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# Technical Information
# **Proline Promag W 10**

Electromagnetic flowmeter



## Flowmeter for basic water and wastewater applications with easy-to-use operation concept

### Application

- The bidirectional measuring principle is virtually independent of pressure, density, temperature and viscosity
- Suitable for basic measuring tasks such as raw water infeed

*Device properties*
- International drinking water approvals
- Degree of protection IP68 (Type 6P enclosure)
- System integration with HART, Modbus RS485
- Flexible operation with app and optional display

### Your benefits

- Reliable measurement at constant accuracy with 0 x DN run without pressure loss
- Flexible engineering – sensor with fixed or lap-joint process connections
- Application fitness – EN ISO 12944 corrosion protection for underground or underwater installation
- Improved plant availability – sensor compliant with industry-specific requirements
- Optimum usability – operation with mobile devices and SmartBlue app or display with touch screen
- Simple, time-saving commissioning – guided parameterization in advance and in the field
- Integrated verification – Heartbeat Technology

Endress+Hauser
People for Process Automation

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# About this document

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## Symbols

### Electronics

⎓ Direct current

~ Alternating current

⎓~ Direct current and alternating current

⏚ Terminal connection for potential equalization

### Types of information

✓✓ Preferred procedures, processes or actions

✓ Permitted procedures, processes or actions

✗ Forbidden procedures, processes or actions

ℹ Additional information

Reference to documentation

Reference to page

Reference to graphic

### Explosion protection

Hazardous area

Non-hazardous area

## Associated documentation

| | |
|---|---|
| Technical Information | Overview of the device with the most important technical data. |
| Operating Instructions | All the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal as well as the technical data and dimensions. |
| Sensor Brief Operating Instructions | Incoming acceptance, transport, storage and mounting of the device. |
| Transmitter Brief Operating Instructions | Electrical connection and commissioning of the device. |
| Description of Parameters | Detailed explanation of the menus and parameters. |
| Safety Instructions | Documents for the use of the device in hazardous areas. |
| Special Documentation | Documents with more detailed information on specific topics. |
| Installation Instructions | Installation of spare parts and accessories. |

ℹ The device documentation is available online on the device product page and in the Downloads area: www.endress.com

## Ordering information

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

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

3. Select **Configuration**.

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

## Registered trademarks

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

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

**Bluetooth®**
The Bluetooth word mark and Bluetooth logos are registered trademarks of Bluetooth SIG. Inc. and any use of such marks by Endress+Hauser is under license. Other trademarks and trade names are those of their respective owners.

**Apple®**
Apple, the Apple logo, iPhone, and iPod touch are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

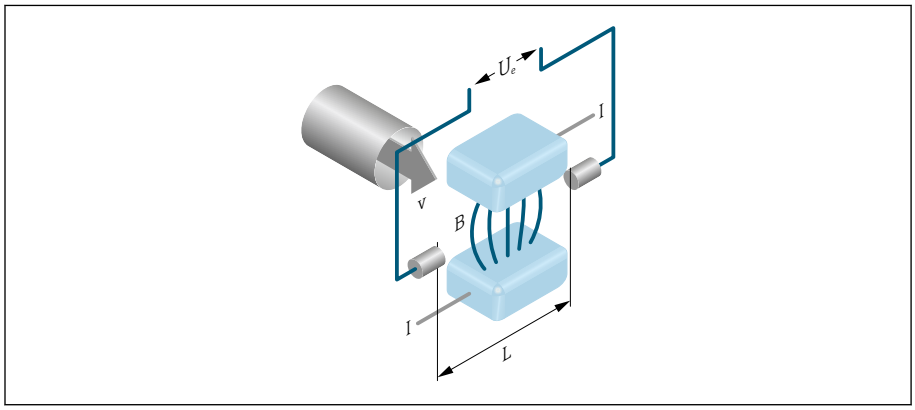
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# Function and system design

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## Measuring principle

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




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*Ue 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 generated by a switched direct current of alternating polarity.

**Formulae for calculation**

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

## Product design

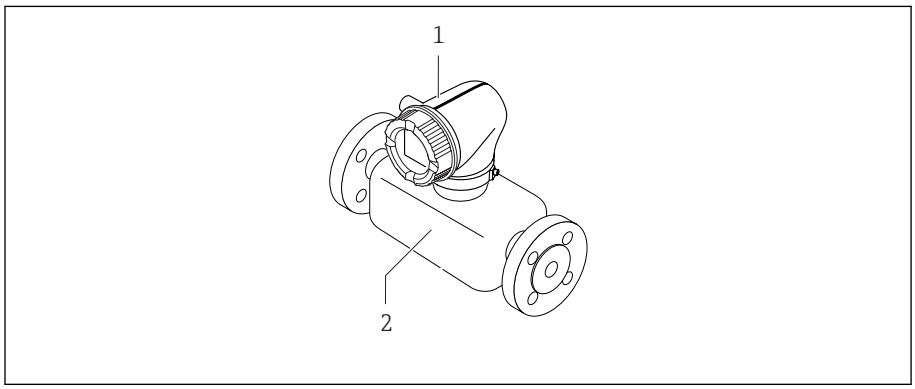
The device consists of a transmitter and a sensor.

Two device versions are available:

- Compact version – transmitter and sensor form a mechanical unit.
- Remote version - transmitter and sensor are mounted in separate locations.

### Compact version

The transmitter and sensor form a mechanical unit.

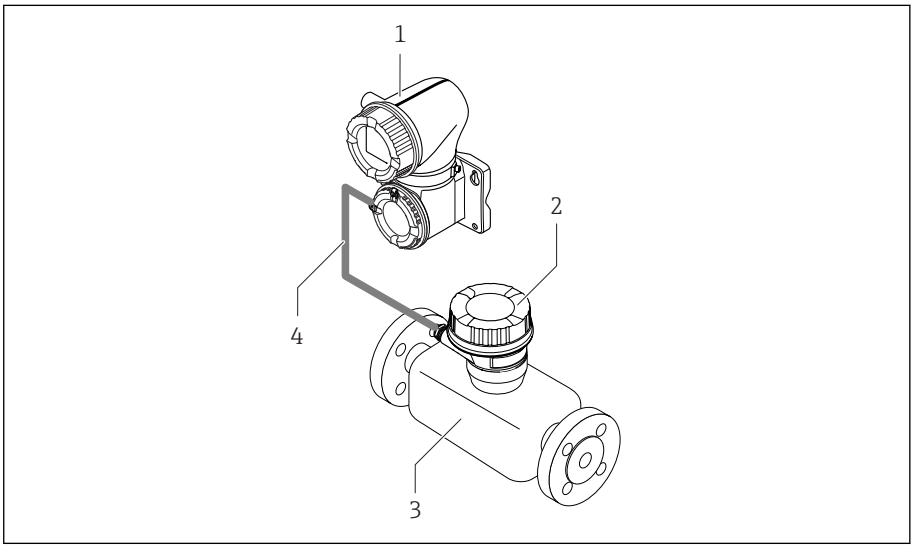



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*1 Transmitter*
*2 Sensor*

### Remote version

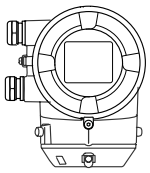
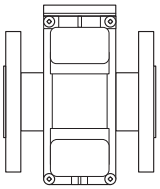
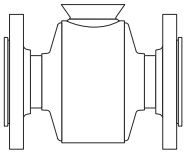
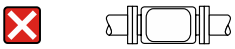
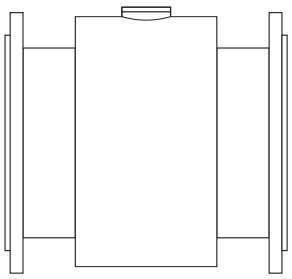
The transmitter and sensor are mounted in physically separate locations.




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1 *Transmitter*
2 *Sensor connection housing*
3 *Sensor*
4 *Connecting cable*

### Measuring system

| Proline 10 transmitter | Promag W sensor |
|---|---|
|  Compact version |  DN 25 to 300 mm (1 to 12 in)  DN 25 to 300 mm (1 to 12 in) |
|  Remote version |  DN 350 to 3 000 mm (14 to 120 in) |

## 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.

## Device-specific IT security

### Access via Bluetooth

Secure signal transmission via Bluetooth uses an encryption method tested by the Fraunhofer Institute.

- Without the SmartBlue App, the device is not visible via Bluetooth.
- Only one point-to-point connection is established between the device and a smartphone or tablet.

### Access via the SmartBlue app

Two access levels (user roles) are defined for the device: the **Operator** user role and the **Maintenance** user role. The **Maintenance** user role is configured when the device leaves the factory.

If a user-specific access code is not defined (in the Enter access code parameter), the default setting **0000** continues to apply and the **Maintenance** user role is automatically enabled. The device's configuration data are not write-protected and can be edited at all times.

If a user-specific access code has been defined (in the Enter access code parameter), all the parameters are write-protected. The device is accessed with the **Operator** user role. When the user-specific access code is entered a second time, the **Maintenance** user role is enabled. All parameters can be written to.

For detailed information, see the "Description of Device Parameters" document pertaining to the device.

### Protecting access via a password

There are a variety of ways to protect against write access to the device parameters:

- User-specific access code:
  Protect write access to the device parameters via all the interfaces.
- Bluetooth key:
  The password protects access and the connection between an operating unit, e.g. a smartphone or tablet, and the device via the Bluetooth interface.

**General notes on the use of passwords**

- The access code and Bluetooth key that are valid when the device is delivered must be redefined during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code and Bluetooth key.
- The user is responsible for the management and careful handling of the access code and Bluetooth key.

### Write protection switch

The entire operating menu can be locked via the write protection switch. The values of the parameters cannot be changed. Write protection is disabled when the device leaves the factory.

Write protection is enabled with the write protection switch on the back of the display module.

# Input

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## Measured variable

| | |
|---|---|
| Direct measured variables | ▪ Volume flow (proportional to induced voltage)<br>▪ Conductivity (order code for "Sensor Option", option CX) |
| Calculated measured variables | Mass flow |

## Operable flow range

Over 1000 : 1

## Measuring range

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

Electrical conductivity:
- ≥ 5 µS/cm for liquids in general
- ≥ 20 µS/cm for demineralized water

*Flow characteristic values in SI units: DN 25 to 125 (1 to 4")*

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [mm] | [in] | [dm³/min] | [dm³/min] | [dm³] | [dm³/min] |
| 25 | 1 | 9 to 300 | 75 | 0.5 | 1 |
| 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 | 1200 | 10 | 20 |
| 125 | – | 220 to 7 500 | 1850 | 15 | 30 |

*Flow characteristic values in SI units: DN 150 to 3000 (6 to 120")*

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [mm] | [in] | [m³/h] | [m³/h] | [m³] | [m³/h] |
| 150 | 6 | 20 to 600 | 150 | 0.025 | 2.5 |
| 200 | 8 | 35 to 1 100 | 300 | 0.05 | 5 |
| 250 | 10 | 55 to 1 700 | 500 | 0.05 | 7.5 |
| 300 | 12 | 80 to 2 400 | 750 | 0.1 | 10 |
| 350 | 14 | 110 to 3 300 | 1000 | 0.1 | 15 |
| 375 | 15 | 140 to 4 200 | 1200 | 0.15 | 20 |
| 400 | 16 | 140 to 4 200 | 1200 | 0.15 | 20 |
| 450 | 18 | 180 to 5 400 | 1500 | 0.25 | 25 |
| 500 | 20 | 220 to 6 600 | 2000 | 0.25 | 30 |
| 600 | 24 | 310 to 9 600 | 2500 | 0.3 | 40 |

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [mm] | [in] | [m³/h] | [m³/h] | [m³] | [m³/h] |
| 700 | 28 | 420 to 13 500 | 3500 | 0.5 | 50 |
| 750 | 30 | 480 to 15 000 | 4000 | 0.5 | 60 |
| 800 | 32 | 550 to 18 000 | 4500 | 0.75 | 75 |
| 900 | 36 | 690 to 22 500 | 6000 | 0.75 | 100 |
| 1000 | 40 | 850 to 28 000 | 7000 | 1 | 125 |
| – | 42 | 950 to 30 000 | 8000 | 1 | 125 |
| 1200 | 48 | 1 250 to 40 000 | 10000 | 1.5 | 150 |
| – | 54 | 1 550 to 50 000 | 13000 | 1.5 | 200 |
| 1400 | – | 1 700 to 55 000 | 14000 | 2 | 225 |
| – | 60 | 1 950 to 60 000 | 16000 | 2 | 250 |
| 1600 | – | 2 200 to 70 000 | 18000 | 2.5 | 300 |
| – | 66 | 2 500 to 80 000 | 20500 | 2.5 | 325 |
| 1800 | 72 | 2 800 to 90 000 | 23000 | 3 | 350 |
| – | 78 | 3 300 to 100 000 | 28500 | 3.5 | 450 |
| 2000 | – | 3 400 to 110 000 | 28500 | 3.5 | 450 |
| – | 84 | 3 700 to 125 000 | 31000 | 4.5 | 500 |
| 2200 | – | 4 100 to 136 000 | 34000 | 4.5 | 540 |
| – | 90 | 4 300 to 143 000 | 36000 | 5 | 570 |
| 2400 | – | 4 800 to 162 000 | 40000 | 5.5 | 650 |
| – | 96 | 5 000 to 168 000 | 42 000 | 6 | 675 |
| – | 102 | 5 700 to 190 000 | 47 500 | 7 | 750 |
| 2600 | – | 5 700 to 191 000 | 48 000 | 7 | 775 |
| – | 108 | 6 500 to 210 000 | 55 000 | 7 | 850 |
| 2800 | – | 6 700 to 222 000 | 55 500 | 8 | 875 |
| – | 114 | 7 100 to 237 000 | 59 500 | 8 | 950 |
| 3000 | – | 7 600 to 254 000 | 63 500 | 9 | 1025 |
| – | 120 | 7 900 to 263 000 | 65 500 | 9 | 1050 |

*Flow characteristic values in US units: 1 to 48" (DN 25 to 1200)*

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [in] | [mm] | [gal/min] | [gal/min] | [gal] | [gal/min] |
| 1 | 25 | 2.5 to 80 | 18 | 0.2 | 0.25 |
| – | 32 | 4 to 130 | 30 | 0.2 | 0.5 |
| 1 ½ | 40 | 7 to 185 | 50 | 0.5 | 0.75 |
| 2 | 50 | 10 to 300 | 75 | 0.5 | 1.25 |
| – | 65 | 16 to 500 | 130 | 1 | 2 |

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [in] | [mm] | [gal/min] | [gal/min] | [gal] | [gal/min] |
| 3 | 80 | 24 to 800 | 200 | 2 | 2.5 |
| 4 | 100 | 40 to 1250 | 300 | 2 | 4 |
| – | 125 | 60 to 1950 | 450 | 5 | 7 |
| 6 | 150 | 90 to 2650 | 600 | 5 | 12 |
| 8 | 200 | 155 to 4850 | 1200 | 10 | 15 |
| 10 | 250 | 250 to 7500 | 1500 | 15 | 30 |
| 12 | 300 | 350 to 10600 | 2400 | 25 | 45 |
| 14 | 350 | 500 to 15000 | 3600 | 30 | 60 |
| 15 | 375 | 600 to 19000 | 4800 | 50 | 60 |
| 16 | 400 | 600 to 19000 | 4800 | 50 | 60 |
| 18 | 450 | 800 to 24000 | 6000 | 50 | 90 |
| 20 | 500 | 1000 to 30000 | 7500 | 75 | 120 |
| 24 | 600 | 1400 to 44000 | 10500 | 100 | 180 |
| 28 | 700 | 1900 to 60000 | 13500 | 125 | 210 |
| 30 | 750 | 2150 to 67000 | 16500 | 150 | 270 |
| 32 | 800 | 2450 to 80000 | 19500 | 200 | 300 |
| 36 | 900 | 3100 to 100000 | 24000 | 225 | 360 |
| 40 | 1000 | 3800 to 125000 | 30000 | 250 | 480 |
| 42 | – | 4200 to 135000 | 33000 | 250 | 600 |
| 48 | 1200 | 5500 to 175000 | 42000 | 400 | 600 |

*Flow characteristic values in US units: 54 to 120" (DN 1400 to 3000)*

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [in] | [mm] | [Mgal/d] | [Mgal/d] | [Mgal] | [Mgal/d] |
| 54 | – | 9 to 300 | 75 | 0.0005 | 1.3 |
| – | 1400 | 10 to 340 | 85 | 0.0005 | 1.3 |
| 60 | – | 12 to 380 | 95 | 0.0005 | 1.3 |
| – | 1600 | 13 to 450 | 110 | 0.0008 | 1.7 |
| 66 | – | 14 to 500 | 120 | 0.0008 | 2.2 |
| 72 | 1800 | 16 to 570 | 140 | 0.0008 | 2.6 |
| 78 | – | 18 to 650 | 175 | 0.0010 | 3.0 |
| – | 2000 | 20 to 700 | 175 | 0.0010 | 2.9 |
| 84 | – | 24 to 800 | 190 | 0.0011 | 3.2 |
| – | 2200 | 26 to 870 | 210 | 0.0012 | 3.4 |
| 90 | – | 27 to 910 | 220 | 0.0013 | 3.6 |
| – | 2400 | 31 to 1030 | 245 | 0.0014 | 4.1 |

| Nominal diameter | | Recommended flow | Factory settings | | |
|---|---|---|---|---|---|
| | | min./max. full scale value (v ~ 0.3/10 m/s) | Full scale value current output (v ~ 2.5 m/s) | Pulse value (~ 2 pulse/s) | Low flow cut off (v ~ 0.04 m/s) |
| [in] | [mm] | [Mgal/d] | [Mgal/d] | [Mgal] | [Mgal/d] |
| 96 | – | 32 to 1066 | 265 | 0.0015 | 4.0 |
| 102 | – | 34 to 1203 | 300 | 0.0017 | 5.0 |
| – | 2600 | 34 to 1212 | 305 | 0.0018 | 5.0 |
| 108 | – | 35 to 1300 | 340 | 0.0020 | 5.0 |
| – | 2800 | 42 to 1405 | 350 | 0.0020 | 6.0 |
| 114 | – | 45 to 1503 | 375 | 0.0022 | 6.0 |
| – | 3000 | 48 to 1613 | 405 | 0.0023 | 6.0 |
| 120 | – | 50 to 1665 | 415 | 0.0024 | 7.0 |

# Output

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Protocol-specific data 21

## Output versions

| Order code for 020: output; input | Output version |
|---|---|
| Option B | ▪ Current output 4 to 20 mA HART<br>▪ Pulse/frequency/switch output |
| Option M | ▪ Modbus RS485<br>▪ Current output 4 to 20 mA |

## Output signal

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

| | |
|---|---|
| **Signal mode** | Choose via terminal assignment:<br>▪ Active<br>▪ Passive |
| **Current range** | Can be set to:<br>▪ 4 to 20 mA NAMUR<br>▪ 4 to 20 mA US<br>▪ 4 to 20 mA<br>▪ Fixed current |
| **Max. output current** | 21.5 mA |
| **Open-circuit voltage** | DC < 28.8 V (active) |
| **Max. input voltage** | DC 30 V (passive) |
| **Max. load** | 400 Ω |
| **Resolution** | 1 µA |
| **Damping** | Configurable: 0 to 999.9 s |
| **Assignable measured variables** | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Conductivity*<br>▪ Noise*<br>▪ Coil current shot time*<br>* Visibility depends on order options or device settings |

### Modbus RS485

| | |
|---|---|
| **Physical interface** | RS485 in accordance with EIA/TIA-485 standard |

### Current output 4 to 20 mA

| | |
|---|---|
| **Signal mode** | Choose via terminal assignment:<br>▪ Active<br>▪ Passive |
| **Current range** | Can be set to:<br>▪ 4 to 20 mA NAMUR<br>▪ 4 to 20 mA US<br>▪ 4 to 20 mA<br>▪ Fixed current |
| **Max. output current** | 21.5 mA |
| **Open-circuit voltage** | DC < 28.8 V (active) |
| **Max. input voltage** | DC 30 V (passive) |

| | |
|---|---|
| **Max. load** | 400 Ω |
| **Resolution** | 1 µA |
| **Damping** | Configurable: 0 to 999.9 s |
| **Assignable measured variables** | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Conductivity*<br>▪ Noise*<br>▪ Coil current shot time*<br>* Visibility depends on order options or device settings |

### Pulse/frequency/switch output

| | |
|---|---|
| **Function** | Can be set to:<br>▪ Pulse output<br>▪ Frequency output<br>▪ Switch output |
| **Version** | Open collector:<br>Passive |
| **Input values** | ▪ DC 10.4 to 30 V<br>▪ Max. 140 mA |
| **Voltage drop** | ▪ ≤ DC 2 V @ 100 mA<br>▪ ≤ DC 2.5 V @ max. input current |

| **Pulse output** | |
|---|---|
| **Pulse width** | Configurable: 0.05 to 2 000 ms |
| **Max. pulse rate** | 10 000 Impulse/s |
| **Pulse value** | Configurable |
| **Assignable measured variables** | ▪ Volume flow<br>▪ Mass flow |

| **Frequency output** | |
|---|---|
| **Output frequency** | Configurable: end value frequency 2 to 10 000 Hz ($f_{max}$ = 12 500 Hz) |
| **Damping** | Configurable: 0 to 999.9 s |
| **Pulse/pause ratio** | 1:1 |
| **Assignable measured variables** | ▪ Off<br>▪ Volume flow<br>▪ Mass flow<br>▪ Conductivity*<br>▪ Noise*<br>▪ Coil current shot time*<br>▪ Reference electrode potential against PE*<br>* Visibility depends on order options or device settings |

| **Switch output** | |
|---|---|
| **Switching behavior** | Binary, conductive or non-conductive |
| **Switching delay** | Configurable: 0 to 100 s |

| | |
|---|---|
| **Number of switching cycles** | Unlimited |
| **Assignable functions** | ▪ Off<br>▪ On<br>▪ Diagnostic behavior:<br>  ▪ Alarm<br>  ▪ Warning<br>  ▪ Warning and alarm<br>▪ Limit value:<br>  ▪ Off<br>  ▪ Volume flow<br>  ▪ Mass flow<br>  ▪ Flow velocity<br>  ▪ Conductivity*<br>  ▪ Corrected conductivity*<br>  ▪ Totalizer 1…3<br>▪ Flow direction monitoring<br>▪ Status<br>  ▪ Empty pipe detection<br>  ▪ Low flow cut off<br>* Visibility depends on order options or device settings |

## Signal on alarm

Output behavior in the event of a device alarm (failure mode)

### HART

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

### Modbus RS485

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

### Current output 4 to 20 mA

| | |
|---|---|
| **4 to 20 mA** | Selectable:<br>▪ Min. value: 3.59 mA<br>▪ Max. value: 21.5 mA<br>▪ Freely definable value between: 3.59 to 21.5 mA<br>▪ Actual value<br>▪ Last valid value |

### Pulse/frequency/switch output

| | |
|---|---|
| **Pulse output** | Selectable:<br>▪ Actual value<br>▪ No pulses |
| **Frequency output** | Selectable:<br>▪ Actual value<br>▪ 0 Hz<br>▪ Defined value: 0 to 12 500 Hz |
| **Switch output** | Selectable:<br>▪ Current status<br>▪ Open<br>▪ Closed |

## Low flow cut off

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

## Galvanic isolation

The outputs are galvanically isolated from one another and from earth.

## Protocol-specific data

### HART

| | |
|---|---|
| **Bus structure** | The HART signal overlays the 4 to 20 mA current output. |
| **Manufacturer ID** | 0x11 |
| **Device type ID** | 0x71 |
| **HART protocol revision** | 7 |
| **Device description files (DTM, DD)** | Information and files under: www.endress.com |

| | |
|---|---|
| **HART load** | At least 250 Ω |
| **System integration** | Measured variables via HART protocol |

### Modbus RS485

| | |
|---|---|
| **Physical interface** | RS485 in accordance with EIA/TIA-485 standard |
| **Terminating resistor** | Not integrated |
| **Protocol** | Modbus Applications Protocol Specification V1.1 |
| **Response times** | ▪ Direct data access: typically 25 to 50 ms<br>▪ Auto-scan buffer (data range): typically 3 to 5 ms |
| **Device type** | Slave |
| **Slave address range** | 1 to 247 |
| **Broadcast address range** | 0 |
| **Function codes** | ▪ 03: Read holding register<br>▪ 04: Read input register<br>▪ 06: Write single registers<br>▪ 08: Diagnostics<br>▪ 16: Write multiple registers<br>▪ 23: Read/write multiple registers |
| **Broadcast messages** | Supported by the following function codes:<br>▪ 06: Write single registers<br>▪ 16: Write multiple registers<br>▪ 23: Read/write multiple registers |
| **Supported baud rate** | ▪ 1 200 BAUD<br>▪ 2 400 BAUD<br>▪ 4 800 BAUD<br>▪ 9 600 BAUD<br>▪ 19 200 BAUD<br>▪ 38 400 BAUD<br>▪ 57 600 BAUD<br>▪ 115 200 BAUD |
| **Data transfer mode** | RTU |
| **Data access** | Each parameter can be accessed via Modbus RS485.<br>For Modbus register information |
| **System integration** | Information on system integration .<br>▪ Modbus RS485 information<br>▪ Function codes<br>▪ Register information<br>▪ Response time<br>▪ Modbus data map |

# Power supply


Terminal assignment 24
Supply voltage 24
Power consumption 24
Current consumption 24
Power supply failure 25
Electrical connection 25
Potential equalization 30
Terminals 32
Cable entries 32
Overvoltage protection 33

## Terminal assignment

The terminal assignment is documented on an adhesive label.

The following terminal assignment is available:

*Current output 4 to 20 mA HART (active) and pulse/frequency/switch output*

| Supply voltage | | Output 1 | | | | Output 2 | |
|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (+) | 23 (–) |
| L/+ | N/– | Current output 4 to 20 mA HART (active) | | – | | Pulse/frequency/switch output (passive) | |

*Current output 4 to 20 mA HART (passive) and pulse/frequency/switch output*

| Supply voltage | | Output 1 | | | | Output 2 | |
|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (+) | 23 (–) |
| L/+ | N/– | – | | Current output 4 to 20 mA HART (passive) | | Pulse/frequency/switch output (passive) | |

*Modbus RS485 and current output 4 to 20 mA (active)*

| Supply voltage | | Output 1 | | | | Output 2 | |
|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (B) | 23 (A) |
| L/+ | N/– | Current output 4 to 20 mA (active) | | – | | Modbus RS485 | |

*Modbus RS485 and current output 4 to 20 mA (passive)*

| Supply voltage | | Output 1 | | | | Output 2 | |
|---|---|---|---|---|---|---|---|
| 1 (+) | 2 (–) | 26 (+) | 27 (–) | 24 (+) | 25 (–) | 22 (B) | 23 (A) |
| L/+ | N/– | – | | Current output 4 to 20 mA (passive) | | Modbus RS485 | |

## Supply voltage

| Order code for "Power supply" | Terminal voltage | | Frequency range |
|---|---|---|---|
| Option **D** | DC 24 V | –20 to +30 % | – |
| Option **E** | AC 100 to 240 V | –15 to +10 % | 50/60 Hz,±5 Hz |
| Option **I** | DC 24 V | –20 to +30 % | – |
| | AC 100 to 240 V | –15 to +10 % | 50/60 Hz, ±5 Hz |
| Option **M** non-hazardous area | DC 24 V | –20 to +30 % | – |
| | AC 100 to 240 V | –15 to +10 % | 50/60 Hz, ±5 Hz |

## Power consumption

- Transmitter: max. 10 W (active power)
- Switch-on current: max. 36 A (< 5 ms) as per NAMUR Recommendation NE 21

## Current consumption

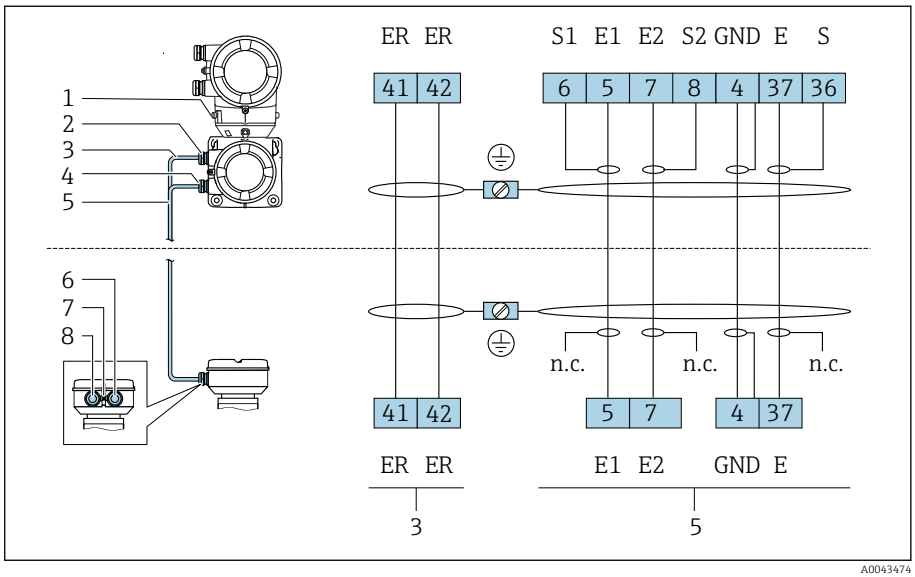
- Max. 400 mA (24 V)
- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

## Power supply failure

- Totalizers stop at the last value measured.
- Device configuration remains unchanged.
- Error messages (incl. total operated hours) are stored.

## Electrical connection

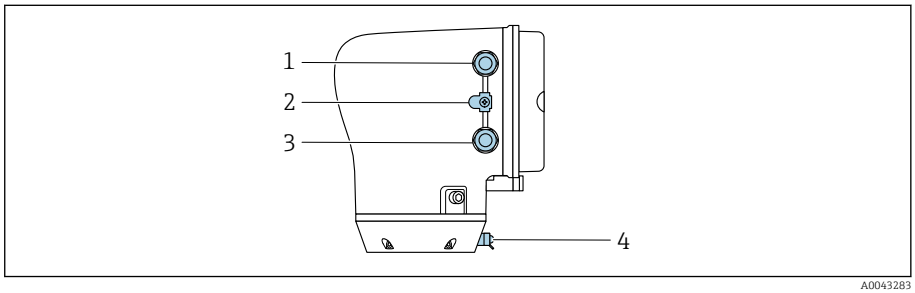
### Connections and terminal assignment, remote version connecting cable



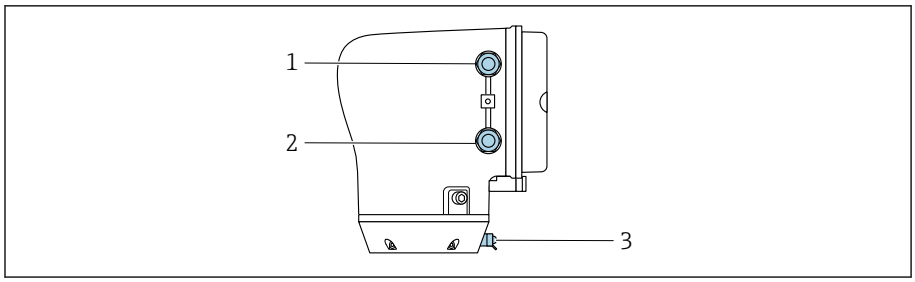

1 *Ground terminal, outer*
2 *Transmitter housing: cable entry for coil current cable*
3 *Coil current cable*
4 *Transmitter housing: cable entry for electrode cable*
5 *Electrode cable*
6 *Sensor connection housing: cable entry for electrode cable*
7 *Ground terminal, outer*
8 *Sensor connection housing: cable entry for coil current cable*

### Transmitter terminal connections

Terminal assignment → *Terminal assignment*, 24




1 *Cable entry for power supply cable: supply voltage*
2 *Outer ground terminal: on transmitters made of polycarbonate with a metal pipe adapter*
3 *Cable entry for signal cable*
4 *Outer ground terminal*

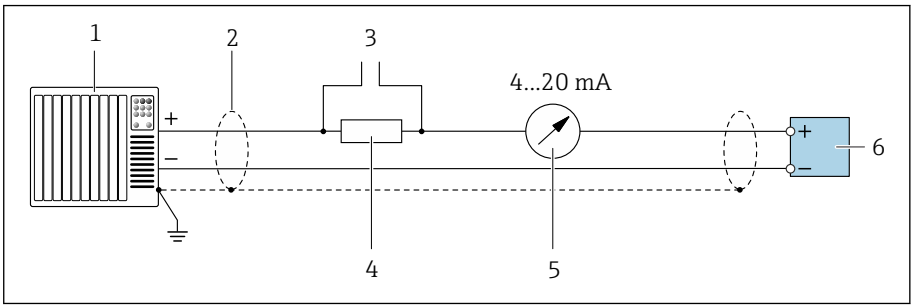



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*1 Cable entry for power supply cable: supply voltage*
*2 Cable entry for signal cable*
*3 Outer ground terminal*

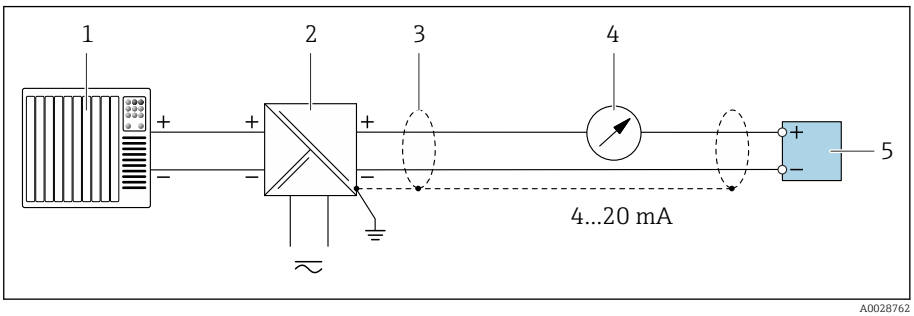
### Examples for electric terminals

*Current output 4 to 20 mA HART (active)*



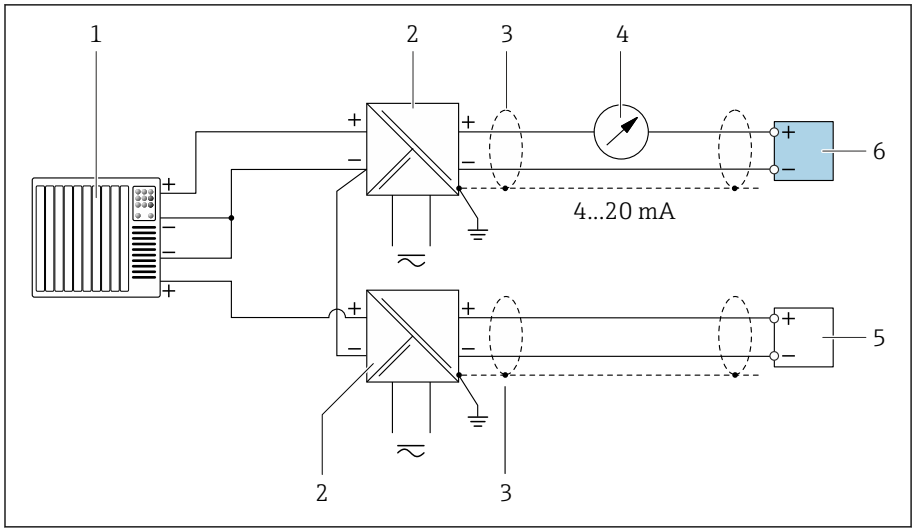

1 *Automation system with current input (e.g. PLC)*
2 *Cable shield*
3 *Connection for HART operating devices*
4 *Resistor for HART communication (≥ 250 Ω): observe max. load*
5 *Analog display unit: observe max. load.*
6 *Transmitter*

*Current output 4 to 20 mA HART (passive)*




1 *Automation system with current input (e.g. PLC)*
2 *Active barrier for supply voltage (e.g. RN221N)*
3 *Cable shield*
4 *Analog display unit: observe max. load*
5 *Transmitter*

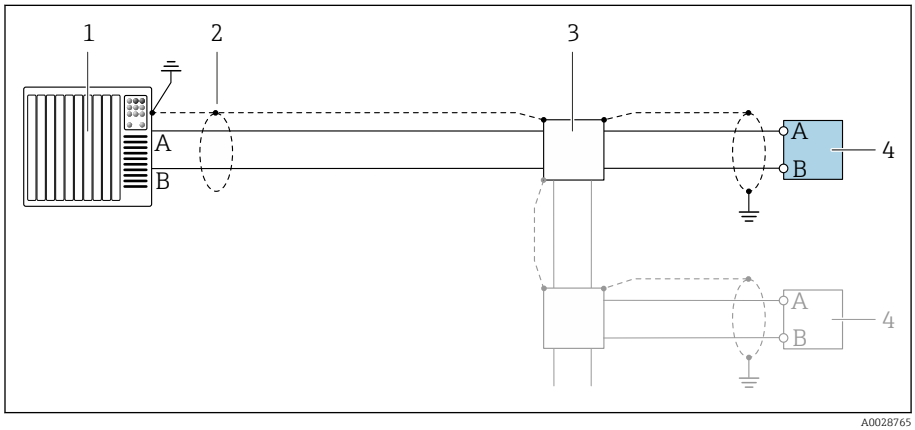
### *HART input (passive)*




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

1 *Automation system with current input (e.g. PLC)*
2 *Active barrier for supply voltage (e.g. RN221N)*
3 *Cable shield*
4 *Analog display unit: observe max. load*
5 *Pressure transmitter (e.g. Cerabar M, Cerabar S: see requirements)*
6 *Transmitter*

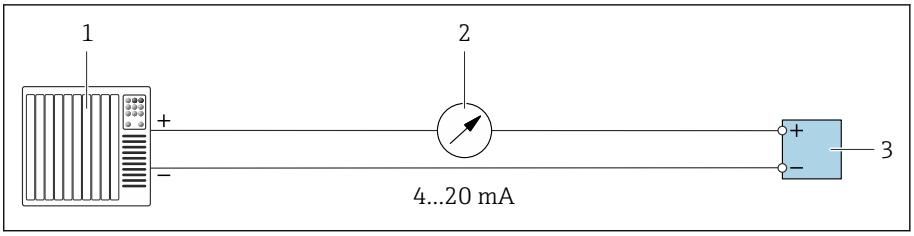
### *Modbus RS485*




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

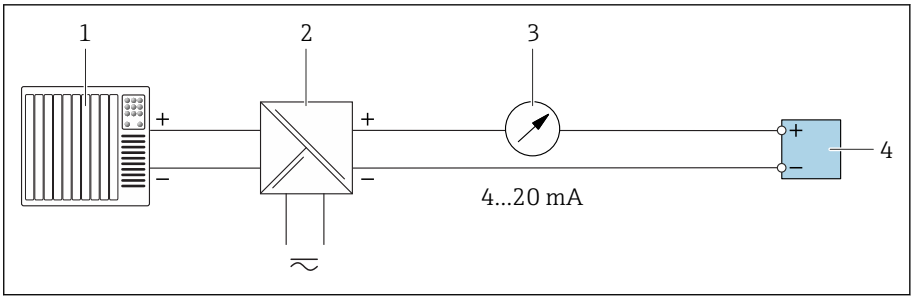
1 *Control system (e.g. PLC)*
2 *Cable shield*
3 *Distribution box*
4 *Transmitter*

### *Current output 4 to 20 mA (active)*



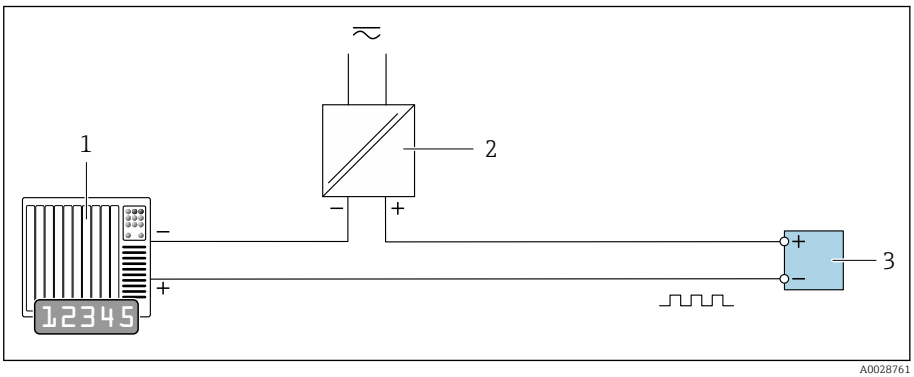

*1 Automation system with current input (e.g. PLC)*
*2 Analog display unit: observe max. load*
*3 Transmitter*

### *Current output 4 to 20 mA (passive)*



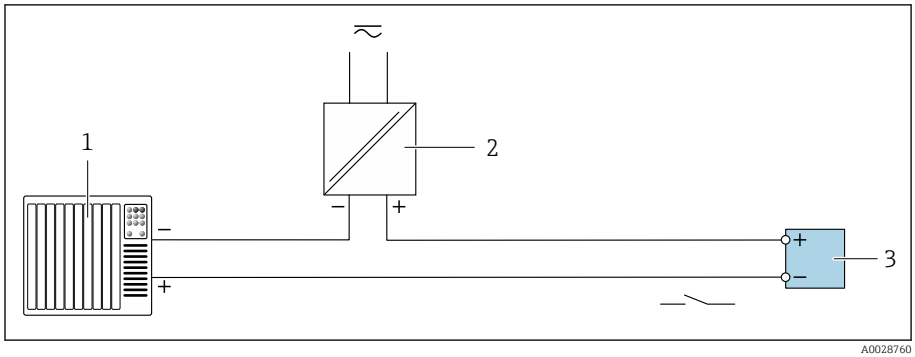

*1 Automation system with current input (e.g. PLC)*
*2 Active barrier for supply voltage (e.g. RN221N)*
*3 Analog display unit: observe max. load*
*4 Transmitter*

### *Pulse/frequency output (passive)*




*1 Automation system with pulse output and frequency input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)*
*2 Supply voltage*
*3 Transmitter: observe input values*

*Switch output (passive)*




A0028760

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

## Potential equalization

### Introduction

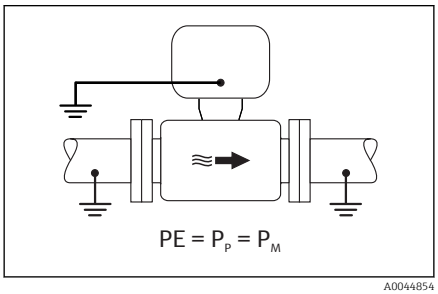
Correct potential equalization (equipotential bonding) is a prerequisite for stable and reliable flow measurement. Inadequate or incorrect potential equalization can result in device failure and present a safety hazard.

The following requirements must be observed to ensure correct, trouble-free measurement:
- The principle that the medium, the sensor and the transmitter must be at the same electrical potential applies.
- Take in-company grounding guidelines, materials and the grounding conditions and potential conditions of the pipe into consideration.
- The necessary potential equalization connections must be established using a ground cable with a minimum cross-section of 6 mm² (0.0093 in²). Also use a cable lug.
- In the case of remote device versions, the ground terminal in the example always refers to the sensor and not to the transmitter.

Accessories such as ground cables and ground disks can be ordered from Endress +Hauser→ *Device-specific accessories*, 📄 130

**Abbreviations used**
- PE (Protective Earth): potential at the potential equalization terminals of the device
- $P_P$ (Potential Pipe): potential of the pipe, measured at the flanges
- $P_M$ (Potential Medium): potential of the medium

### Connection examples for standard situations

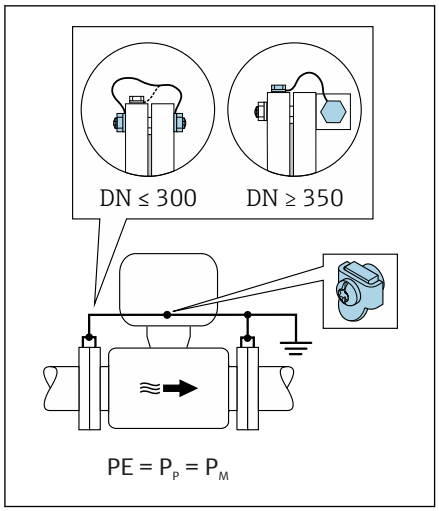



A0044854

**Unlined and grounded metal pipe**
- Potential equalization is via the measuring pipe.
- The medium is set to ground potential.

Starting conditions:
- Pipes are correctly grounded on both sides.
- Pipes are conductive and at the same electrical potential as the medium

▶ Connect the connection housing of the transmitter or sensor to ground potential via the ground terminal provided for this purpose.

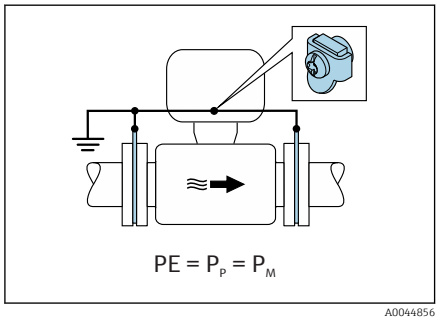


A0042089

**Unlined metal pipe**
- Potential equalization is via the ground terminal and pipe flanges.
- The medium is set to ground potential.

Starting conditions:
- Pipes are not sufficiently grounded.
- Pipes are conductive and at the same electrical potential as the medium

1. Connect both sensor flanges to the pipe flange via a ground cable and ground them.
2. Connect the connection housing of the transmitter or sensor to ground potential via the ground terminal provided for this purpose.
3. For DN ≤ 300 (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
4. For DN ≥ 350 (14"): Mount the ground cable directly on the metal transport bracket. Observe the screw tightening torques: see the Brief Operating Instructions for the sensor.



A0044856

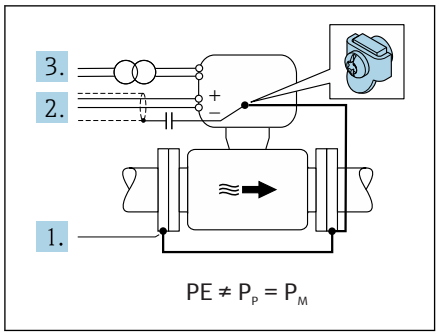
**Plastic pipe or pipe with insulating liner**
- Potential equalization is via the ground terminal and ground disks.
- The medium is set to ground potential.

Starting conditions:
- The pipe has an insulating effect.
- Low-impedance medium grounding close to the sensor is not guaranteed.
- Equalizing currents through the medium cannot be ruled out.

1. Connect the ground disks via the ground cable to the ground terminal of the connection housing of the transmitter or sensor.
2. Connect the connection to ground potential.

## Connection example with the potential of medium not equal to potential equalization connection without the "Floating measurement" option

In these cases, the medium potential can differ from the potential of the device.



A0042253

**Metal, ungrounded pipe**
The sensor and transmitter are installed in a way that provides electrical insulation from PE, e.g. applications for electrolytic processes or systems with cathodic protection.

Starting conditions:
- Unlined metal pipe
- Pipes with an electrically conductive liner

1. Connect the pipe flanges and transmitter via the ground cable.
2. Route the shielding of the signal lines via a capacitor (recommended value 1.5µF/ 50V).
3. Device connected to power supply such that it is floating in relation to the potential equalization connection (isolation transformer). This measure is not required in the case of 24V DC supply voltage without PE (= SELV power unit).

## Connection examples with the potential of medium not equal to potential equalization connection with the "Floating measurement" option

In these cases, the medium potential can differ from the potential of the device.

**Introduction**

The "Floating measurement" option enables the galvanic isolation of the measuring system from the device potential. This minimizes harmful equalizing currents caused by

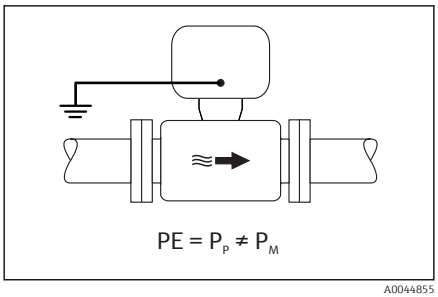
differences in potential between the medium and the device. The "Floating measurement" option is optionally available: order code for "Sensor option", option CV

*Operating conditions for the use of the "Floating measurement" option*

| | |
|---|---|
| Device version | Compact version and remote version (length of connecting cable ≤ 10 m) |
| Differences in voltage between medium potential and device potential | As small as possible, usually in the mV range |
| Alternating voltage frequencies in the medium or at ground potential (PE) | Below typical power line frequency in the country |

To achieve the specified conductivity measuring accuracy, a conductivity calibration is recommended when the device is installed.

A full pipe adjustment is recommended when the device is installed.

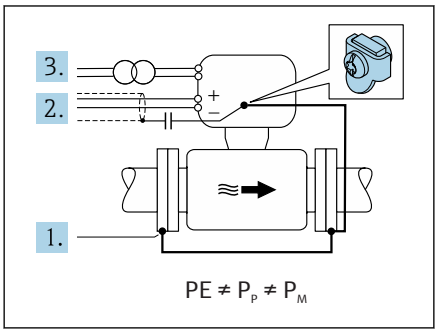



A0044855

**Plastic pipe**
Sensor and transmitter are correctly grounded. A difference in potential can occur between the medium and potential equalization connection. Potential equalization between $P_M$ and PE via the reference electrode is minimized with the "Floating measurement" option.

Starting conditions:
- The pipe has an insulating effect.
- Equalizing currents through the medium cannot be ruled out.

1. Use the "Floating measurement" option, while also observing the operating conditions for floating measurement.
2. Connect the connection housing of the transmitter or sensor to ground potential via the ground terminal provided for this purpose.




A0044857

**Metal, ungrounded pipe with insulating liner**
The sensor and transmitter are installed in a way that provides electrical insulation from PE. The medium and pipe have different potentials. The "Floating measurement" option minimizes harmful equalizing currents between $P_M$ and $P_P$ via the reference electrode.

Starting conditions:
- Metal pipe with insulating liner
- Equalizing currents through the medium cannot be ruled out.

1. Connect the pipe flanges and transmitter via the ground cable.
2. Route the shielding of the signal cables via a capacitor (recommended value 1.5µF/ 50V).
3. Device connected to power supply such that it is floating in relation to the potential equalization connection (isolation transformer). This measure is not required in the case of 24V DC supply voltage without PE (= SELV power unit).
4. Use the "Floating measurement" option, while also observing the operating conditions for floating measurement.

## Terminals

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

## Cable entries

- Cable gland: M20 × 1.5 for cable Ø6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½", G ½" Ex d
  - M20

## Overvoltage protection

| | |
|---|---|
| **Mains voltage fluctuations** | → *Supply voltage*, 24 |
| **Overvoltage category** | Overvoltage category II |
| **Short-term, temporary overvoltage** | Between cable and neutral conductor up to 1200 V for max. 5s |
| **Long-term, temporary overvoltage** | Up to 500 V between cable and ground |

# Cable specification

Requirements for connecting cable 36
Ground cable requirements 36
Connecting cable requirements 37

## Requirements for connecting cable

### Electrical safety

As per applicable national regulations.

### Permitted temperature range

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

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

- A standard installation cable is sufficient.
- Provide grounding according to applicable national codes and regulations.

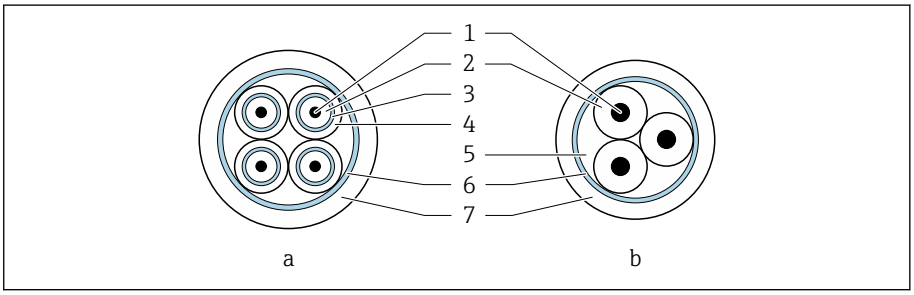
### Signal cable

- Current output 4 to 20 mA HART:
  A shielded cable is recommended, observe the grounding concept of the facility.
- Pulse/frequency/switch output:
  Standard installation cable
- Modbus RS485:
  Cable type A according to EIA/TIA-485 standard is recommended
- Current output 4 to 20 mA:
  Standard installation cable

## Ground cable requirements

Copper wire: at least 6 $mm^2$ (0.0093 $in^2$)

## Connecting cable requirements




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*3 Cable cross-section*

*a Electrode cable*
*b Coil current cable*
*1 Core*
*2 Core insulation*
*3 Core shield*
*4 Core jacket*
*5 Core reinforcement*
*6 Cable shield*
*7 Outer jacket*

**Preterminated connecting cables**
Two connecting cable versions can be ordered from Endress+Hauser for use with IP68 protection:
- Cable is already connected to the sensor.
- Cable is connected by the customer (incl. tools for sealing the connection compartment).

**Armored connecting cable**
Armored connecting cables with additional, metal reinforcing braid can be ordered from Endress+Hauser. Armored connecting cables are used:
- When laying the cable directly in the ground
- Where there is a risk of damage from rodents
- If using the device below IP68 degree of protection

### Electrode cable

| | |
|---|---|
| **Design** | 3×0.38 mm² (20 AWG) with common, braided copper shield (Ø ~ 9.5 mm (0.37 in)) and individual shielded cores<br>If using the empty pipe detection (EPD) function:<br>4×0.38 mm² (20 AWG)) with common, braided copper shield (Ø ~ 9.5 mm (0.37 in)) and individual shielded cores |
| **Conductor resistance** | ≤ 50 Ω/km (0.015 Ω/ft) |
| **Capacitance: core/shield** | ≤ 420 pF/m (128 pF/ft) |
| **Cable length** | Depends on the medium conductivity: maximum 200 m (656 ft) |
| **Cable lengths (available for order)** | 5 m (15 ft), 10 m (30 ft), 20 m (60 ft) or variable length: maximum 200 m (656 ft)<br>Armored cables: variable length up to maximum 200 m (656 ft) |
| **Operating temperature** | –20 to +80 °C (–4 to +176 °F) |

### Coil current cable

| | |
|---|---|
| **Design** | 3×0.38 mm² (20 AWG) with common, braided copper shield (Ø ~ 9.5 mm (0.37 in)) and individual shielded cores |
| **Conductor resistance** | ≤ 37 Ω/km (0.011 Ω/ft) |
| **Capacitance: core/shield** | ≤ 120 pF/m (37 pF/ft) |
| **Cable length** | Depends on the medium conductivity, max. 200 m (656 ft) |

| | |
|---|---|
| **Cable lengths (available for order)** | 5 m (15 ft), 10 m (30 ft), 20 m (60 ft) or variable length up to max. 200 m (656 ft)<br>Armored cables: variable length up to max. 200 m (656 ft) |
| **Operating temperature** | –20 to +80 °C (–4 to +176 °F) |
| **Test voltage for cable insulation** | ≤ AC 1 433 V rms 50/60 Hz or ≥ DC 2 026 V |

# Performance characteristics

Reference operating conditions 40
Maximum measured error 40
Repeatability 40
Influence of ambient temperature 40

## Reference operating conditions

- Error limits based on ISO 20456:2017
- 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

To obtain measured errors, use the *Applicator* sizing tool → *Service-specific accessory* , 131

## Maximum measured error

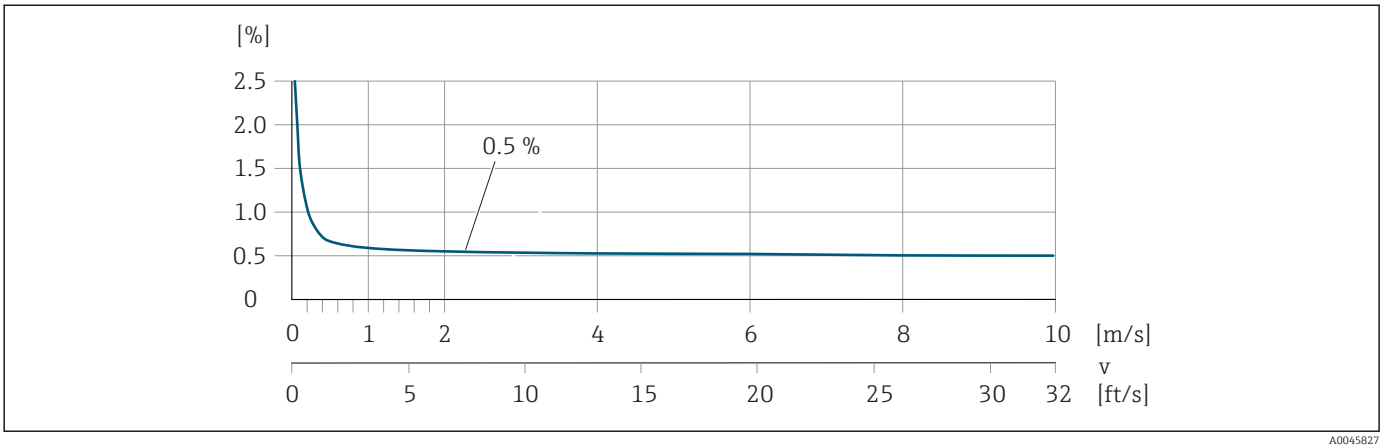
o. r. = of reading

### Error limits under reference operating conditions

*Volume flow*

±0.5 % o. r.±1 mm/s (±0.04 in/s)

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




A0045827

*Electrical conductivity*

Max. measured error not specified.

### Accuracy of outputs

| | |
|---|---|
| **Current output** | ±5 µA |
| **Pulse/frequency output** | Max. ±100 ppm o. r. (across the entire ambient temperature range) |

## Repeatability

| | |
|---|---|
| **Volume flow** | Max. ±0.1 % o. r. ± 0.5 mm/s (0.02 in/s) |
| **Electrical conductivity** | Max. ±5 % o. r. (5 to 100 000 µS/cm) |

## Influence of ambient temperature

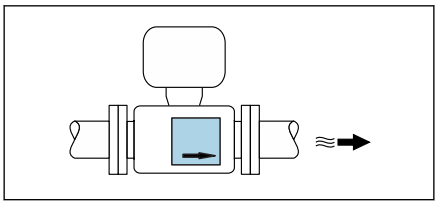
| | |
|---|---|
| **Current output** | Temperature coefficient max. 1 µA/°C |
| **Pulse/frequency output** | No additional effect. Is included in the accuracy. |

# Installation

Installation conditions 42

## Installation conditions

### Flow direction



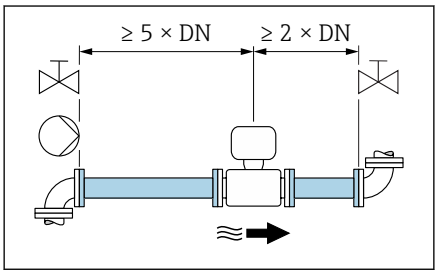
A0041163

Install the device in the direction of flow.

Note the direction of arrow on the nameplate.

### Installation with inlet runs and outlet runs

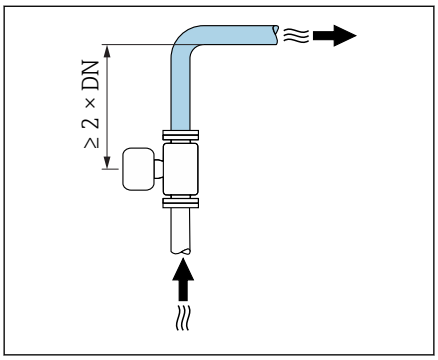
Installation requires inlet and outlet runs: devices with the order code for "Design", option D, E, F and G.




A0028997

Ensure straight, undisturbed inlet and outlet runs.

To avoid negative pressure and to comply with accuracy specifications, install the sensor upstream from assemblies that produce turbulence (e.g. valves, T-sections) and downstream from pumps → *Installation near pumps*, 45.




A0042132

Keep a sufficient distance to the next pipe elbow.

### Installation without inlet runs and outlet runs

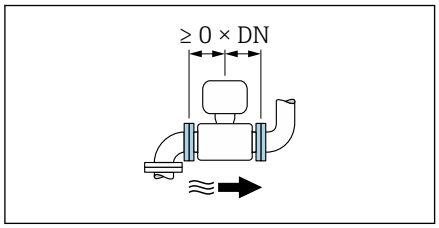
Depending on the device design and installation location, the inlet and outlet runs can be reduced or omitted entirely.

**Maximum measured error**
When the device is installed with the inlet and outlet runs described, a maximum measured error of ±0.5 % of the reading ±1 mm/s (0.04 in/s) can be guaranteed.

*Devices and possible order options*

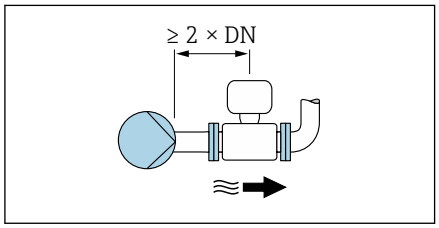
| Order code for "Design" | | |
|---|---|---|
| **Option** | **Description** | **Design** |
| H | Lap joint flange, 0 x DN inlet/outlet runs | Full Bore [1] |
| I | Fixed flange, 0 x DN inlet/outlet runs | |
| J | Fixed flange, short installed length, 0 x DN inlet/outlet runs | |
| K | Fixed flange, long installed length, 0 x DN inlet/outlet runs | |

1) "Full Bore" stands for the full diameter of the measuring tube. There is no pressure loss with a full diameter.



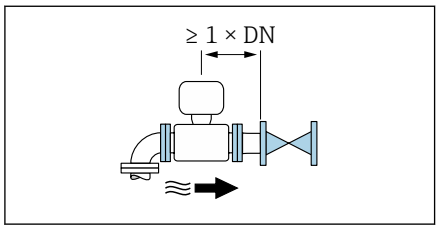
A0032859

For devices with the order code for "Design", option H, I no inlet or outlet runs need to be considered.



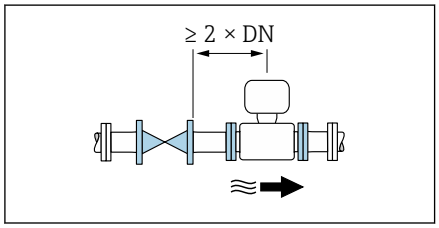

Installation downstream of pumps
Installation without inlet and outlet runs is possible: devices with the order code for "Design", option H and I.

For devices with the order code for "Design", option J and K, inlet runs of only ≥ 2 x DN must be taken into consideration.




Installation upstream of valves
Installation without inlet and outlet runs is possible: devices with the order code for "Design", option H and I.

For devices with the order code for "Design", option J and K, outlet runs of only ≥ 1 x DN must be taken into consideration.

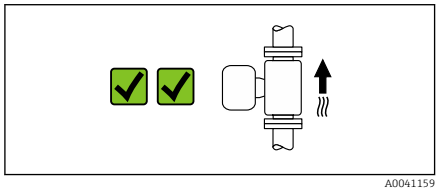


A0045786

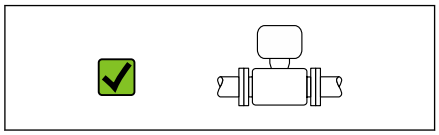
Installation downstream of valves
Installation without inlet and outlet runs is possible if the valve is 100% open during operation: devices with the order code for "Design", option H and I.

In the case of devices with the order code for "Design", option J and K, an inlet run of only ≥ 2 x DN must be taken into consideration if the valve is 100% open during operation.

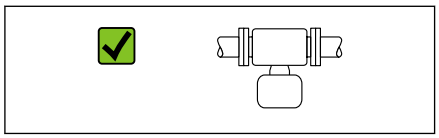
## Orientations


A0041159

**Vertical orientation, upward direction of flow**
For all applications.

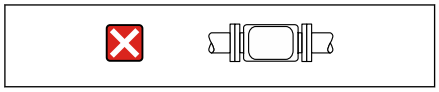

A0041160

**Horizontal orientation, transmitter at top**
This orientation is suitable for the following applications:
- For low process temperatures in order to maintain the minimum ambient temperature for the transmitter.
- For empty pipe detection, even in the case of empty or partially filled measuring pipes.


A0041161

**Horizontal orientation, transmitter at bottom**
This orientation is suitable for the following applications:
- For high process temperatures in order to maintain the maximum ambient temperature for the transmitter.
- To prevent the electronics from overheating in the event of strong heat formation (e.g. CIP or SIP cleaning process), install the measuring device with the transmitter part pointing downwards.

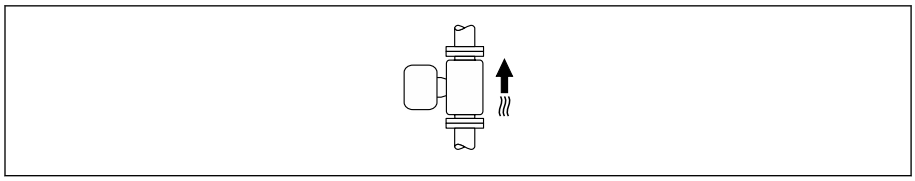
This orientation is not suitable for the following applications:
If empty pipe detection is to be used.


A0048872

**Horizontal orientation, transmitter at side**
This orientation is not suitable

### *Vertical*

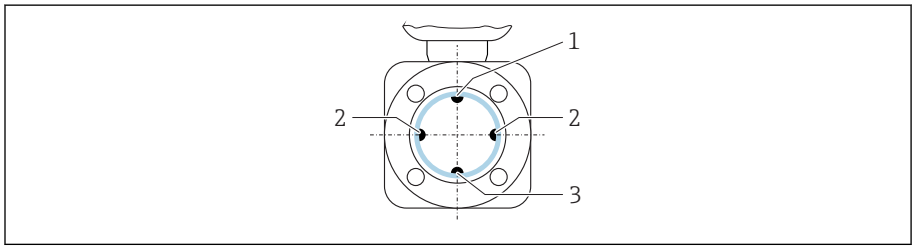
Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.



A0015591

*Horizontal*

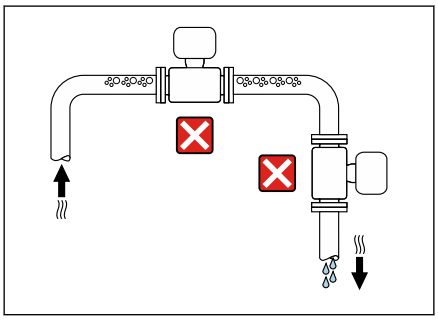
- Ideally, the measuring electrode plane should be horizontal. This prevents brief insulation of the measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no guarantee that the empty pipe detection function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




A0029344

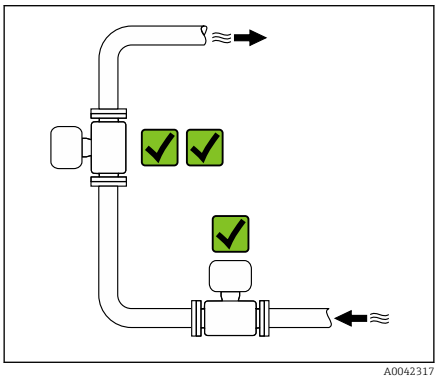
*1 EPD electrode for empty pipe detection*
*2 Measuring electrodes for signal detection*
*3 Reference electrode for potential equalization*

## Mounting locations



A0042131

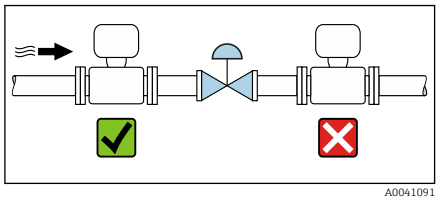
- Do not install the device at the highest point of the pipe.
- Do not install the device upstream from a free pipe outlet in a down pipe.



A0042317

The device should ideally be installed in an ascending pipe.

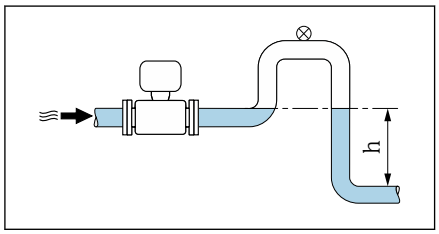
### Installation near control valves



A0041091

Install the device in the direction of flow upstream from the control valve.

### Installation upstream from a down pipe




A0041089

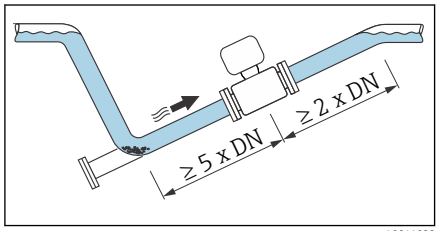
NOTICE

**Negative pressure in the measuring pipe can damage the liner!**

- ▶ If installing upstream from down pipes with a length h ≥ 5 m (16.4 ft): install a siphon with a vent valve downstream from the device.

This arrangement prevents the flow of liquid stopping in the pipe and air entrainment.

### Installation with partially filled pipes

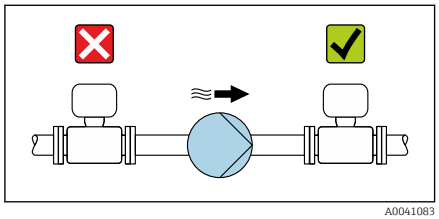



A0041088

- Partially filled pipes with a gradient require a drain-type configuration.
- The installation of a cleaning valve is recommended.

For devices with the order code for "Design", option H, I, J or K no inlet or outlet runs need to be considered.

### Installation near pumps



A0041083

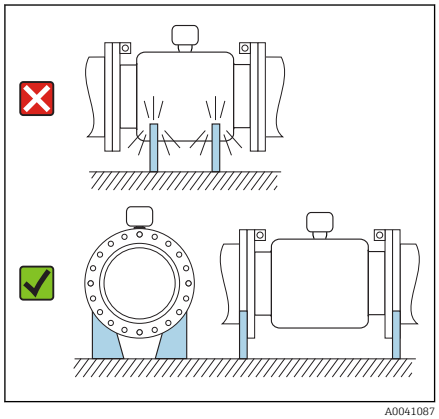
NOTICE

**Negative pressure in the measuring pipe can damage the liner!**

- ▶ Install the device in the direction of flow downstream from the pump.
- ▶ Install pulsation dampers if reciprocating, diaphragm or peristaltic pumps are used.

- Information on the liner's resistance to partial vacuum → *Pressure tightness*, 🖹 59
- Information on the measuring system's resistance to vibration and shock → *Vibration-resistance and shock-resistance*, 🖹 51

### Installation of very heavy devices



A0041087

Support is required with nominal diameters of DN ≥ 350 (14") and higher.

NOTICE

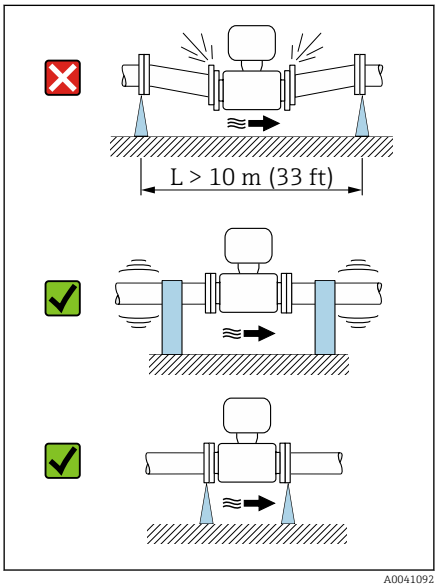
**Damage to the device!**

If incorrect support is provided, the sensor housing could buckle and the internal magnetic coils could be damaged.

- ▶ Only provide supports at the pipe flanges.

### Pipe vibrations

A remote version is recommended in the event of strong pipe vibrations.



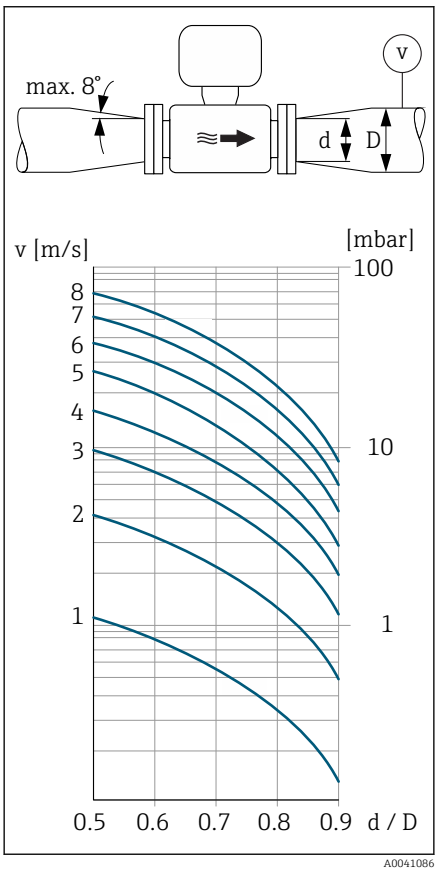

A0041092

**NOTICE**

**Pipe vibrations can damage the device!**

- Do not expose the device to strong vibrations.
- Support the pipe and fix it in place.
- Support the device and fix it in place.
- Mount the sensor and transmitter separately.

### Adapters




A0041086

Suitable adapters (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resulting higher rate of flow improves measuring accuracy with very slow-moving media.

The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders. It only applies to liquids with a viscosity similar to that of water.

1. Calculate the ratio of the diameters d/D.
2. Determine the flow velocity after the reduction.
3. From the chart, determine the pressure loss as a function of the flow velocity v and the d/D ratio.

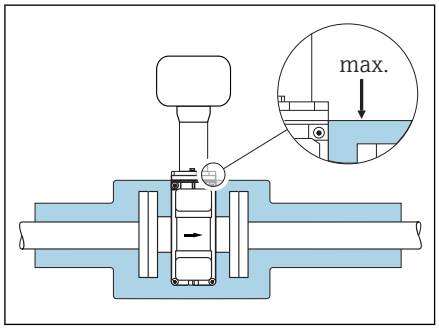
### Seals

Note the following when installing seals:

- For liner with polyurethane: no seal is required.
- For "PTFE" liner: no seal is required.
- For liner with hard rubber: seal is **always** required.
- For DIN flanges: only install seals according to DIN EN 1514-1.

### Thermal insulation

The sensor and pipe must be insulated in the event of very hot media. The insulation helps to slow energy loss and prevent injuries from accidental contact with hot pipes.



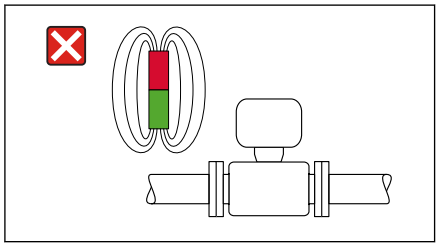
A0041093

**NOTICE**

**If the meter electronics overheat this can damage the device!**

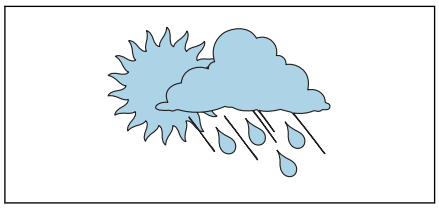
- ▶ Keep the housing support completely free (heat dissipation).
- ▶ Provide insulation but make sure it does not go beyond the upper edge of the two sensor half-shells.

### Magnetism and static electricity


A0042152

Do not install the device near magnetic fields, e.g. motors, pumps, transformers.

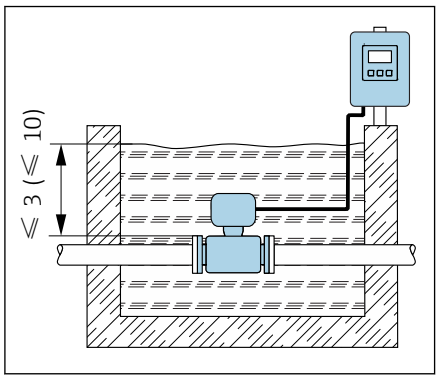
### Outdoor use


A0023989

- Avoid exposure to direct sunlight.
- Install in a location protected from sunlight.
- Avoid direct exposure to weather conditions.
- Use a weather protection cover → *Transmitter*, 130.

### Immersion in water

Only the remote version with IP68, type 6P, is suitable for immersion in water.



A0042412

**NOTICE**

**If the maximum water depth and operating duration are exceeded, this will damage the device!**

- ▶ Observe the maximum water depth and operating duration.

**Order code for "Sensor option", options CB, CC**

Use of device under water at a maximum water depth of:

- 3 m (10 ft): permanent use
- 10 m (30 ft): max. 48 hours

**Order code for "Sensor option", option CQ "Temporarily water-proof"**

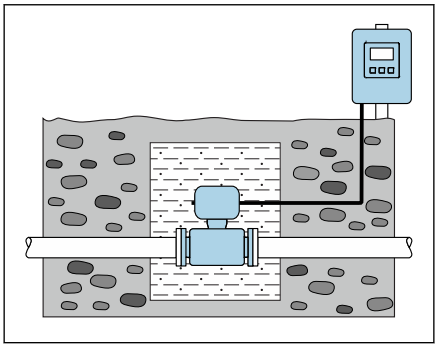
Temporary use of the device under non-corrosive water at a maximum water depth of:
3 m (10 ft): max. 168 hours

**Order code for "Sensor option", options CD, CE**

- For the operation of the device under water and in saline water
- Operating duration at a maximum depth of:
  - 3 m (10 ft): permanent use
  - 10 m (30 ft): maximum 48 hours

## Use in buried applications

Only the remote version with IP68 is suitable for use in buried applications.



A0042646

### Order code for "Sensor option", options CD, CE

The device can be used in buried applications without the need to implement additional precautionary measures on the device.
Installation is performed according to regional installation regulations.

# Environment

Ambient temperature range 50
Storage temperature 50
Relative humidity 50
Operating height 50
Atmosphere 50
Degree of protection 50
Vibration-resistance and shock-resistance 51
Electromagnetic compatibility (EMC) 51

## Ambient temperature range

| | |
|---|---|
| **Transmitter** | −40 to +60 °C (−40 to +140 °F) |
| **Local display** | −20 to +60 °C (−4 to +140 °F)<br>The readability of the display may be impaired at temperatures outside the temperature range. |
| **Sensor** | ▪ Process connection, carbon steel: −10 to +60 °C (+14 to +140 °F)<br>▪ Process connection, stainless steel: −40 to +60 °C (−40 to +140 °F) |
| **Liner** | Do not exceed or fall below the permitted temperature range of the liner → *Medium temperature range*, 54. |

Dependency of ambient temperature on medium temperature → *Medium temperature range*, 54

## Storage temperature

The storage temperature corresponds to the ambient temperature range of the transmitter and sensor.

## Relative humidity

The device is suitable for use in outdoor and indoor areas with a relative humidity of 5 to 95%.

## Operating height

According to EN 61010-1
- Without overvoltage protection: ≤ 2 000 m
- With overvoltage protection: > 2 000 m

## Atmosphere

According to IEC 60529: If a plastic housing is permanently exposed to certain steam and air mixtures, this can damage the housing.

More Informationen: Endress+Hauser sales organizations.

## Degree of protection

| | | |
|---|---|---|
| **Transmitter** | ▪ IP66/67, Type 4X enclosure, suitable for pollution degree 4<br>▪ Open housing: IP20, Type 1 enclosure, suitable for pollution degree 2 | |
| **Sensor** | IP66/67, Type 4X enclosure, suitable for pollution degree 4 | |
| **Optional sensor** | | |
| Order code for "Sensor option", option CB, CC | IP68, Type 6P enclosure<br>Fully welded, with protective coating as per EN ISO 12944 C5-M and EN 60529 | Use of device under water at a maximum water depth of:<br>▪ 3 m (10 ft): permanent use<br>▪ 10 m (30 ft): max. 48 hours |
| Order code for "Sensor option", option CD, CE | IP68, type 6P enclosure<br>Fully welded, with protective coating as per EN ISO 12944 Im2/Im3 and EN 60529 | Use of the device in buried applications, under water and in saline water at a maximum water depth of:<br>▪ 3 m (10 ft): permanent use<br>▪ 10 m (30 ft): max. 48 hours<br>▪ Use of device under water at a maximum water depth of:<br>10 m (30 ft): max. 48 hours<br>▪ Use of device in buried applications |

| | | |
|---|---|---|
| Order code for "Sensor option", option CQ | IP68, type 6P, temporarily waterproof | Temporary use of the device under non-corrosive water at a maximum water depth of:<br>3 m (10 ft): max. 168 hours |
| Order code for "Sensor option", option C3 | IP66/67, type 4X enclosure<br>Fully welded, with protective coating as per EN ISO 12944 C5-M | For operation in corrosive environment |

## Vibration-resistance and shock-resistance

### Compact version

| | | |
|---|---|---|
| **Vibration, sinusoidal**<br>▪ Following IEC 60068-2-6<br>▪ 20 cycles per axis | 2 to 8.4 Hz<br>8.4 to 2 000 Hz | 3.5 mm peak<br>1 g peak |
| **Vibration, broad-band random**<br>▪ Following IEC 60068-2-64<br>▪ 120 min per axis | 10 to 200 Hz<br>200 to 2 000 Hz | 0.003 $g^2$/Hz<br>0.001 $g^2$/Hz (1.54 g rms) |
| **Shocks, half-sine**<br>▪ Following IEC 60068-2-27<br>▪ 3 positive and 3 negative shocks | 6 ms 30 g | |

**Shock**
Due to rough handling according to IEC 60068-2-31.

### Remote version (sensor)

| | | |
|---|---|---|
| **Vibration, sinusoidal**<br>▪ Following IEC 60068-2-6<br>▪ 20 cycles per axis | 2 to 8.4 Hz<br>8.4 to 2 000 Hz | 7.5 mm peak<br>2 g peak |
| **Vibration, broad-band random**<br>▪ Following IEC 60068-2-6<br>▪ 120 min per axis | 10 to 200 Hz<br>200 to 2 000 Hz | 0.01 $g^2$/Hz<br>0.003 $g^2$/Hz (2.7 g rms) |
| **Shocks, half-sine**<br>▪ Following IEC 60068-2-6<br>▪ 3 positive and 3 negative shocks | 6 ms 50 g | |

**Shock**
Due to rough handling according to IEC 60068-2-31.

## Electromagnetic compatibility (EMC)

As per IEC/EN 61326 and NAMUR Recommendation NE 21.

For more information: Declaration of Conformity

# Process

Medium temperature range 54
Conductivity 54
Flow limit 54
Pressure-temperature ratings 56
Pressure tightness 59
Pressure loss 59

## Medium temperature range

The medium temperature range depends on the liner.

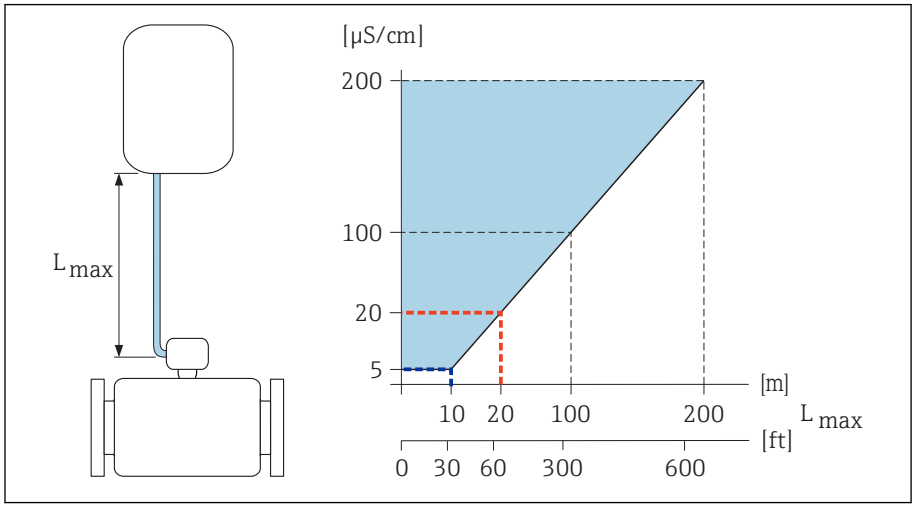
| | |
|---|---|
| **Hard rubber** | 0 to +80 °C (+32 to +176 °F) |
| **Polyurethane** | −20 to +50 °C (−4 to +122 °F) |
| **PTFE** | ▪ Process connection, carbon steel: −10 to +90 °C (+14 to +194 °F)<br>▪ Process connection, stainless steel: −20 to +90 °C (−4 to +194 °F) |

## Conductivity

The minimum conductivity is:
- 5 µS/cm for liquids in general
- 20 µS/cm for demineralized water

The following basic conditions must be observed for < 20 µS/cm:
- Order code 013 for "Functionality", option D "Extended transmitter" and higher output signal damping is recommended for values under 20 µS/cm.
- Observe the maximum permitted cable length $L_{max}$. This length is determined by the conductivity of the medium.
- With order code 013 "Functionality", option A "Standard transmitter" and empty pipe detection (EPD) switched on, the minimum conductivity is 20 µS/cm.
- With order code 013 "Functionality", option A "Standard transmitter" - remote version, empty pipe detection may not be activated if $L_{max}$ > 20 m.

Note that in the case of the remote version, the minimum conductivity depends on the cable length.




4 *Permitted length of connecting cable*

*Colored area = permitted range*
*$L_{max}$ = length of connecting cable in [m] ([ft])*
*[µS/cm] = medium conductivity*
*Red line = order code 013 "Functionality", option A "Standard transmitter"*
*Blue line = order code 013 "Functionality", option D "Extended transmitter"*

## Flow limit

Pipe diameter and flow rate determine the nominal diameter of the sensor.

The flow velocity is increased by reducing the sensor nominal diameter.

| | |
|---|---|
| 2 to 3 m/s (6.56 to 9.84 ft/s) | Optimum flow velocity |
| v < 2 m/s (6.56 ft/s) | For abrasive media, e.g. potter's clay, lime milk, ore slurry |
| v > 2 m/s (6.56 ft/s) | For media producing buildup, e.g. wastewater sludge |

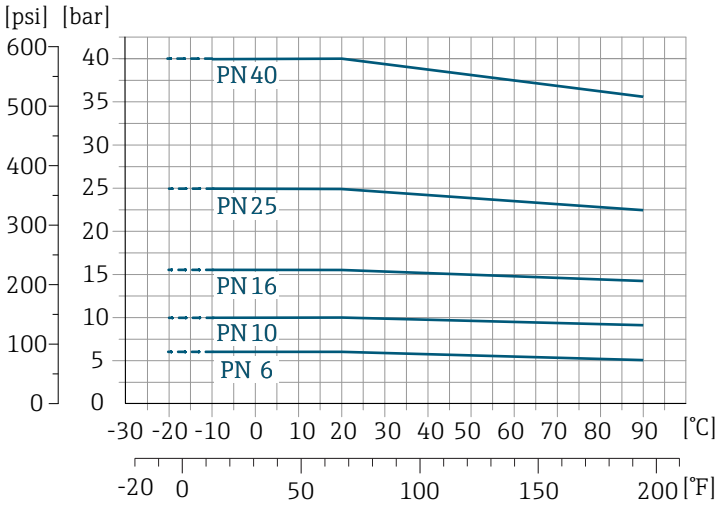
## Pressure-temperature ratings

Maximum permitted medium pressure as a function of the medium temperature

The data relate to all pressure bearing parts of the device.

### Fixed flange according to EN 1092-1

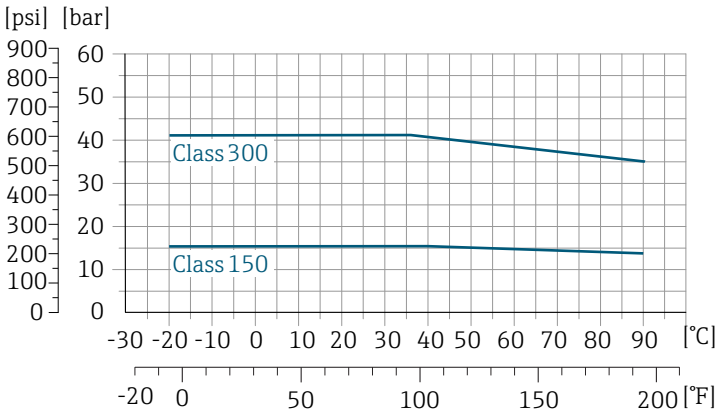
Stainless steel (−20 °C (−4 °F))
Carbon steel (−10 °C (14 °F))




A0038122-EN

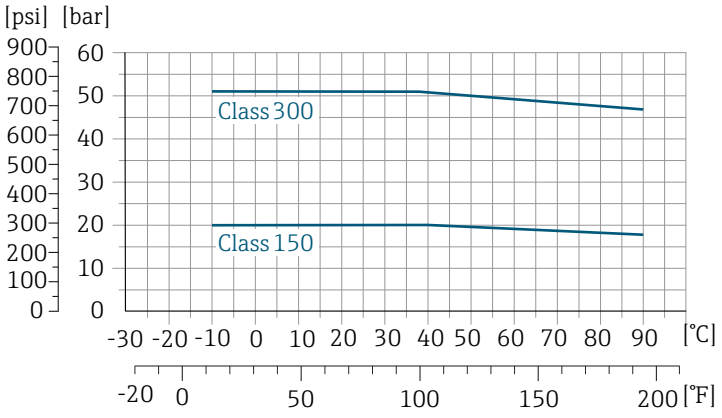
### Fixed flange according to ASME B16.5

Stainless steel




A0038123-EN

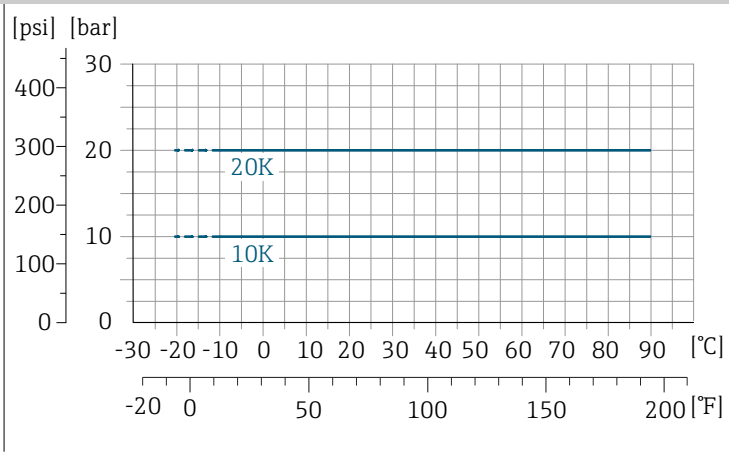
Carbon steel




A0038121-EN

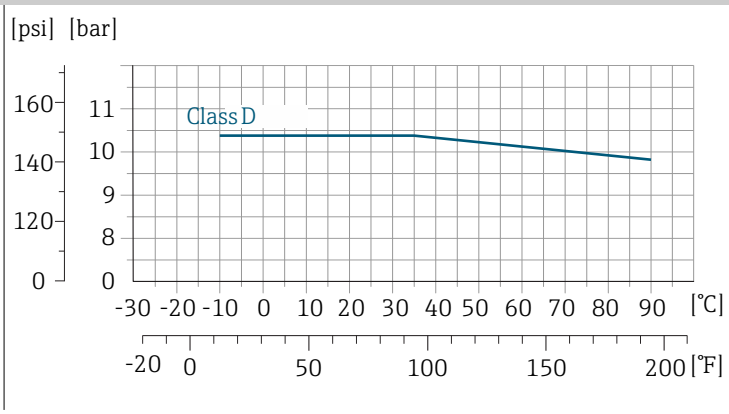
## Fixed flange according to JIS B2220

Stainless steel (−20 °C (−4 °F))
Carbon steel (−10 °C (14 °F))



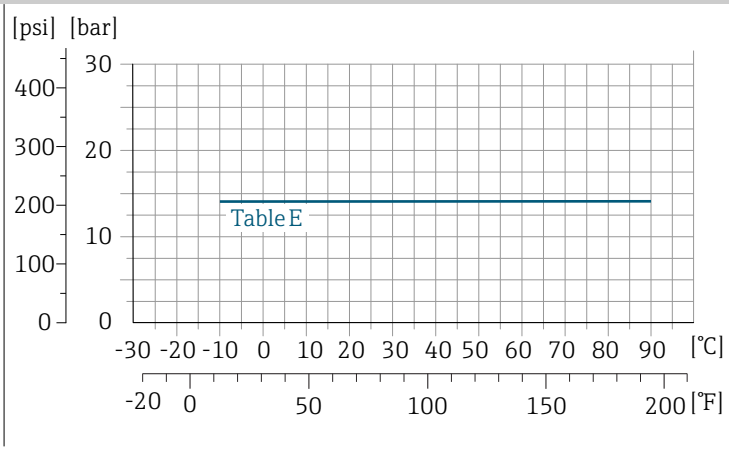

## Fixed flange according to AWWA C207

Carbon steel



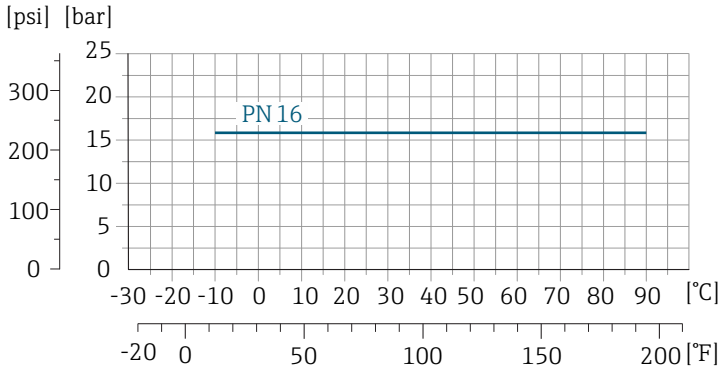

## Fixed flange according to AS 2129

Carbon steel



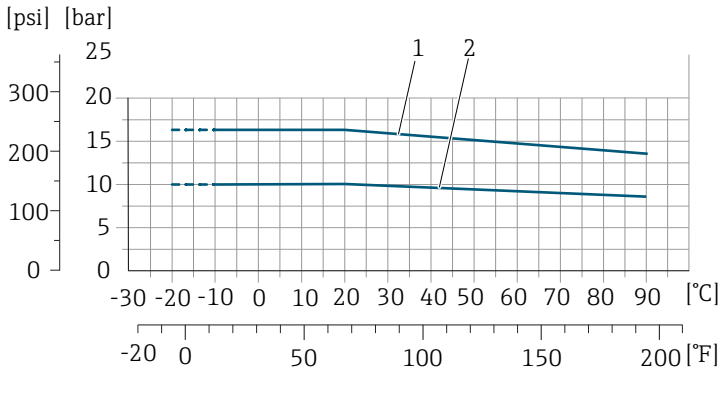
## Fixed flange according to AS 4087

Carbon steel




## Lap joint flange/lap joint flange, stamped plate according to EN 1092-1 and ASME B16.5

Stainless steel (−20 °C (−4 °F))
Carbon steel (−10 °C (14 °F))




*1 Lap joint flange PN16/Class150*
*2 Lap joint flange, stamped plate PN10, lap joint flange PN10*

## Pressure tightness

Limit values for the absolute pressure depending on the liner and medium temperature

| PTFE | Nominal diameter | | Absolute pressure in [mbar] ([psi]) | |
|---|---|---|---|---|
| | [mm] | [in] | +25 °C (+77 °F) | +90 °C (+194 °F) |
| | 25 | 1 | 0 (0) | 0 (0) |
| | 40 | 2 | 0 (0) | 0 (0) |
| | 50 | 2 | 0 (0) | 0 (0) |
| | 65 | 2 ½ | 0 (0) | 40 (0.58) |
| | 80 | 3 | 0 (0) | 40 (0.58) |
| | 100 | 4 | 0 (0) | 135 (2.0) |
| | 125 | 5 | 135 (2.0) | 240 (3.5) |
| | 150 | 6 | 135 (2.0) | 240 (3.5) |
| | 200 | 8 | 200 (2.9) | 290 (4.2) |
| | 250 | 10 | 330 (4.8) | 400 (5.8) |
| | 300 | 12 | 400 (5.8) | 500 (7.3) |

| Hard rubber | +25 °C (+77 °F) | +50 °C (+122 °F) | +80 °C (+176 °F) |
|---|---|---|---|
| | 0 (0) | 0 (0) | 0 (0) |

| Polyurethane | +25 °C (+77 °F) | +50 °C (+122 °F) |
|---|---|---|
| | 0 (0) | 0 (0) |

## Pressure loss

- No pressure loss: transmitter installed in a pipe with the same nominal diameter.
- Pressure loss information when adapters are used → *Adapters*, 46

# Mechanical construction

Weight 62
Measuring pipe specification 66
Materials 67
Fitted electrodes 68
Process connections 68
Surface roughness 68

## Weight

All values refer to devices with flanges with a standard pressure rating.
Weight data are guideline values. The weight may be lower than indicated depending on the pressure rating and design.

**Transmitter remote version**
- Polycarbonate: 1.4 kg (3.1 lbs)
- Aluminum: 2.4 kg (5.3 lbs)

**Sensor remote version**
Aluminum sensor connection housing: see the information in the following table.

### Weight in SI units

| Order code for "Design", options D, E, H, I | Nominal diameter | | EN (DIN), AS, JIS | | ASME (Class 150) |
|---|---|---|---|---|---|
| | [mm] | [in] | Pressure rating | [kg] | [kg] |
| | 25 | 1 | PN 40 | 10 | 5 |
| | 32 | – | PN 40 | 11 | – |
| | 40 | 1 ½ | PN 40 | 12 | 7 |
| | 50 | 2 | PN 40 | 13 | 9 |
| | 65 | – | PN 16 | 13 | – |
| | 80 | 3 | PN 16 | 15 | 14 |
| | 100 | 4 | PN 16 | 18 | 19 |
| | 125 | – | PN 16 | 25 | – |
| | 150 | 6 | PN 16 | 31 | 33 |
| | 200 | 8 | PN 10 | 52 | 52 |
| | 250 | 10 | PN 10 | 81 | 90 |
| | 300 | 12 | PN 10 | 95 | 129 |
| | 350 | 14 | PN 6 | 106 | 172 |
| | 375 | 15 | PN 6 | 121 | – |
| | 400 | 16 | PN 6 | 121 | 203 |

| Order code for "Design", options G, K | Nominal diameter | | EN (DIN) (PN 6) | ASME (Class 150), AWWA (Class D) |
|---|---|---|---|---|
| | [mm] | [in] | [kg] | [kg] |
| | 450 | 18 | 161 | 255 |
| | 500 | 20 | 156 | 285 |
| | 600 | 24 | 208 | 405 |
| | 700 | 28 | 304 | 400 |
| | – | 30 | – | 460 |
| | 800 | 32 | 357 | 550 |
| | 900 | 36 | 485 | 800 |
| | 1000 | 40 | 589 | 900 |
| | – | 42 | – | 1 100 |
| | 1200 | 48 | 850 | 1 400 |
| | – | 54 | 850 | 2 200 |
| | 1400 | – | 1 300 | – |
| | – | 60 | – | 2 700 |

| Order code for "Design", options G, K | Nominal diameter | | EN (DIN) (PN 6) | ASME (Class 150), AWWA (Class D) |
|---|---|---|---|---|
| | [mm] | [in] | [kg] | [kg] |
| | 1600 | – | 1845 | – |
| | – | 66 | – | 3700 |
| | 1800 | 72 | 2357 | 4100 |
| | – | 78 | 2929 | 4600 |
| | 2000 | – | 2929 | – |

| Order code for "Design", options F, J | Nominal diameter | | EN (DIN) (PN16) | AS (PN 16) | ASME (Class 150), AWWA (Class D) |
|---|---|---|---|---|---|
| | [mm] | [in] | [kg] | [kg] | [kg] |
| | 450 | 18 | 142 | 138 | 191 |
| | 500 | 20 | 182 | 186 | 228 |
| | 600 | 24 | 227 | 266 | 302 |
| | 700 | 28 | 291 | 369 | 266 |
| | – | 30 | – | 447 | 318 |
| | 800 | 32 | 353 | 524 | 383 |
| | 900 | 36 | 444 | 704 | 470 |
| | 1000 | 40 | 566 | 785 | 587 |
| | – | 42 | – | – | 670 |
| | 1200 | 48 | 843 | 1229 | 901 |
| | – | 54 | – | – | 1273 |
| | 1400 | – | 1204 | – | – |
| | – | 60 | – | – | 1594 |
| | 1600 | – | 1845 | – | – |
| | – | 66 | – | – | 2131 |
| | 1800 | 72 | 2357 | – | 2568 |
| | – | 78 | 2929 | – | 3113 |
| | 2000 | – | 2929 | – | 3113 |
| | – | 84 | – | – | 3755 |
| | 2200 | – | 3422 | – | – |
| | – | 90 | – | – | 4797 |
| | 2400 | – | 4094 | – | – |

### Weight in US units

All values refer to devices with flanges with a standard pressure rating.
Weight data are guideline values. The weight may be lower than indicated depending on the pressure rating and design.

**Transmitter remote version**
- Polycarbonate: 3.1 lb
- Aluminum: 5.3 lb

**Sensor remote version**
Aluminum sensor connection housing: see the information in the following table.

| Order code for "Design", options D, E, H, I | Nominal diameter | | ASME (Class 150) |
|---|---|---|---|
| | [mm] | [in] | [lb] |
| | 25 | 1 | 11 |
| | 32 | – | – |
| | 40 | 1 ½ | 15 |
| | 50 | 2 | 20 |
| | 65 | – | – |
| | 80 | 3 | 31 |
| | 100 | 4 | 42 |
| | 125 | – | – |
| | 150 | 6 | 73 |
| | 200 | 8 | 115 |
| | 250 | 10 | 198 |
| | 300 | 12 | 284 |
| | 350 | 14 | 379 |
| | 375 | 15 | – |
| | 400 | 16 | 448 |

| Order code for "Design", options F, J | Nominal diameter | | ASME (Class 150), AWWA (Class D) |
|---|---|---|---|
| | [mm] | [in] | [lb] |
| | 450 | 18 | 421 |
| | 500 | 20 | 503 |
| | 600 | 24 | 666 |
| | 700 | 28 | 587 |
| | – | 30 | 701 |
| | 800 | 32 | 845 |
| | 900 | 36 | 1036 |
| | 1000 | 40 | 1294 |
| | – | 42 | 1477 |
| | 1200 | 48 | 1987 |
| | – | 54 | 2807 |
| | 1400 | – | – |
| | – | 60 | 3515 |
| | 1600 | – | – |
| | – | 66 | 4699 |
| | 1800 | 72 | 5662 |

| Order code for "Design", options F, J | Nominal diameter | | ASME (Class 150), AWWA (Class D) |
|---|---|---|---|
| | [mm] | [in] | [lb] |
| | – | 78 | 6864 |
| | 2000 | – | 6864 |
| | – | 84 | 8280 |
| | 2200 | – | – |
| | – | 90 | 10577 |
| | 2400 | – | – |

| Order code for "Design", options G, K | Nominal diameter | | ASME (Class 150), AWWA (Class D) |
|---|---|---|---|
| | [mm] | [in] | [lb] |
| | 450 | 18 | 562 |
| | 500 | 20 | 628 |
| | 600 | 24 | 893 |
| | 700 | 28 | 882 |
| | – | 30 | 1014 |
| | 800 | 32 | 1213 |
| | 900 | 36 | 1764 |
| | 1000 | 40 | 1984 |
| | – | 42 | 2426 |
| | 1200 | 48 | 3087 |
| | – | 54 | 4851 |
| | 1400 | – | – |
| | – | 60 | 5954 |
| | 1600 | – | – |
| | – | 66 | 8158 |
| | 1800 | 72 | 9040 |
| | – | 78 | 10143 |
| | 2000 | – | – |

## Measuring pipe specification

| Nominal diameter | | Rating | | | | Measuring pipe internal diameter | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EN (DIN) | ASME<br>AWWA | AS 2129<br>AS 4087 | JIS | Hard rubber | | Polyurethane | | PTFE | |
| [mm] | [in] | | | | | [mm] | [in] | [mm] | [in] | [mm] | [in] |
| 25 | 1 | PN 40 | Class 150 | – | 20K | – | – | 24 | 0.94 | 25 | 0.98 |
| 32 | – | PN 40 | – | – | 20K | – | – | 32 | 1.26 | 34 | 1.34 |
| 40 | 1 ½ | PN 40 | Class 150 | – | 20K | – | – | 38 | 1.50 | 40 | 1.57 |
| 50 | 2 | PN 40 | Class 150 | Table E, PN 16 | 10K | 50 | 1.97 | 50 | 1.97 | 52 | 2.05 |
| 65 | – | PN 16 | – | – | 10K | 66 | 2.60 | 66 | 2.60 | 68 | 2.68 |
| 80 | 3 | PN 16 | Class 150 | Table E, PN 16 | 10K | 79 | 3.11 | 79 | 3.11 | 80 | 3.15 |
| 100 | 4 | PN 16 | Class 150 | Table E, PN 16 | 10K | 102 | 4.02 | 102 | 4.02 | 104 | 4.09 |
| 125 | – | PN 16 | – | – | 10K | 127 | 5.00 | 127 | 5.00 | 130 | 5.12 |
| 150 | 6 | PN 16 | Class 150 | Table E, PN 16 | 10K | 156 | 6.14 | 156 | 6.14 | 156 | 6.14 |
| 200 | 8 | PN 10 | Class 150 | Table E, PN 16 | 10K | 204 | 8.03 | 204 | 8.03 | 202 | 7.95 |
| 250 | 10 | PN 10 | Class 150 | Table E, PN 16 | 10K | 258 | 10.2 | 258 | 10.2 | 256 | 10.08 |
| 300 | 12 | PN 10 | Class 150 | Table E, PN 16 | 10K | 309 | 12.2 | 309 | 12.2 | 306 | 12.05 |
| 350 | 14 | PN 6 | Class 150 | Table E, PN 16 | 10K | 337 | 13.3 | 342 | 13.5 | – | – |
| 375 | 15 | – | – | PN 16 | 10K | 389 | 15.3 | – | – | – | – |
| 400 | 16 | PN 6 | Class 150 | Table E, PN 16 | 10K | 387 | 15.2 | 392 | 15.4 | – | – |
| 450 | 18 | PN 6 | Class 150 | – | 10K | 436 | 17.1 | 437 | 17.2 | – | – |
| 500 | 20 | PN 6 | Class 150 | Table E, PN 16 | 10K | 487 | 19.1 | 492 | 19.4 | – | – |
| 600 | 24 | PN 6 | Class 150 | Table E, PN 16 | 10K | 589 | 23.0 | 594 | 23.4 | – | – |
| 700 | 28 | PN 6 | Class D | Table E, PN 16 | 10K | 688 | 27.1 | 692 | 27.2 | – | – |
| 750 | 30 | – | Class D | Table E, PN 16 | 10K | 737 | 29.1 | 742 | 29.2 | – | – |
| 800 | 32 | PN 6 | Class D | Table E, PN 16 | – | 788 | 31.0 | 794 | 31.3 | – | – |
| 900 | 36 | PN 6 | Class D | Table E, PN 16 | – | 889 | 35.0 | 891 | 35.1 | – | – |
| 1000 | 40 | PN 6 | Class D | Table E, PN 16 | – | 991 | 39.0 | 994 | 39.1 | – | – |
| – | 42 | – | Class D | – | – | 1043 | 41.1 | 1043 | 41.1 | – | – |
| 1200 | 48 | PN 6 | Class D | Table E, PN 16 | – | 1191 | 46.9 | 1197 | 47.1 | – | – |
| – | 54 | – | Class D | – | – | 1339 | 52.7 | – | – | – | – |
| 1400 | – | PN 6 | – | – | – | 1402 | 55.2 | – | – | – | – |
| – | 60 | – | Class D | – | – | 1492 | 58.7 | – | – | – | – |
| 1600 | – | PN 6 | – | – | – | 1600 | 63.0 | – | – | – | – |
| – | 66 | – | Class D | – | – | 1638 | 64.5 | – | – | – | – |
| 1800 | 72 | PN 6 | – | – | – | 1786 | 70.3 | – | – | – | – |
| – | 78 | – | Class D | – | – | 1989 | 78.3 | – | – | – | – |
| 2000 | – | PN 6 | – | – | – | 1989 | 78.3 | – | – | – | – |
| – | 84 | – | Class D | – | – | 2099 | 84.0 | – | – | – | – |
| 2200 | – | PN 6 | – | – | – | 2194 | 87.8 | – | – | – | – |
| – | 90 | – | Class D | – | – | 2246 | 89.8 | – | – | – | – |
| 2400 | – | PN 6 | – | – | – | 2391 | 94.1 | – | – | – | – |

## Materials

| | |
|---|---|
| **Transmitter housing** | |
| Order code for "Housing" | ▪ Option A: aluminum, AlSi10Mg, coated<br>▪ Option M: polycarbonate |
| Window material | ▪ Order code for "Housing" option A: glass<br>▪ Order code for "Housing" option M: polycarbonate |
| **Sensor connection housing** | |
| | ▪ Aluminum, AlSi10Mg, coated<br>▪ Polycarbonate (in conjunction with order code for "Sensor option", options CB, CC, CD, CE, CF, CQ, C3) |
| **Cable glands and entries** | |
| Cable gland M20×1.5 | Plastic |
| Adapter for cable entry with female thread G ½" or NPT ½" | Nickel-plated brass |
| **Connecting cable for remote version** | |
| | Electrode cable and coil current cable:<br>▪ PVC cable with copper shield<br>▪ Reinforced cable: PVC cable with copper shield and additional steel wire braided jacket |
| **Sensor housing** | |
| DN 25 to 300 (1 to 12") | ▪ Aluminum half-shell housing: aluminum, AlSi10Mg, coated<br>▪ Fully welded carbon steel housing with protective varnish |
| DN 350 to 3 000 (14 to 120") | Fully welded carbon steel housing with protective varnish |
| **Measuring tubes** | |
| DN 25 to 600 (1 to 24") | Stainless steel: 1.4301, 1.4306, 304, 304L |
| DN 700 to 3 000 (28 to 120") | Stainless steel: 1.4301, 304 |
| **Liner** | |
| DN 25 to 300 (1 to 12") | PTFE |
| DN 25 to 1 200 (1 to 48") | Polyurethane |
| DN 50 to 3 000 (2 to 120") | Hard rubber |
| **Electrodes** | |
| | ▪ Stainless steel: 1.4435 (316L)<br>▪ Alloy C22, 2.4602 (UNS N06022) |
| **Seals** | |
| | As per DIN EN 1514-1, Form IBC |

| Process connections | |
|---|---|
| | For flanges made of carbon steel:<br>▪ DN ≤ 300 (12"): with Al/Zn protective coating or protective varnish<br>▪ DN ≥ 350 (14"): protective varnish<br><br>All carbon steel lap joint flanges are supplied with a hot-dip galvanized finish. |
| EN 1092-1 (DIN 2501) | Fixed flange<br>▪ Carbon steel:<br>▪ DN ≤ 300: S235JRG2, S235JR+N, P245GH, A105, E250C<br>▪ DN 350 to 3 000: P245GH, S235JRG2, A105, E250C<br>▪ DN 350 to 600: P245GH, S235JRG2, A105, E250C<br>▪ Stainless steel:<br>▪ DN ≤ 300: 1.4404, 1.4571, F316L<br>▪ DN 350 to 600: 1.4571, F316L, 1.4404<br>▪ DN 700 to 1 000: 1.4404, F316L<br><br>Lap joint flange<br>▪ Carbon steel DN ≤ 300: S235JRG2, A105, E250C<br>▪ Stainless steel DN ≤ 300: 1.4306,1.4404, 1.4571, F316L<br><br>Lap joint flange, stamped plate<br>▪ Carbon steel DN ≤ 300: S235JRG2 similar to S235JR+AR or 1.0038<br>▪ Stainless steel DN ≤ 300: 1.4301 similar to 304 |
| ASME B16.5 | ▪ Carbon steel: A105<br>▪ Stainless steel: F316L |
| JIS B2220 | ▪ Carbon steel: A105, A350 LF2<br>▪ Stainless steel: F316L |
| AWWA C207 | Carbon steel: A105, P265GH, A181 Class 70, E250C, S275JR |
| AS 2129 | Carbon steel: A105, E250C, P235GH, P265GH, S235JRG2 |
| AS 4087 | Carbon steel: A105, P265GH, S275JR |

| Accessories | |
|---|---|
| Protective cover | Stainless steel, 1.4404 (316L) |
| Pipe mounting set | Stainless steel 1.4301 (304) |
| Wall mounting kit | Stainless steel 1.4301 (304) |
| Grounding rings | 15 to 1 200 mm (½ to 48 in)<br>▪ Stainless steel, 1.4435 (316L)<br>▪ Alloy C22, 2.4602 (UNS N06022) |

## Fitted electrodes

Standard electrodes:
- Measuring electrodes
- Reference electrodes
- Empty pipe detection electrodes

## Process connections

- EN 1092-1 (DIN 2501)
- ASME B16.5
- JIS B2220
- AS 2129 Table E
- AS 4087 PN 16
- AWWA C207 Class D

## Surface roughness

All data relate to parts in contact with medium.

Electrodes with 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum:
< 0.5 µm (19.7 µin)

# Dimensions in SI units

**Compact version** 72
DN 25 to 300 (1 to 12") 72
DN 350 to 900 (14 to 36") 74
DN 1000 to 3000 (40 to 120") 76

**Remote version** 78
Transmitter remote version 78
Sensor connection housing 78
DN 25 to 300 (1 to 12") aluminum half-shell housing 79
DN 25 to 300 (1 to 12") fully welded housing 80
DN 350 to 900 (14 to 36") 81
DN 1000 to 3000 (40 to 120") 82

**Fixed flange** 83
Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10 83
Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16 84
Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 25 85
Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 40 86
Flange according to ASME B16.5, Class 150 87
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Flange according to JIS B2220, 10K 89
Flange according to JIS B2220, 20K 90
Flange according to AWWA, Class D 91
Flange according to AS 2129, Tab. E 92
Flange according to AS 4087, PN 16 93

**Lap joint flange** 94
Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10 94
Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16 95
Lap joint flange according to ASME B16.5, Class 150 96

**Lap joint flange, stamped plate** 97
Lap joint flange, stamped plate in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10 97

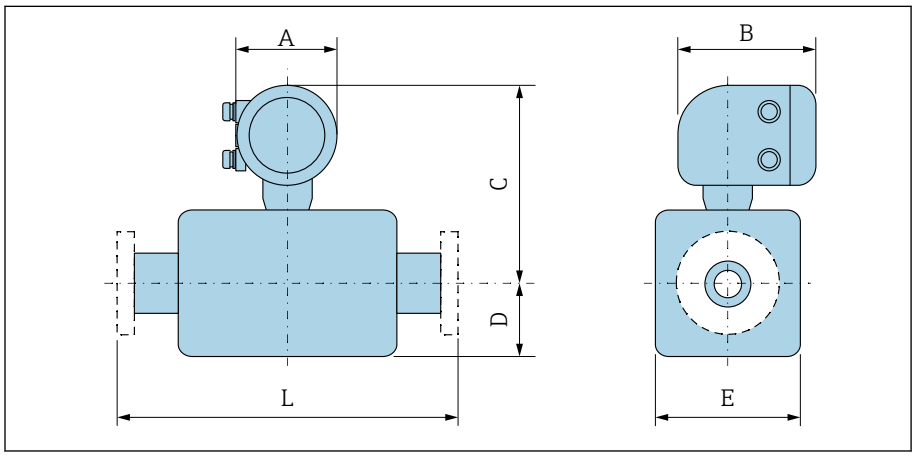
**Accessories** 98
Protective cover 98
Ground disks for flanges 98

## Compact version

### DN 25 to 300 (1 to 12")

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

Sensor with aluminum half-shell housing



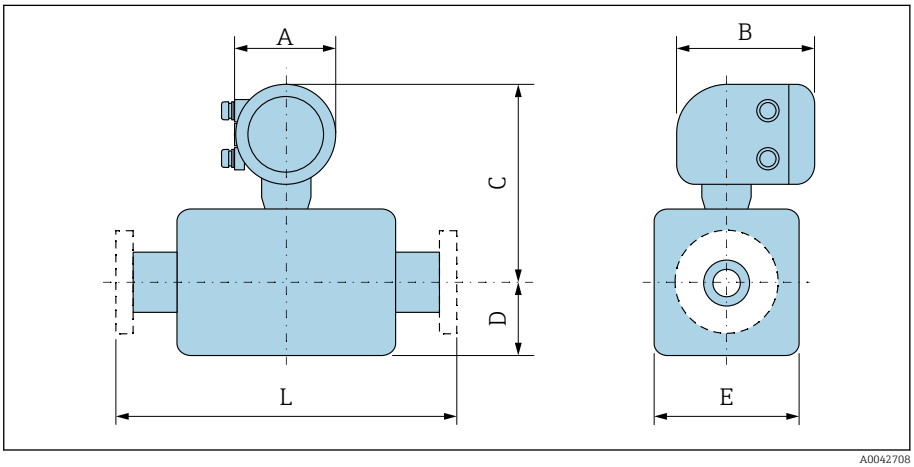

A0042708

| DN | | A [1] | B | Order code for "Design" Options D, E, H, I C [2] | D [2] | E [2] | L [3] |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 25 | 1 | 139 | 178 | 258 | 84 | 120 | 200 |
| 32 | – | 139 | 178 | 258 | 84 | 120 | 200 |
| 40 | 1 ½ | 139 | 178 | 258 | 84 | 120 | 200 |
| 50 | 2 | 139 | 178 | 258 | 84 | 120 | 200 |
| 65 | – | 139 | 178 | 283 | 109 | 180 | 200 |
| 80 | 3 | 139 | 178 | 283 | 109 | 180 | 200 |
| 100 | 4 | 139 | 178 | 283 | 109 | 180 | 250 |
| 125 | – | 139 | 178 | 323 | 150 | 260 | 250 |
| 150 | 6 | 139 | 178 | 323 | 150 | 260 | 300 |
| 200 | 8 | 139 | 178 | 348 | 180 | 324 | 350 |
| 250 | 10 | 139 | 178 | 373 | 205 | 400 | 450 |
| 300 | 12 | 139 | 178 | 398 | 230 | 460 | 500 |

1) Depending on the cable entry used: values up to + 30 mm
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

*Order code for "Housing", option M "Compact, polycarbonate"*

Sensor with aluminum half-shell housing

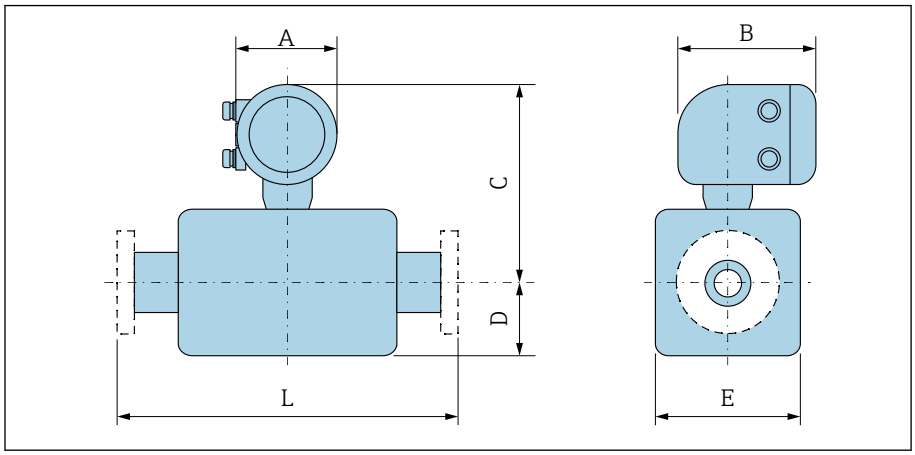



| DN | | A [1] | B | Order code for "Design" Options D, E, H, I C [2] | D [2] | E [2] | L [3] |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| 25 | 1 | 132 | 172 | 255 | 84 | 120 | 200 |
| 32 | – | 132 | 172 | 255 | 84 | 120 | 200 |
| 40 | 1 ½ | 132 | 172 | 255 | 84 | 120 | 200 |
| 50 | 2 | 132 | 172 | 255 | 84 | 120 | 200 |
| 65 | – | 132 | 172 | 280 | 109 | 180 | 200 |
| 80 | 3 | 132 | 172 | 280 | 109 | 180 | 200 |
| 100 | 4 | 132 | 172 | 280 | 109 | 180 | 250 |
| 125 | – | 132 | 172 | 320 | 150 | 260 | 250 |
| 150 | 6 | 132 | 172 | 320 | 150 | 260 | 300 |
| 200 | 8 | 132 | 172 | 345 | 180 | 324 | 350 |
| 250 | 10 | 132 | 172 | 370 | 205 | 400 | 450 |
| 300 | 12 | 132 | 172 | 395 | 230 | 460 | 500 |

1) Depending on the cable entry used: values up to + 30 mm
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

## DN 350 to 900 (14 to 36")

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

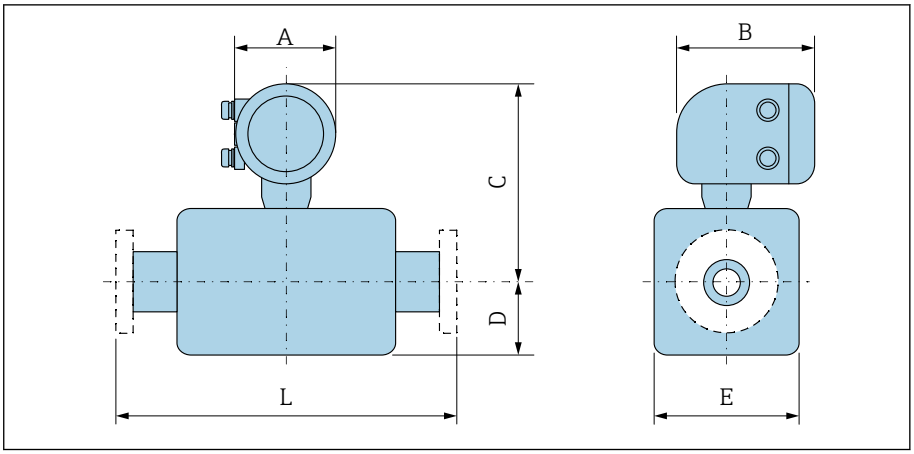



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| DN | | A [1] | B | Order code for "Design" | | | | | | L [3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Options E, F | | | Option G | | | | |
| | | | | C [2] | D [2] | E [2] | C [2] | D [2] | E [2] | | |
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | |
| 350 | 14 | 139 | 178 | 457 | 245 | 490 | – | – | – | 550 | |
| 375 | 15 | 139 | 178 | 483 | 271 | 542 | – | – | – | 600 | |
| 400 | 16 | 139 | 178 | 483 | 271 | 542 | – | – | – | 600 | |
| 450 | 18 | 139 | 178 | 465 | 299 | 598 | 508 | 333 | 666 | 600 [4] | 650 [5] |
| 500 | 20 | 139 | 178 | 490 | 324 | 648 | 534 | 359 | 717 | 600 [4] | 650 [5] |
| 600 | 24 | 139 | 178 | 540 | 365 | 730 | 586 | 411 | 821 | 600 [4] | 780 [5] |
| 700 | 28 | 139 | 178 | 601 | 430 | 860 | 688 | 512 | 1024 | 700 [4] | 910 [5] |
| 750 | 30 | 139 | 178 | 639 | 467 | 934 | 688 | 512 | 1024 | 750 [4] | 975 [5] |
| 800 | 32 | 139 | 178 | 658 | 486 | 972 | 709 | 534 | 1065 | 800 [4] | 1040 [5] |
| 900 | 36 | 139 | 178 | 708 | 536 | 1072 | 786 | 610 | 1218 | 900 [4] | 1170 [5] |

1) Depending on the cable entry used: values up to + 30 mm
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

*Order code for "Housing", option M "Compact, polycarbonate"*

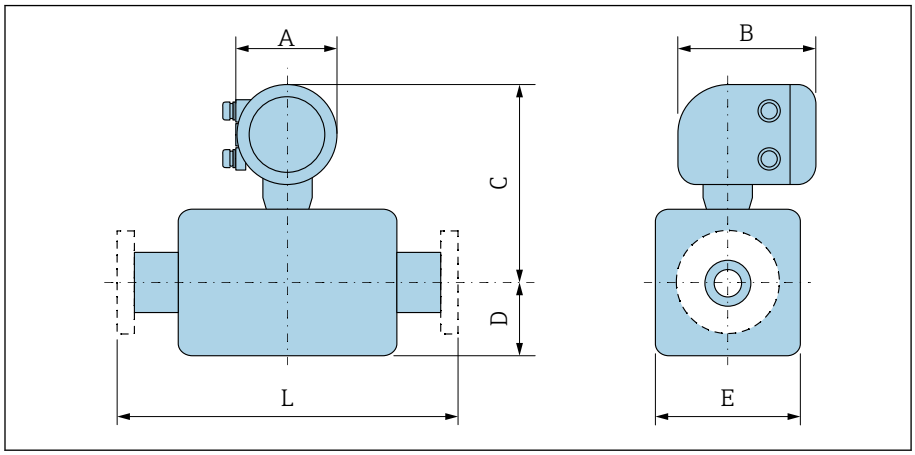



| DN | | A [1] | B | Order code for "Design" | | | | | | L [3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Options E, F | | | Option G | | | | |
| | | | | C [2] | D [2] | E [2] | C [2] | D [2] | E [2] | | |
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | |
| 350 | 14 | 132 | 172 | 454 | 245 | 490 | – | – | – | 550 | |
| 375 | 15 | 132 | 172 | 480 | 271 | 542 | – | – | – | 600 | |
| 400 | 16 | 132 | 172 | 480 | 271 | 542 | – | – | – | 600 | |
| 450 | 18 | 132 | 172 | 462 | 299 | 598 | 505 | 333 | 666 | 600 [4] | 650 [5] |
| 500 | 20 | 132 | 172 | 487 | 324 | 648 | 531 | 359 | 717 | 600 [4] | 650 [5] |
| 600 | 24 | 132 | 172 | 537 | 365 | 730 | 583 | 411 | 821 | 600 [4] | 780 [5] |
| 700 | 28 | 132 | 172 | 598 | 430 | 860 | 685 | 512 | 1024 | 700 [4] | 910 [5] |
| 750 | 30 | 132 | 172 | 636 | 467 | 934 | 685 | 512 | 1024 | 750 [4] | 975 [5] |
| 800 | 32 | 132 | 172 | 655 | 486 | 972 | 706 | 534 | 1065 | 800 [4] | 1040 [5] |
| 900 | 36 | 132 | 172 | 705 | 536 | 1072 | 783 | 610 | 1218 | 900 [4] | 1170 [5] |

1) Depending on the cable entry used: values up to + 30 mm
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

### DN 1000 to 3000 (40 to 120")

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

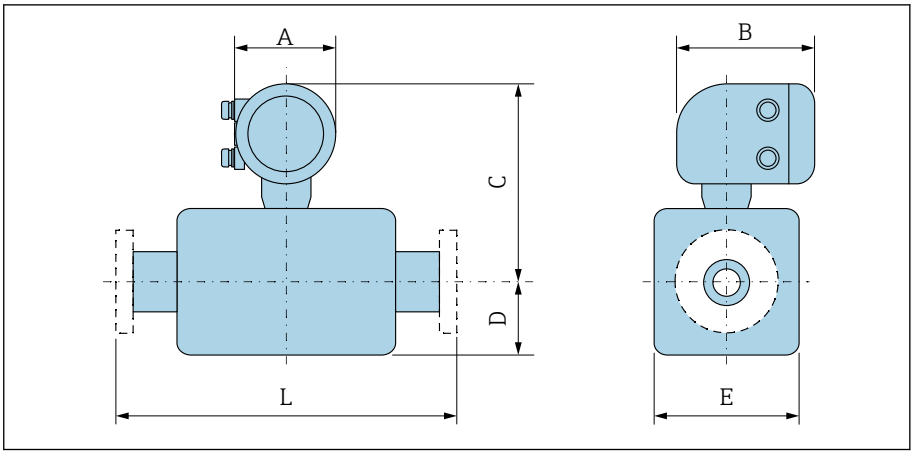


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| DN | | A [1] | B | C [2] | D [2] | E [2] | L [3] | |
|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | |
| 1000 | 40 | 139 | 178 | 759 | 582 | 1164 | 1000 [4] | 1300 [5] |
| – | 42 | 139 | 178 | 795 | 618 | 1236 | 1050 [4] | 1365 [5] |
| 1200 | 48 | 139 | 178 | 873 | 696 | 1392 | 1200 [4] | 1560 [5] |
| – | 54 | 139 | 178 | 986 | 809 | 1617 | 1350 [4] | 1755 [5] |
| 1400 | – | 139 | 178 | 986 | 809 | 1617 | 1400 [4] | 1820 [5] |
| – | 60 | 139 | 178 | 1086 | 909 | 1817 | 1500 [4] | 1950 [5] |
| 1600 | – | 139 | 178 | 1086 | 909 | 1817 | 1600 [4] | 2080 [5] |
| – | 66 | 139 | 178 | 1137 | 960 | 1919 | 1650 [4] | 2145 [5] |
| 1800 | 72 | 139 | 178 | 1193 | 1016 | 2032 | 1800 [4] | 2340 [5] |
| – | 78 | 139 | 178 | 1305 | 1127 | 2254 | 2000 [4] | 2600 [5] |
| 2000 | – | 139 | 178 | 1305 | 1127 | 2254 | 2000 [4] | 2600 [5] |
| – | 84 | 139 | 178 | 1405 | 1227 | 2454 | 2150 [4] | |
| 2200 | – | 139 | 178 | 1405 | 1227 | 2454 | 2200 [4] | |
| – | 90 | 139 | 178 | 1510 | 1227 | 2664 | 2300 [4] | |
| 2400 | – | 139 | 178 | 1510 | 1332 | 2664 | 2400 [4] | |
| – | 96 | 139 | 178 | 1609 | 1431 | 2861 | 2450 [4] | |
| – | 102 | 139 | 178 | 1694 | 1516 | 3032 | 2600 [4] | |
| 2600 | – | 139 | 178 | 1620 | 1442 | 2883 | 2600 [4] | |
| – | 108 | 139 | 178 | 1781 | 1602 | 3204 | 2750 [4] | |
| 2800 | – | 139 | 178 | 1725 | 1547 | 3093 | 2800 [4] | |
| – | 114 | 139 | 178 | 1866 | 1688 | 3375 | 2900 [4] | |
| 3000 | – | 139 | 178 | 1825 | 1647 | 3293 | 3000 [4] | |
| – | 120 | 139 | 178 | 1952 | 1774 | 3547 | 3050 [4] | |

1) Depending on the cable entry used: values up to + 30 mm
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

*Order code for "Housing", option M "Compact, polycarbonate"*

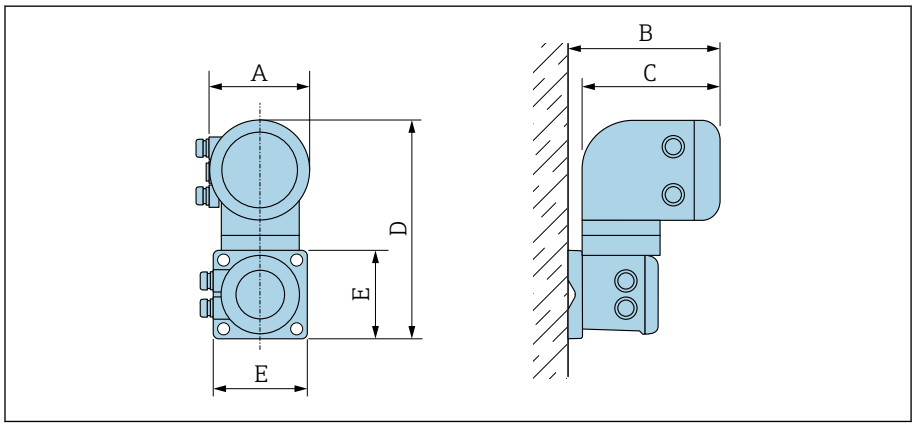



| DN | | A [1] | B | C [2] | D [2] | E [2] | L [3] | |
|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | |
| 1000 | 40 | 132 | 172 | 756 | 582 | 1164 | 1000 [4] | 1300 [5] |
| – | 42 | 132 | 172 | 792 | 618 | 1236 | 1050 [4] | 1365 [5] |
| 1200 | 48 | 132 | 172 | 870 | 696 | 1392 | 1200 [4] | 1560 [5] |
| – | 54 | 132 | 172 | 983 | 809 | 1617 | 1350 [4] | 1755 [5] |
| 1400 | – | 132 | 172 | 983 | 809 | 1617 | 1400 [4] | 1820 [5] |
| – | 60 | 132 | 172 | 1083 | 909 | 1817 | 1500 [4] | 1950 [5] |
| 1600 | – | 132 | 172 | 1083 | 909 | 1817 | 1600 [4] | 2080 [5] |
| – | 66 | 132 | 172 | 1134 | 960 | 1919 | 1650 | 2145 [5] |
| 1800 | 72 | 132 | 172 | 1190 | 1016 | 2032 | 1800 [4] | 2340 [5] |
| – | 78 | 132 | 172 | 1302 | 1127 | 2254 | 2000 [4] | 2600 [5] |
| 2000 | – | 132 | 172 | 1302 | 1127 | 2254 | 2000 [4] | 2600 [5] |
| – | 84 | 132 | 172 | 1402 | 1227 | 2454 | 2150 [4] | |
| 2200 | – | 132 | 172 | 1402 | 1227 | 2454 | 2200 [4] | |
| – | 90 | 132 | 172 | 1507 | 1227 | 2664 | 2300 [4] | |
| 2400 | – | 132 | 172 | 1507 | 1332 | 2664 | 2400 [4] | |
| – | 96 | 132 | 172 | 1606 | 1431 | 2861 | 2450 [4] | |
| – | 102 | 132 | 172 | 1691 | 1516 | 3032 | 2600 [4] | |
| 2600 | – | 132 | 172 | 1617 | 1442 | 2883 | 2600 [4] | |
| – | 108 | 132 | 172 | 1778 | 1602 | 3204 | 2750 [4] | |
| 2800 | – | 132 | 172 | 1722 | 1547 | 3093 | 2800 [4] | |
| – | 114 | 132 | 172 | 1863 | 1688 | 3375 | 2900 [4] | |
| 3000 | – | 132 | 172 | 1822 | 1647 | 3293 | 3000 [4] | |
| – | 120 | 132 | 172 | 1949 | 1774 | 3547 | 3050 [4] | |

1) Depending on the cable entry used: values up to + 30 mm
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

## Remote version

### Transmitter remote version

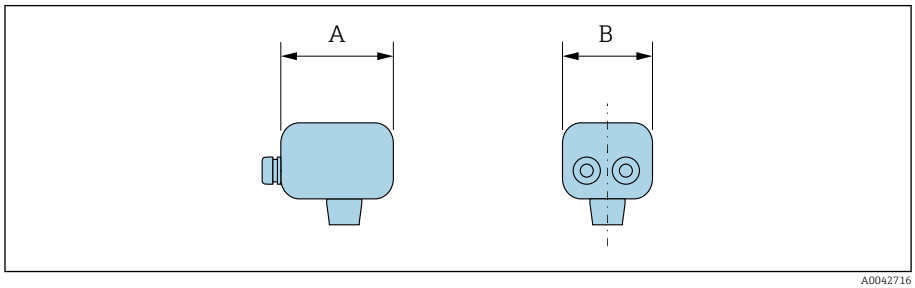



A0042715

| Order code for "Housing" | A [1] [mm] | B [mm] | C [mm] | D [mm] | E [mm] |
|---|---|---|---|---|---|
| Option N "Remote, polycarbonate" | 132 | 187 | 172 | 307 | 130 |
| Option P "Remote, aluminum, coated" | 139 | 185 | 178 | 309 | 130 |

1) Depending on the cable entry used: values up to + 30 mm

### Sensor connection housing




A0042716

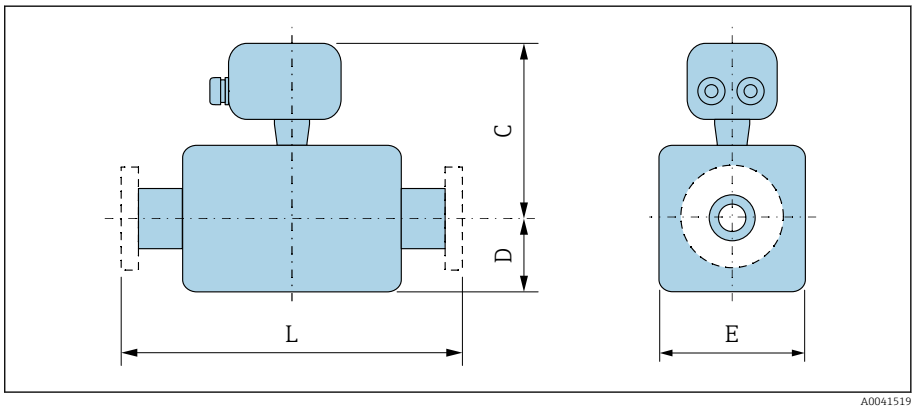
| Housing material | A [1] [mm] | B [mm] |
|---|---|---|
| Polycarbonate plastic [2] | 113 | 112 |
| Aluminum, coated | 148 | 136 |

1) Depending on the cable entry used: values up to + 30 mm
2) In conjunction with order code for "Sensor option", options CB, CC, CD, CE, C3

### DN 25 to 300 (1 to 12") aluminum half-shell housing

Sensor with aluminum half-shell housing.

Sensor connection housing: aluminum, AlSi10Mg, coated

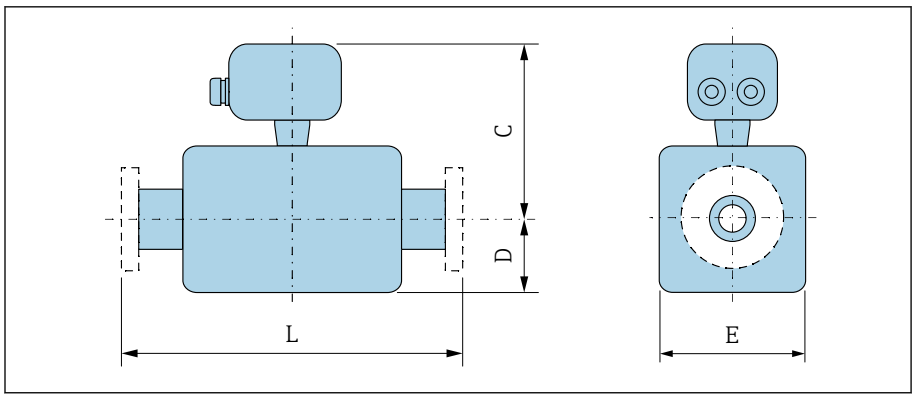



| DN | | Order code for "Design" Options D, E, H, I | | | |
|---|---|---|---|---|---|
| | | C [1] | D | E | L [2] |
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] |
| 25 | 1 | 197 | 84 | 120 | 200 |
| 32 | – | 197 | 84 | 120 | 200 |
| 40 | 1 ½ | 197 | 84 | 120 | 200 |
| 50 | 2 | 197 | 84 | 120 | 200 |
| 65 | – | 222 | 109 | 180 | 200 |
| 80 | 3 | 222 | 109 | 180 | 200 |
| 100 | 4 | 222 | 109 | 180 | 250 |
| 125 | – | 262 | 150 | 260 | 250 |
| 150 | 6 | 262 | 150 | 260 | 300 |
| 200 | 8 | 287 | 180 | 324 | 350 |
| 250 | 10 | 312 | 205 | 400 | 450 |
| 300 | 12 | 337 | 230 | 460 | 500 |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

### DN 25 to 300 (1 to 12") fully welded housing

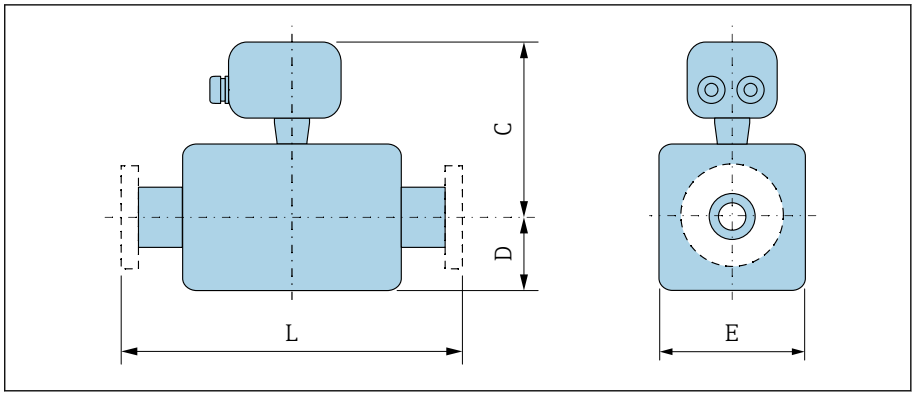
Sensor with fully welded carbon steel housing:
Order code for "Sensor option", options CB, CC, CD, CE, C3




| DN | | Order code for "Design" Options A, E | | | |
|---|---|---|---|---|---|
| | | C [1] | D [1] | E [1] | L [2] |
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] |
| 25 | 1 | 189 | 70 | 140 | 200 |
| 32 | – | 189 | 70 | 140 | 200 |
| 40 | 1 ½ | 189 | 70 | 140 | 200 |
| 50 | 2 | 189 | 70 | 140 | 200 |
| 65 | – | 202 | 82 | 165 | 200 |
| 80 | 3 | 207 | 87 | 175 | 200 |
| 100 | 4 | 219 | 100 | 200 | 250 |
| 125 | – | 232 | 113 | 226 | 250 |
| 150 | 6 | 254 | 134 | 269 | 300 |
| 200 | 8 | 279 | 160 | 320 | 350 |
| 250 | 10 | 313 | 193 | 387 | 450 |
| 300 | 12 | 338 | 218 | 437 | 500 |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

### DN 350 to 900 (14 to 36")

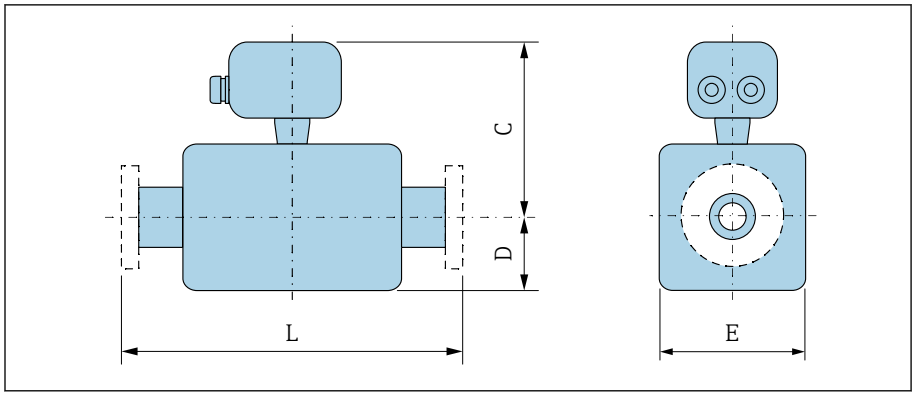



A0041519

| DN | | Order code for "Design" | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Options E, F | | | Option G | | | | |
| | | C [1] | D [1] | E [1] | C [1] | D [1] | E [1] | L [2] | |
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | |
| 350 | 14 | 395 | 245 | 490 | – | – | – | 550 | |
| 375 | 15 | 421 | 271 | 542 | – | – | – | 600 | |
| 400 | 16 | 421 | 271 | 542 | – | – | – | 600 | |
| 450 | 18 | 403 | 299 | 598 | 446 | 333 | 666 | 600 [3] | 650 [4] |
| 500 | 20 | 428 | 324 | 648 | 472 | 359 | 717 | 600 [3] | 650 [4] |
| 600 | 24 | 478 | 365 | 730 | 524 | 411 | 821 | 600 [3] | 780 [4] |
| 700 | 28 | 539 | 430 | 860 | 626 | 512 | 1024 | 700 [3] | 910 [4] |
| 750 | 30 | 577 | 467 | 934 | 626 | 512 | 1024 | 750 [3] | 975 [4] |
| 800 | 32 | 596 | 486 | 972 | 647 | 534 | 1065 | 800 [3] | 1040 [4] |
| 900 | 36 | 646 | 536 | 1072 | 724 | 610 | 1218 | 900 [3] | 1170 [4] |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
3) Order code for "Design", option F "Fixed flange, short installed length"
4) Order code for "Design", option G "Fixed flange, long installed length"

### DN 1000 to 3000 (40 to 120")




| DN | | C [1] | D [1] | E [1] | L [2] | |
|---|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] | |
| 1000 | 40 | 698 | 582 | 1164 | 1000 [3] | 1300 [4] |
| – | 42 | 734 | 618 | 1236 | 1050 [3] | 1365 [4] |
| 1200 | 48 | 812 | 696 | 1392 | 1200 [3] | 1560 [4] |
| – | 54 | 925 | 809 | 1617 | 1350 [3] | 1755 [4] |
| 1400 | – | 925 | 809 | 1617 | 1400 [3] | 1820 [4] |
| – | 60 | 1025 | 909 | 1817 | 1500 [3] | 1950 [4] |
| 1600 | – | 1025 | 909 | 1817 | 1600 [3] | 2080 [4] |
| – | 66 | 1076 | 960 | 1919 | 1650 [3] | 2145 [4] |
| 1800 | 72 | 1132 | 1016 | 2032 | 1800 [3] | 2340 [4] |
| – | 78 | 1244 | 1127 | 2254 | 2000 [3] | 2600 [4] |
| 2000 | – | 1244 | 1127 | 2254 | 2000 [3] | 2600 [4] |
| – | 84 | 1344 | 1227 | 2454 | 2150 [3] | |
| 2200 | – | 1344 | 1227 | 2454 | 2200 [3] | |
| – | 90 | 1449 | 1227 | 2664 | 2300 [3] | |
| 2400 | – | 1449 | 1332 | 2664 | 2400 [3] | |
| – | 96 | 1548 | 1431 | 2861 | 2450 [3] | |
| – | 102 | 1633 | 1516 | 3032 | 2600 [3] | |
| 2600 | – | 1559 | 1442 | 2883 | 2600 [3] | |
| – | 108 | 1720 | 1602 | 3204 | 2750 [3] | |
| 2800 | – | 1664 | 1547 | 3093 | 2800 [3] | |
| – | 114 | 1805 | 1688 | 3375 | 2900 [3] | |
| 3000 | – | 1764 | 1647 | 3293 | 3000 [3] | |
| – | 120 | 1891 | 1774 | 3547 | 3050 [3] | |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
3) Order code for "Design", option F "Fixed flange, short installed length"
4) Order code for "Design", option G "Fixed flange, long installed length"

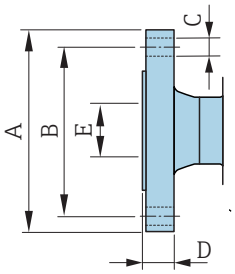
## Fixed flange

### Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10

- Carbon steel: order code for "Process connection", option D2K
- Stainless steel: order code for "Process connection", option D2S

Surface roughness: EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66



A0041915

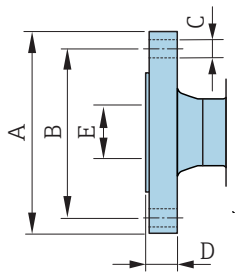
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 200 | 340 | 295 | 8 × Ø22 | 26 |
| 250 | 395 | 350 | 12 × Ø22 | 28 |
| 300 | 445 | 400 | 12 × Ø22 | 28 |
| 350 | 505 | 460 | 16 × Ø22 | 26 |
| 400 | 565 | 515 | 16 × Ø26 | 26 |
| 450 | 615 | 565 | 20 × Ø26 | 26 |
| 500 | 670 | 620 | 20 × Ø26 | 28 |
| 600 | 780 | 725 | 20 × Ø30 | 30 |
| 700 | 895 | 840 | 24 × Ø30 | 35 |
| 800 | 1 015 | 950 | 24 × Ø33 | 38 |
| 900 | 1 115 | 1 050 | 28 × Ø33 | 38 |
| 1000 | 1 230 | 1 160 | 28 × Ø36 | 44 |
| 1200 | 1 455 | 1 380 | 32 × Ø39 | 55 |
| 1400 | 1 675 | 1 590 | 36 × Ø42 | 65 |
| 1600 | 1 915 | 1 820 | 40 × Ø48 | 75 |
| 1800 | 2 115 | 2 020 | 44 × Ø48 | 85 |
| 2000 | 2 325 | 2 230 | 48 × Ø48 | 90 |
| 2200 | 2 550 | 2 440 | 52 × Ø56 | 100 |
| 2400 | 2 760 | 2 650 | 56 × Ø56 | 110 |
| 2600 | 2 960 | 2 850 | 60 × Ø56 | 110 |
| 2800 | 3 180 | 3 070 | 64 × Ø56 | 124 |
| 3000 | 3 405 | 3 290 | 68 × Ø62 | 132 |

### Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16

- Carbon steel: order code for "Process connection", option D3K
- Stainless steel: order code for "Process connection", option D3S

Surface roughness: EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66



A0041915

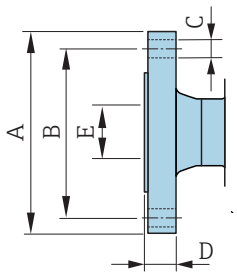
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 65 | 185 | 145 | 8 × Ø18 | 20 |
| 80 | 200 | 160 | 8 × Ø18 | 20 |
| 100 | 220 | 180 | 8 × Ø18 | 22 |
| 125 | 250 | 210 | 8 × Ø18 | 24 |
| 150 | 285 | 240 | 8 × Ø22 | 24 |
| 200 | 340 | 295 | 12 × Ø22 | 26 |
| 250 | 405 | 355 | 12 × Ø26 | 32 |
| 300 | 460 | 410 | 12 × Ø26 | 32 |
| 350 | 520 | 470 | 16 × Ø26 | 30 |
| 400 | 580 | 525 | 16 × Ø30 | 32 |
| 450 | 640 | 585 | 20 × Ø30 | 34 |
| 500 | 715 | 650 | 20 × Ø33 | 36 |
| 600 | 840 | 770 | 20 × Ø36 | 40 |
| 700 | 910 | 840 | 24 × Ø36 | 40 |
| 800 | 1025 | 950 | 24 × Ø39 | 41 |
| 900 | 1125 | 1050 | 28 × Ø39 | 48 |
| 1000 | 1255 | 1170 | 28 × Ø42 | 59 |
| 1200 | 1485 | 1390 | 32 × Ø48 | 78 |
| 1400 | 1685 | 1590 | 36 × Ø48 | 84 |
| 1600 | 1930 | 1820 | 40 × Ø56 | 102 |
| 1800 | 2130 | 2020 | 44 × Ø56 | 110 |
| 2000 | 2345 | 2230 | 48 × Ø62 | 124 |

### Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 25

- Carbon steel: order code for "Process connection", option D4K
- Stainless steel: order code for "Process connection", option D4S

Surface roughness: EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66



A0041915

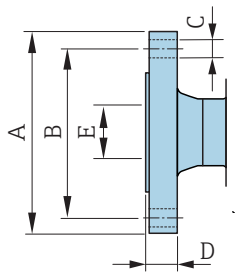
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 200 | 360 | 310 | 12 × Ø26 | 32 |
| 250 | 425 | 370 | 12 × Ø30 | 36 |
| 300 | 485 | 430 | 16 × Ø30 | 40 |
| 350 | 555 | 490 | 16 × Ø33 | 38 |
| 400 | 620 | 550 | 16 × Ø36 | 40 |
| 450 | 670 | 600 | 20 × Ø36 | 46 |
| 500 | 730 | 660 | 20 × Ø36 | 48 |
| 600 | 845 | 770 | 20 × Ø39 | 48 |
| 700 | 960 | 875 | 24 × Ø42 | 50 |
| 800 | 1085 | 990 | 24 × Ø48 | 53 |
| 900 | 1185 | 1090 | 28 × Ø48 | 57 |
| 1000 | 1320 | 1210 | 28 × Ø56 | 63 |

### Flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 40

- Carbon steel: order code for "Process connection", option D5K
- Stainless steel: order code for "Process connection", option D5S

Surface roughness: EN 1092-1 Form B1 (DIN 2526 Form C), Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66.



A0041915

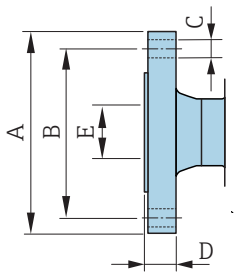
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 25 | 115 | 85 | 4 × Ø14 | 16 |
| 32 | 140 | 100 | 4 × Ø18 | 18 |
| 40 | 150 | 110 | 4 × Ø18 | 18 |
| 50 | 165 | 125 | 4 × Ø18 | 20 |
| 65 | 185 | 145 | 8 × Ø18 | 24 |
| 80 | 200 | 160 | 8 × Ø18 | 26 |
| 100 | 235 | 190 | 8 × Ø22 | 26 |
| 125 | 270 | 220 | 8 × Ø26 | 28 |
| 150 | 300 | 250 | 8 × Ø26 | 30 |

### Flange according to ASME B16.5, Class 150

- Carbon steel: order code for "Process connection", option A1K
- Stainless steel: order code for "Process connection", option A1S

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66




A0041915

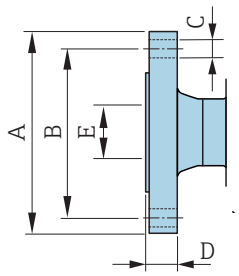
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 25 | 108 | 79.2 | 4 × Ø16 | 12.6 |
| 40 | 127 | 98.6 | 4 × Ø16 | 15.9 |
| 50 | 152.4 | 120.7 | 4 × Ø19.1 | 17.5 |
| 80 | 190.5 | 152.4 | 4 × Ø19.1 | 22.3 |
| 100 | 228.6 | 190.5 | 8 × Ø19.1 | 22.3 |
| 150 | 279.4 | 241.3 | 8 × Ø22.4 | 23.8 |
| 200 | 342.9 | 298.5 | 8 × Ø22.4 | 26.8 |
| 250 | 406.4 | 362 | 12 × Ø25.4 | 29.6 |
| 300 | 482.6 | 431.8 | 12 × Ø25.4 | 30.2 |
| 350 | 535 | 476.3 | 12 × Ø28.6 | 35.4 |
| 400 | 595 | 539.8 | 16 × Ø28.6 | 37 |
| 450 | 635 | 577.9 | 16 × Ø31.8 | 40.1 |
| 500 | 700 | 635 | 20 × Ø31.8 | 43.3 |
| 600 | 815 | 749.3 | 20 × Ø34.9 | 48.1 |

### Flange according to ASME B16.5, Class 300

- Carbon steel: order code for "Process connection", option A2K
- Stainless steel: order code for "Process connection", option A2S

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66




A0041915

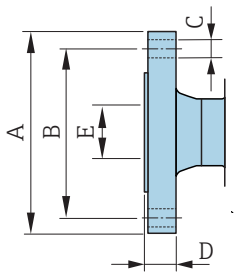
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 25 | 123.9 | 88.9 | 4 × Ø19.1 | 15.9 |
| 40 | 155.4 | 114.3 | 4 × Ø22.4 | 19 |
| 50 | 165.1 | 127 | 8 × Ø19.1 | 20.8 |
| 80 | 209.6 | 168.1 | 8 × Ø22.4 | 26.8 |
| 100 | 254 | 200.2 | 8 × Ø22.4 | 30.2 |
| 150 | 317.5 | 269.7 | 12 × Ø22.4 | 35 |

### Flange according to JIS B2220, 10K

- Carbon steel: order code for "Process connection", option N3K
- Stainless steel: order code for "Process connection", option N3S

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66




A0041915

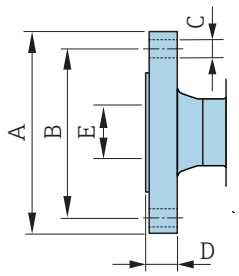
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 50 | 155 | 120 | 4 × Ø19 | 16 |
| 65 | 175 | 140 | 4 × Ø19 | 18 |
| 80 | 185 | 150 | 8 × Ø19 | 18 |
| 100 | 210 | 175 | 8 × Ø19 | 18 |
| 125 | 250 | 210 | 8 × Ø23 | 20 |
| 150 | 280 | 240 | 8 × Ø23 | 22 |
| 200 | 330 | 290 | 12 × Ø23 | 22 |
| 250 | 400 | 355 | 12 × Ø25 | 24 |
| 300 | 445 | 400 | 16 × Ø25 | 24 |

### Flange according to JIS B2220, 20K

- Carbon steel: order code for "Process connection", option N4K
- Stainless steel: order code for "Process connection", option N4S

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66



A0041915

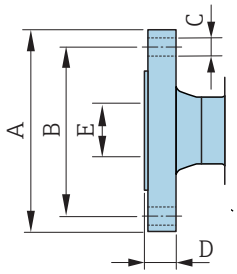
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 25 | 125 | 90 | 4 × Ø19 | 16 |
| 32 | 135 | 100 | 4 × Ø19 | 18 |
| 40 | 140 | 105 | 4 × Ø19 | 18 |
| 50 | 155 | 120 | 8 × Ø19 | 18 |
| 65 | 175 | 140 | 8 × Ø19 | 20 |
| 80 | 200 | 160 | 8 × Ø23 | 22 |
| 100 | 225 | 185 | 8 × Ø23 | 24 |
| 125 | 270 | 225 | 8 × Ø25 | 26 |
| 150 | 305 | 260 | 12 × Ø25 | 28 |
| 200 | 350 | 305 | 12 × Ø25 | 30 |
| 250 | 430 | 380 | 12 × Ø27 | 34 |
| 300 | 480 | 430 | 16 × Ø27 | 36 |

### Flange according to AWWA, Class D

Order code for "Process connection", option W1K

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66




A0041915

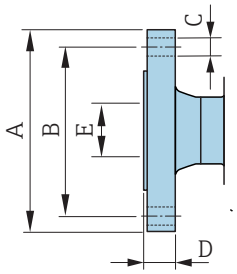
| DN | | A | B | C | D |
|---|---|---|---|---|---|
| [mm] | [in] | [mm] | [mm] | [mm] | [mm] |
| 700 | 28 | 927 | 863.6 | 28 × Ø35 | 33.4 |
| 750 | 30 | 984 | 914.4 | 28 × Ø35 | 35 |
| 800 | 32 | 1060 | 977.9 | 28 × Ø42 | 38.1 |
| 900 | 36 | 1168 | 1085.9 | 32 × Ø42 | 41.3 |
| 1000 | 40 | 1289 | 1200.2 | 36 × Ø42 | 41.3 |
| – | 42 | 1346 | 1257.3 | 36 × Ø42 | 44.5 |
| 1200 | 48 | 1511 | 1422.4 | 44 × Ø42 | 47.7 |
| – | 54 | 1683 | 1593.9 | 44 × Ø48 | 54 |
| – | 60 | 1855 | 1759 | 52 × Ø48 | 57.2 |
| – | 66 | 2032 | 1930.4 | 52 × Ø48 | 63.5 |
| 1800 | 72 | 2197 | 2095.5 | 60 × Ø48 | 66.7 |
| – | 78 | 2362 | 2260.6 | 64 × Ø54 | 69.9 |
| – | 84 | 2535 | 2425.7 | 64 × Ø54 | 73.1 |
| – | 90 | 2705 | 2717.8 | 68 × Ø60 | 76.2 |
| – | 96 | 2877 | 2755.9 | 68 × Ø60.3 | 82.55 |
| – | 102 | 3048 | 2908.3 | 68 × Ø66.7 | 82.55 |
| – | 108 | 3219 | 3067.0 | 68 × Ø66.7 | 85.73 |
| – | 114 | 3391 | 3219.5 | 68 × Ø73 | 88.90 |
| – | 120 | 3562 | 3371.8 | 68 × Ø73 | 88.90 |

### Flange according to AS 2129, Tab. E

Order code for "Process connection", option M2K

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66.




A0041915

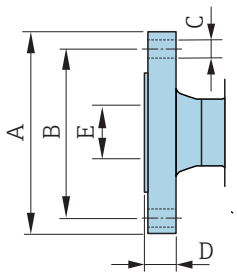
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 80 | 185 | 146 | 4 × Ø18 | 12 |
| 100 | 215 | 178 | 8 × Ø18 | 13 |
| 150 | 280 | 235 | 8 × Ø22 | 17 |
| 200 | 335 | 292 | 8 × Ø22 | 19 |
| 250 | 405 | 356 | 12 × Ø22 | 22 |
| 300 | 455 | 406 | 12 × Ø26 | 25 |
| 350 | 525 | 470 | 12 × Ø26 | 30 |
| 400 | 580 | 521 | 12 × Ø26 | 32 |
| 450 | 640 | 584 | 16 × Ø26 | 35 |
| 500 | 705 | 641 | 16 × Ø26 | 38 |
| 600 | 825 | 756 | 16 × Ø33 | 48 |
| 700 | 910 | 845 | 20 × Ø33 | 51 |
| 750 | 995 | 927 | 20 × Ø36 | 54 |
| 800 | 1060 | 984 | 20 × Ø36 | 54 |
| 900 | 1175 | 1092 | 24 × Ø36 | 64 |
| 1000 | 1255 | 1175 | 24 × Ø39 | 67 |
| 1200 | 1490 | 1410 | 32 × Ø39 | 79 |

### Flange according to AS 4087, PN 16

Order code for "Process connection", option M3K

Surface roughness: Ra 6.3 to 12.5 µm

E: Internal diameter depends on the liner → 66




A0041915

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] |
|---|---|---|---|---|
| 80 | 185 | 146 | 4 × Ø18 | 12 |
| 100 | 215 | 178 | 4 × Ø18 | 13 |
| 150 | 280 | 235 | 8 × Ø18 | 13 |
| 200 | 335 | 292 | 8 × Ø18 | 19 |
| 250 | 405 | 356 | 8 × Ø22 | 19 |
| 300 | 455 | 406 | 12 × Ø22 | 23 |
| 350 | 525 | 470 | 12 × Ø26 | 30 |
| 375 | 550 | 495 | 12 × Ø26 | 30 |
| 400 | 580 | 521 | 12 × Ø26 | 32 |
| 450 | 640 | 584 | 12 × Ø26 | 30 |
| 500 | 705 | 641 | 16 × Ø26 | 38 |
| 600 | 825 | 756 | 16 × Ø30 | 48 |
| 700 | 910 | 845 | 20 × Ø30 | 56 |
| 750 | 995 | 927 | 20 × Ø33 | 56 |
| 800 | 1060 | 984 | 20 × Ø36 | 56 |
| 900 | 1175 | 1092 | 24 × Ø36 | 66 |
| 1000 | 1255 | 1175 | 24 × Ø36 | 66 |
| 1200 | 1490 | 1410 | 32 × Ø36 | 76 |

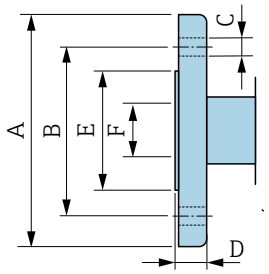
## Lap joint flange

### Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10

- Carbon steel: order code for "Process connection", option D22
- Stainless steel: order code for "Process connection", option D24

Surface roughness (flange): Ra 6.3 to 12.5 µm

F: Internal diameter depends on the liner → 66




A0042254

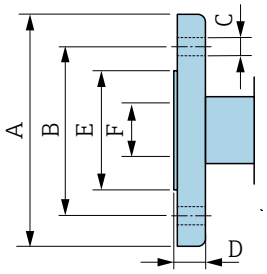
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] |
|---|---|---|---|---|---|
| 200 | 340 | 295 | 8 × Ø22 | 24 | 264 |
| 250 | 395 | 350 | 12 × Ø22 | 26 | 317 |
| 300 | 445 | 400 | 12 × Ø22 | 26 | 367 |

### Lap joint flange in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 16

- Carbon steel: order code for "Process connection", option D32
- Stainless steel: order code for "Process connection", option D34

Surface roughness (flange): Ra 6.3 to 12.5 µm

F: Internal diameter depends on the liner → 66



A0042254

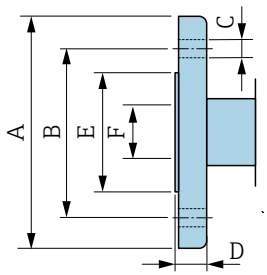
| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] |
|---|---|---|---|---|---|
| 25 | 115 | 85 | 4 × Ø14 | 16 | 49 |
| 32 | 140 | 100 | 4 × Ø18 | 18 | 65 |
| 40 | 150 | 110 | 4 × Ø18 | 18 | 71 |
| 50 | 165 | 125 | 4 × Ø18 | 20 | 88 |
| 65 | 185 | 145 | 8 × Ø18 | 20 | 103 |
| 80 | 200 | 160 | 8 × Ø18 | 20 | 120 |
| 100 | 220 | 180 | 8 × Ø18 | 22 | 148 |
| 125 | 250 | 210 | 8 × Ø18 | 22 | 177 |
| 150 | 285 | 240 | 8 × Ø22 | 24 | 209 |
| 200 | 340 | 295 | 12 × Ø22 | 26 | 264 |
| 250 | 405 | 355 | 12 × Ø26 | 29 | 317 |
| 300 | 460 | 410 | 12 × Ø26 | 32 | 367 |

### Lap joint flange according to ASME B16.5, Class 150

- Carbon steel: order code for "Process connection", option A12
- Stainless steel: order code for "Process connection", option A14

Surface roughness (flange): Ra 6.3 to 12.5 µm

F: Internal diameter depends on the liner → 66




A0042254

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] |
|---|---|---|---|---|---|
| 25 | 110 | 80 | 4 × Ø16 | 14 | 49 |
| 40 | 125 | 98 | 4 × Ø16 | 17.5 | 71 |
| 50 | 150 | 121 | 4 × Ø19 | 19 | 88 |
| 80 | 190 | 152 | 4 × Ø19 | 24 | 120 |
| 100 | 230 | 190 | 8 × Ø19 | 24 | 148 |
| 150 | 280 | 241 | 8 × Ø23 | 25 | 209 |
| 200 | 345 | 298 | 8 × Ø23 | 29 | 264 |
| 250 | 405 | 362 | 12 × Ø25 | 30 | 317 |
| 300 | 485 | 432 | 12 × Ø25 | 32 | 378 |

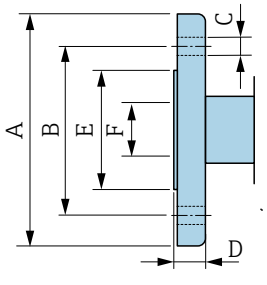
## Lap joint flange, stamped plate

### Lap joint flange, stamped plate in accordance with EN 1092-1 (DIN 2501 / DIN 2512N): PN 10

- Carbon steel: order code for "Process connection", option D21
- Stainless steel: order code for "Process connection", option D23

Surface roughness (flange): Ra 6.3 to 12.5 µm

F: Internal diameter depends on the liner → 66

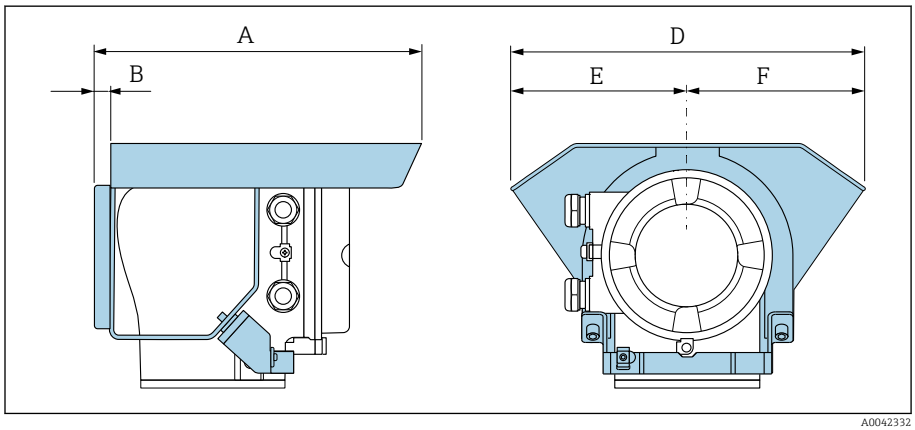


A0042254

| DN [mm] | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] |
|---|---|---|---|---|---|
| 25 | 115 | 85 | 4 x Ø13.5 | 16.5 | 49 |
| 32 | 140 | 100 | 4 x Ø17.5 | 17 | 65 |
| 40 | 150 | 110 | 4 x Ø17.5 | 16.5 | 71 |
| 50 | 165 | 125 | 4 x Ø17.5 | 18.5 | 88 |
| 65 | 185 | 145 | 4 x Ø17.5 | 20 | 103 |
| 80 | 200 | 160 | 8 x Ø17.5 | 23.5 | 120 |
| 100 | 220 | 180 | 8 x Ø17.5 | 24.5 | 148 |
| 125 | 250 | 210 | 8 x Ø17.5 | 24 | 177 |
| 150 | 285 | 240 | 8 x Ø21.5 | 25 | 209 |
| 200 | 340 | 295 | 8 x Ø21.5 | 27.5 | 264 |
| 250 | 405 | 350 | 12 x Ø21.5 | 30.5 | 317 |
| 300 | 445 | 400 | 12 x Ø21.5 | 34.5 | 367 |

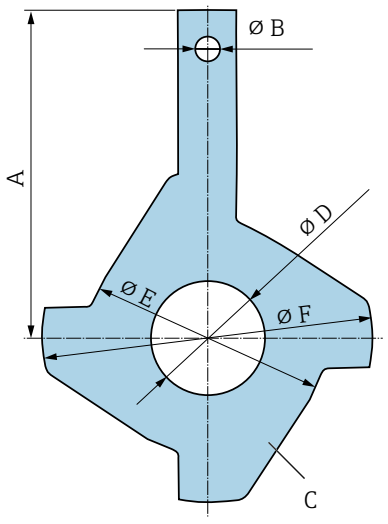
## Accessories

### Protective cover



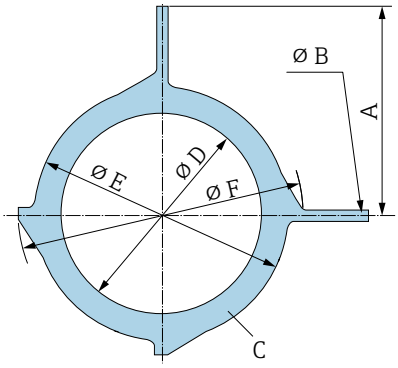

| A [mm] | B [mm] | D [mm] | E [mm] | F [mm] |
|---|---|---|---|---|
| 257 | 12 | 280 | 140 | 140 |

### Ground disks for flanges

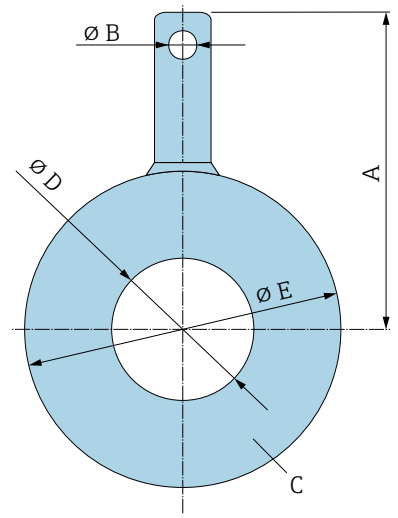



| DN 15 to 300 (½ to 12") | DN | | Pressure rating | A | B | C [1] | D | E | F |
|---|---|---|---|---|---|---|---|---|---|
| | [mm] | [in] | | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
| | 25 | 1" | [2]. | 87.5 | 6.5 | 2 | 26 | 62 | 77.5 |
| | 32 | 1 ¼" | [2] | 94.5 | 6.5 | 2 | 35 | 80 | 87.5 |
| | 40 | 1 ½" | [2] | 103 | 6.5 | 2 | 41 | 82 | 101 |
| | 50 | 2" | [2] | 108 | 6.5 | 2 | 52 | 101 | 115.5 |
| | 65 | 2 ½" | [2] | 118 | 6.5 | 2 | 68 | 121 | 131.5 |
| | 80 | 3" | [2] | 135 | 6.5 | 2 | 80 | 131 | 154.5 |
| | 100 | 4" | [2] | 153 | 6.5 | 2 | 104 | 156 | 186.5 |
| | 125 | 5" | [2] | 160 | 6.5 | 2 | 130 | 187 | 206.5 |
| | 150 | 6" | [2] | 184 | 6.5 | 2 | 158 | 217 | 256 |
| | 200 | 8" | [2] | 205 | 6.5 | 2 | 206 | 267 | 288 |
| | 250 | 10" | [2] | 240 | 6.5 | 2 | 260 | 328 | 359 |
| | 300 | 12" | PN 10<br>PN 16<br>Cl. 150 | 273 | 6.5 | 2 | 312 | 375 | 413 |

1) Material thickness
2) In the case of DN 25 to 250, ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version.

| DN 300 to 600 (12 to 24") | DN | | Rating | A | B | C [1] | D | E | F |
|---|---|---|---|---|---|---|---|---|---|
| | [mm] | [in] | | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] |
|  A0042323 | 300 | 12" | PN 25<br>JIS 10K<br>JIS 20K | 268 | 9 | 2 | 310 | 375 | 404 |
| | 350 | 14" | PN 6<br>PN 10<br>PN 16 | 365 | 9 | 2 | 343 | 420 | 479 |
| | 375 | 15" | PN 16 | 395 | 9 | 2 | 393 | 461 | 523 |
| | 400 | 16" | PN 6<br>PN 10<br>PN 16 | 395 | 9 | 2 | 393 | 470 | 542 |
| | 450 | 18" | PN 6<br>PN 10<br>PN 16 | 417 | 9 | 2 | 439 | 525 | 583 |
| | 500 | 20" | PN 6<br>PN 10<br>PN 16 | 460 | 9 | 2 | 493 | 575 | 650 |
| | 600 | 24" | PN 6<br>PN 10<br>PN 16 | 522 | 9 | 2 | 593 | 676 | 766 |

1) Material thickness

| DN 700 to 1200 (28 to 48") | DN | | Rating | A | B | C [1] | D | E |
|---|---|---|---|---|---|---|---|---|
| | [mm] | [inch] | | [mm] | [mm] | [mm] | [mm] | [mm] |
|  A0042324 | 700 | 28" | PN 6<br>PN10<br>PN16<br>Cl, D | 18.11<br>18.9<br>19.29<br>19.45 | 6.4 | 2 | 697<br>693<br>687<br>693 | 786<br>813<br>807<br>832 |
| | 750 | 30" | Cl, D | 20.59 | 6.4 | 2 | 743 | 833 |
| | 800 | 32" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 520<br>540<br>550<br>561 | 6.4 | 2 | 799<br>795<br>789<br>795 | 893<br>920<br>914<br>940 |
| | 900 | 36" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 570<br>590<br>595<br>615 | 6.4 | 2 | 897<br>893<br>886<br>893 | 993<br>1020<br>1014<br>1048 |
| | 1000 | 40" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 620<br>650<br>660<br>675 | 6.4 | 2 | 999<br>995<br>988<br>995 | 1093<br>1127<br>1131<br>1163 |
| | – | 42" | PN 6 | 704 | 6.4 | 2 | 1044<br>1044 | 1220 |
| | 1200 | 48" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 733<br>760<br>786<br>775 | 6.4 | 2 | 1203<br>1196<br>1196<br>1188 | 1310<br>1344<br>1385<br>1345 |

1) Material thickness

# Dimensions in US units

**Compact version** 102
DN 25 to 300 (1 to 12") 102
DN 350 to 900 (14 to 36") 104
DN 1000 to 3000 (40 to 120") 106

**Remote version** 108
Transmitter remote version 108
Sensor connection housing 108
DN 25 to 300 (1 to 12") aluminum half-shell housing 109
DN 25 to 300 (1 to 12") fully welded housing 110
DN 350 to 900 (14 to 36") 111
DN 1000 to 3000 (40 to 120") 112

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Flange according to ASME B16.5, Class 300 113
Flange according to AWWA, Cl. D 114

**Lap joint flange** 115
Lap joint flange according to ASME B16.5, Class 150 115

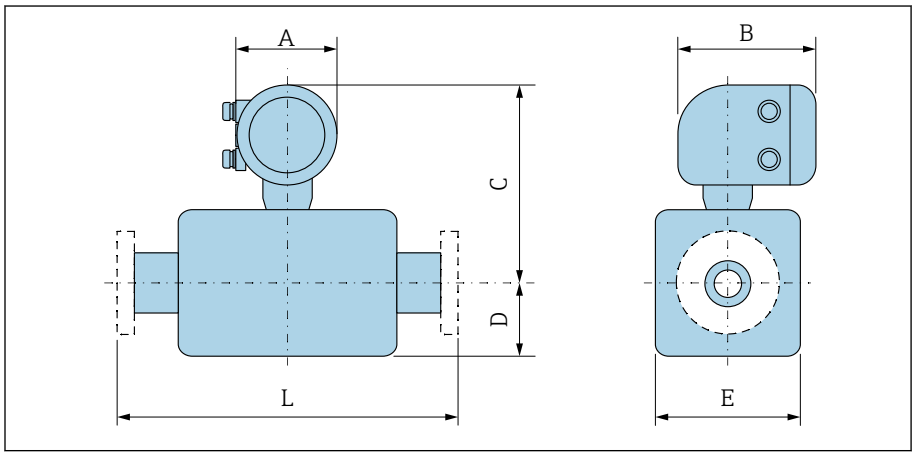
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## Compact version

### DN 25 to 300 (1 to 12")

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

Sensor with aluminum half-shell housing

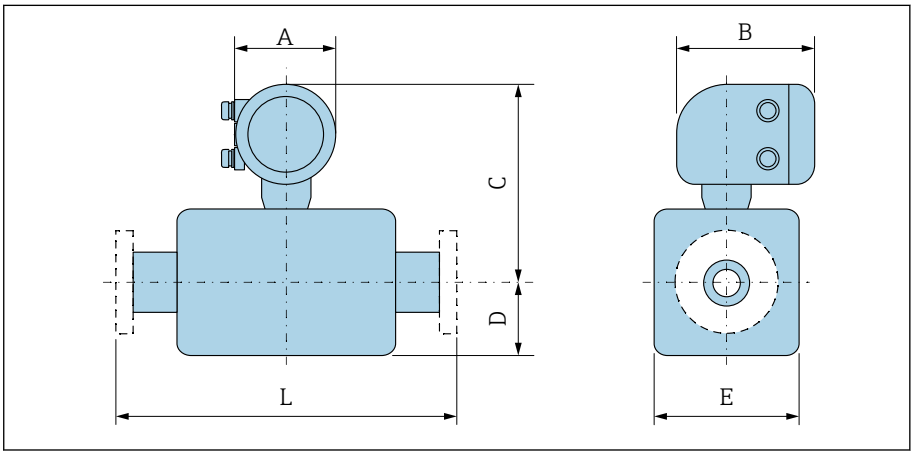



| DN | | A [1] | B | Order code for "Design" Options D, E, H, I C [2] | D [2] | E [2] | L [3] |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| 25 | 1 | 5.47 | 7.01 | 10.16 | 3.31 | 4.72 | 7.87 |
| 32 | – | 5.47 | 7.01 | 10.16 | 3.31 | 4.72 | 7.87 |
| 40 | 1 ½ | 5.47 | 7.01 | 10.16 | 3.31 | 4.72 | 7.87 |
| 50 | 2 | 5.47 | 7.01 | 10.16 | 3.31 | 4.72 | 7.87 |
| 65 | – | 5.47 | 7.01 | 11.14 | 4.29 | 7.09 | 7.87 |
| 80 | 3 | 5.47 | 7.01 | 11.14 | 4.29 | 7.09 | 7.87 |
| 100 | 4 | 5.47 | 7.01 | 11.14 | 4.29 | 7.09 | 9.84 |
| 125 | – | 5.47 | 7.01 | 12.72 | 5.91 | 10.24 | 9.84 |
| 150 | 6 | 5.47 | 7.01 | 12.72 | 5.91 | 10.24 | 11.81 |
| 200 | 8 | 5.47 | 7.01 | 13.7 | 7.09 | 12.76 | 13.78 |
| 250 | 10 | 5.47 | 7.01 | 14.69 | 8.07 | 15.75 | 17.72 |
| 300 | 12 | 5.47 | 7.01 | 15.67 | 9.06 | 18.11 | 19.69 |

1) Depending on the cable entry used: values up to +1.18 in
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

*Order code for "Housing", option M "Compact, polycarbonate"*

Sensor with aluminum half-shell housing



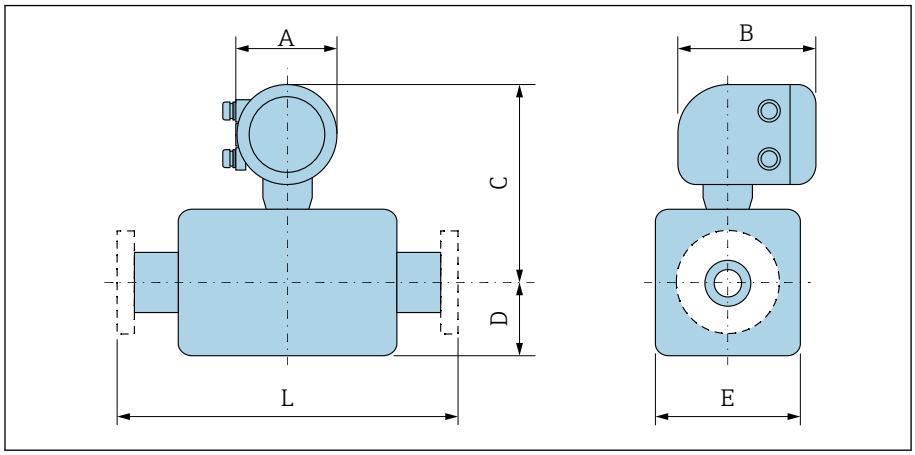

A0042708

| DN | | A [1] | B | Order code for "Design" Options D, E, H, I C [2] | D [2] | E [2] | L [3] |
|---|---|---|---|---|---|---|---|
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] |
| 25 | 1 | 5.2 | 6.77 | 10.04 | 3.31 | 4.72 | 7.87 |
| 32 | – | 5.2 | 6.77 | 10.04 | 3.31 | 4.72 | 7.87 |
| 40 | 1 ½ | 5.2 | 6.77 | 10.04 | 3.31 | 4.72 | 7.87 |
| 50 | 2 | 5.2 | 6.77 | 10.04 | 3.31 | 4.72 | 7.87 |
| 65 | – | 5.2 | 6.77 | 11.02 | 4.29 | 7.09 | 7.87 |
| 80 | 3 | 5.2 | 6.77 | 11.02 | 4.29 | 7.09 | 7.87 |
| 100 | 4 | 5.2 | 6.77 | 11.02 | 4.29 | 7.09 | 9.84 |
| 125 | – | 5.2 | 6.77 | 12.6 | 5.91 | 10.24 | 9.84 |
| 150 | 6 | 5.2 | 6.77 | 12.6 | 5.91 | 10.24 | 11.81 |
| 200 | 8 | 5.2 | 6.77 | 13.58 | 7.09 | 12.76 | 13.78 |
| 250 | 10 | 5.2 | 6.77 | 14.57 | 8.07 | 15.75 | 17.72 |
| 300 | 12 | 5.2 | 6.77 | 15.55 | 9.06 | 18.11 | 19.69 |

1) Depending on the cable entry used: values up to +1.18 in
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

## DN 350 to 900 (14 to 36")

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

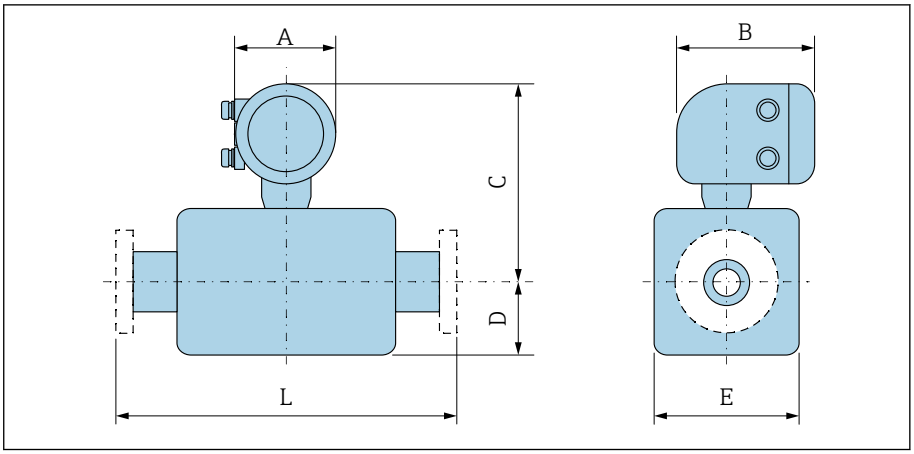



A0042708

| DN | | A [1] | B | Order code for "Design" | | | | | | L [3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Options E, F | | | Option G | | | | |
| | | | | C [2] | D [2] | E [2] | C [2] | D [2] | E [2] | | |
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | |
| 350 | 14 | 5.47 | 7.01 | 17.99 | 9.65 | 19.29 | – | – | – | 21.65 | |
| 375 | 15 | 5.47 | 7.01 | 19.02 | 10.67 | 21.34 | – | – | – | 23.62 | |
| 400 | 16 | 5.47 | 7.01 | 19.02 | 10.67 | 21.34 | – | – | – | 23.62 | |
| 450 | 18 | 5.47 | 7.01 | 18.31 | 11.77 | 23.54 | 20 | 13.11 | 26.22 | 23.62 [4] | 25.59 [5] |
| 500 | 20 | 5.47 | 7.01 | 19.29 | 12.76 | 25.51 | 21.02 | 14.13 | 28.23 | 23.62 | 25.59 |
| 600 | 24 | 5.47 | 7.01 | 21.26 | 14.37 | 28.74 | 23.07 | 16.18 | 32.32 | 23.62 | 30.71 |
| 700 | 28 | 5.47 | 7.01 | 23.66 | 16.93 | 33.86 | 27.09 | 20.16 | 40.31 | 27.56 | 35.83 |
| 750 | 30 | 5.47 | 7.01 | 25.16 | 18.39 | 36.77 | 27.09 | 20.16 | 40.31 | 29.53 | 38.39 |
| 800 | 32 | 5.47 | 7.01 | 25.91 | 19.13 | 38.27 | 27.91 | 21.02 | 41.93 | 31.5 | 40.94 |
| 900 | 36 | 5.47 | 7.01 | 27.87 | 21.1 | 42.2 | 30.94 | 24.02 | 47.95 | 35.43 | 46.06 |

1) Depending on the cable entry used: values up to +1.18 in
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

*Order code for "Housing", option M "Compact, polycarbonate"*

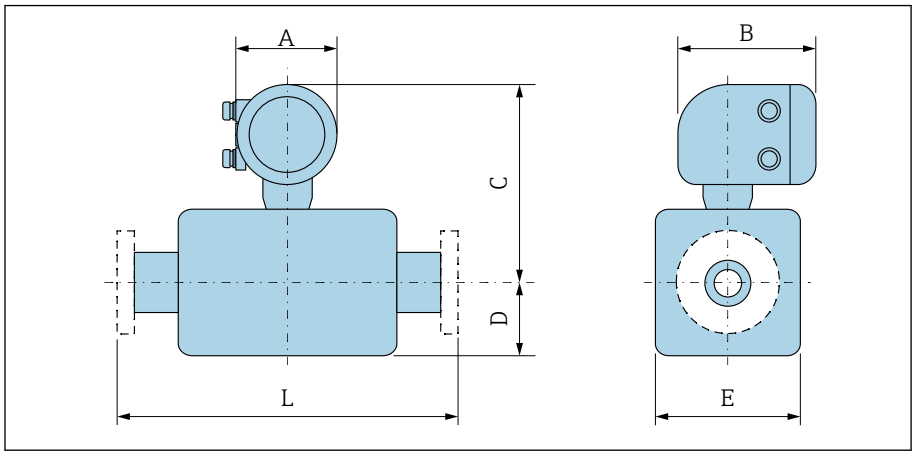



| DN | | A [1] | B | Order code for "Design" | | | | | | L [3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Options E, F | | | Option G | | | | |
| | | | | C [2] | D [2] | E [2] | C [2] | D [2] | E [2] | | |
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | |
| 350 | 14 | 5.2 | 6.77 | 17.87 | 9.65 | 19.29 | – | – | – | 21.65 | |
| 375 | 15 | 5.2 | 6.77 | 18.9 | 10.67 | 21.34 | – | – | – | 23.62 | |
| 400 | 16 | 5.2 | 6.77 | 18.9 | 10.67 | 21.34 | – | – | – | 23.62 | |
| 450 | 18 | 5.2 | 6.77 | 18.19 | 11.77 | 23.54 | 19.88 | 13.11 | 26.22 | 23.62 [4] | 25.59 [5] |
| 500 | 20 | 5.2 | 6.77 | 19.17 | 12.76 | 25.51 | 20.91 | 14.13 | 28.23 | 23.62 | 25.59 |
| 600 | 24 | 5.2 | 6.77 | 21.14 | 14.37 | 28.74 | 22.95 | 16.18 | 32.32 | 23.62 | 30.71 |
| 700 | 28 | 5.2 | 6.77 | 23.54 | 16.93 | 33.86 | 26.97 | 20.16 | 40.31 | 27.56 | 35.83 |
| 750 | 30 | 5.2 | 6.77 | 25.04 | 18.39 | 36.77 | 26.97 | 20.16 | 40.31 | 29.53 | 38.39 |
| 800 | 32 | 5.2 | 6.77 | 25.79 | 19.13 | 38.27 | 27.8 | 21.02 | 41.93 | 31.5 | 40.94 |
| 900 | 36 | 5.2 | 6.77 | 27.76 | 21.1 | 42.2 | 30.83 | 24.02 | 47.95 | 35.43 | 46.06 |

1) Depending on the cable entry used: values up to +1.18 in
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

## DN 1000 to 3000 (40 to 120")

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

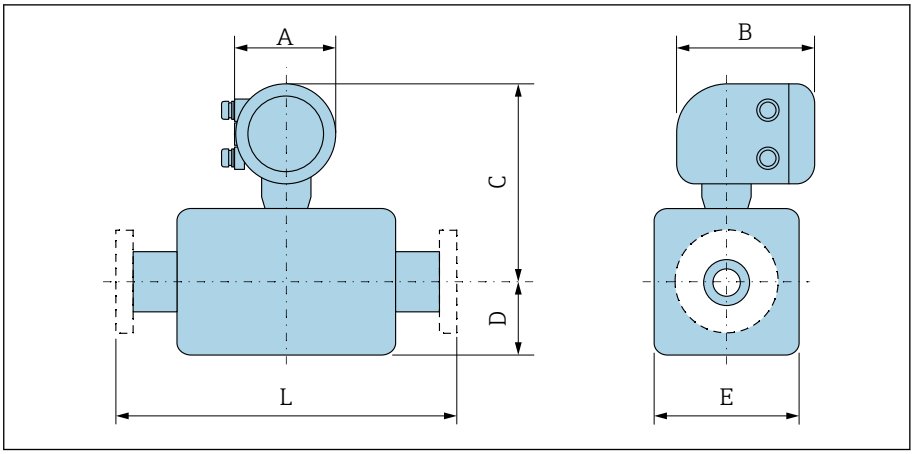



A0042708

| DN | | A [1] | B | C [2] | D [2] | E [2] | L [3] | |
|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | |
| 1000 | 40 | 5.47 | 7.01 | 29.88 | 22.91 | 45.83 | 39.37 [4] | 51.18 [5] |
| – | 42 | 5.47 | 7.01 | 31.3 | 24.33 | 48.66 | 41.34 | 53.74 |
| 1200 | 48 | 5.47 | 7.01 | 34.37 | 27.4 | 54.8 | 47.24 | 61.42 |
| – | 54 | 5.47 | 7.01 | 38.82 | 31.85 | 63.66 | 53.15 | 69.09 |
| 1400 | – | 5.47 | 7.01 | 38.82 | 31.85 | 63.66 | 55.12 | 71.65 |
| – | 60 | 5.47 | 7.01 | 42.76 | 35.79 | 71.54 | 59.06 | 76.77 |
| 1600 | – | 5.47 | 7.01 | 42.76 | 35.79 | 71.54 | 62.99 | 81.89 |
| – | 66 | 5.47 | 7.01 | 44.76 | 37.8 | 75.55 | 64.96 | 84.45 |
| 1800 | 72 | 5.47 | 7.01 | 46.97 | 40 | 80 | 70.87 | 92.13 |
| – | 78 | 5.47 | 7.01 | 51.38 | 44.37 | 88.74 | 78.74 | 102.36 |
| 2000 | – | 5.47 | 7.01 | 51.38 | 44.37 | 88.74 | 78.74 | 102.36 |
| – | 84 | 5.47 | 7.01 | 55.31 | 48.31 | 96.61 | 84.65 | |
| 2200 | – | 5.47 | 7.01 | 55.31 | 48.31 | 96.61 | 86.61 | |
| – | 90 | 5.47 | 7.01 | 59.45 | 48.31 | 104.88 | 90.55 | |
| 2400 | – | 5.47 | 7.01 | 59.45 | 52.44 | 104.88 | 94.49 | |
| – | 96 | 5.47 | 7.01 | 63.35 | 56.34 | 112.64 | 96.46 | |
| – | 102 | 5.47 | 7.01 | 66.69 | 59.69 | 119.37 | 102.36 | |
| 2600 | – | 5.47 | 7.01 | 63.78 | 56.77 | 113.50 | 102.36 | |
| – | 108 | 5.47 | 7.01 | 70.12 | 63.07 | 126.14 | 108.27 | |
| 2800 | – | 5.47 | 7.01 | 67.91 | 60.91 | 121.77 | 110.24 | |
| – | 114 | 5.47 | 7.01 | 73.46 | 66.46 | 132.87 | 114.17 | |
| 3000 | – | 5.47 | 7.01 | 71.85 | 64.84 | 129.65 | 118.11 | |
| – | 120 | 5.47 | 7.01 | 76.85 | 69.84 | 139.65 | 120.08 | |

1) Depending on the cable entry used: values up to +1.18 in
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

*Order code for "Housing", option M "Compact, polycarbonate"*

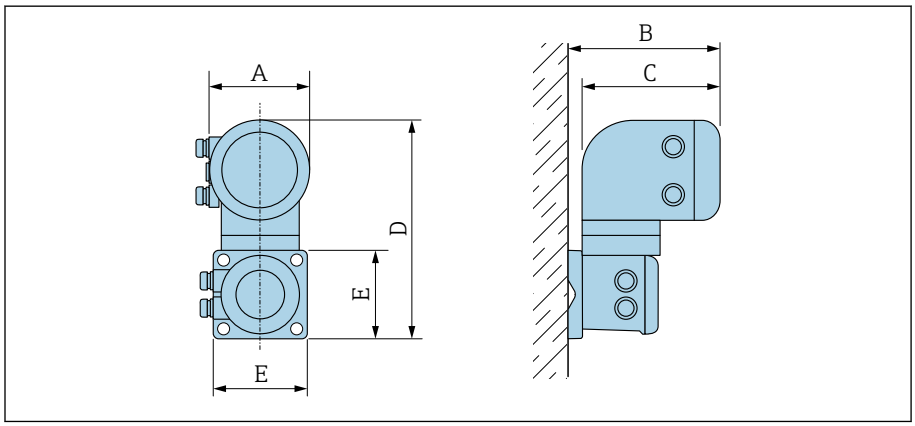



| DN | | A [1] | B | C [2] | D | E | L [3] | |
|---|---|---|---|---|---|---|---|---|
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | |
| 1000 | 40 | 5.2 | 6.77 | 29.76 | 22.91 | 45.83 | 39.37 [4] | 51.18 [5] |
| – | 42 | 5.2 | 6.77 | 31.18 | 24.33 | 48.66 | 41.34 | 53.74 |
| 1200 | 48 | 5.2 | 6.77 | 34.25 | 27.4 | 54.8 | 47.24 | 61.42 |
| – | 54 | 5.2 | 6.77 | 38.7 | 31.85 | 63.66 | 53.15 | 69.09 |
| 1400 | – | 5.2 | 6.77 | 38.7 | 31.85 | 63.66 | 55.12 | 71.65 |
| – | 60 | 5.2 | 6.77 | 42.64 | 35.79 | 71.54 | 59.06 | 76.77 |
| 1600 | – | 5.2 | 6.77 | 42.64 | 35.79 | 71.54 | 62.99 | 81.89 |
| – | 66 | 5.2 | 6.77 | 44.65 | 37.8 | 75.55 | 64.96 | 84.45 |
| 1800 | 72 | 5.2 | 6.77 | 46.85 | 40 | 80 | 70.87 | 92.13 |
| – | 78 | 5.2 | 6.77 | 51.26 | 44.37 | 88.74 | 78.74 | 102.36 |
| 2000 | – | 5.2 | 6.77 | 51.26 | 44.37 | 88.74 | 78.74 | 102.36 |
| – | 84 | 5.2 | 6.77 | 55.2 | 48.31 | 96.61 | 84.65 | |
| 2200 | – | 5.2 | 6.77 | 55.2 | 48.31 | 96.61 | 86.61 | |
| – | 90 | 5.2 | 6.77 | 59.33 | 48.31 | 104.88 | 90.55 | |
| 2400 | – | 5.2 | 6.77 | 59.33 | 52.44 | 104.88 | 94.49 | |
| – | 96 | 5.47 | 7.01 | 63.47 | 56.34 | 112.64 | 96.46 | |
| – | 102 | 5.47 | 7.01 | 66.81 | 59.69 | 119.37 | 102.36 | |
| 2600 | – | 5.47 | 7.01 | 63.9 | 56.77 | 113.50 | 102.36 | |
| – | 108 | 5.47 | 7.01 | 70.24 | 63.07 | 126.14 | 108.27 | |
| 2800 | – | 5.47 | 7.01 | 68.03 | 60.91 | 121.77 | 110.24 | |
| – | 114 | 5.47 | 7.01 | 73.58 | 66.46 | 132.87 | 114.17 | |
| 3000 | – | 5.47 | 7.01 | 71.97 | 64.84 | 129.65 | 118.11 | |
| – | 120 | 5.47 | 7.01 | 76.97 | 69.84 | 139.65 | 120.08 | |

1) Depending on the cable entry used: values up to +1.18 in
2) Reference values: depending on the pressure rating, design and order option
3) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
4) Order code for "Design", option F "Fixed flange, short installed length"
5) Order code for "Design", option G "Fixed flange, long installed length"

## Remote version

### Transmitter remote version

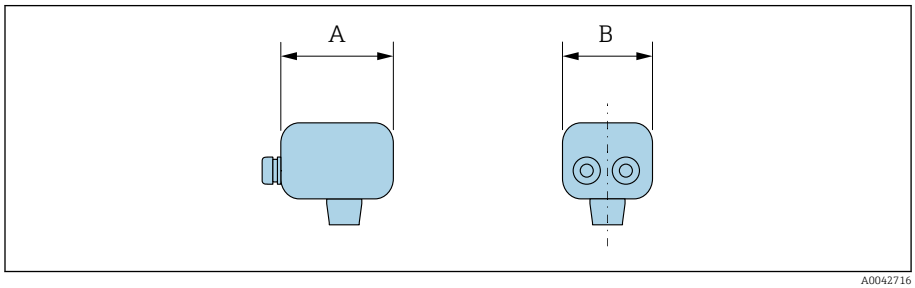



A0042715

| Order code for "Housing" | A [1] [in] | B [in] | C [in] | D [in] | E [in] |
|---|---|---|---|---|---|
| Option N "Remote, polycarbonate" | 5.2 | 7.36 | 6.77 | 12.09 | 5.12 |
| Option P "Remote, aluminum, coated" | 5.47 | 7.28 | 7.01 | 12.17 | 5.12 |

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

### Sensor connection housing




A0042716

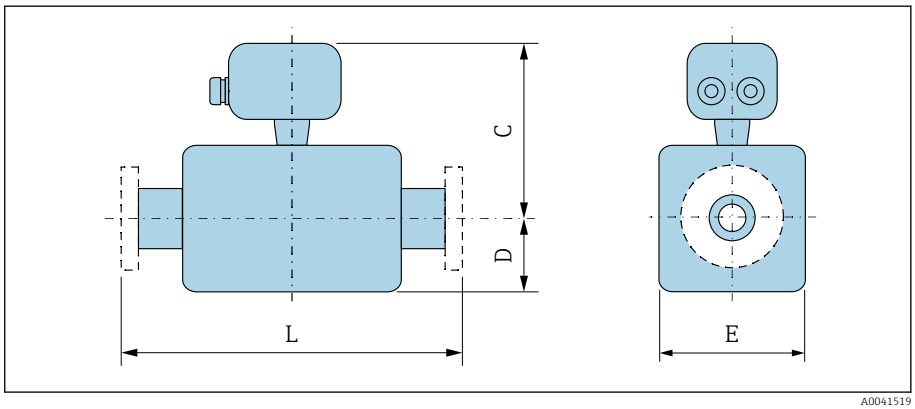
| Housing material | A [1] [in] | B [in] |
|---|---|---|
| Polycarbonate plastic [2] | 4.45 | 4.41 |
| Aluminum, coated | 5.83 | 5.35 |

1) Depending on the cable entry used: values up to + 1.18 in
2) In conjunction with order code for "Sensor option", options CB, CC, CD, CE, C3

### DN 25 to 300 (1 to 12") aluminum half-shell housing

Sensor with aluminum half-shell housing.

Sensor connection housing: aluminum, AlSi10Mg, coated

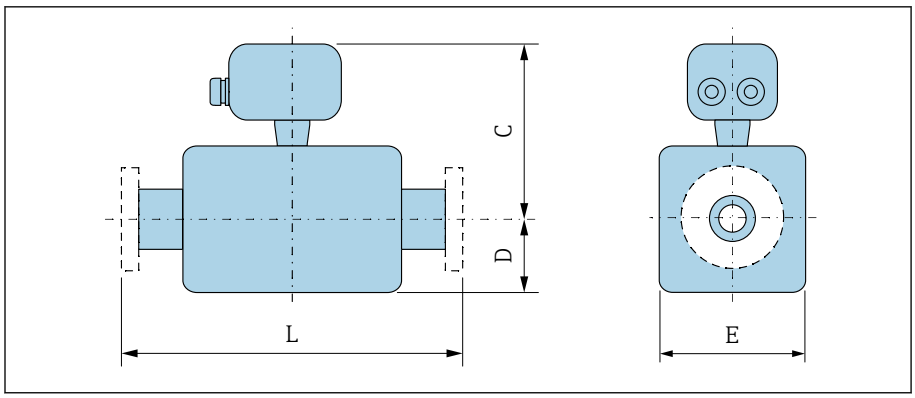



| DN | | Order code for "Design" Options D, E, H, I | | | |
|---|---|---|---|---|---|
| | | C [1] | D | E | L [2] |
| [mm] | [in] | [in] | [in] | [in] | [in] |
| 25 | 1 | 7.76 | 3.31 | 4.72 | 7.87 |
| 32 | – | 7.76 | 3.31 | 4.72 | 7.87 |
| 40 | 1 ½ | 7.76 | 3.31 | 4.72 | 7.87 |
| 50 | 2 | 7.76 | 3.31 | 4.72 | 7.87 |
| 65 | – | 8.74 | 4.29 | 7.09 | 7.87 |
| 80 | 3 | 8.74 | 4.29 | 7.09 | 7.87 |
| 100 | 4 | 8.74 | 4.29 | 7.09 | 9.84 |
| 125 | – | 10.31 | 5.91 | 10.24 | 9.84 |
| 150 | 6 | 10.31 | 5.91 | 10.24 | 11.81 |
| 200 | 8 | 11.3 | 7.09 | 12.76 | 13.78 |
| 250 | 10 | 12.28 | 8.07 | 15.75 | 17.72 |
| 300 | 12 | 13.27 | 9.06 | 18.11 | 19.69 |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

### DN 25 to 300 (1 to 12") fully welded housing

Sensor with fully welded carbon steel housing:
Order code for "Sensor option", options CB, CC, CD, CE, C3

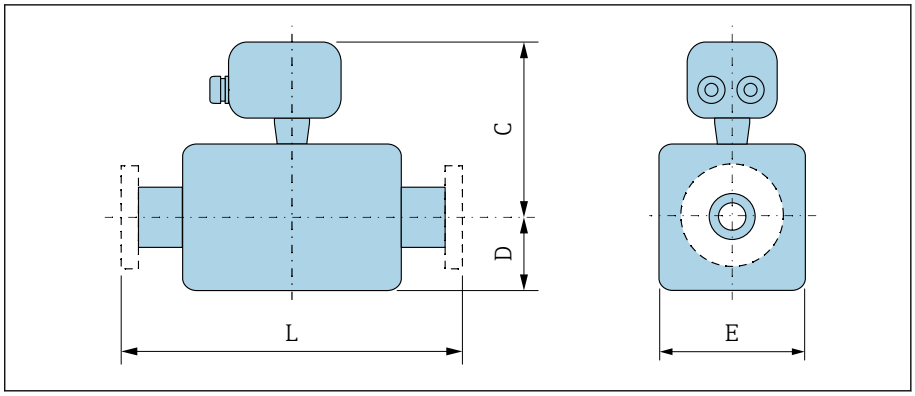



A0041519

| DN | | Order code for "Design" Options A, E | | | |
|---|---|---|---|---|---|
| | | C [1] | D [1] | E [1] | L [2] |
| [mm] | [in] | [in] | [in] | [in] | [in] |
| 25 | 1 | 7.44 | 2.76 | 5.51 | 7.87 |
| 32 | – | 7.44 | 2.76 | 5.51 | 7.87 |
| 40 | 1 ½ | 7.44 | 2.76 | 5.51 | 7.87 |
| 50 | 2 | 7.44 | 2.76 | 5.51 | 7.87 |
| 65 | – | 7.95 | 3.23 | 6.5 | 7.87 |
| 80 | 3 | 8.15 | 3.43 | 6.89 | 7.87 |
| 100 | 4 | 8.62 | 3.94 | 7.87 | 9.84 |
| 125 | – | 9.13 | 4.45 | 8.9 | 9.84 |
| 150 | 6 | 10 | 5.28 | 10.59 | 11.81 |
| 200 | 8 | 10.98 | 6.3 | 12.6 | 13.78 |
| 250 | 10 | 12.32 | 7.6 | 15.24 | 17.72 |
| 300 | 12 | 13.31 | 8.58 | 17.2 | 19.69 |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).

### DN 350 to 900 (14 to 36")

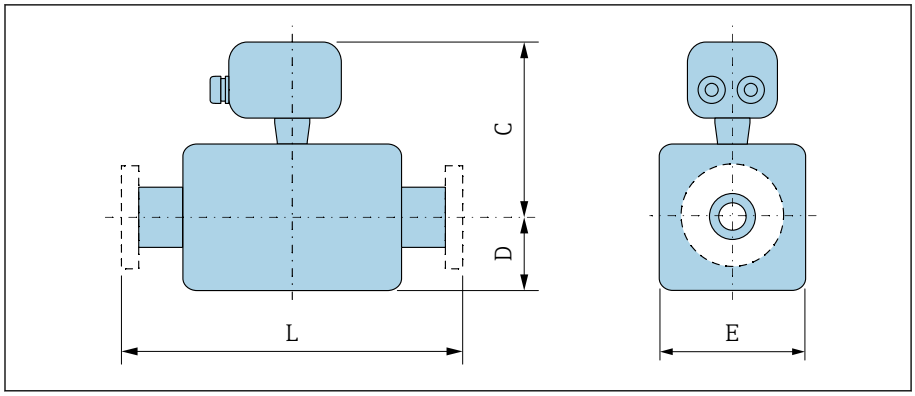



A0041519

| DN | | Order code for "Design" | | | | | | L [2] | |
|---|---|---|---|---|---|---|---|---|---|
| | | Options E, F | | | Option G | | | | |
| | | C [1] | D | E | C | D | E | | |
| [mm] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | [in] | |
| 350 | 14 | 15.55 | 9.65 | 19.29 | – | – | – | 21.65 | |
| 375 | 15 | 16.57 | 10.67 | 21.34 | – | – | – | 23.62 | |
| 400 | 16 | 16.57 | 10.67 | 21.34 | – | – | – | 23.62 | |
| 450 | 18 | 15.87 | 11.77 | 23.54 | 17.56 | 13.11 | 26.22 | 23.62 [3] | 25.59 [4] |
| 500 | 20 | 16.85 | 12.76 | 25.51 | 18.58 | 14.13 | 28.23 | 23.62 | 25.59 |
| 600 | 24 | 18.82 | 14.37 | 28.74 | 20.63 | 16.18 | 32.32 | 23.62 | 30.71 |
| 700 | 28 | 21.22 | 16.93 | 33.86 | 24.65 | 20.16 | 40.31 | 27.56 | 35.83 |
| 750 | 30 | 22.72 | 18.39 | 36.77 | 24.65 | 20.16 | 40.31 | 29.53 | 38.39 |
| 800 | 32 | 23.46 | 19.13 | 38.27 | 25.47 | 21.02 | 41.93 | 31.5 | 40.94 |
| 900 | 36 | 25.43 | 21.1 | 42.2 | 28.5 | 24.02 | 47.95 | 35.43 | 46.06 |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
3) Order code for "Design", option F "Fixed flange, short installed length"
4) Order code for "Design", option G "Fixed flange, long installed length"

### DN 1000 to 3000 (40 to 120")




A0041519

| DN | | C [1] | D [1] | E [1] | L [2] | |
|---|---|---|---|---|---|---|
| [mm] | [in] | [in] | [in] | [in] | [in] | |
| 1000 | 40 | 27.48 | 22.91 | 45.83 | 39.37 [3] | 51.18 [4] |
| – | 42 | 28.9 | 24.33 | 48.66 | 41.34 | 53.74 |
| 1200 | 48 | 31.97 | 27.4 | 54.8 | 47.24 | 61.42 |
| – | 54 | 36.42 | 31.85 | 63.66 | 53.15 | 69.09 |
| 1400 | – | 36.42 | 31.85 | 63.66 | 55.12 | 71.65 |
| – | 60 | 40.35 | 35.79 | 71.54 | 59.06 | 76.77 |
| 1600 | – | 40.35 | 35.79 | 71.54 | 62.99 | 81.89 |
| – | 66 | 42.36 | 37.8 | 75.55 | 64.96 | 84.45 |
| 1800 | 72 | 44.57 | 40 | 80 | 70.87 | 92.13 |
| – | 78 | 48.98 | 44.37 | 88.74 | 78.74 | 102.36 |
| 2000 | – | 48.98 | 44.37 | 88.74 | 78.74 | 102.36 |
| – | 84 | 52.91 | 48.31 | 96.61 | 84.65 | |
| 2200 | – | 52.91 | 48.31 | 96.61 | 86.61 | |
| – | 90 | 57.05 | 48.31 | 104.88 | 90.55 | |
| 2400 | – | 57.05 | 52.44 | 104.88 | 94.49 | |
| – | 96 | 60.95 | 56.34 | 112.64 | 96.46 | |
| – | 102 | 64.29 | 59.69 | 119.37 | 102.36 | |
| 2600 | – | 61.38 | 56.77 | 113.50 | 102.36 | |
| – | 108 | 67.72 | 63.07 | 126.14 | 108.27 | |
| 2800 | – | 65.51 | 60.91 | 121.77 | 110.24 | |
| – | 114 | 71.06 | 66.46 | 132.87 | 114.17 | |
| 3000 | – | 69.45 | 64.84 | 129.65 | 118.11 | |
| – | 120 | 74.45 | 69.84 | 139.65 | 120.08 | |

1) Reference values: depending on the pressure rating, design and order option
2) Total installed length is independent of the process connections. Installed length according to DVGW (German Technical and Scientific Association for Gas and Water).
3) Order code for "Design", option F "Fixed flange, short installed length"
4) Order code for "Design", option G "Fixed flange, long installed length"

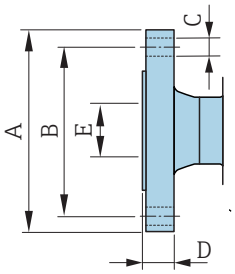
## Fixed flange

### Flange according to ASME B16.5, Class 150

- Carbon steel: order code for "Process connection", option A1K
- Stainless steel: order code for "Process connection", option A1S

Surface roughness: Ra 250 to 492 µin

E: Internal diameter depends on the liner → 66



A0041915

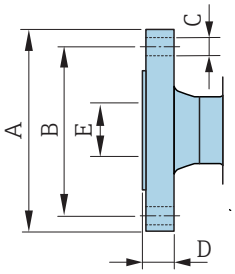
| DN [in] | A [in] | B [in] | C [in] | D [in] |
|---|---|---|---|---|
| 1 | 4.25 | 3.12 | 4 × Ø0.63 | 0.5 |
| 1 ½ | 5 | 3.88 | 4 × Ø0.63 | 0.63 |
| 2 | 6 | 4.75 | 4 × Ø0.75 | 0.69 |
| 3 | 7.5 | 6 | 4 × Ø0.75 | 0.88 |
| 4 | 9 | 7.5 | 8 × Ø0.75 | 0.88 |
| 6 | 11 | 9.5 | 8 × Ø0.88 | 0.94 |
| 8 | 13.5 | 11.75 | 8 × Ø0.88 | 1.06 |
| 10 | 16 | 14.25 | 12 × Ø1 | 1.17 |
| 12 | 19 | 17 | 12 × Ø1 | 1.19 |
| 14 | 21.06 | 18.75 | 12 × Ø1.13 | 1.39 |
| 16 | 23.43 | 21.25 | 16 × Ø1.13 | 1.46 |
| 18 | 25 | 22.75 | 16 × Ø1.25 | 1.58 |
| 20 | 27.56 | 25 | 20 × Ø1.25 | 1.7 |
| 24 | 32.09 | 29.5 | 20 × Ø1.37 | 1.89 |

### Flange according to ASME B16.5, Class 300

- Carbon steel: order code for "Process connection", option A2K
- Stainless steel: order code for "Process connection", option A2S

Surface roughness: Ra 250 to 492 µin

E: Internal diameter depends on the liner → 66



A0041915

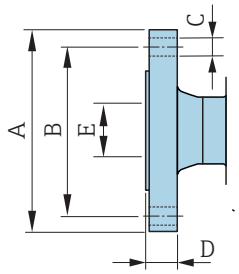
| DN [in] | A [in] | B [in] | C [in] | D [in] |
|---|---|---|---|---|
| 1 | 4.88 | 3.5 | 4 × Ø0.75 | 0.63 |
| 1 ½ | 6.12 | 4.5 | 4 × Ø0.88 | 0.75 |
| 2 | 6.5 | 5 | 8 × Ø0.75 | 0.82 |
| 3 | 8.25 | 6.62 | 8 × Ø0.88 | 1.06 |
| 4 | 10 | 7.88 | 8 × Ø0.88 | 1.19 |
| 6 | 12.5 | 10.62 | 12 × Ø0.88 | 1.38 |

### Flange according to AWWA, Cl. D

Order code for "Process connection", option W1K

Surface roughness: Ra 250 to 492 µin

E: Internal diameter depends on the liner → 66




A0041915

| DN [in] | A [in] | B [in] | C [in] | D [in] |
|---|---|---|---|---|
| 28 | 36.5 | 34 | 28 × Ø1.38 | 1.31 |
| 30 | 38.74 | 36 | 28 × Ø1.38 | 1.38 |
| 32 | 41.73 | 38.5 | 28 × Ø1.65 | 1.5 |
| 36 | 45.98 | 42.75 | 32 × Ø1.65 | 1.63 |
| 40 | 50.75 | 47.25 | 36 × Ø1.65 | 1.63 |
| 42 | 52.99 | 49.5 | 36 × Ø1.65 | 1.75 |
| 48 | 59.49 | 56 | 44 × Ø1.65 | 1.88 |
| 54 | 66.26 | 62.75 | 44 × Ø1.89 | 2.13 |
| 60 | 73.03 | 69.25 | 52 × Ø1.89 | 2.25 |
| 66 | 80 | 76 | 52 × Ø1.89 | 2.5 |
| 72 | 86.5 | 82.5 | 60 × Ø1.89 | 2.63 |
| 78 | 92.99 | 89 | 64 × Ø2.13 | 2.75 |
| 84 | 99.8 | 95.5 | 64 × Ø2.13 | 2.88 |
| 90 | 106.5 | 107 | 68 × Ø2.36 | 3 |
| 96 | 113.27 | 108.50 | 68 × Ø2.37 | 3.25 |
| 102 | 120.00 | 114.50 | 68 × Ø2.63 | 3.25 |
| 108 | 126.73 | 120.75 | 68 × Ø2.63 | 3.38 |
| 114 | 133.50 | 126.75 | 68 × Ø2.87 | 3.50 |
| 120 | 140.24 | 132.75 | 68 × Ø2.87 | 3.50 |

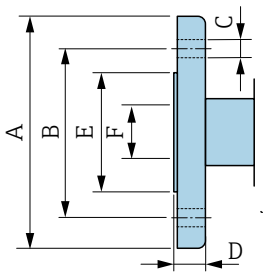
## Lap joint flange

### Lap joint flange according to ASME B16.5, Class 150

- **Carbon steel:** order code for "Process connection", option A12
- **Stainless steel:** order code for "Process connection", option A14

Surface roughness (flange): Ra 248 to 492 µin

F: Internal diameter depends on the liner → 66

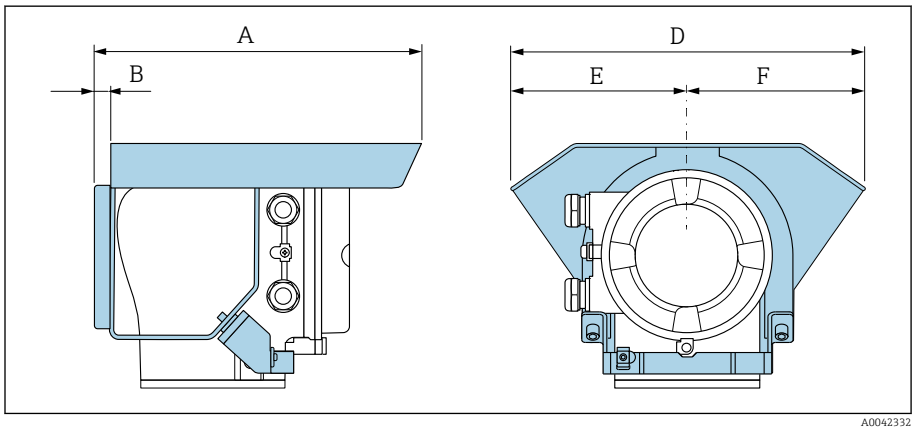


A0042254

| DN [in] | A [in] | B [in] | C [in] | D [in] | E [in] |
|---|---|---|---|---|---|
| 1 | 4.33 | 3.15 | 4 × Ø0.63 | 0.55 | 1.93 |
| 1 ½ | 4.92 | 3.86 | 4 × Ø0.63 | 0.69 | 2.8 |
| 2 | 5.91 | 4.76 | 4 × Ø0.75 | 0.75 | 3.46 |
| 3 | 7.48 | 5.98 | 4 × Ø0.75 | 0.94 | 4.72 |
| 4 | 9.06 | 7.48 | 8 × Ø0.75 | 0.94 | 5.83 |
| 6 | 11.02 | 9.49 | 8 × Ø0.91 | 0.98 | 8.23 |
| 8 | 13.58 | 11.73 | 8 × Ø0.91 | 1.14 | 10.39 |
| 10 | 15.94 | 14.25 | 12 × Ø0.98 | 1.18 | 12.48 |
| 12 | 19.09 | 17.01 | 12 × Ø0.98 | 1.26 | 14.88 |

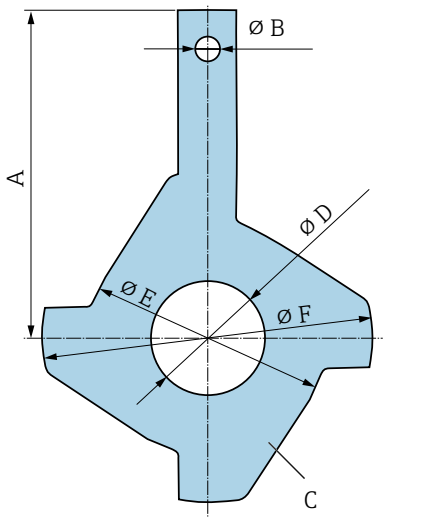
## Accessories

### Protective cover




| A [in] | B [in] | D [in] | E [in] | F [in] |
|---|---|---|---|---|
| 10.12 | 0.47 | 11.02 | 5.51 | 5.51 |

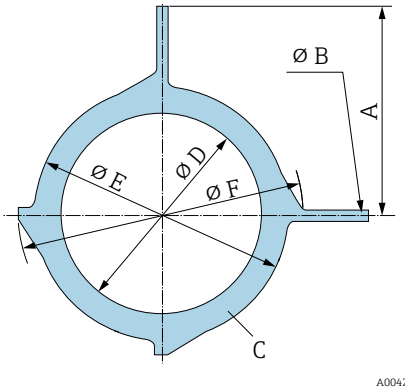
### Ground disks for flanges




| DN 15 to 300 (½ to 12") | DN | | Pressure rating | A | B | C [1] | D | E | F |
|---|---|---|---|---|---|---|---|---|---|
| | [mm] | [in] | | [in] | [in] | [in] | [in] | [in] | [in] |
| | 25 | 1" | [2]. | 3.44 | 0.26 | 0.08 | 1.02 | 2.44 | 3.05 |
| | 32 | 1 ¼" | [2] | 3.72 | 0.26 | 0.08 | 1.38 | 3.15 | 3.44 |
| | 40 | 1 ½" | [2] | 4.06 | 0.26 | 0.08 | 1.61 | 3.23 | 3.98 |
| | 50 | 2" | [2] | 4.25 | 0.26 | 0.08 | 2.05 | 3.98 | 4.55 |
| | 65 | 2 ½" | [2] | 4.65 | 0.26 | 0.08 | 2.68 | 4.76 | 5.18 |
| | 80 | 3" | [2] | 5.31 | 0.26 | 0.08 | 3.15 | 5.16 | 6.08 |
| | 100 | 4" | [2] | 6.02 | 0.26 | 0.08 | 4.09 | 6.14 | 7.34 |
| | 125 | 5" | [2] | 6.3 | 0.26 | 0.08 | 5.12 | 7.36 | 8.13 |
| | 150 | 6" | [2] | 7.24 | 0.26 | 0.08 | 6.22 | 8.54 | 10.08 |
| | 200 | 8" | [2] | 8.07 | 0.26 | 0.08 | 8.11 | 10.51 | 11.34 |
| | 250 | 10" | [2] | 9.45 | 0.26 | 0.08 | 10.24 | 12.91 | 14.13 |
| | 300 | 12" | PN 10<br>PN 16<br>Cl. 150 | 10.75 | 0.26 | 0.08 | 12.28 | 14.76 | 16.26 |

1) Material thickness
2) In the case of DN 1 to 10", ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version.

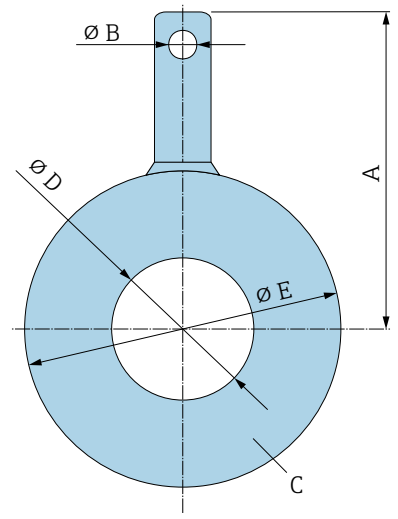
**DN 300 to 600 (12 to 24")**




| DN [mm] | DN [in] | Rating | A [in] | B [in] | C [1] [in] | D [in] | E [in] | F [in] |
|---|---|---|---|---|---|---|---|---|
| 300 | 12" | PN 25<br>JIS 10K<br>JIS 20K | 10.55 | 0.35 | 0.08 | 12.2 | 14.76 | 15.91 |
| 350 | 14" | PN 6<br>PN 10<br>PN 16 | 14.37 | 0.35 | 0.08 | 13.5 | 16.54 | 18.86 |
| 375 | 15" | PN 16 | 15.55 | 0.35 | 0.08 | 15.47 | 18.15 | 20.59 |
| 400 | 16" | PN 6<br>PN 10<br>PN 16 | 15.55 | 0.35 | 0.08 | 15.47 | 18.5 | 21.34 |
| 450 | 18" | PN 6<br>PN 10<br>PN 16 | 16.42 | 0.35 | 0.08 | 17.28 | 20.67 | 22.95 |
| 500 | 20" | PN 6<br>PN 10<br>PN 16 | 18.11 | 0.35 | 0.08 | 19.41 | 22.64 | 25.59 |
| 600 | 24" | PN 6<br>PN 10<br>PN 16 | 20.55 | 0.35 | 0.08 | 23.35 | 26.61 | 30.16 |

1) Material thickness

**DN 700 to 1200 (28 to 48")**




| DN [mm] | DN [in] | Rating | A [in] | B [in] | C [1] [in] | D [in] | E [in] |
|---|---|---|---|---|---|---|---|
| 700 | 28" | PN 6<br>PN10<br>PN16<br>Cl, D | 18.11<br>18.9<br>19.29<br>19.45 | 0.25 | 0.08 | 27.44<br>27.28<br>27.05<br>27.28 | 30.94<br>32.01<br>31.77<br>32.76 |
| 750 | 30" | Cl, D | 20.59 | 0.25 | 0.08 | 29.25 | 32.8 |
| 800 | 32" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 20.47<br>21.26<br>21.65<br>22.09 | 0.25 | 0.08 | 31.46<br>31.3<br>31.06<br>31.3 | 35.16<br>36.22<br>35.98<br>37.01 |
| 900 | 36" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 22.44<br>23.23<br>23.43<br>24.21 | 0.25 | 0.08 | 35.31<br>35.16<br>34.88<br>35.16 | 39.09<br>40.16<br>39.92<br>41.26 |
| 1000 | 40" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 24.41<br>25.59<br>25.98<br>26.57 | 0.25 | 0.08 | 39.33<br>39.17<br>38.9<br>39.17 | 43.03<br>44.37<br>44.53<br>45.79 |
| – | 42" | PN 6 | 27.72 | 0.25 | 0.08 | 41.1 | 48.03 |
| 1200 | 48" | PN 6<br>PN 10<br>PN 16<br>Cl, D | 28.86<br>29.92<br>30.94<br>30.51 | 0.25 | 0.08 | 47.36<br>47.09<br>47.09<br>46.77 | 51.57<br>52.91<br>54.53<br>52.95 |

1) Material thickness

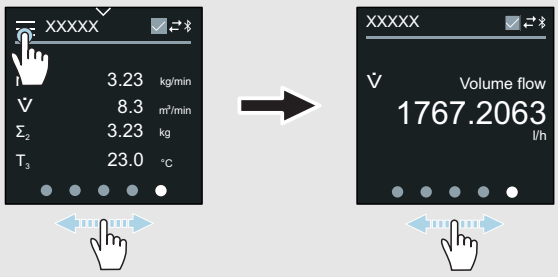
# Local display

Operating concept 120
Operating options 120
Operating tools 121

## Operating concept

| | |
|---|---|
| Operation method | ▪ Operation via local display with touch screen.<br>▪ Operation via SmartBlue App. |
| Menu structure | Operator-oriented menu structure for user-specific tasks:<br>▪ Diagnostics<br>▪ Application<br>▪ System<br>▪ Guidance<br>▪ Language |
| Commissioning | ▪ Commissioning via a guided menu (**Commissioning** wizard).<br>▪ Menu guidance with interactive help function for individual parameters. |
| Reliable operation | ▪ Operation in local language.<br>▪ Uniform operating philosophy in device and in the SmartBlue App.<br>▪ Write protection<br>▪ When electronics modules are replaced: configurations are transferred using the T-DAT Backup device memory. The device memory contains process data, device data and the event logbook. No reconfiguration is necessary. |
| Diagnostic behavior | Efficient diagnostic behavior increases measurement availability:<br>▪ Open troubleshooting measures via local display and SmartBlue App.<br>▪ Diverse simulation options.<br>▪ Logbook of events that have occurred. |

## Operating options

| | |
|---|---|
| Local display | <br>A0042957<br><br>Display elements:<br>▪ LCD touch screen<br>▪ Depends on the orientation, automatic alignment of local display.<br>▪ Configuration of display format for measured variables and status variables.<br><br>Operating elements:<br>▪ Touch screen<br>▪ Local display can also be accessed in the hazardous area. |
| SmartBlue App | ▪ The SmartBlue App allows the user to put devices into operation and operate them.<br>▪ Based on Bluetooth.<br>▪ No separate driver required.<br>▪ Available for mobile handheld terminals, tablets and smartphones.<br>▪ Suitable for convenient and secure access to devices in hard-to-reach locations or in hazardous areas.<br>▪ Can be used within a 20 m (65.6 ft) radius of the device.<br>▪ Encrypted and secure data transmission.<br>▪ No data loss during commissioning and maintenance.<br>▪ Diagnostic information and process information in real time. |

## Operating tools

| Operating tools | Operating unit | Interface | Additional information |
|---|---|---|---|
| DeviceCare SFE100 | ▪ Notebook<br>▪ PC<br>▪ Tablet with Microsoft Windows system | ▪ CDI service interface<br>▪ Fieldbus protocol | Innovation brochure IN01047S |
| FieldCare SFE500 | ▪ Notebook<br>▪ PC<br>▪ Tablet with Microsoft Windows system | ▪ CDI service interface<br>▪ Fieldbus protocol | Operating Instructions BA00027S and BA00059S |
| SmartBlue App | ▪ Devices with iOS: iOS9.0 or higher<br>▪ Devices with Android: Android 4.4 KitKat or higher | Bluetooth | Endress+HauserSmartBlue App:<br>▪ Google Playstore (Android)<br>▪ iTunes Apple Shop (iOS devices) |
| Device Xpert | Field Xpert SFX 100/350/370 | HART fieldbus protocol | Operating Instructions BA01202S |

# Certificates and approvals

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Drinking water approval 124
Pharmaceutical compatibility 124
HART certification 124
Radio approval 124
Additional approvals 124
Other standards and guidelines 124

## Non-Ex approval

- cCSAus
- EAC
- UK
- KC

## Pressure Equipment Directive

- CRN
- PED Cat. II/III

## Drinking water approval

- ACS
- KTW/W270
- NSF 61
- WRAS BS 6920

## Pharmaceutical compatibility

- FDA
- USP Class VI
- TSE/BSE Certificate of Suitability

## HART certification

The 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).

## Radio approval

The device has radio approvals.

## Additional approvals

VDS (for stationary fire extinguishing systems)

## Other standards and guidelines

- IEC/EN 60529
  Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
  Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal)
- IEC/EN 60068-2-31
  Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- IEC/EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements.
- CAN/CSA-C22.2 No. 61010-1-12
  Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements.
- IEC/EN 61326
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements)
- ANSI/ISA-61010-1 (82.02.01)
  Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General 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.
- ETSI EN 300 328
  Guidelines for 2.4 GHz radio components
- EN 301489
  Electromagnetic compatibility and radio spectrum matters (ERM).

# Application packages

Use 128
Heartbeat Verification + Monitoring 128

## Use

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 relevant order code is available from your local Endress+Hauser sales organization or on the product page of the Endress+Hauser website: www.endress.com.

## Heartbeat Verification + Monitoring

### Heartbeat Verification

Availability depends on the product structure.

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

### Heartbeat Monitoring

Availability depends on the product structure.

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

# Accessories

Device-specific accessories 130
Communication-specific accessories 131
Service-specific accessory 131
System components 132

## Device-specific accessories

### Transmitter

| Accessories | Description | Order number |
|---|---|---|
| Proline 10 transmitter | Installation Instructions EA01350D | 5XBBXX-*...* |
| Weather protection cover | Protects the device from weather exposure:<br>Installation Instructions EA01351D | 71502730 |
| Connecting cable | Can be ordered with the device.<br>The following cable lengths are available: order code for "Cable, sensor connection"<br>▪ 5 m (16 ft)<br>▪ 10 m (32 ft)<br>▪ 20 m (65 ft)<br>▪ User-configurable cable length (m or ft)<br>Max. cable length: 200 m (660 ft) | DK5013-*...* |
| Ground cable | 1 ground cable set for potential equalization, consisting of 2 ground cables | |

### Sensor

| Accessories | Description |
|---|---|
| Ground disks | Ground medium in lined measuring pipes.<br>Installation Instructions EA00070D |

## Communication-specific accessories

| Accessories | Description |
|---|---|
| Commubox FXA195 USB/HART modem | Intrinsically safe HART communication with FieldCare and FieldXpert<br>Technical Information TI00404F |
| Commubox FXA291 | Connects the Endress+Hauser devices with the CDI interface (= Endress+Hauser Common Data Interface) to the USB interface of a personal computer or laptop.<br>Technical Information TI405C/07 |
| HART Loop Converter HMX50 | Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.<br>▪ Technical Information TI00429F<br>▪ Operating Instructions BA00371F |
| Fieldgate FXA42 | Transmission of measured values from connected 4 to 20 mA analog and digital devices.<br>▪ Technical Information TI01297S<br>▪ Operating Instructions BA01778S<br>▪ Product page: www.endress.com/fxa42 |
| Field Xpert SMT70 | Tablet PC for the configuration of the device. Enables mobile Plant Asset Management to manage the devices with a digital communication interface. Suitable for Zone 2.<br>▪ Technical Information TI01342S<br>▪ Operating Instructions BA01709S<br>▪ Product page: www.endress.com/smt70 |
| Field Xpert SMT77 | Tablet PC for the configuration of the device. Enables mobile Plant Asset Management to manage the devices with a digital communication interface. Suitable for Zone 1.<br>▪ Technical Information TI01418S<br>▪ Operating Instructions BA01923S<br>▪ Product page: www.endress.com/smt77 |

## Service-specific accessory

| Accessories | Description | Order number |
|---|---|---|
| Applicator | Software for selecting and sizing Endress+Hauser devices. | https://portal.endress.com/webapp/applicator |
| W@M Life Cycle Management | ▪ Information platform with software applications and services<br>▪ Supports the entire life cycle of the facility. | www.endress.com/lifecyclemanagement |
| FieldCare | FDT-based plant asset management software from Endress+Hauser. Management and configuration of Endress+Hauser devices.<br>Operating Instructions BA00027S and BA00059S | ▪ Device driver: www.endress.com → Download Area<br>▪ CD-ROM (contact Endress+Hauser)<br>▪ DVD (contact Endress+Hauser) |
| DeviceCare | Software for connecting and configuring Endress+Hauser devices.<br>Innovation brochure IN01047S | ▪ Device driver: www.endress.com → Download Area<br>▪ CD-ROM (contact Endress+Hauser)<br>▪ DVD (contact Endress+Hauser) |

## System components

| Accessories | Description |
|---|---|
| Memograph M | Graphic data manager:<br>▪ Record measured values<br>▪ Monitor limit values<br>▪ Analyze measuring points<br>▪ Technical Information TI00133R<br>▪ Operating Instructions BA00247R |
| iTEMP | Temperature transmitter:<br>▪ Measure the absolute pressure and gauge pressure of gases, vapors and liquids<br>▪ Read the medium temperature<br>"Fields of Activity" document FA00006T |




www.addresses.endress.com

Endress+Hauser

People for Process Automation