Fix Input | | | |
| RPI | 5 ms to 10 s (factory setting: 20 ms) | | |
| Exclusive Owner Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x68 | 398 |
| | O → T configuration: | 0x66 | 56 |
| | T → O configuration: | 0x64 | 32 |
| Exclusive Owner Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x69 | - |
| | O → T configuration: | 0x66 | 56 |
| | T → O configuration: | 0x64 | 32 |
| Input only Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x68 | 398 |
| | O → T configuration: | 0xC7 | - |
| | T → O configuration: | 0x64 | 32 |
| Input only Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x69 | - |
| | O → T configuration: | 0xC7 | - |
| | T → O configuration: | 0x64 | 32 |

| | | | |
|------------------------------------|--|----------|-------------|
| Input Assembly | <ul style="list-style-type: none"> ▪ Current device diagnostics ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 | | |
| Configurable Input | | | |
| RPI | 5 ms to 10 s (factory setting: 20 ms) | | |
| Exclusive Owner Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x68 | 398 |
| | O → T configuration: | 0x66 | 56 |
| | T → O configuration: | 0x65 | 88 |
| Exclusive Owner Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x69 | - |
| | O → T configuration: | 0x66 | 56 |
| | T → O configuration: | 0x65 | 88 |
| Input only Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x68 | 398 |
| | O → T configuration: | 0xC7 | - |
| | T → O configuration: | 0x65 | 88 |
| Input only Multicast | | Instance | Size [byte] |
| | Instance configuration: | 0x69 | - |
| | O → T configuration: | 0xC7 | - |
| | T → O configuration: | 0x65 | 88 |
| Configurable Input Assembly | <ul style="list-style-type: none"> ▪ Volume flow ▪ Corrected volume flow ▪ Mass flow ▪ Electronic temperature ▪ Totalizer 1 to 3 ▪ Flow velocity ▪ Volume flow unit ▪ Corrected volume flow unit ▪ Mass flow unit ▪ Temperature unit ▪ Unit totalizer 1-3 ▪ Flow velocity unit ▪ Verification result ▪ Verification status <p> The range of options increases if the measuring device has one or more application packages.</p> | | |
| Fix Output | | | |
| Output Assembly | <ul style="list-style-type: none"> ▪ Activation of reset totalizers 1-3 ▪ Activation of reference density compensation ▪ Activation of temperature compensation ▪ Reset totalizers 1-3 ▪ External density ▪ Density unit ▪ External temperature ▪ Activation verification ▪ Start verification | | |

| Configuration | |
|-------------------------------|--|
| Configuration Assembly | <p>Only the most common configurations are listed below.</p> <ul style="list-style-type: none"> ▪ Software write protection ▪ Mass flow unit ▪ Mass unit ▪ Volume flow unit ▪ Volume unit ▪ Corrected volume flow unit ▪ Corrected volume unit ▪ Density unit ▪ Reference density unit ▪ Temperature unit ▪ Pressure unit ▪ Length ▪ Totalizer 1-3: <ul style="list-style-type: none"> - Assignment - Unit - Operating mode - Failsafe mode ▪ Alarm delay |

PROFINET

| | |
|---|--|
| Protocol | "Application layer protocol for decentral device periphery and distributed automation", version 2.3 |
| Conformity class | B |
| Communication type | 100 MBit/s |
| Device profile | Application interface identifier 0xF600 Generic device |
| Manufacturer ID | 0x11 |
| Device type ID | 0x843A |
| Device description files (GSD, DTM) | <p>Information and files under:</p> <ul style="list-style-type: none"> ▪ www.endress.com ▪ On the product page for the device: Documents/Software → Device drivers ▪ www.profibus.org |
| Baud rates | Automatic 100 Mbit/s with full-duplex detection |
| Cycle times | From 8 ms |
| Polarity | Auto-polarity for automatic correction of crossed TxD and RxD pairs |
| Supported connections | <ul style="list-style-type: none"> ▪ 1 x AR (Application Relation) ▪ 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) ▪ Manufacturer-specific software (FieldCare, DeviceCare) ▪ Web browser ▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device |
| 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 |

| | |
|--|--|
| Output values (from measuring device to automation system) | Analog Input module (slot 1 to 10) <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature Discrete Input module (slot 1 to 10) <ul style="list-style-type: none"> ▪ Empty pipe detection ▪ Low flow cut off Diagnostics Input module (slot 1 to 10) <ul style="list-style-type: none"> ▪ Last diagnostics ▪ Current diagnosis Totalizer 1 to 3 (slot 11 to 13) <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow Heartbeat Verification module (fixed assignment) Verification status (slot 17) |
| Input values (from automation system to measuring device) | Analog Output module (fixed assignment) <ul style="list-style-type: none"> ▪ External density (slot 14) ▪ External temperature (slot 15) Discrete Output module (fixed assignment) Activate/deactivate positive zero return (slot 16) |
| Supported functions | Totalizer 1 to 3 (slot 11 to 13) <ul style="list-style-type: none"> ▪ Totalize ▪ Reset and hold ▪ Preset and hold ▪ Stop ▪ Operating mode configuration: <ul style="list-style-type: none"> - Net flow total - Forward flow total - Reverse flow total Heartbeat Verification module (fixed assignment) Start verification (slot 17) |

Administration of software options

| Input/output value | Process variable | Category | Slot |
|--------------------|-----------------------------|------------------|--------|
| Output value | Mass flow | Process variable | 1...10 |
| | Volume flow | | |
| | Corrected volume flow | | |
| | Temperature | | |
| | Conductivity | | |
| | Corrected conductivity | | |
| | Electronic temperature | | |
| | Flow velocity | | |
| | Current device diagnostics | | |
| | Previous device diagnostics | | |

| Input/output value | Process variable | Category | Slot |
|--------------------|----------------------|--------------------------------------|---------|
| Input/output value | Totalizer | Totalizer | 11...13 |
| Input value | External density | Process monitoring | 14 |
| | External temperature | | 15 |
| | Flow override | | 16 |
| | Status verification | Heartbeat Verification ¹⁾ | 17 |

1) Only available with the "Heartbeat" application package.

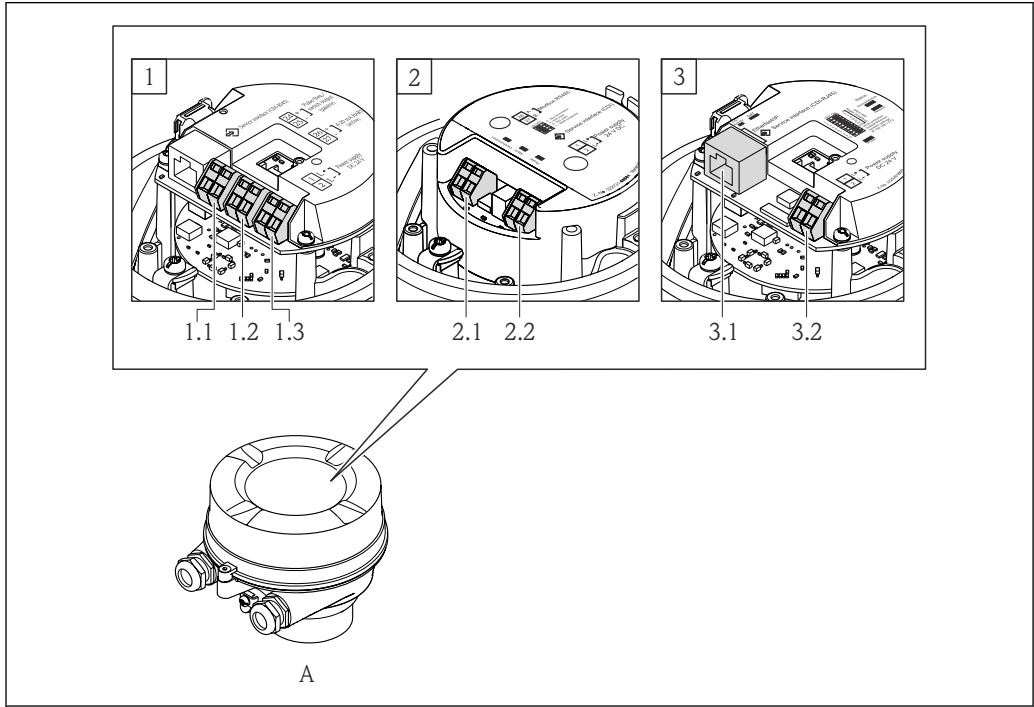
Startup configuration

| | |
|-----------------------------|--|
| Startup configuration (NSU) | <p>If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used.</p> <p>The following configuration is taken from the automation system:</p> <ul style="list-style-type: none"> ▪ Management <ul style="list-style-type: none"> - Software revision - Write protection ▪ System units <ul style="list-style-type: none"> - Mass flow - Mass - Volume flow - Volume - Corrected volume flow - Corrected volume - Density - Temperature - Conductivity ▪ Sensor adjustment ▪ Process parameter <ul style="list-style-type: none"> - Damping (flow, conductivity, temperature) - Flow override - Filter options ▪ Low flow cut off <ul style="list-style-type: none"> - Assign process variable - Switch-on/switch-off point - Pressure shock suppression ▪ Empty pipe detection <ul style="list-style-type: none"> - Assign process variable - Limit values - Response time ▪ External compensation <ul style="list-style-type: none"> - Temperature source - Density source - Density value ▪ Diagnostic settings ▪ Diagnostic behavior for diverse diagnostic information |
|-----------------------------|--|

Power supply

Terminal assignment

Overview: housing version and connection versions



A0019825

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

Transmitter

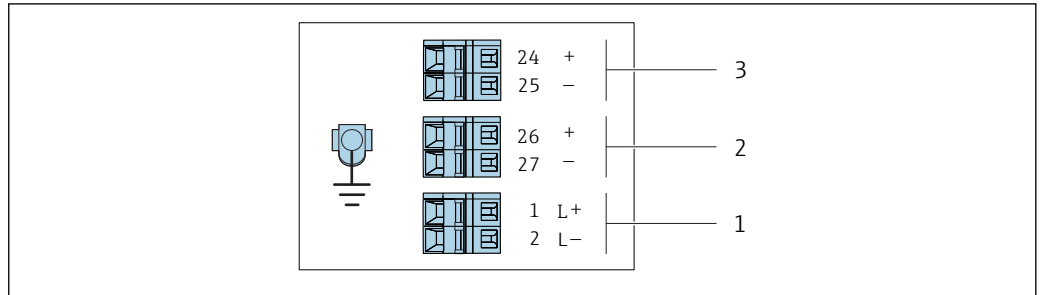
Connection version 4-20 mA HART with pulse/frequency/switch output

Order code for "Output", option B

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

| Order code "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|----------------------|---|--------------|--|
| | Outputs | Power supply | |
| Option A | Terminals | Terminals | <ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G 1/2" ▪ Option D: thread NPT 1/2" |
| Option A | Device plugs (Verweisziel existiert nicht, aber @y.link.required=true) | Terminals | <ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT 1/2" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G 1/2" ▪ Option U: plug M12x1 + thread M20 |

| Order code "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|------------------------------|--------------|--|
| | Outputs | Power supply | |
| Option A | Device plugs | Device plugs | Option Q: 2 x plug M12x1 |
| Order code for "Housing": Option A: compact, coated aluminum | | | |



A0016888

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

1 Power supply: DC 24 V

2 Output 1: 4-20 mA HART (active)

3 Output 2: pulse/frequency/switch output (passive)

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

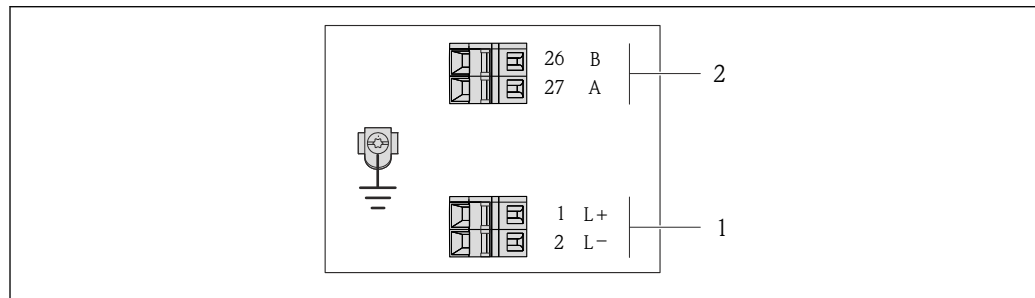
PROFIBUS DP connection version

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

Order code for "Output", option L

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

| Order code "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|---|---|---|--|
| | Output | Power supply | |
| Option A | Terminals | Terminals | <ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G ½" ▪ Option D: thread NPT ½" |
| Option A | Device plugs (Verweisziel existiert nicht, aber @y.link.required='true') | Terminals | <ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT ½" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G ½" ▪ Option U: plug M12x1 + thread M20 |
| Option A | Device plugs (Verweisziel existiert nicht, aber @y.link.required='true') | Device plugs (Verweisziel existiert nicht, aber @y.link.required='true') | Option Q: 2 x plug M12x1 |
| Order code for "Housing": Option A: compact, coated aluminum | | | |



A0022716

 3 PROFIBUS DP terminal assignment

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

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

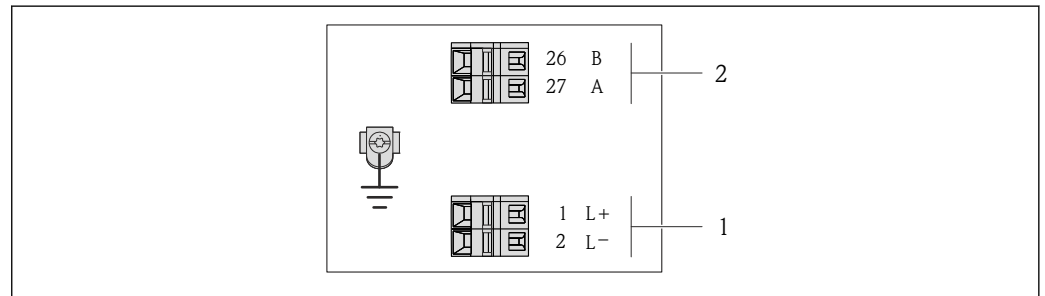
Modbus RS485 connection version

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

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

| Order code "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|----------------------|--|--|--|
| | Output | Power supply | |
| Option A | Terminals | Terminals | <ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G ½" ▪ Option D: thread NPT ½" |
| Option A | Device plugs (Verweissziel existiert nicht, aber @y.link.required='true') | Terminals | <ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT ½" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G ½" ▪ Option U: plug M12x1 + thread M20 |
| Option A | Device plugs (Verweissziel existiert nicht, aber @y.link.required='true') | Device plugs (Verweissziel existiert nicht, aber @y.link.required='true') | Option Q : 2 x plug M12x1 |

Order code for "Housing":
Option **A**: compact, coated aluminum



A0019528

4 Modbus RS485 terminal assignment

- 1 Power supply: DC 24 V
- 2 Modbus RS485

| Order code "Output" | Terminal number | | | |
|---------------------|-----------------|--------|--------------|--------|
| | Power supply | | Output | |
| | 1 (L+) | 2 (L-) | 26 (B) | 27 (A) |
| Option M | DC 24 V | | Modbus RS485 | |

Order code for "Output":
Option **M**: Modbus RS485

Modbus RS485 connection version



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

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

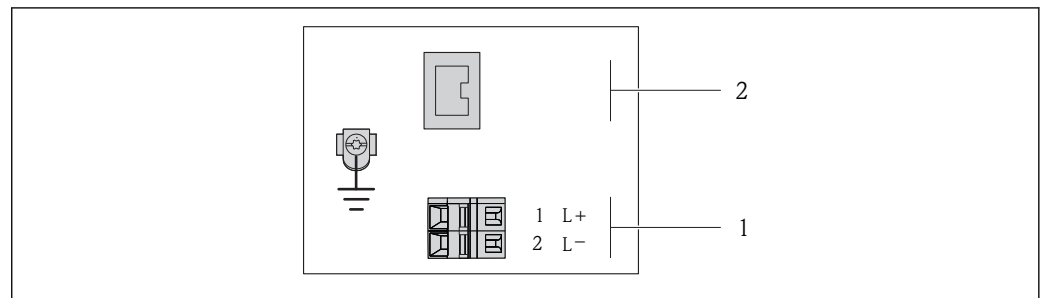
EtherNet/IP connection version

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

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

| Order code "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|----------------------|---|---|--|
| | Output | Power supply | |
| Option A | Device plugs (Verweisziel existiert nicht, aber @y.link.required='true') | Terminals | <ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT ½" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G ½" ▪ Option U: plug M12x1 + thread M20 |
| Option A | Device plugs (Verweisziel existiert nicht, aber @y.link.required='true') | Device plugs (Verweisziel existiert nicht, aber @y.link.required='true') | Option Q : 2 x plug M12x1 |

Order code for "Housing":
Option **A**: compact, coated aluminum



A0017054

5 EtherNet/IP terminal assignment

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

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

Order code for "Output":
Option **N**: EtherNet/IP

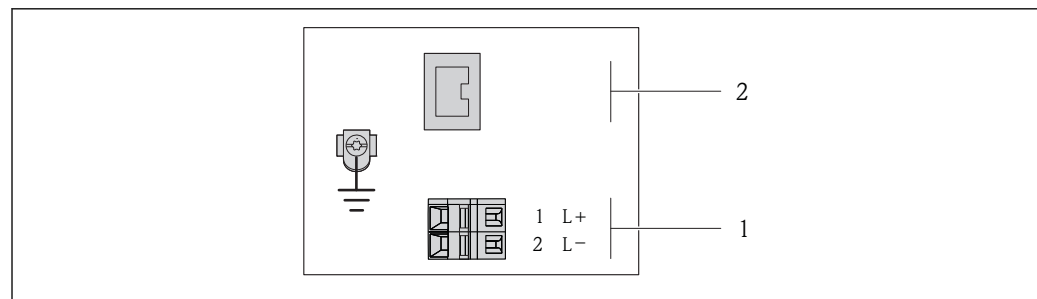
PROFINET connection version

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

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

| Order code for "Housing" | Connection methods available | | Possible options for order code "Electrical connection" |
|--------------------------|------------------------------|----------------------|--|
| | Output | Power supply | |
| Option A | Device plugs → 26 | Terminals | <ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT 1/2" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G 1/2" ▪ Option U: plug M12x1 + thread M20 |
| Option A | Device plugs → 26 | Device plugs → 26 | Option Q : 2 x plug M12x1 |

Order code for "Housing":
Option **A**: compact, coated aluminum



A0017054

6 *PROFINET terminal assignment*

- 1 Power supply: DC 24 V
- 2 PROFINET

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

Order code for "Output":
Option **R**: PROFINET

Pin assignment, device plug

- i** Order codes for the M12x1 connectors, see the "Order code for **electrical connection**" column:
- 4-20 mA HART, pulse/frequency/switch output → 20
 - PROFIBUS DP → 22
 - Modbus RS485 → 23
 - EtherNet/IP → 25
 - PROFINET → 26

Supply voltage

For all connection versions (device side)

| Pin | Assignment | |
|-----|------------|---------------------|
| | Pin | Assignment |
| 1 | L+ | DC 24 V |
| 2 | | Not assigned |
| 3 | | Not assigned |
| 4 | L- | DC 24 V |
| 5 | | Grounding/shielding |

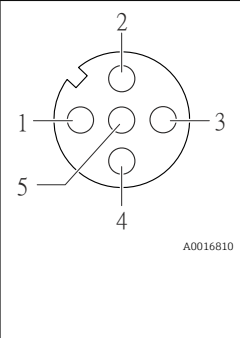
A0016809

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

- i** The following is recommended as a socket:
- Binder, series 763, part no. 79 3440 35 05
 - Alternatively: Phoenix part no. 1669767 SAC-5P-M12MS
 - With the order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
 - With the order code for "Output", option **N**: EtherNet/IP
 - When using the device in a hazardous location: Use a suitably certified socket.

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

Device plug for signal transmission (device side)

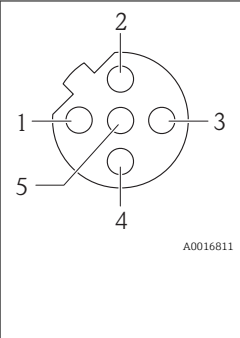
|  | Pin | Assignment | |
|---|-----|-------------|---|
| | 1 | + | 4-20 mA HART (active) |
| | 2 | - | 4-20 mA HART (active) |
| | 3 | + | Pulse/frequency/switch output (passive) |
| | 4 | - | Pulse/frequency/switch output (passive) |
| | 5 | | Grounding/shielding |
| Coding | | Plug/socket | |
| A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

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

PROFIBUS DP

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

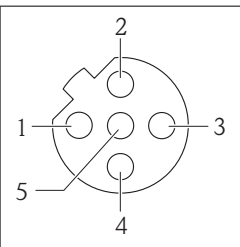
Device plug for signal transmission (device side)

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


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

MODBUS RS485

Device plug for signal transmission (device side)

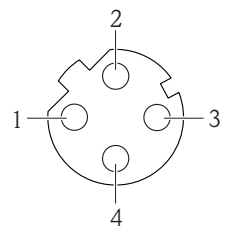
|  | Pin | Assignment | |
|---|-----|------------|---------------------|
| | 1 | | Not assigned |
| | 2 | A | Modbus RS485 |
| | 3 | | Not assigned |
| | 4 | B | Modbus RS485 |
| | 5 | | Grounding/shielding |


| | Coding | Plug/socket |
|--|--------|-------------|
| | B | Socket |

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

EtherNet/IP

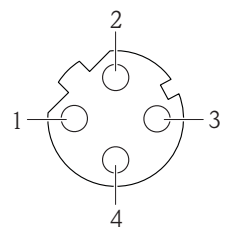
Device plug for signal transmission (device side)


|  A0016812 | 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
 ■ When using the device in a hazardous location, use a suitably certified plug.

PROFINET

Device plug for signal transmission (device side)

|  A0016812 | Pin | | Assignment |
|---|-----|-------------|------------|
| | 1 | + | TD + |
| | 2 | + | RD + |
| | 3 | - | TD - |
| | 4 | - | RD - |
| Coding | | Plug/socket | |
| D | | Socket | |

-  Recommended plug:
 ■ Binder, series 763, part no. 99 3729 810 04
 ■ Phoenix, part no. 1543223 SACC-M12MSD-4Q
 ■ When using the device in a hazardous location, use a suitably certified plug.

Supply voltage

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

Transmitter

For device version with all communication types: DC 20 to 30 V

Power consumption

Transmitter

| Order code for "Output" | Maximum Power consumption |
|---|---------------------------|
| Option B : 4-20 mA HART with pulse/frequency/switch output | 3.5 W |
| Option L : PROFIBUS DP | 3.5 W |
| Option M : Modbus RS485 | 3.5 W |
| Option N : EtherNet/IP | 3.5 W |
| Option R : PROFINET | 3.5 W |

Current consumption

Transmitter

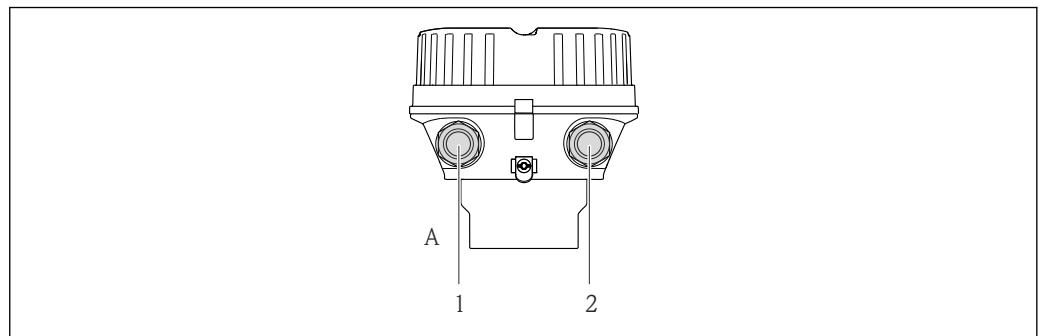
| Order code for "Output" | Maximum Current consumption | Maximum switch-on current |
|---|-----------------------------|---------------------------|
| Option B : 4-20mA HART, pul./freq./switch output | 145 mA | 18 A (< 0.125 ms) |
| Option L : PROFIBUS DP | 145 mA | 18 A (< 0.125 ms) |
| Option M : Modbus RS485 | 90 mA | 10 A (< 0.8 ms) |
| Option N : EtherNet/IP | 145 mA | 18 A (< 0.125 ms) |
| Option R : PROFINET | 145 mA | 18 A (< 0.125 ms) |

Power supply failure

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






Electrical connection

Connecting the transmitter



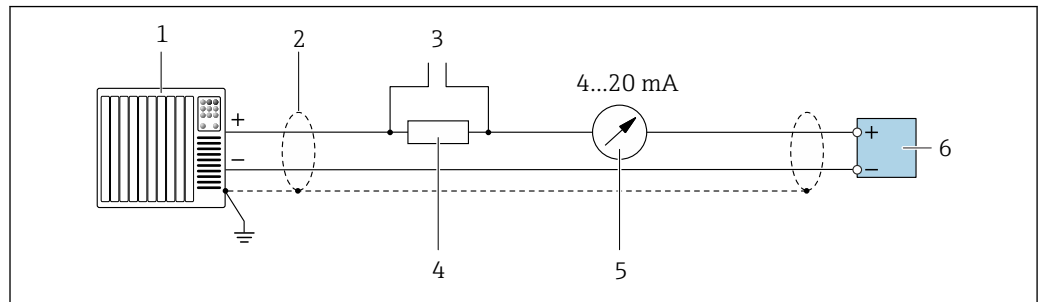
A0019B24

- A *Housing version: compact, aluminum coated*
- 1 *Cable entry or device plug for signal transmission*
- 2 *Cable entry or device plug for supply voltage*

-  ■ Terminal assignment →  20
-  ■ Pin assignment, device plug →  26
-  In the case of device versions with a connector, the transmitter housing does not need to be opened to connect the signal cable or power supply cable.

Connection examples

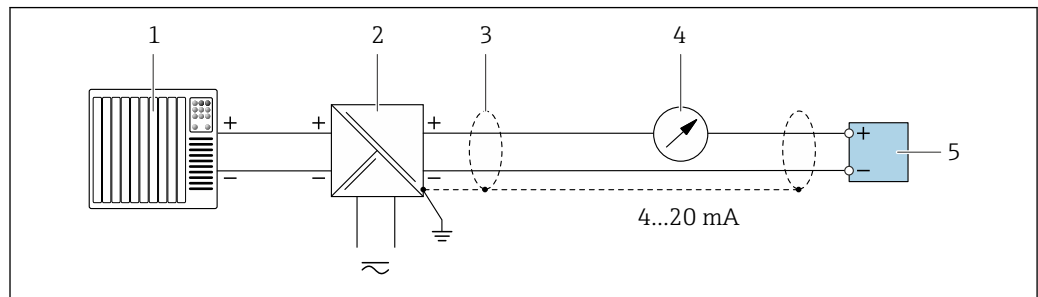
Current output 4 to 20 mA HART



A0029055

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

- 1 Automation system with current input (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 34
- 3 Connection for HART operating devices → 54
- 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 5 Analog display unit: observe maximum load
- 6 Transmitter

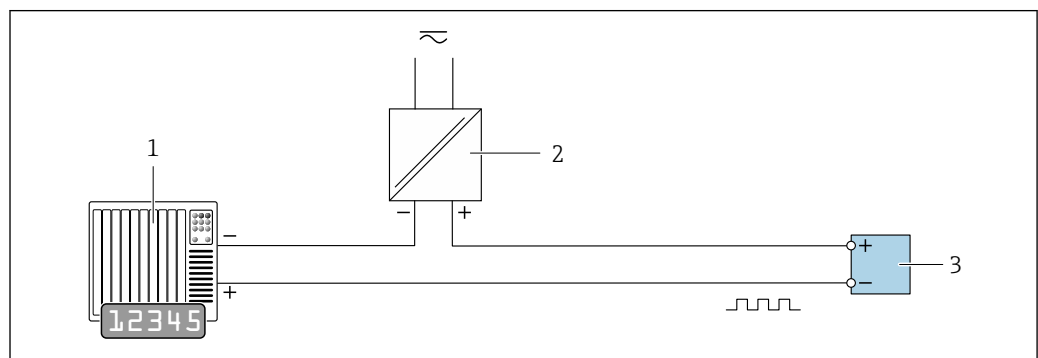


A0028762

8 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: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 34
- 4 Analog display unit: observe maximum load
- 5 Transmitter

Pulse/frequency output

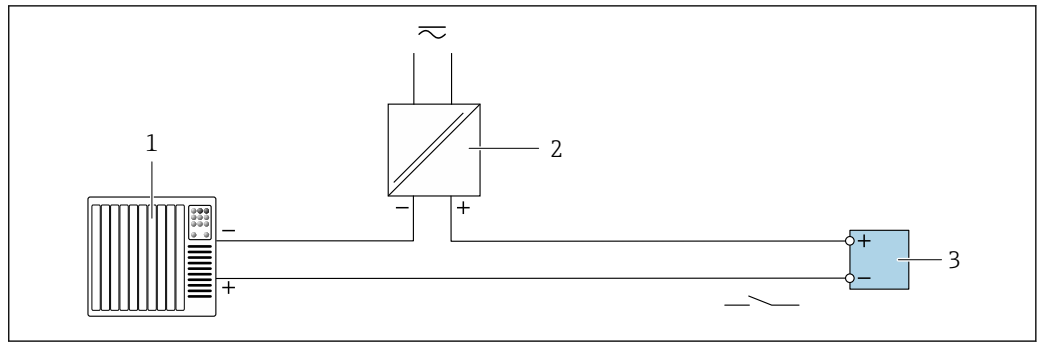


A0028761

9 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values

Switch output

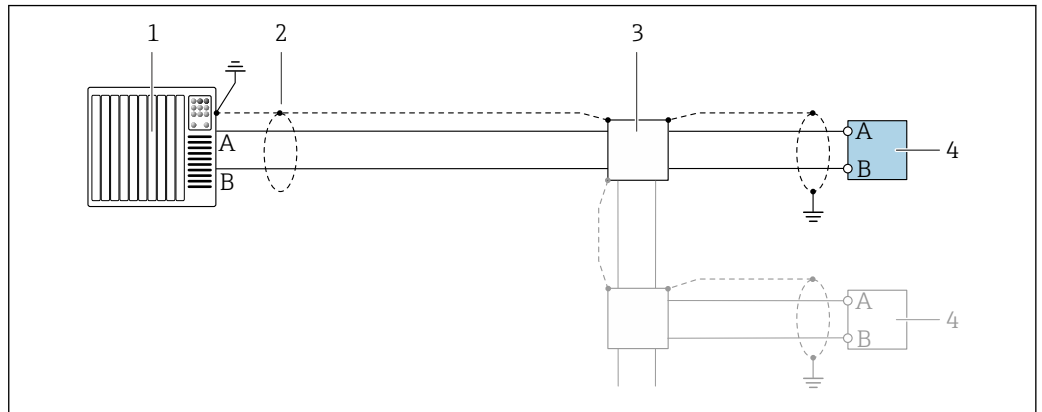


A0028760

10 Connection example for switch output (passive)

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

PROFIBUS DP



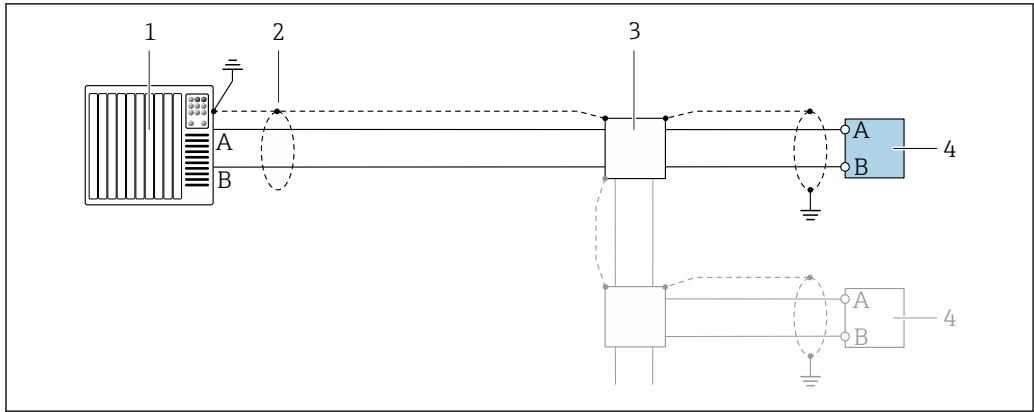
A0028765

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

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

i If baud rates > 1.5 MBaud an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.

Modbus RS485

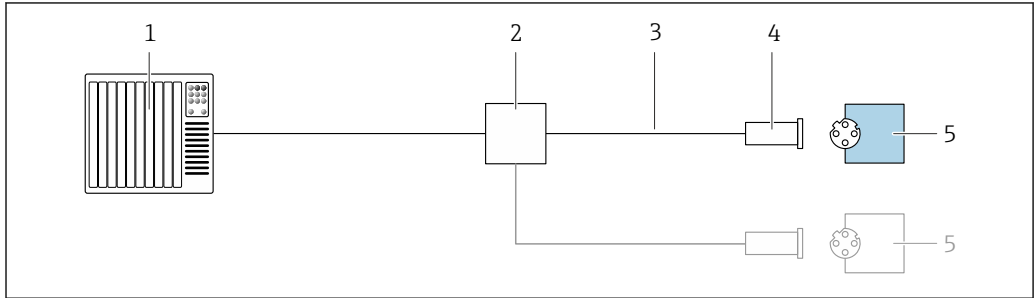


A0028765

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

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

EtherNet/IP

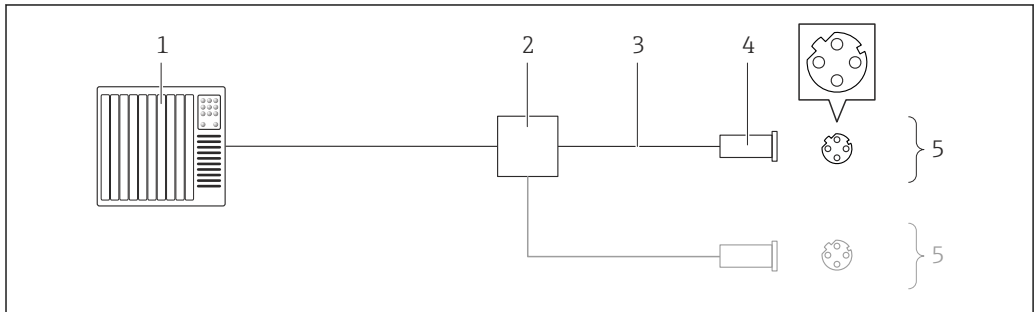


A0028767

13 Connection example for EtherNet/IP

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

PROFINET

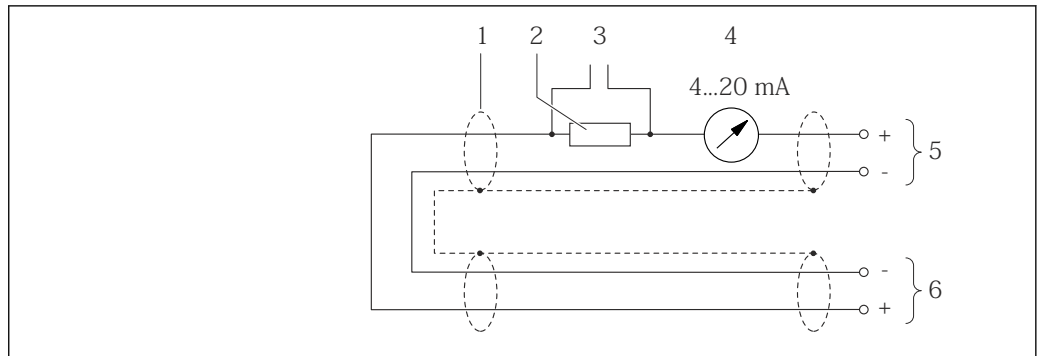


A0016805

14 Connection example for PROFINET

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

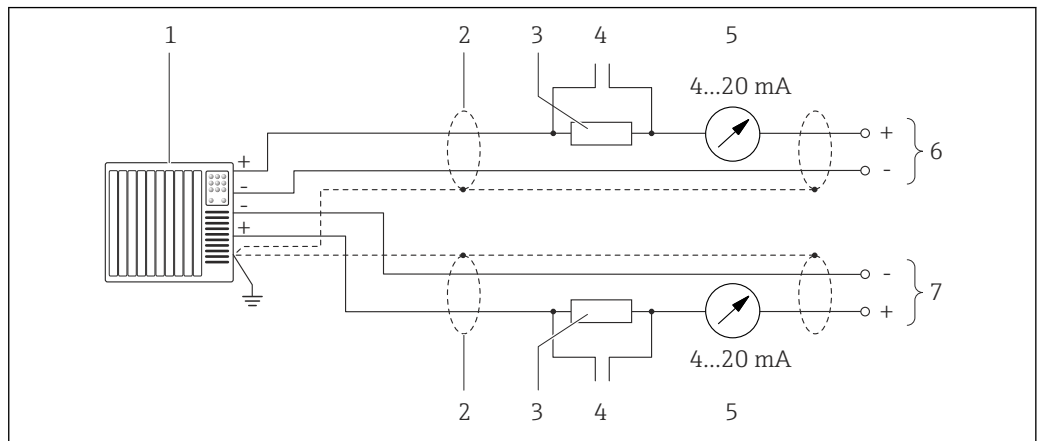
HART input



A0019828

15 Connection example for HART input (burst mode) via current output (active)

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



A0019830

16 Connection example for HART input (master mode) via current output (active)

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

Potential equalization

Requirements

Please consider the following to ensure correct measurement:

- Same electrical potential for the medium and sensor
- Company-internal grounding concepts
- Pipe material and grounding



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

Terminals

Transmitter

Spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

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

Cable specification**Permitted temperature range**

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

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output 4 to 20 mA HART

A shielded cable is recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

PROFIBUS DP

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

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

Modbus RS485

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

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

EtherNet/IP

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

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

PROFINET

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

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

Performance characteristics

Reference operating conditions

- Error limits following DIN EN 29104, in future ISO 20456
- Water, typically +15 to +45 °C (+59 to +113 °F); 0.5 to 7 bar (73 to 101 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025


Maximum measured error

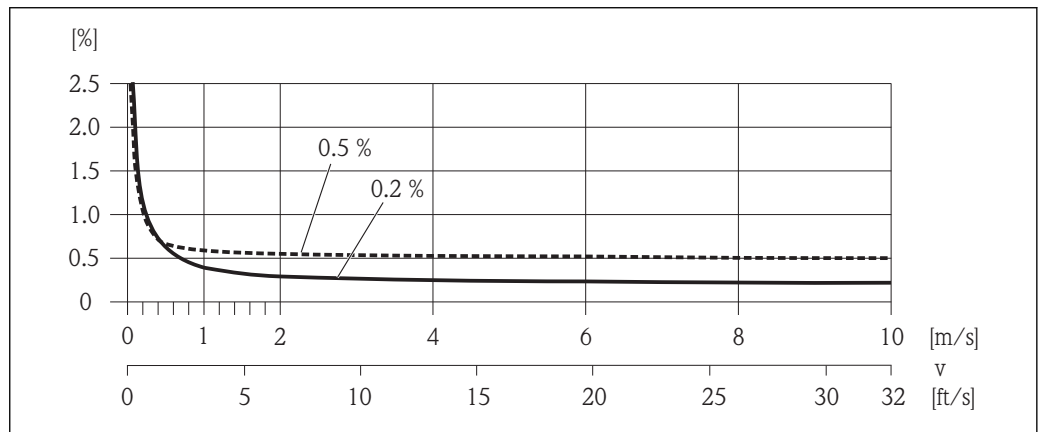
Error limits under reference operating conditions

o.r. = of reading

Volume flow

- ±0.5 % o.r. ± 1 mm/s (0.04 in/s)
- Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s)

 Fluctuations in the supply voltage do not have any effect within the specified range.




 17 Maximum measured error in % o.r.

A0005531

Electrical conductivity

Max. measured error not specified.

Accuracy of outputs

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

The outputs have the following base accuracy specifications.

Current output

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

Pulse/frequency output

o.r. = of reading

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

Repeatability

o.r. = of reading

Volume flowMax. ± 0.1 % o.r. ± 0.5 mm/s (0.02 in/s)**Electrical conductivity**Max. ± 5 % o.r.**Temperature measurement response time** $T_{90} < 15$ s**Influence of ambient temperature****Current output**

o.r. = of reading

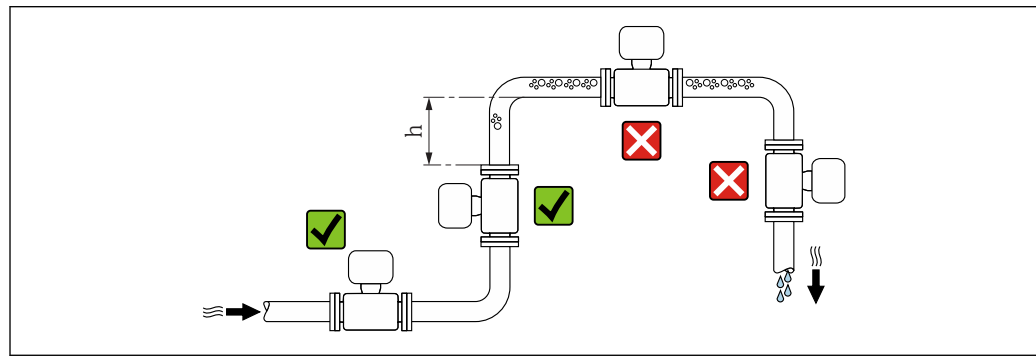
| | |
|--------------------------------|----------------------------|
| Temperature coefficient | Max. ± 0.005 % o.r./°C |
|--------------------------------|----------------------------|

Pulse/frequency output

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

Installation

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

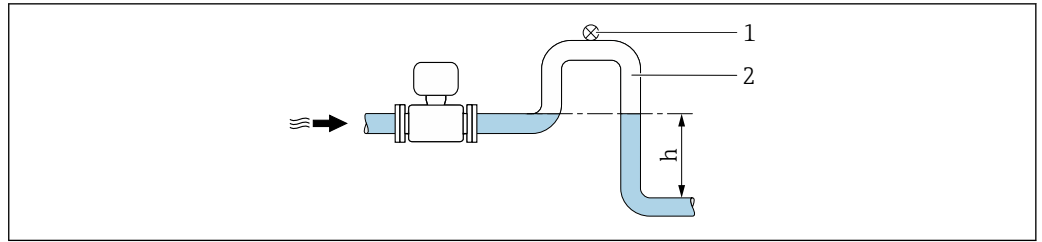
Mounting location

A0029343

Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: $h \geq 2 \times DN$

Installation in down pipes

Install a siphon with a vent valve downstream of the sensor in down pipes whose length $h \geq 5$ m (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.



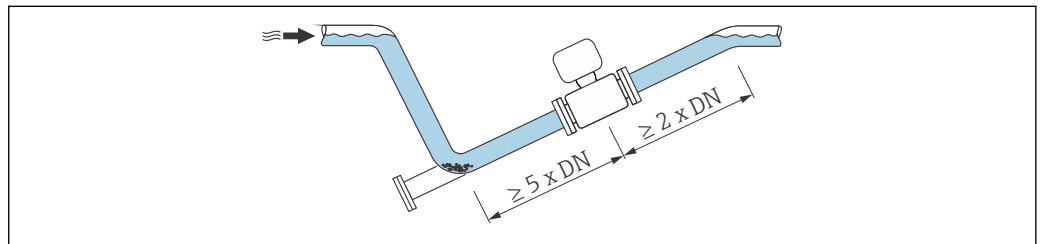
A0028981

18 Installation in a down pipe

- 1 Vent valve
- 2 Pipe siphon
- h Length of down pipe

Installation in partially filled pipes

A partially filled pipe with a gradient necessitates a drain-type configuration.



A0029257

Orientation

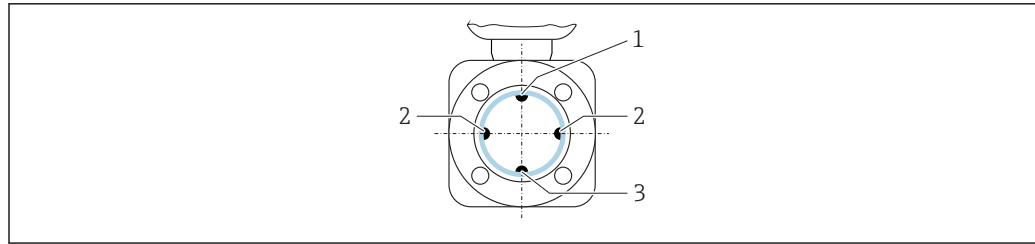
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

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

- 1) Applications with low process temperatures may decrease the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
- 3) To prevent the electronics module from overheating in the case of a sharp rise in temperature (e.g. CIP- or SIP processes), install the device with the transmitter component pointing downwards.

Horizontal

- Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no guarantee that the empty pipe detection function will actually respond to a partially filled or empty measuring tube.



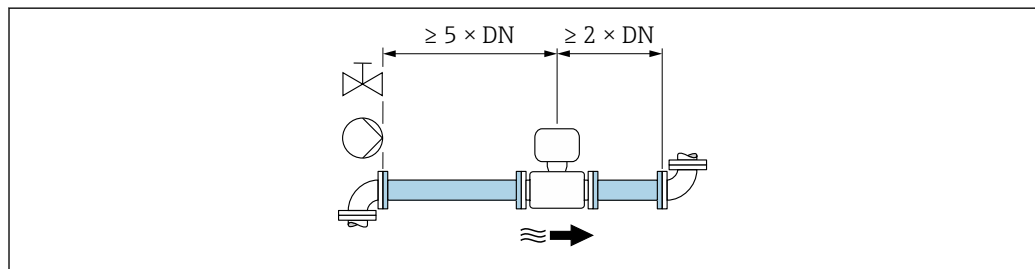
A0029344

- 1 EPD electrode for empty pipe detection
- 2 Measuring electrodes for signal detection
- 3 Reference electrode for potential equalization

Inlet and outlet runs

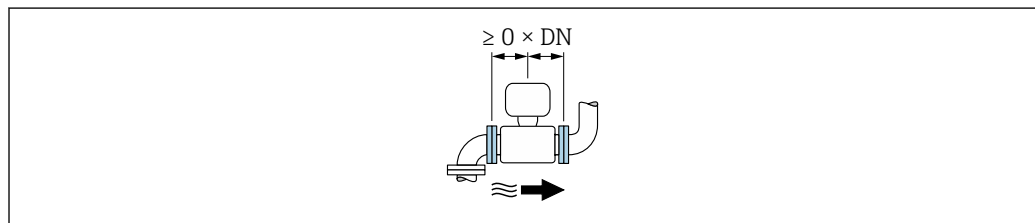
If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows.

Observe the following inlet and outlet runs to comply with accuracy specifications:



A0028997

- 19 Order code for "Design", option A "Insertion length short, ISO/DVGW until DN400, DN450-2000 1:1" and order code for "Design", option B "Insertion length long, ISO/DVGW until DN400, DN450-2000 1:1.3"



A0032859

- 20 Order code for "Design", option C "Insertion length short ISO/DVGW until DN300, w/o inlet and outlet runs, constricted meas.tube"

Adapters

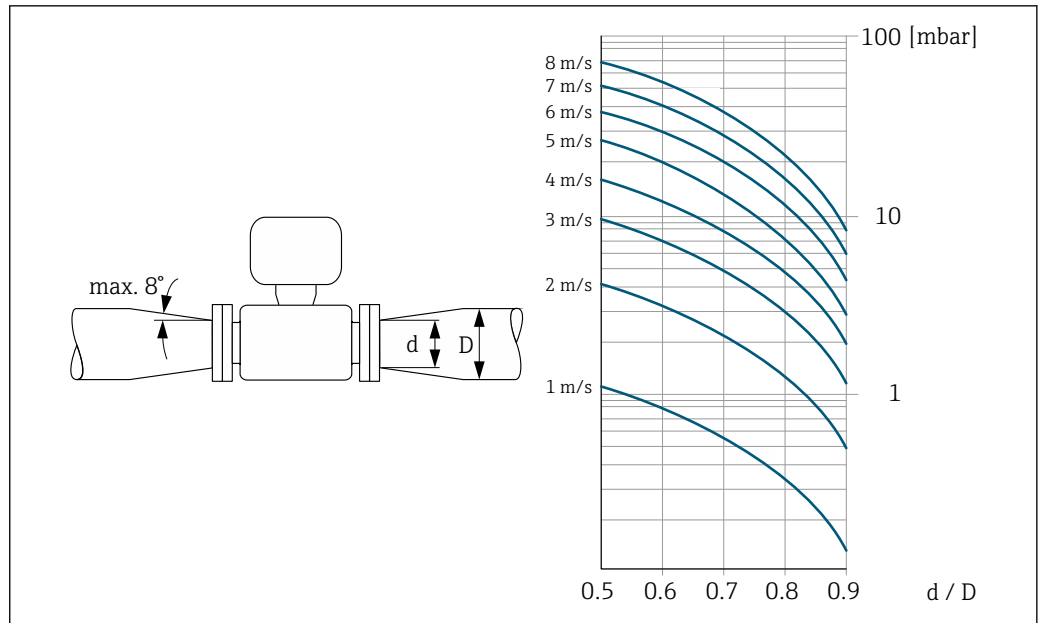
Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.

The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders:

- Calculate the ratio of the diameters d/D .
- From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



The nomogram only applies to liquids with a viscosity similar to that of water.



Environment

Ambient temperature range

| | |
|---------------|--|
| Transmitter | -40 to +60 °C (-40 to +140 °F) |
| Local display | -20 to +60 °C (-4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range. |
| Sensor | Process connection material, carbon steel: -10 to +60 °C (+14 to +140 °F) |
| Liner | Do not exceed or fall below the permitted temperature range of the liner . |

If operating outdoors:

- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

Storage temperature

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors. → 39

- Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.
- If protection caps or protective covers are mounted these should never be removed before installing the measuring device.



Degree of protection

Transmitter and sensor

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

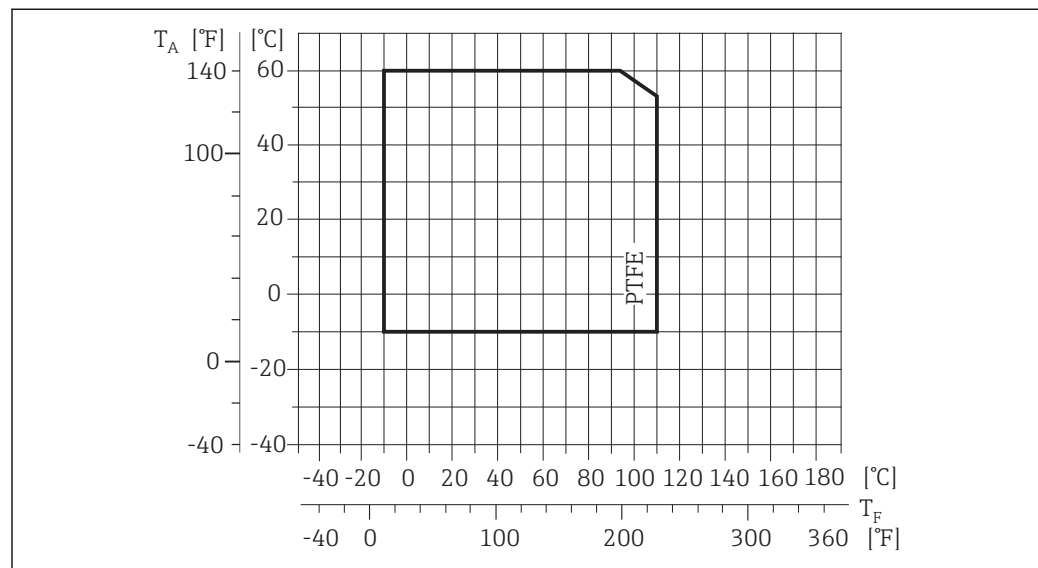
Vibration resistance

- Vibration, sinusoidal according to 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 resistance | Shock, half-sine according to IEC 60068-2-27 6 ms 30 g |
| Impact resistance | Rough handling shocks according to IEC 60068-2-31 |
| Mechanical load | <ul style="list-style-type: none"> ■ Protect the transmitter housing against mechanical effects, such as shock or impact. ■ Never use the transmitter housing as a ladder or climbing aid. |
| Electromagnetic compatibility (EMC) | <ul style="list-style-type: none"> ■ Depends on the communication protocol: <ul style="list-style-type: none"> - HART, PROFIBUS DP, EtherNet/IP: As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21) - Modbus RS485: As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21) - PROFINET: as per IEC/EN 61326 ■ Complies with emission limits for industry as per EN 55011 (Class A) ■ Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784 <p> 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.</p> <p> Details are provided in the Declaration of Conformity.</p> |

Process

Medium temperature range -10 to +110 °C (-4 to +230 °F)



A0029171-EN

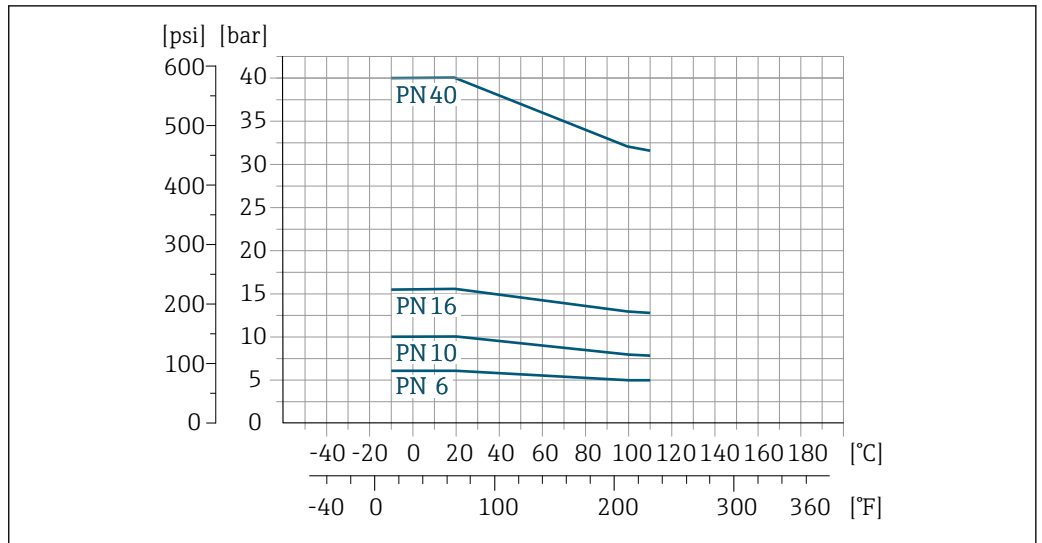
T_A Ambient temperature

T_F Medium temperature

Conductivity ≥ 5 μS/cm for liquids in general. Stronger filter damping is required for very low conductivity values.

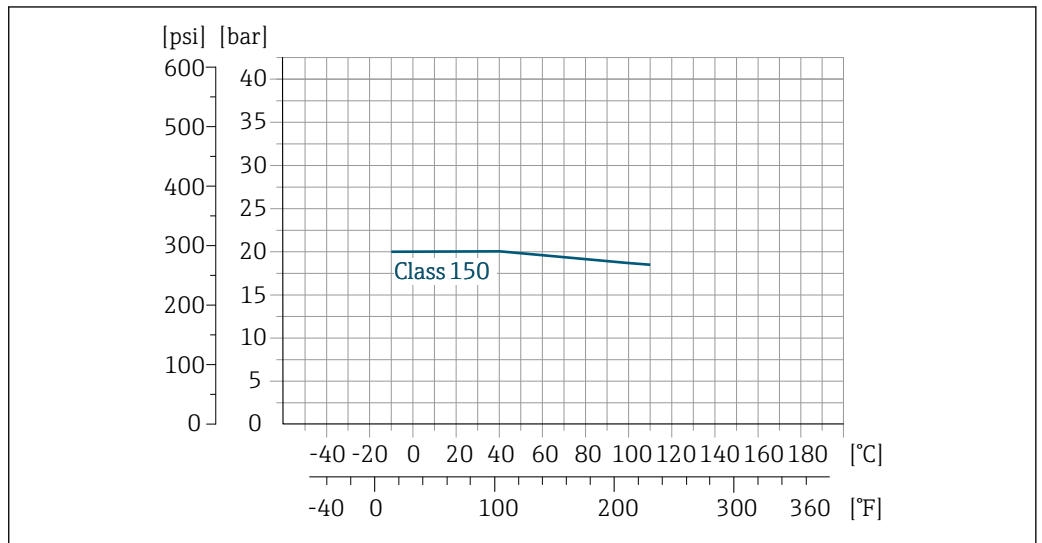
Pressure-temperature ratings The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

Process connection: flange according to EN 1092-1 (DIN 2501)

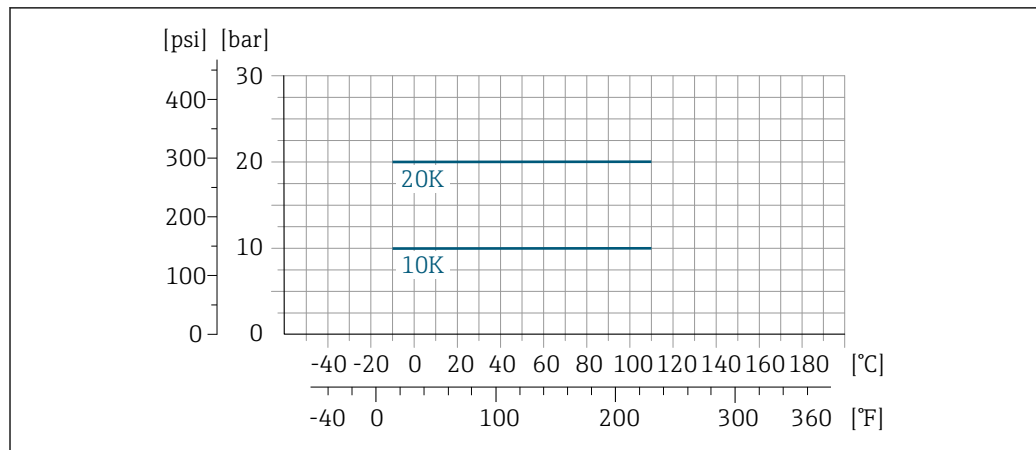


21 Process connection material: carbon steel, FE410WB/S235JRG2

Process connection: flange according to ASME B16.5



22 Process connection material: carbon steel, A105

Process connection: flange according to JIS B2220

A0029396-EN

23 Process connection material: carbon steel, S235JRG2/HII

Pressure tightness

"-" = no specifications possible

Liner: PTFE

| Nominal diameter | | Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures: | | | |
|------------------|------|--|------------------|-------------------|-------------------|
| [mm] | [in] | +25 °C (+77 °F) | +80 °C (+176 °F) | +100 °C (+212 °F) | +110 °C (+230 °F) |
| 15 | ½ | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 25 | 1 | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 32 | - | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 40 | 1 ½ | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 50 | 2 | 0 (0) | 0 (0) | 0 (0) | 100 (1.45) |
| 65 | - | 0 (0) | - | 40 (0.58) | 130 (1.89) |
| 80 | 3 | 0 (0) | - | 40 (0.58) | 130 (1.89) |
| 100 | 4 | 0 (0) | - | 135 (1.96) | 170 (2.47) |
| 125 | - | 135 (1.96) | - | 240 (3.48) | 385 (5.58) |
| 150 | 6 | 135 (1.96) | - | 240 (3.48) | 385 (5.58) |
| 200 | 8 | 200 (2.90) | - | 290 (4.21) | 410 (5.95) |
| 250 | 10 | 330 (4.79) | - | 400 (5.80) | 530 (7.69) |
| 300 | 12 | 400 (5.80) | - | 500 (7.25) | 630 (9.14) |
| 350 | 14 | 470 (6.82) | - | 600 (8.70) | 730 (10.6) |
| 400 | 16 | 540 (7.83) | - | 670 (9.72) | 800 (11.6) |
| 450 | 18 | No negative pressure permitted! | | | |
| 500 | 20 | | | | |
| 600 | 24 | | | | |

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:

- $v < 2$ m/s (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- $v > 2$ m/s (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludge)



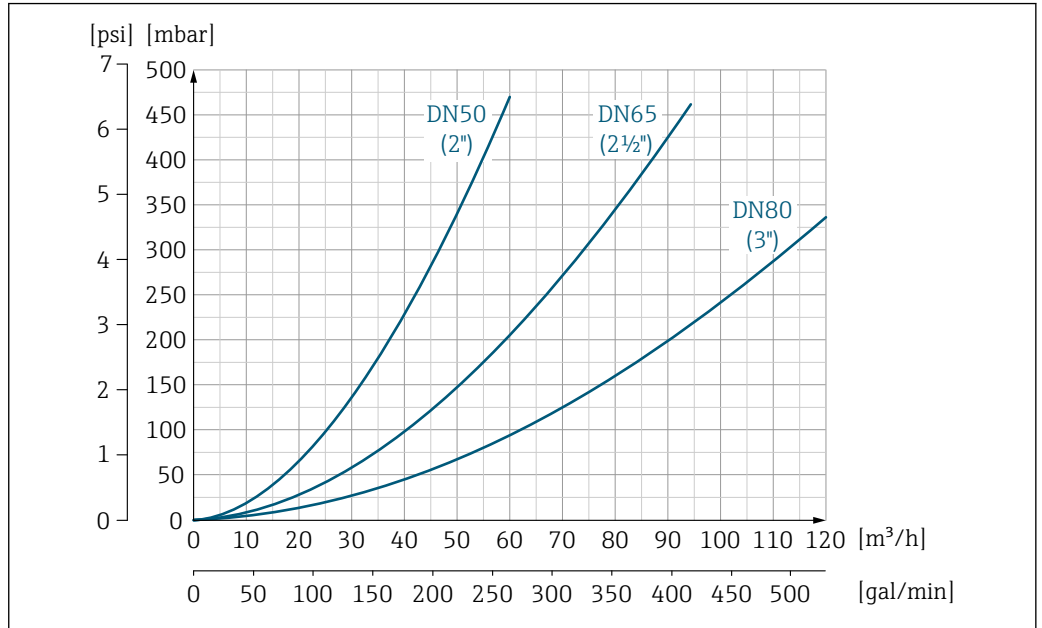
A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.



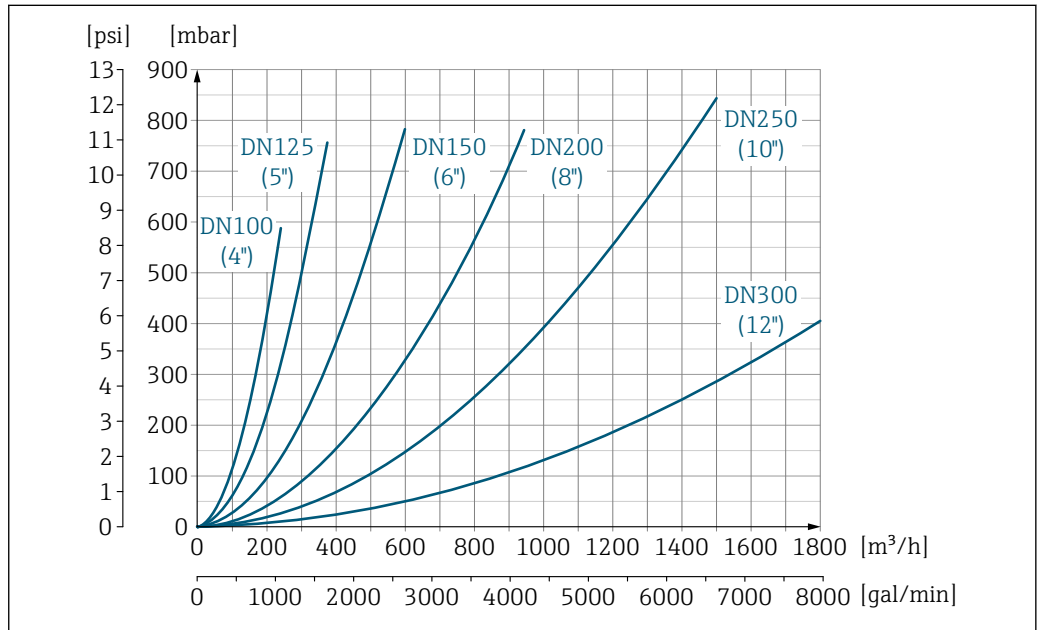
For an overview of the full scale values for the measuring range, see the "Measuring range" section → 6

Pressure loss

- No pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → 38

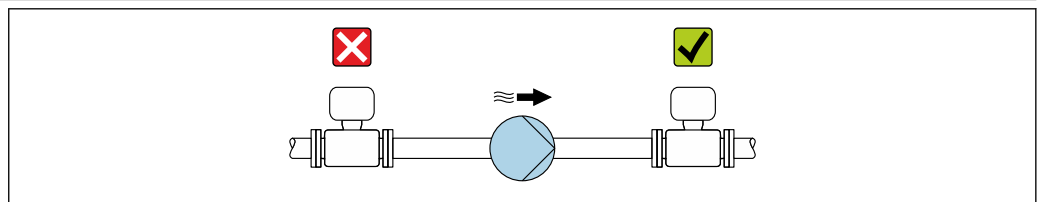


24 Pressure loss DN 50 to 80 (2 to 3") in the case of order code for "Design", option C "Insertion length short ISO/DVGW to DN300, without inlet/outlet runs, constricted meas.tube"



25 Pressure loss DN 100 to 300 (4 to 12") in the case of order code for "Design", option C "Insertion length short ISO/DVGW to DN300, without inlet/outlet runs, constricted meas.tube"

System pressure

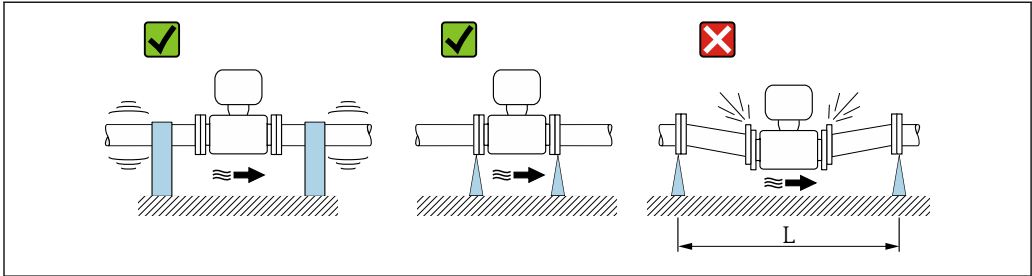


Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

i Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.

- i** Information on the liner's resistance to partial vacuum → 42
- i** Information on the shock resistance of the measuring system → 40
- i** Information on the vibration resistance of the measuring system → 39

Vibrations



26 Measures to avoid device vibrations ($L > 10\text{ m}$ (33 ft))

In the event of very strong vibrations, the pipe and sensor must be supported and fixed.

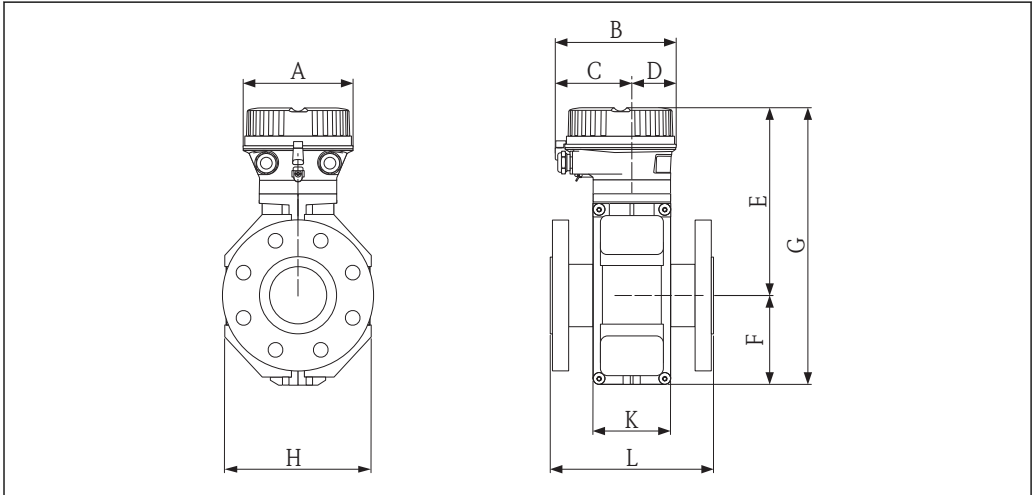
- i** Information on the shock resistance of the measuring system → 40
- i** Information on the vibration resistance of the measuring system → 39

Mechanical construction

Design, dimensions

Compact version

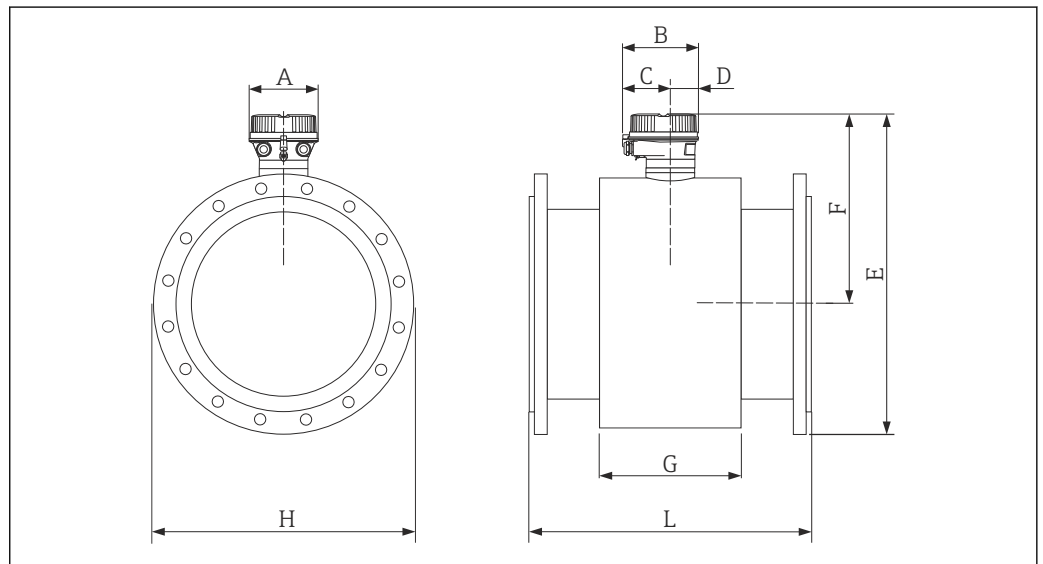
Order code for "Housing", option A "Compact, coated aluminum"



| DN | L ¹⁾ | A | B | C | D | E ²⁾ | F | G ²⁾ | H | K |
|------|-----------------|------|-------|------|------|-----------------|------|-----------------|------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 15 | 200 | 136 | 147.5 | 93.5 | 54 | 197 | 84 | 281 | 120 | 94 |
| 25 | 200 | 136 | 147.5 | 93.5 | 54 | 197 | 84 | 281 | 120 | 94 |
| 32 | 200 | 136 | 147.5 | 93.5 | 54 | 197 | 84 | 281 | 120 | 94 |
| 40 | 200 | 136 | 147.5 | 93.5 | 54 | 197 | 84 | 281 | 120 | 94 |

| DN | L ¹⁾ | A | B | C | D | E ²⁾ | F | G ²⁾ | H | K |
|------|-----------------|------|-------|------|------|-----------------|------|-----------------|------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 50 | 200 | 136 | 147.5 | 93.5 | 54 | 197 | 84 | 281 | 120 | 94 |
| 65 | 200 | 136 | 147.5 | 93.5 | 54 | 222 | 109 | 331 | 180 | 94 |
| 80 | 200 | 136 | 147.5 | 93.5 | 54 | 222 | 109 | 331 | 180 | 94 |
| 100 | 250 | 136 | 147.5 | 93.5 | 54 | 222 | 109 | 331 | 180 | 94 |
| 125 | 250 | 136 | 147.5 | 93.5 | 54 | 262 | 150 | 412 | 260 | 140 |
| 150 | 300 | 136 | 147.5 | 93.5 | 54 | 262 | 150 | 412 | 260 | 140 |
| 200 | 350 | 136 | 147.5 | 93.5 | 54 | 287 | 180 | 467 | 324 | 156 |
| 250 | 450 | 136 | 147.5 | 93.5 | 54 | 312 | 205 | 517 | 400 | 166 |
| 300 | 500 | 136 | 147.5 | 93.5 | 54 | 337 | 230 | 567 | 460 | 166 |

- 1) The length (L) is always the same, irrespective of the selected pressure rating.
- 2) If using a display, order code for "Display; Operation", option B: values + 28 mm



A0023368

| DN | L ¹⁾ | A | B | C | D | F ²⁾ | G |
|------|-----------------|------|-------|------|------|-----------------|------|
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 350 | 550 | 136 | 147.5 | 93.5 | 54 | 399 | 290 |
| 400 | 600 | 136 | 147.5 | 93.5 | 54 | 425 | 290 |
| 450 | 600 | 136 | 147.5 | 93.5 | 54 | 450 | 290 |
| 500 | 600 | 136 | 147.5 | 93.5 | 54 | 476 | 290 |
| 600 | 600 | 136 | 147.5 | 93.5 | 54 | 528 | 290 |

- 1) The length (L) is always the same, irrespective of the selected pressure rating.
- 2) If using a display, order code for "Display; operation", option B: values + 28 mm

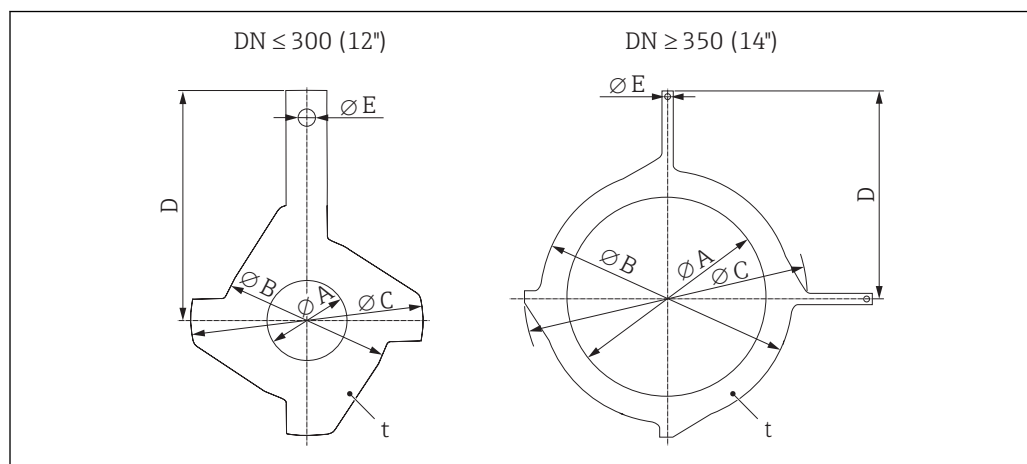
| DN | E ¹⁾ for pressure rating | | | | H for pressure rating | | | |
|------|-------------------------------------|-------|-------|------|-----------------------|-------|-------|------|
| | PN 6 | PN 10 | PN 16 | ASME | PN 6 | PN 10 | PN 16 | ASME |
| [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 350 | 644 | 651 | 659 | 665 | 490 | 505 | 520 | 533 |
| 400 | 695 | 707 | 715 | 723 | 540 | 565 | 580 | 597 |

| DN [mm] | E ¹⁾ for pressure rating | | | | H for pressure rating | | | |
|------------|-------------------------------------|---------------|---------------|--------------|-----------------------|---------------|---------------|--------------|
| | PN 6 [mm] | PN 10 [mm] | PN 16 [mm] | ASME [mm] | PN 6 [mm] | PN 10 [mm] | PN 16 [mm] | ASME [mm] |
| 450 | 747 | 757 | 770 | 767 | 595 | 615 | 640 | 635 |
| 500 | 798 | 811 | 833 | 825 | 645 | 670 | 715 | 699 |
| 600 | 905 | 918 | 948 | 934 | 755 | 780 | 840 | 813 |

1) If using a display, order code for "Display; operation", option B: values + 28 mm

Accessories

Ground disk for flange connection



A0003221

| DN ¹⁾ EN (DIN), JIS [mm] | A PTFE [mm] | B [mm] | C [mm] | D [mm] | E [mm] | t [mm] |
|---|-------------------|-----------|-----------|-----------|-----------|-----------|
| 15 | 16 | 43 | 61.5 | 73 | 6.5 | 2 |
| 25 | 26 | 62 | 77.5 | 87.5 | 6.5 | 2 |
| 32 | 35 | 80 | 87.5 | 94.5 | 6.5 | 2 |
| 40 | 41 | 82 | 101 | 103 | 6.5 | 2 |
| 50 | 52 | 101 | 115.5 | 108 | 6.5 | 2 |
| 65 | 68 | 121 | 131.5 | 118 | 6.5 | 2 |
| 80 | 80 | 131 | 154.5 | 135 | 6.5 | 2 |
| 100 | 104 | 156 | 186.5 | 153 | 6.5 | 2 |
| 125 | 130 | 187 | 206.5 | 160 | 6.5 | 2 |
| 150 | 158 | 217 | 256 | 184 | 6.5 | 2 |
| 200 | 206 | 267 | 288 | 205 | 6.5 | 2 |
| 250 | 260 | 328 | 359 | 240 | 6.5 | 2 |
| 300 ²⁾ | 312 | 375 | 413 | 273 | 6.5 | 2 |
| 300 ³⁾ | 310 | 375 | 404 | 268 | 6.5 | 2 |
| 350 ²⁾ | 343 | 433 | 479 | 365 | 9.0 | 2 |
| 400 ²⁾ | 393 | 480 | 542 | 395 | 9.0 | 2 |
| 450 ²⁾ | 439 | 538 | 583 | 417 | 9.0 | 2 |

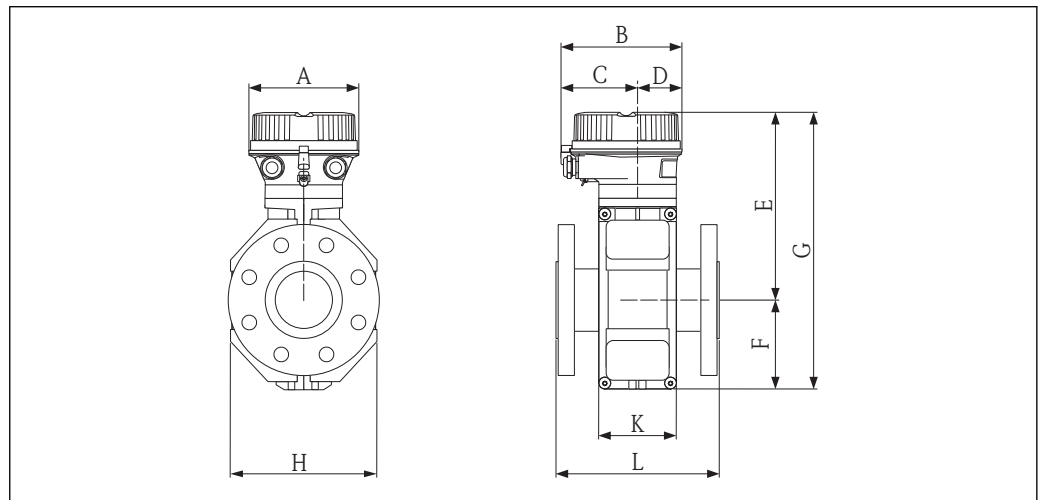
| DN ¹⁾ EN (DIN), JIS [mm] | A PTFE [mm] | B [mm] | C [mm] | D [mm] | E [mm] | t [mm] |
|---|-------------------|-----------|-----------|-----------|-----------|-----------|
| 500 ²⁾ | 493 | 592 | 650 | 460 | 9.0 | 2 |
| 600 ²⁾ | 593 | 693 | 766 | 522 | 9.0 | 2 |

- 1) Ground disks DN 15 to 250 (½ to 10") can be used for all available flange standards/pressure ratings.
- 2) PN 10/16
- 3) JIS 10K/20K

Design, dimensions

Compact version

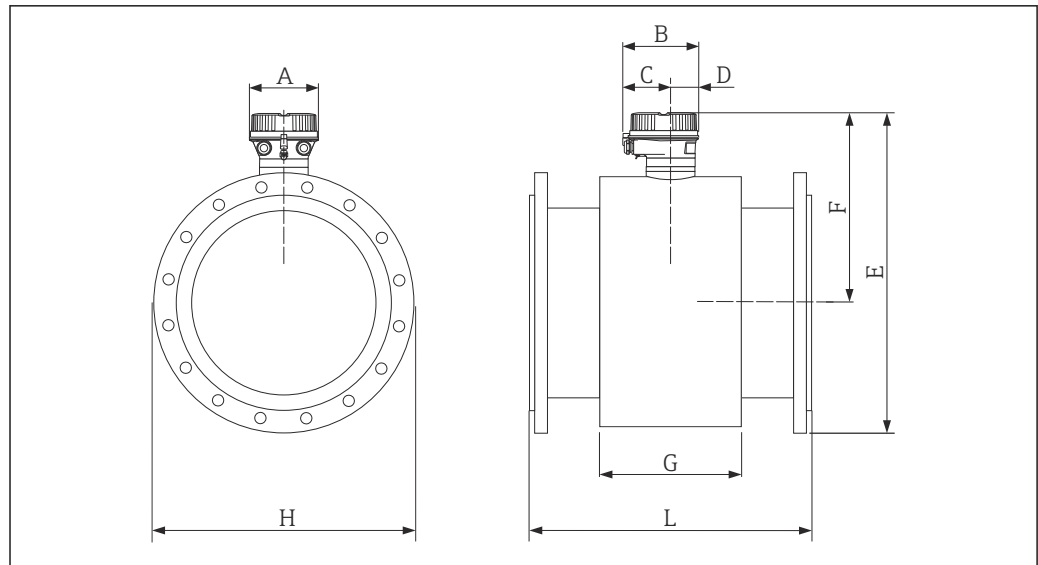
Order code for "Housing", option A "Compact, coated aluminum"



A0019491

| DN | L ¹⁾ | A | B | C | D | E ²⁾ | F | G ²⁾ | H | K |
|------|-----------------|------|------|------|------|-----------------|------|-----------------|------|------|
| [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| ½ | 7.87 | 5.35 | 5.81 | 3.68 | 2.13 | 7.76 | 3.31 | 11.1 | 4.72 | 3.70 |
| 1 | 7.87 | 5.35 | 5.81 | 3.68 | 2.13 | 7.76 | 3.31 | 11.1 | 4.72 | 3.70 |
| 1 ½ | 7.87 | 5.35 | 5.81 | 3.68 | 2.13 | 7.76 | 3.31 | 11.1 | 4.72 | 3.70 |
| 2 | 7.87 | 5.35 | 5.81 | 3.68 | 2.13 | 7.76 | 3.31 | 11.1 | 4.72 | 3.70 |
| 3 | 7.87 | 5.35 | 5.81 | 3.68 | 2.13 | 8.74 | 4.29 | 13.0 | 7.09 | 3.70 |
| 4 | 9.84 | 5.35 | 5.81 | 3.68 | 2.13 | 8.74 | 4.29 | 13.0 | 7.09 | 3.70 |
| 6 | 11.8 | 5.35 | 5.81 | 3.68 | 2.13 | 10.3 | 5.91 | 16.2 | 10.2 | 5.51 |
| 8 | 13.8 | 5.35 | 5.81 | 3.68 | 2.13 | 11.3 | 7.09 | 18.4 | 12.8 | 6.14 |
| 10 | 17.7 | 5.35 | 5.81 | 3.68 | 2.13 | 12.3 | 8.07 | 20.4 | 15.8 | 6.54 |
| 12 | 19.7 | 5.35 | 5.81 | 3.68 | 2.13 | 13.3 | 9.06 | 22.3 | 18.1 | 6.54 |

- 1) The length (L) is always the same, irrespective of the selected pressure rating.
- 2) If using a display, order code for "Display; operation", option B: values + 1.1 in



A0023368

| DN [in] | L ¹⁾ [in] | A [in] | B [in] | C [in] | D [in] | F ²⁾ [in] | G [in] |
|------------|-------------------------|-----------|-----------|-----------|-----------|-------------------------|-----------|
| 14 | 21.6 | 5.35 | 5.81 | 3.68 | 2.13 | 15.7 | 11.4 |
| 16 | 23.6 | 5.35 | 5.81 | 3.68 | 2.13 | 16.7 | 11.4 |
| 18 | 23.6 | 5.35 | 5.81 | 3.68 | 2.13 | 17.7 | 11.4 |
| 20 | 23.6 | 5.35 | 5.81 | 3.68 | 2.13 | 18.7 | 11.4 |
| 24 | 23.6 | 5.35 | 5.81 | 3.68 | 2.13 | 20.8 | 11.4 |

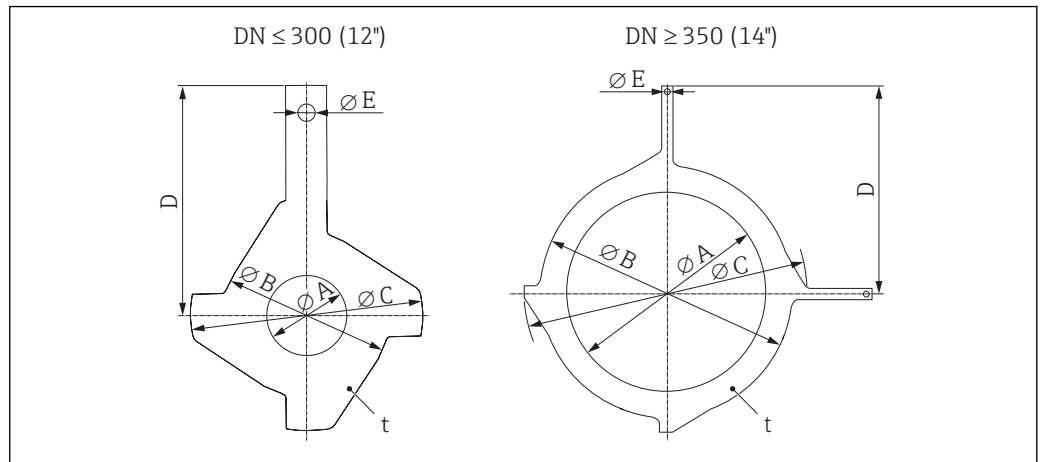
- 1) The length (L) is always the same, irrespective of the selected pressure rating.
- 2) If using a display, order code for "Display; operation", option B: values + 1.1 in

| DN [in] | E ¹⁾ for pressure rating | | | | H for pressure rating | | | |
|------------|-------------------------------------|---------------|---------------|--------------|-----------------------|---------------|---------------|--------------|
| | PN 6 [in] | PN 10 [in] | PN 16 [in] | ASME [in] | PN 6 [in] | PN 10 [in] | PN 16 [in] | ASME [in] |
| 14 | 25.4 | 25.6 | 25.9 | 26.2 | 19.3 | 19.9 | 20.5 | 21.0 |
| 16 | 27.4 | 27.8 | 28.2 | 28.5 | 21.3 | 22.2 | 22.8 | 23.5 |
| 18 | 29.4 | 29.8 | 30.3 | 30.2 | 23.4 | 24.2 | 25.2 | 25.0 |
| 20 | 31.4 | 31.9 | 32.8 | 32.5 | 25.4 | 26.4 | 28.2 | 27.5 |
| 24 | 35.6 | 36.1 | 37.3 | 36.8 | 29.7 | 30.7 | 33.1 | 32.0 |

- 1) If using a display, order code for "Display; operation", option B: values + 1.1 in

Accessories

Ground disk for flange connection



A0003221

| DN ¹⁾ ASME [in] | A PTFE [in] | B [in] | C [in] | D [in] | E [in] | t [in] |
|----------------------------------|-------------------|-----------|-----------|-----------|-----------|-----------|
| ½ | 0.63 | 1.69 | 2.42 | 2.87 | 0.26 | 0.08 |
| 1 | 1.02 | 2.44 | 3.05 | 3.44 | 0.26 | 0.08 |
| 1 ½ | 1.61 | 3.23 | 3.98 | 4.06 | 0.26 | 0.08 |
| 2 | 2.05 | 3.98 | 4.55 | 4.25 | 0.26 | 0.08 |
| 3 | 3.15 | 5.16 | 6.08 | 5.31 | 0.26 | 0.08 |
| 4 | 4.09 | 6.14 | 7.34 | 6.02 | 0.26 | 0.08 |
| 6 | 6.22 | 8.54 | 10.08 | 7.24 | 0.26 | 0.08 |
| 8 | 8.11 | 10.51 | 11.34 | 8.07 | 0.26 | 0.08 |
| 10 | 10.24 | 12.91 | 14.13 | 9.45 | 0.26 | 0.08 |
| 12 | 12.28 | 14.76 | 16.26 | 10.75 | 0.26 | 0.08 |
| 14 | 13.50 | 17.05 | 18.86 | 14.37 | 0.35 | 0.08 |
| 16 | 15.47 | 18.90 | 21.34 | 15.55 | 0.35 | 0.08 |
| 18 | 17.28 | 21.18 | 22.95 | 16.42 | 0.35 | 0.08 |
| 20 | 19.41 | 23.31 | 25.59 | 18.11 | 0.35 | 0.08 |
| 24 | 23.35 | 27.28 | 30.16 | 20.55 | 0.35 | 0.08 |

1) Ground disks can be used for all available pressure ratings.

Weight

Compact version

- Including the transmitter (1.8 kg (4.0 lb))
- Weight specifications excluding packaging material

Weight in SI units

| Nominal diameter | | EN (DIN) | | | | ASME | JIS |
|------------------|------|--------------|---------------|---------------|---------------|-------------------|-------------|
| [mm] | [in] | PN 6 [kg] | PN 10 [kg] | PN 16 [kg] | PN 40 [kg] | Class 150 [kg] | 10K [kg] |
| 15 | ½ | - | - | - | 4.9 | 4.9 | 4.9 |
| 25 | 1 | - | - | - | 5.7 | 5.7 | 5.7 |
| 32 | - | - | - | - | 6.4 | - | 5.7 |
| 40 | 1 ½ | - | - | - | 7.8 | 7.8 | 6.7 |
| 50 | 2 | - | - | - | 9.0 | 9.0 | 7.7 |
| 65 | - | - | - | 10.4 | - | - | 9.5 |
| 80 | 3 | - | - | 12.4 | - | 12.4 | 10.9 |
| 100 | 4 | - | - | 14.4 | - | 14.4 | 13.1 |
| 125 | - | - | - | 19.9 | - | - | 19.4 |
| 150 | 6 | - | - | 23.9 | - | 23.9 | 22.9 |
| 200 | 8 | - | 43.4 | 44.4 | - | 43.4 | 40.3 |
| 250 | 10 | - | 63.4 | 68.4 | - | 73.4 | 67.8 |
| 300 | 12 | - | 68.4 | 79.4 | - | 108.4 | 70.7 |
| 350 | 14 | 75.8 | 86.8 | 102 | - | 135.8 | 79 |
| 400 | 16 | 87.8 | 102.8 | 123.8 | - | 166.8 | 100 |
| 450 | 18 | 101.7 | 116.7 | 147.6 | - | 190.9 | 128 |
| 500 | 20 | 113.2 | 130.8 | 188.3 | - | 226.8 | 142 |
| 600 | 24 | 153.8 | 179.4 | 298.3 | - | 327.1 | 188 |

Weight in US units

| Nominal diameter | | ASME |
|------------------|------|--------------------|
| [mm] | [in] | Class 150 [lbs] |
| 15 | ½ | 10.8 |
| 25 | 1 | 12.6 |
| 40 | 1 ½ | 17.2 |
| 50 | 2 | 19.9 |
| 80 | 3 | 27.3 |
| 100 | 4 | 31.8 |
| 150 | 6 | 52.7 |
| 200 | 8 | 95.7 |
| 250 | 10 | 161.9 |
| 300 | 12 | 239.0 |
| 350 | 14 | 299.4 |
| 400 | 16 | 367.8 |
| 450 | 18 | 420.8 |
| 500 | 20 | 500.1 |
| 600 | 24 | 721.1 |

Measuring tube specification

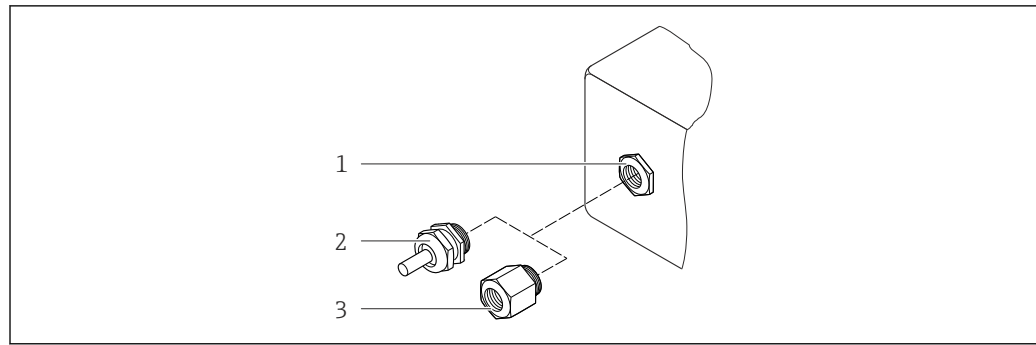
| Nominal diameter | | Pressure rating | | | Process connection internal diameter | |
|------------------|------|-------------------|---------------|--------------|--------------------------------------|------|
| [mm] | [in] | EN (DIN) [bar] | ASME [psi] | JIS [bar] | PTFE | |
| | | | | | [mm] | [in] |
| 15 | ½ | PN 40 | Class 150 | 20K | 14 | 0.55 |
| 25 | 1 | PN 40 | Class 150 | 20K | 26 | 1.02 |
| 32 | – | PN 40 | – | 20K | 34 | 1.34 |
| 40 | 1 ½ | PN 40 | Class 150 | 20K | 40 | 1.57 |
| 50 | 2 | PN 40 | Class 150 | 10K | 51 | 2.01 |
| 65 | – | PN 16 | – | 10K | 67 | 2.64 |
| 80 | 3 | PN 16 | Class 150 | 10K | 79 | 3.11 |
| 100 | 4 | PN 16 | Class 150 | 10K | 103 | 4.06 |
| 125 | – | PN 16 | – | 10K | 128 | 5.04 |
| 150 | 6 | PN 16 | Class 150 | 10K | 155 | 6.10 |
| 200 | 8 | PN 10/16 | Class 150 | 10K | 203 | 7.99 |
| 250 | 10 | PN 10 | – | 10K | 257 | 10.1 |
| 250 | 10 | PN 16 | Class 150 | 10K | 255 | 10.0 |
| 300 | 12 | PN 16 | Class 150 | 10K | 302 | 11.9 |
| 350 | 14 | PN 6/10 | – | 10K | 338 | 13.3 |
| 350 | 14 | PN 16 | Class 150 | 10K | 334 | 13.1 |
| 400 | 16 | PN 6/10 | – | 10K | 388 | 15.3 |
| 400 | 16 | PN 16 | – | 10K | 386 | 15.2 |
| 400 | 16 | – | Class 150 | 10K | 384 | 15.1 |
| 450 | 18 | PN 6/10 | – | 10K | 440 | 17.3 |
| 450 | 18 | PN 16 | – | 10K | 438 | 17.2 |
| 450 | 18 | – | Class 150 | 10K | 434 | 17.1 |
| 500 | 20 | PN 6/10 | – | 10K | 491 | 19.3 |
| 500 | 20 | PN 16 | – | 10K | 487 | 19.2 |
| 500 | 20 | – | Class 150 | 10K | 485 | 19.1 |
| 600 | 24 | PN 6 | – | 10K | 592 | 23.3 |
| 600 | 24 | PN 10 | – | 10K | 590 | 23.2 |
| 600 | 24 | PN 16 | – | 10K | 588 | 23.2 |
| 600 | 24 | – | Class 150 | 10K | 582 | 22.9 |

Materials

Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated":
Aluminum, AlSi10Mg, coated
- Window material for optional local display (→ 54):
For order code for "Housing", option **A**: glass

Cable entries/cable glands



A0020640

▣ 27 Possible cable entries/cable glands

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

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

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

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

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

- DN 15 to 300 (½ to 12"): coated aluminum AlSi10Mg
- DN 350 to 600 (14 to 24"): carbon steel with protective varnish

Measuring tubes

Stainless steel, 1.4301/304/1.4306/304L; for flanges made of carbon with Al/Zn protective coating (DN 15 to 300 (½ to 12")) or protective varnish (DN 350 to 600 (14 to 24"))

Liner

PTFE

Process connections

EN 1092-1 (DIN 2501)

Carbon steel, E250C¹⁾/S235JRG2/P245GH

ASME B16.5

Carbon steel, A105

JIS B2220

Carbon steel, A105/A350 LF2

1) DN 15 to 300 (½ to 12") with Al/Zn-protective coating; DN 350 to 600 (14 to 24") with protective coating

Electrodes

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum

Seals

As per DIN EN 1514-1, form IBC

Accessories

Ground disks

Stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum; titanium

Fitted electrodes

Measuring electrodes, reference electrodes and electrodes for empty pipe detection:
Standard: stainless steel, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum

Process connections

- EN 1092-1 (DIN 2501): DN ≤ 300 (12") Form A, DN ≥ 350 (14") Form B; dimensions DN 65 PN 16 and only as per EN 1092-1
- ASME B16.5
- JIS B2220
- AS 2129 Table E
- AS 4087 PN 16



Surface roughness

Stainless steel electrodes, 1.4435 (F316L); Alloy C22, 2.4602 (UNS N06022); tantalum:
≤ 0.3 to 0.5 μm (11.8 to 19.7 μin)
(All data relate to parts in contact with fluid)

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning

- Individual menus for applications
- Menu guidance with brief explanations of the individual parameter functions

Reliable operation

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

Efficient diagnostics increase measurement availability

- Troubleshooting measures can be called up via the operating tools and web browser
- Diverse simulation options
- Status indicated by several light emitting diodes (LEDs) on the electronic module in the housing compartment

Local display

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

The local display is only available with the following device order code:

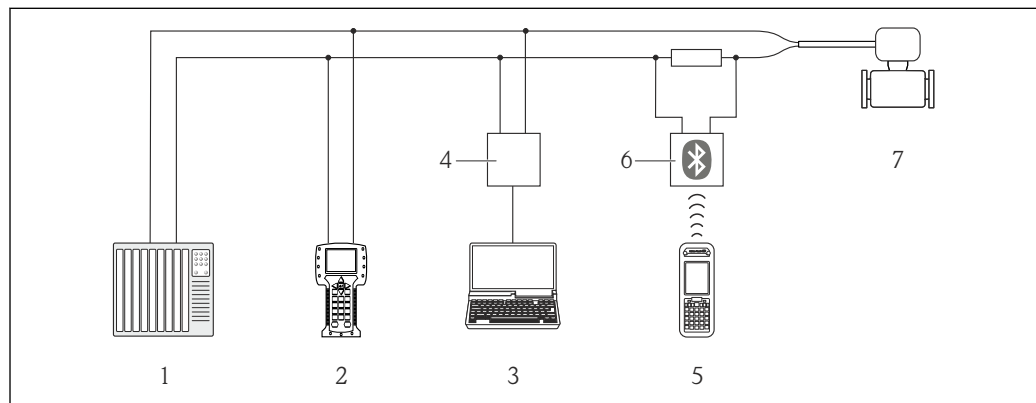
Order code for "Display; operation", option **B**: 4-line; illuminated, via communication

Display element


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

Remote operation**Via HART protocol**

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



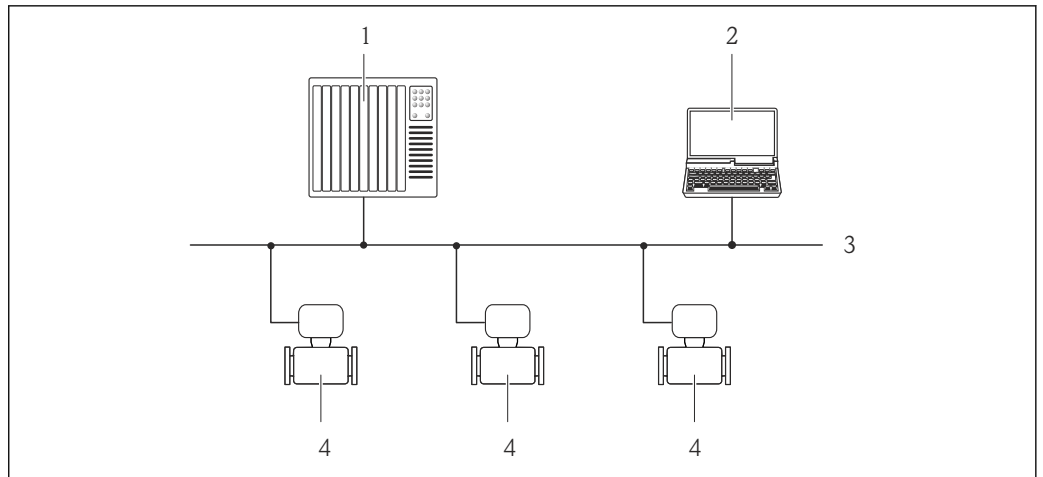
A0016948

 28 Options for remote operation via HART protocol

- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 4 Commubox FXA 195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 VIATOR Bluetooth modem with connecting cable
- 7 Transmitter

Via PROFIBUS DP network

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



A0020903

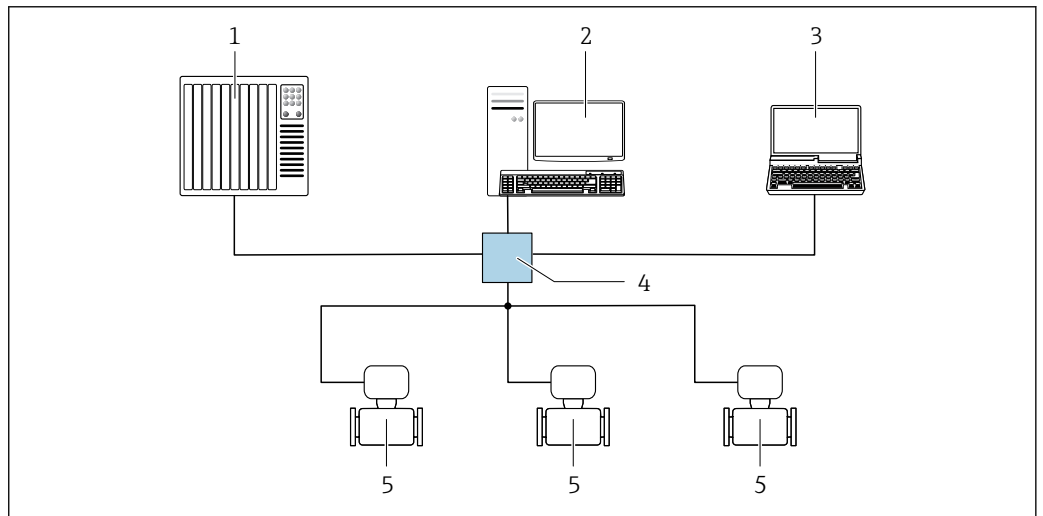
29 Options for remote operation via PROFIBUS DP network

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

Via EtherNet/IP network

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

Star topology



A0032078

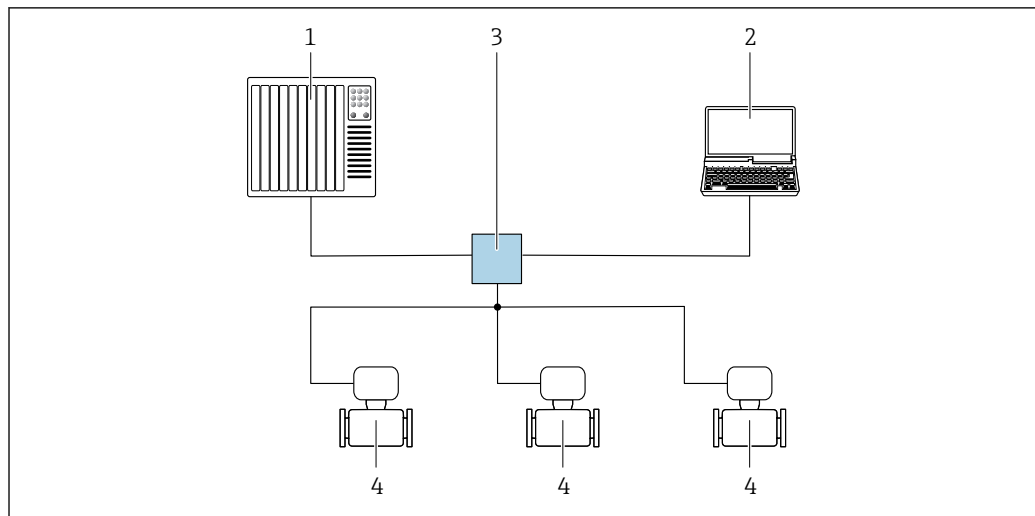
30 Options for remote operation via EtherNet/IP network: star topology

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

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



A0026545

31 Options for remote operation via PROFINET network: star topology

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

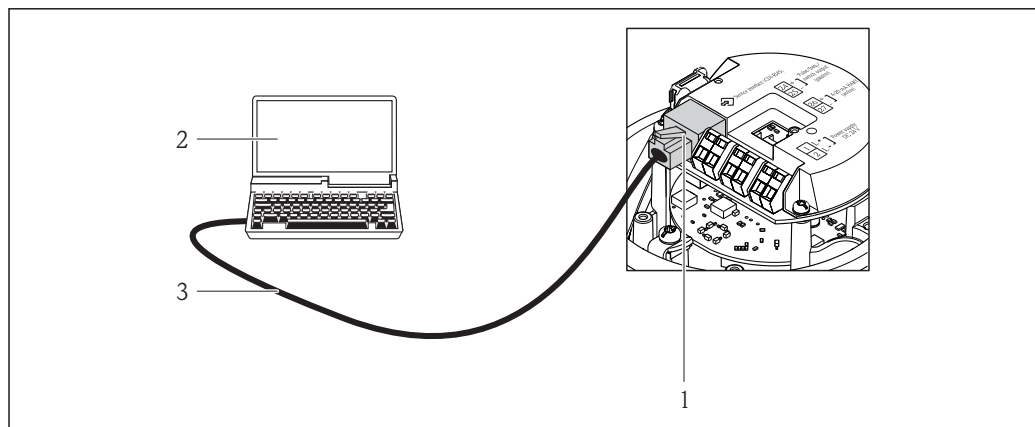
Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:

- Order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
- Order code for "Output", option **L**: PROFIBUS DP
- Order code for "Output", option **N**: EtherNet/IP
- Order code for "Output", option **R**: PROFINET

HART

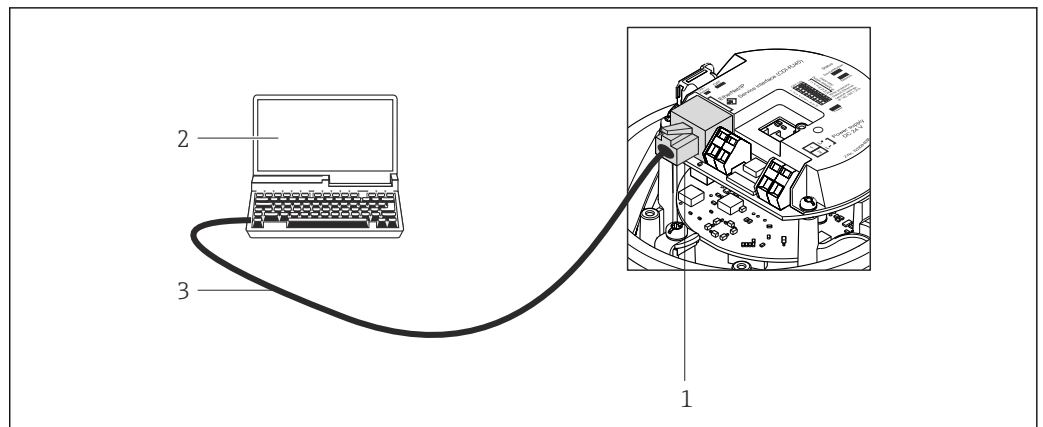


A0016926

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

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

PROFIBUS DP

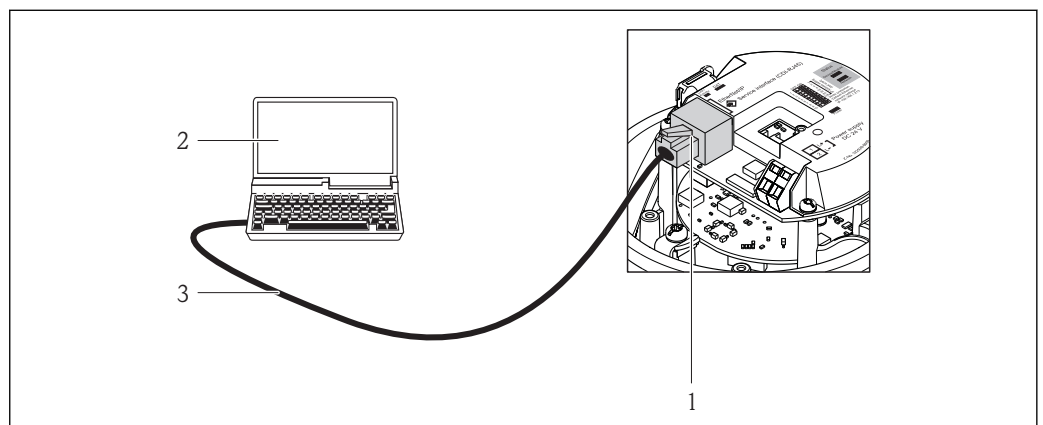


A0021270

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

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

EtherNet/IP

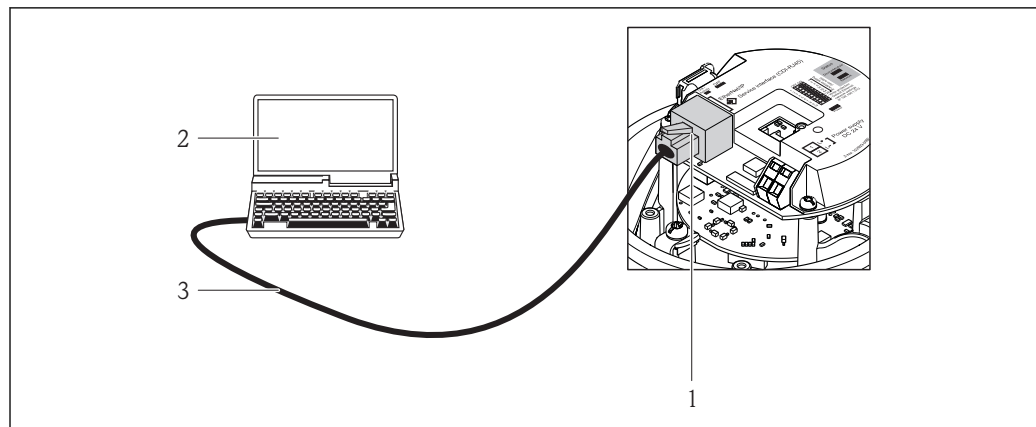


A0016940

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

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

PROFINET



A0016940

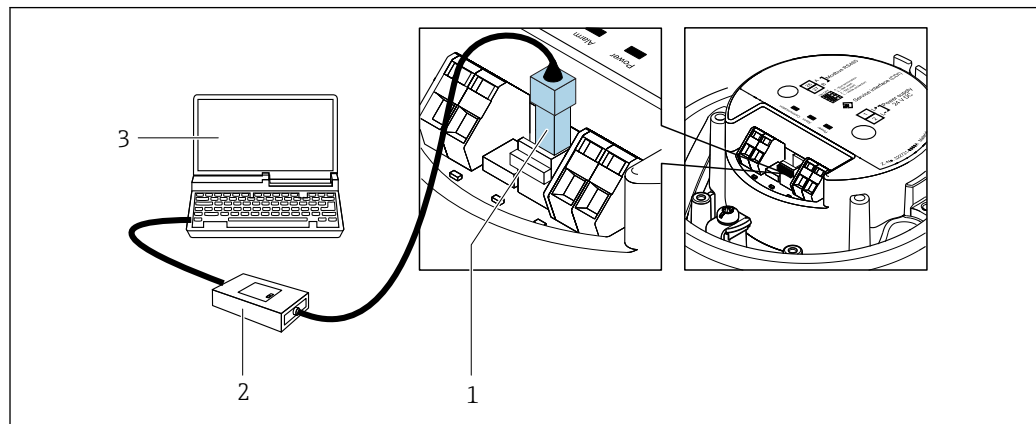
35 Connection for order code for "Output", option R: PROFINET

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

Via service interface (CDI)

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

Modbus RS485



A0030216

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

Certificates and approvals

CE mark

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

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

C-Tick symbol

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

Ex approval

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



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

ATEX, IECEX

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

Ex nA

| Category | Type of protection |
|----------|--------------------|
| IIBG | Ex nA IIC T6-T1 Gc |

HART certification

HART interface

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

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

Certification PROFIBUS

PROFIBUS interface

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

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

Modbus RS485 certification

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

EtherNet/IP certification

The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:

- Certified in accordance with the ODVA Conformance Test
- EtherNet/IP Performance Test
- EtherNet/IP PlugFest compliance
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFINET

PROFINET interface

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

- Certified according to:
 - Test specification for PROFINET devices
 - PROFINET Security Level 1 – Netload Class
- The device can also be operated with certified devices of other manufacturers (interoperability)

Pressure Equipment Directive

The devices can be ordered with or without a PED approval. If a device with a PED approval is required, this must be explicitly stated in the order. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary.

- With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EC.
- Devices bearing this marking (PED) are suitable for the following types of medium: Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
- Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art. 4, Par. 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EC.

Other standards and guidelines

- EN 60529
Degrees of protection provided by enclosures (IP code)
- EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- IEC/EN 61326
Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 105
Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
Self-monitoring and diagnosis of field devices
- NAMUR NE 131
Requirements for field devices for standard applications

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com



Product Configurator - the tool for individual product configuration

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

Application packages

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

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

Cleaning

| Package | Description |
|----------------------------------|---|
| Electrode cleaning circuit (ECC) | The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe ₃ O ₄) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to AVOID build up of highly conductive matter and thin layers (typical of magnetite). |

Heartbeat Technology

| Package | Description |
|------------------------------------|---|
| Heartbeat Verification +Monitoring | <p>Heartbeat Verification Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> ▪ 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. <p>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:</p> <ul style="list-style-type: none"> ▪ Draw conclusions - using these data and other information - about the impact process influences (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time. ▪ Schedule servicing in time. ▪ Monitor the process or product quality, e.g. gas pockets. |

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 |
|--------------|--|
| Ground cable | Set, consisting of two ground cables for potential equalization. |

For the sensor




| Accessories | Description |
|--------------|--|
| Ground disks | <p>Are used to ground the medium in lined measuring tubes to ensure proper measurement.</p> <p> For details, see Installation Instructions EA00070D</p> |

Communication-specific accessories


| Accessories | Description |
|-----------------------------|---|
| Commubox FXA195 HART | <p>For intrinsically safe HART communication with FieldCare via the USB interface.</p> <p> For details, see "Technical Information" TI00404F</p> |
| Commubox FXA291 | <p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> For details, see the "Technical Information" document TI405C/07</p> |
| HART Loop Converter HMX50 | <p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.</p> <p> For details, see "Technical Information" TI00429F and Operating Instructions BA00371F</p> |
| Wireless HART adapter SWA70 | <p>Is used for the wireless connection of field devices.</p> <p>The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity.</p> <p> For details, see Operating Instructions BA00061S</p> |

| | |
|--------------------|--|
| Fieldgate FXA320 | Gateway for the remote monitoring of connected 4 to 20 mA measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00053S |
| Fieldgate FXA520 | Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00051S |
| Field Xpert SFX350 | Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices and can be used in non-hazardous areas.  For details, see Operating Instructions BA01202S |
| Field Xpert SFX370 | Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices and can be used in the non-hazardous area and in the hazardous area.  For details, see Operating Instructions BA01202S |


Service-specific accessories

| Accessories | Description |
|-----------------|--|
| Applicator | Software for selecting and sizing Endress+Hauser measuring devices: <ul style="list-style-type: none"> Choice of measuring devices for 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. Applicator is available: <ul style="list-style-type: none"> Via the Internet: https://wapps.endress.com/applicator As a downloadable DVD for local PC installation. |
| W@M | W@M Life Cycle Management 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. 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. Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit www.endress.com/lifecyclemanagement |
| FieldCare | FDT-based plant asset management tool from Endress+Hauser. 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.  For details, see Operating Instructions BA00027S and BA00059S |
| DeviceCare | Tool for connecting and configuring Endress+Hauser field devices.  For details, see Innovation brochure IN01047S |
| Commubox FXA291 | Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.  For details, see "Technical Information" TI00405C |

System components

| Accessories | Description |
|----------------------------------|---|
| Memograph M graphic data manager | <p>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.</p> <p> For details, see "Technical Information" TI00133R and Operating Instructions BA00247R</p> |

Supplementary documentation

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

Standard documentation

Brief Operating Instructions

 Brief Operating Instructions containing all the important information for standard commissioning is enclosed with the device.

Operating Instructions

| Measuring device | Documentation code | | | | |
|------------------|--------------------|-------------|--------------|-------------|----------|
| | HART | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Promag E 100 | BA01305D | BA01307D | BA01306D | BA01308D | BA01423D |

Description of device parameters

| Measuring device | Documentation code | | | | |
|------------------|--------------------|-------------|--------------|-------------|----------|
| | HART | PROFIBUS DP | Modbus RS485 | EtherNet/IP | PROFINET |
| Promag 100 | GP01038D | GP01039D | GP01040D | GP01041D | GP01042D |

Supplementary device-dependent documentation

Safety Instructions

| Contents | Documentation code |
|------------------|--------------------|
| ATEX/IECEX Ex nA | XA01090D |

Special Documentation

| Contents | Documentation code |
|---|--------------------|
| Information on the Pressure Equipment Directive | SD01056D |
| Modbus RS485 Register Information | SD01148D |
| Heartbeat Technology | SD01149D |

Installation Instructions

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

Registered trademarks

HART®

Registered trademark of the FieldComm Group, Austin, Texas, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Modbus®

Registered trademark of SCHNEIDER AUTOMATION, INC.

EtherNet/IP™

Trademark of ODVA, Inc.

PROFINET®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Microsoft®

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