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Technical Information
Proline Promag H 10

Electromagnetic flowmeter



Flowmeter for basic hygienic applications with easy-to-use operation concept

Application

- The bidirectional measuring principle is virtually independent of pressure, density, temperature and viscosity
- For applications with sanitary requirements

Device properties
- Liner made of PFA
- Hygienic version as per 3-A, EHEDG
- Wetted materials CIP/SIP cleanable
- System integration with HART, Modbus RS485, IO-Link
- Flexible operation with app and optional display

Your benefits

- Easy integration into your plant infrastructure with IO-Link protocol
- Flexible installation – hygienic measurement with 0 x DN inlet run and numerous process connections
- Energy-saving flow measurement – no pressure loss due to cross section constriction
- Maintenance-free – no moving parts
- Optimum usability – display with touchscreen (only for HART and Modbus RS485 communication protocols) or operation with mobile devices and SmartBlue app
- Simple, time-saving commissioning – guided parameterization in advance and in the field
- Built-in verification – Heartbeat Technology

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People for Process Automation

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Symbols

Electronics

⎓ Direct current

~ Alternating current

⎓~ Direct current and alternating current

⏚ Terminal connection for potential equalization

Device communication

Communication via a wireless, local area network.

Bluetooth is enabled.

Types of information

✓✓ Preferred procedures, processes or actions

✓ Permitted procedures, processes or actions

✗ Forbidden procedures, processes or actions

Additional information

Reference to documentation

Reference to page

Reference to graphic

Explosion protection

Hazardous area

Non-hazardous area

Related 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.

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 information specific to the measuring point, such as the 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, Texas USA

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

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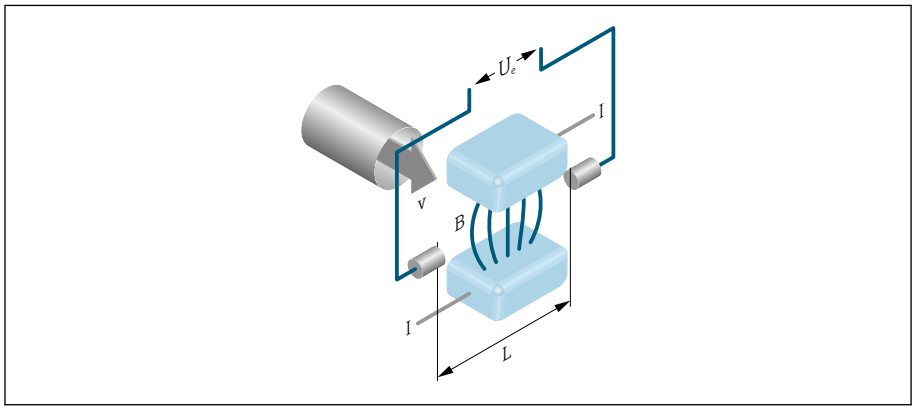
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Function and system design

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Measuring principle

According to *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 induced voltage (U_e) is proportional to the flow velocity (v) and is transmitted to the amplifier via the working 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

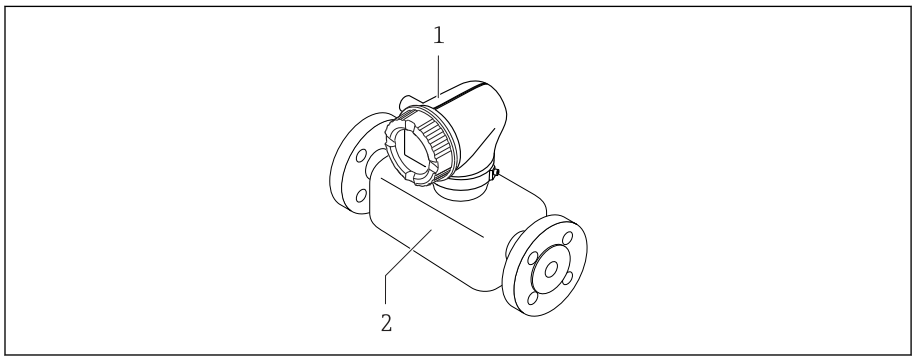
The device consists of a transmitter and a sensor.

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.

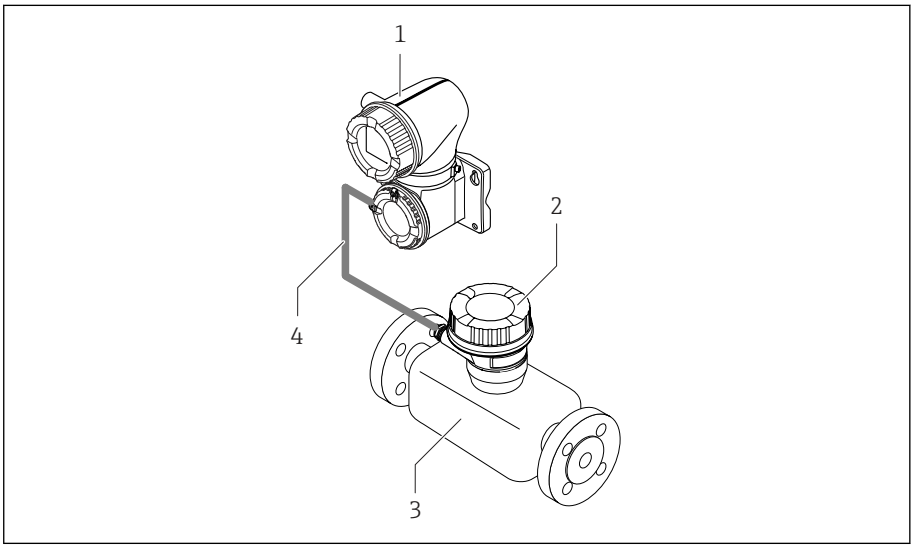


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1 *Transmitter*
2 *Sensor*

Remote version

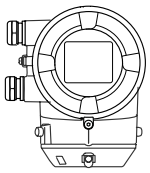
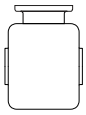
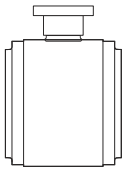
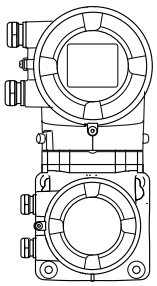
The transmitter and sensor are mounted in physically separate locations.



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

Measuring system

Proline 10 transmitter	Promag H sensor	
 Compact version	 DN 2 to 25 mm (1/12 to 1 in)	 DN > 25 mm (1 in)
 Remote version		

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) ▪ Conductivity (order code for "Sensor option", option CX) ▪ Temperature (DN 15 to 150 (½" to 6") with order code for "Sensor option", option CI "Medium temperature measurement")
Calculated measured variables	Mass flow Corrected conductivity (DN 15 to 150 (½" to 6") with order code for "Sensor option", option CI "Medium temperature measurement" and order code for "Functionality", option D)

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 2 to 150 (1/12 to 6")

Nominal diameter		Recommended Flow rate	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]
2	1/12	0.06 to 1.8	0.5	0.005	0.01
4	5/32	0.25 to 7	2	0.025	0.05
8	5/16	1 to 30	8	0.1	0.1
15	½	4 to 100	25	0.2	0.5
25	1	9 to 300	75	0.5	1
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	5	220 to 7 500	1850	15	30
150	6	330 to 10 000	2 500	30	42

Flow characteristic values in US units: 1/12 - 6" (DN 2 - 150)

Nominal diameter		Recommended Flow rate	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]
1/12	2	0.015 to 0.5	0.1	0.001	0.002
1/32	4	0.07 to 2	0.5	0.005	0.008

Nominal diameter		Recommended Flow rate	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]
5/16	8	0.25 to 8	2	0.02	0.025
½	15	1 to 27	6	0.05	0.1
1	25	2.5 to 80	18	0.2	0.25
1 ½	40	7 to 190	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
3	80	24 to 800	200	2	2.5
4	100	40 to 1 250	300	2	4
5	125	60 to 1 950	450	5	7
6	150	90 to 2 650	600	5	12

Output

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Output versions

Order code 020: output; input	Output version
Option B	▪ Current output 4 to 20 mA HART ▪ Pulse/frequency/switch output
Option F	IO-Link
Option M	▪ Modbus RS485 ▪ 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: ▪ Active ▪ Passive
Current range	Can be set to: ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA ▪ 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 ▪ Volume flow ▪ Mass flow ▪ Temperature* ▪ Conductivity* ▪ Corrected conductivity* ▪ Noise* ▪ Coil current shot time* * Visibility depends on order options or device settings

IO-Link

Physical interface	Similar to the standard IEC 61131-9
Signal	Digital communication signal IO-Link, 3-wire
IO-Link version	1.1
IO-Link SSP version	Smart Sensor Profile 2nd Edition V1.2
IO-Link device port	IO-Link port class A

Modbus RS485

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

Current output 4 to 20 mA [1]

Signal mode	Choose via terminal assignment: ▪ Active ▪ Passive
Current range	Can be set to: ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA ▪ 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 ▪ Volume flow ▪ Mass flow ▪ Temperature* ▪ Conductivity* ▪ Corrected conductivity* ▪ Noise* ▪ Coil current shot time* * Visibility depends on order options or device settings

Pulse/frequency/switch output [2]

Function	Can be set to: ▪ Pulse output ▪ Frequency output ▪ Switching output
Version	Open collector: Passive
Input values	▪ DC 10.4 to 30 V ▪ Max. 140 mA
Voltage drop	▪ ≤ DC 2 V @ 100 mA ▪ ≤ 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 ▪ Mass flow

1) Only available with Modbus RS485
2) Only available with 4 to 20 mA HART

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 ▪ Volume flow ▪ Mass flow ▪ Temperature* ▪ Conductivity* ▪ Corrected conductivity* ▪ Noise* ▪ Coil current shot time* ▪ Reference electrode potential against PE* * 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
	▪ On
	▪ Diagnostic behavior:
	  ▪ Alarm
	  ▪ Warning
	  ▪ Warning and alarm
	▪ Limit value:
	  ▪ Off
	  ▪ Volume flow
	  ▪ Mass flow
	  ▪ Temperature*
	  ▪ Flow velocity
	  ▪ Conductivity*
	  ▪ Corrected conductivity*
	  ▪ Totalizer 1…3
	▪ Flow direction monitoring
	▪ Status
	  ▪ Empty pipe detection
	  ▪ Low flow cut off
	* 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

IO-Link

Operating mode	Digital transmission of all failure information
Device status	Readable via cyclic and acyclic data transmission

Modbus RS485

Failure mode	Selectable: ▪ NaN value instead of current value ▪ Last valid value

Current output 4 to 20 mA

4 to 20 mA	Selectable: ▪ Min. value: 3.59 mA ▪ Max. value: 21.5 mA ▪ Freely definable value between: 3.59 to 21.5 mA ▪ Actual value ▪ Last valid value

Pulse/frequency/switch output

Pulse output	Selectable: ▪ Actual value ▪ No pulses
Frequency output	Selectable: ▪ Actual value ▪ 0 Hz ▪ Defined value: 0 to 12 500 Hz
Switch output	Selectable: ▪ Current status ▪ Open ▪ 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 is superimposed on 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

IO-Link

IO-Link specification	Version 1.1.3
Device ID	9728257
Manufacturer ID	17
Smart Sensor Profile	Smart Sensor Profile 2nd Edition V1.2; supported ▪ Identification and Diagnosis ▪ Digital Measuring and Switching Sensor (as per SSP type 4.3.4) ▪ Function Class Sensor Control Wide
Smart Sensor Profile Type	Measuring profile type 4.3.4 Measuring and Switching Sensor, floating point, 4 channel
SIO mode	No
Speed	COM2 (38.4 kBaud)
Minimum cycle time	12 ms
Process data width	Input: 18 bytes (as per SSP 4.3.4) Output: 2 bytes (as per SSP 4.3.4)
OnRequestdata	8 bytes
Data storage	Yes
Block configuration	Yes
Device operational	The device is operational 6 s after the supply voltage has been applied
System integration	Cyclic input measured variables: ▪ Volume flow [m³/h] ▪ Conductivity [S/m], depending on order options or device settings ▪ Temperature [°C], depending on the sensor option selected ▪ Totalizer 1 [m³] Cyclic output measured variables: ▪ **Totalizer** submenu – **Totalize** option ▪ **Totalizer** submenu – **Reset + hold** option ▪ **Totalizer** submenu – **Reset + totalize** option ▪ **Totalizer** submenu – **Hold** option ▪ Flow override ▪ Device search

Device description

In order to integrate field devices into a digital communication system, the IO-Link system needs a description of the device parameters, such as output data, input data, data format, data volume and supported transmission rate.

These data are available in the device description (IODD) which is provided to the IO-Link Master when the communication system is commissioned.

The IODD can be downloaded as follows:
- www.endress.com
- https://ioddfinder.io-link.com

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 ▪ 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 ▪ 04: Read input register ▪ 06: Write single registers ▪ 08: Diagnostics ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Broadcast messages	Supported by the following function codes: ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Supported baud rate	▪ 1 200 BAUD ▪ 2 400 BAUD ▪ 4 800 BAUD ▪ 9 600 BAUD ▪ 19 200 BAUD ▪ 38 400 BAUD ▪ 57 600 BAUD ▪ 115 200 BAUD
Data transfer mode	RTU
Data access	Each parameter can be accessed via Modbus RS485. For Modbus register information
System integration	Information on system integration . ▪ Modbus RS485 information ▪ Function codes ▪ Register information ▪ Response time ▪ Modbus data map

Power supply

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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 **A** IO-Link port class A	DC 18 to 30 V [1]		–
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

1) These values are absolute minimum and maximum values. No tolerance applies. The DC power unit must be tested to ensure it meets technical safety requirements (e.g. PELV, SELV) with limited power sources (e.g. Class 2).

Power consumption

- Transmitter:
  - HART, Modbus RS485: Max. 10 W (active power)
  - IO-Link: Max. 6 W (active power)
- Switch-on current:
  - HART, Modbus RS485: Max. 36 A (< 5 ms) as per NAMUR Recommendation NE 21
  - IO-Link: Max. 400 mA

Current consumption

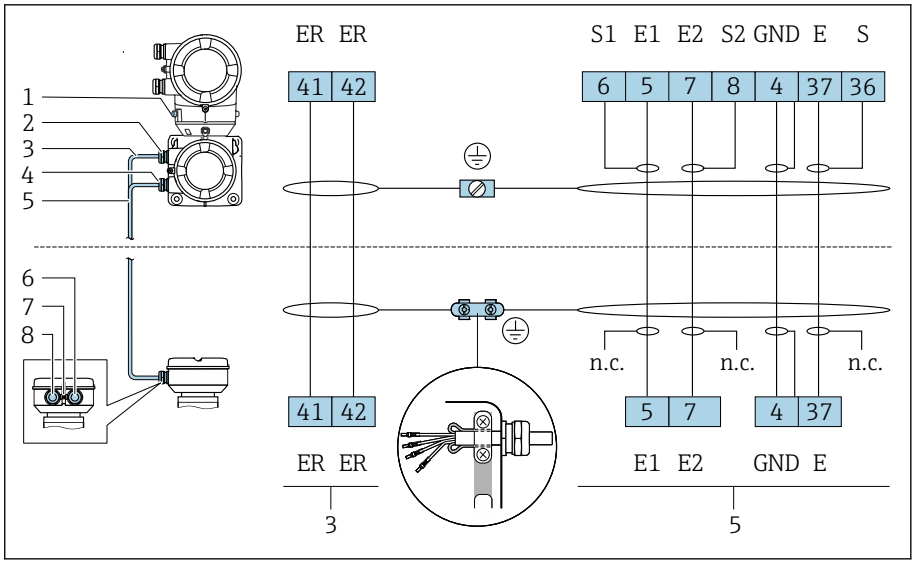
- Max. 400 mA (24 V)
- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)
- Max 200 mA. (18 to 30 V, IO-Link port class A)

Power supply failure

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

Electrical connection

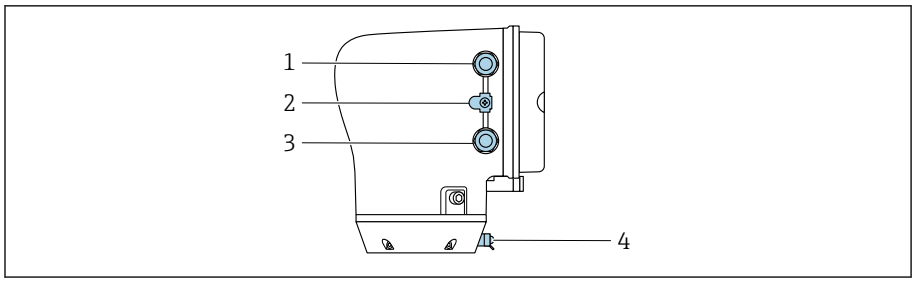
Connections and terminal assignment, remote version connecting cable



1 *Outer ground terminal*
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 *Outer ground terminal*
8 *Sensor connection housing: cable entry for coil current cable*

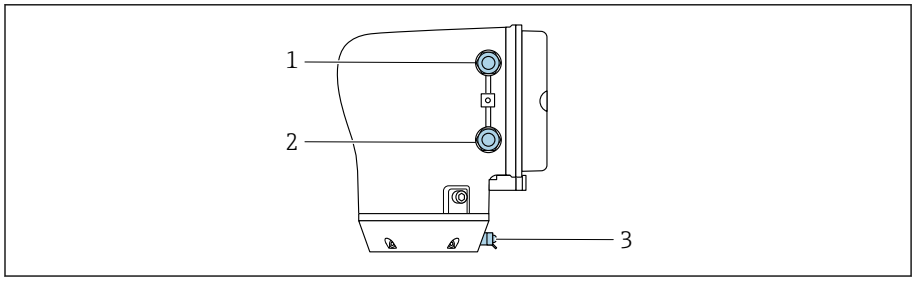
Transmitter terminal connections

Terminal assignment → *Terminal assignment*, 26



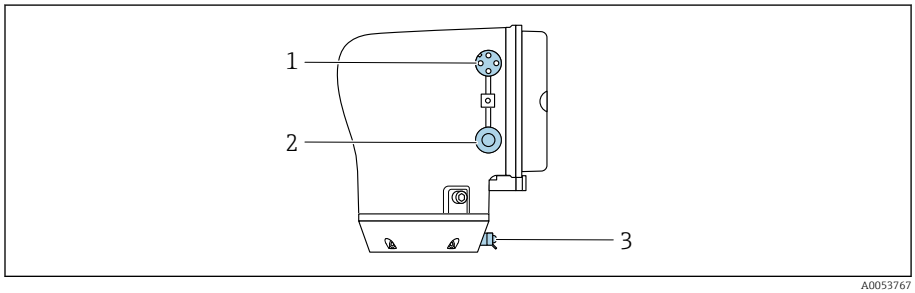
A0043283

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



A0045438

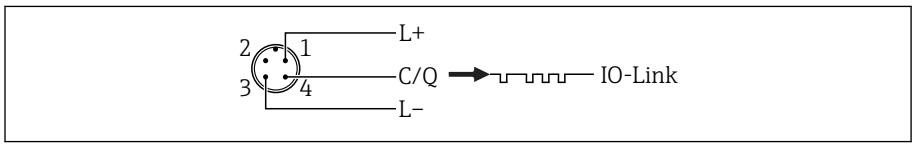
1 Cable entry for power supply cable: supply voltage
2 Cable entry for signal cable
3 Outer ground terminal



A0053767

1 M12 plug for power supply (supply voltage) and signals (IO-Link)
2 Dummy plug
3 Outer ground terminal

Pin assignment of IO-Link device plug



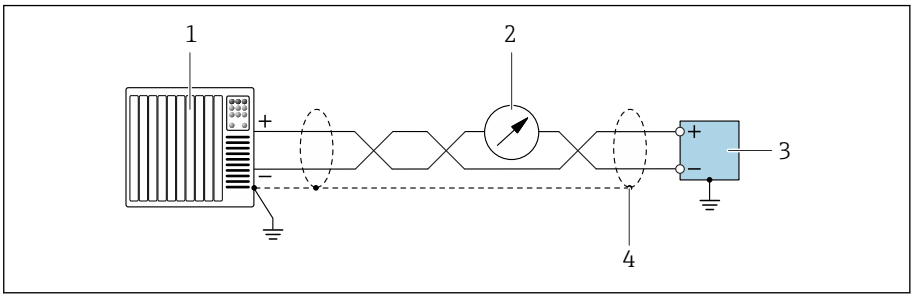
A0053891

1 M12 A-coded (IEC 61076-2-101)

1 PIN 1: power supply
2 PIN 2: not used
3 PIN 3: reference potential for power supply/output
4 PIN 4: output 1 (IO-link)

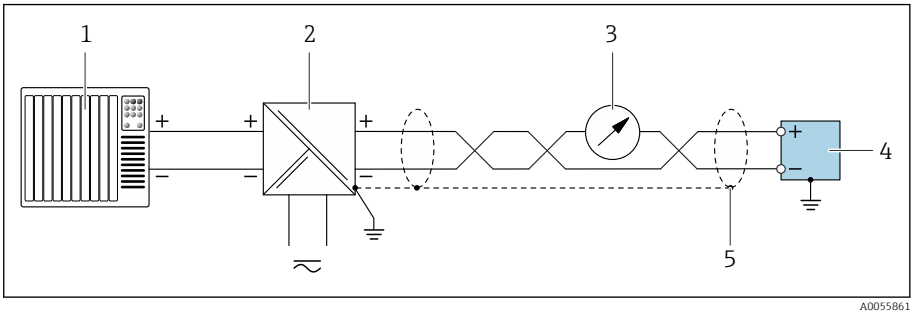
Examples of electric terminals

Current output 4 to 20 mA HART



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

1 *Automation system with 4 to 20 mA current input with HART (e.g. PLC)*
2 *Optional display unit: Note maximum load*
3 *Transmitter with 4 to 20 mA current output with HART (active)*
4 *Ground the cable shield on one side only. For installations in compliance with NAMUR NE98, grounding of the cable shield on both sides is required.*



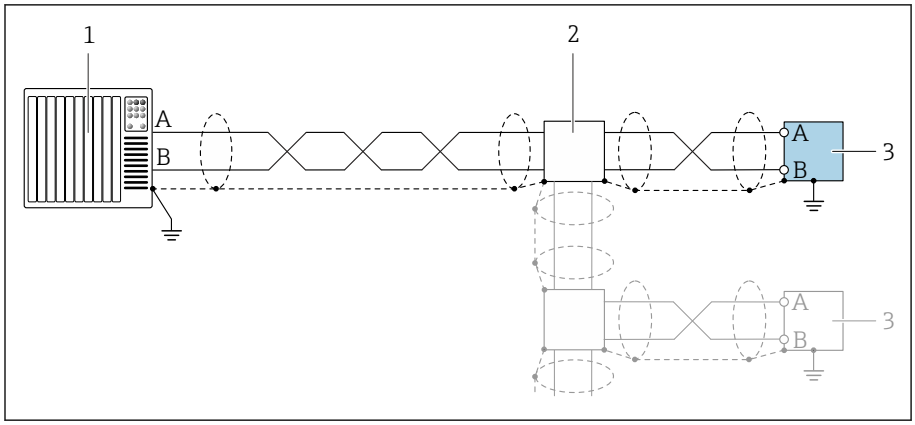
3 *Connection example for 4 to 20 mA current output with HART (passive)*

1 *Automation system with 4 to 20 mA current input with HART (e.g. PLC)*
2 *Power supply*
3 *Optional display unit: Note maximum load*
4 *Transmitter with 4 to 20 mA current output with HART (passive)*
5 *Ground the cable shield on one side only. For installations in compliance with NAMUR NE98, grounding of the cable shield on both sides is required.*

IO-Link

See https://io-link.com"IO-Link System Description"

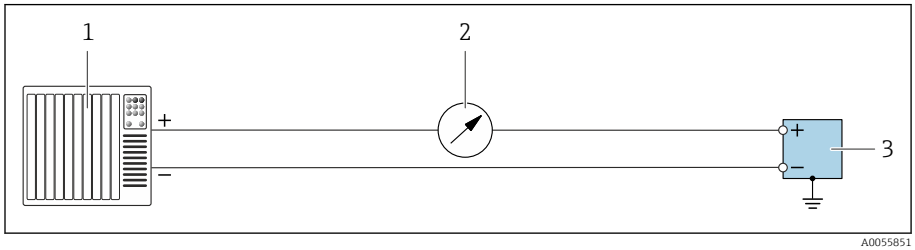
Modbus RS485



4 *Connection example for Modbus RS485*

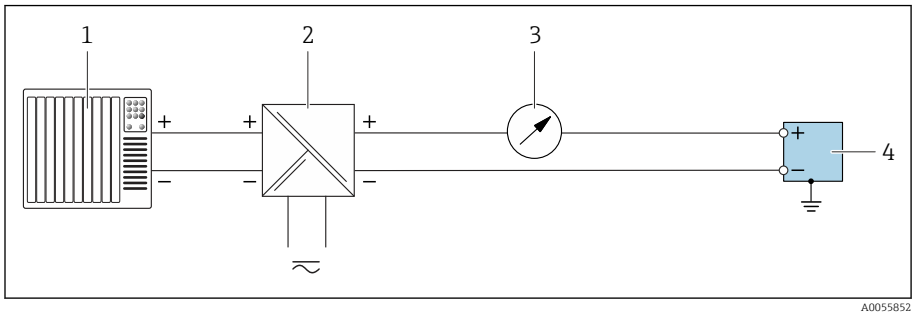
1 *Automation system with Modbus master (e.g. PLC)*
2 *Optional distribution box*
3 *Transmitter with Modbus RS485*

Current output 4 to 20 mA (without HART)



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

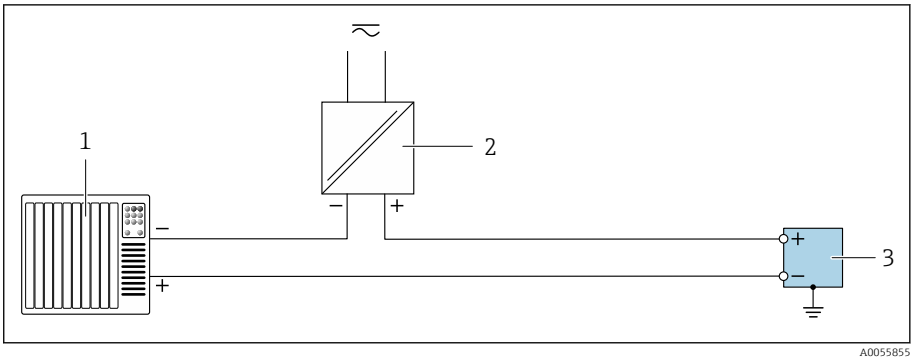
1 *Automation system with current input (e.g. PLC)*
2 *Optional additional display unit: Observe maximum load*
3 *Flowmeter with current output (active)*



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

1 *Automation system with current input (e.g. PLC)*
2 *Power supply*
3 *Optional additional display unit: Observe maximum load*
4 *Transmitter with current output (passive)*

Pulse output/frequency output/switch output



7 *Connection example for pulse output/frequency output/switch output (passive)*

1 *Automation system with pulse input/frequency input/switch input (e.g. PLC)*
2 *Power supply*
3 *Transmitter with pulse output/frequency output/switch output (passive)*

Potential equalization

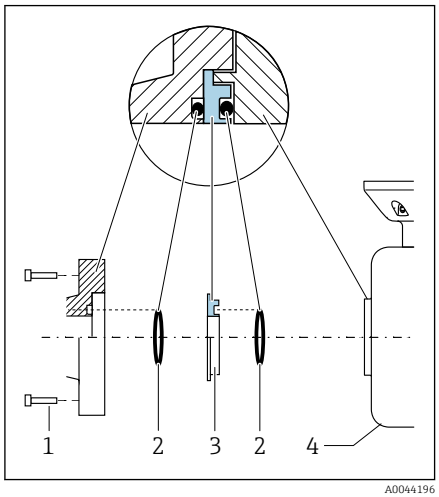
Metal process connections

Potential equalization is via the metal process connections that are in contact with the medium and mounted directly on the sensor.

Plastic process connections

Note the following when using grounding rings:
- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. The plastic disks act as "spacers" and do not have any potential equalization function. They perform a significant sealing function at the sensor and process connection interfaces. In the case of process connections without metal grounding rings, the plastic disks and seals must never be removed. Plastic disks and seals must always be installed.
- Grounding rings can be ordered separately as accessory DK5HR* from Endress+Hauser (does not contain any seals). When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion!
- If seals are required, they can be additionally ordered with seal set DK5G*.
- Grounding rings including seals are mounted inside the process connections. This does not affect the installed length.

Connection example for potential equalization with additional grounding ring



NOTICE

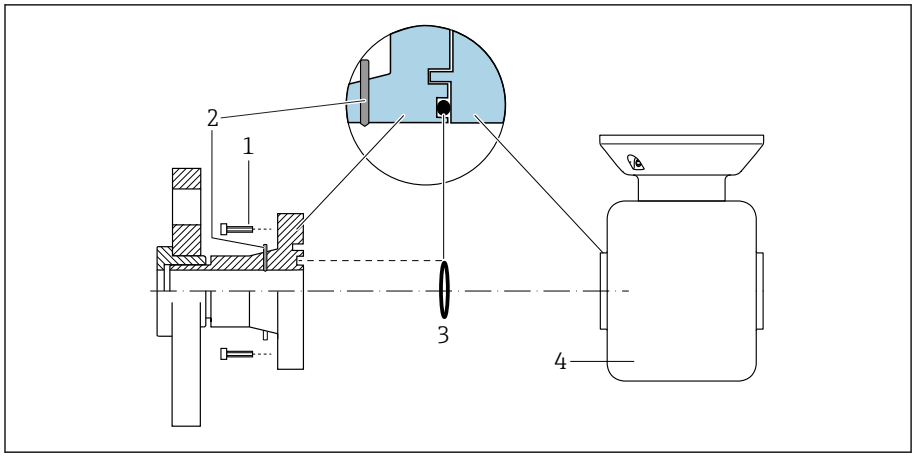
If potential equalization is not provided, this can lead to the electrochemical degradation of the electrodes or affect measurement accuracy!

Damage to the device.

- ▶ Install grounding rings.
- ▶ Provide (establish) potential equalization.

1. Loosen the hexagonal-headed bolts (1).
2. Remove the process connection from the sensor (4).
3. Remove the plastic disk (3), along with the seals (2), from the process connection.
4. Place the first seal (2) into the groove of the process connection.
5. Place the metal grounding ring (3) into the process connection.
6. Place the second seal (2) into the groove of the grounding ring.
7. Observe the maximum screw tightening torques for lubricated threads: 7 Nm (5.2 lbf ft)
8. Mount the process connection on the sensor (4).

Connection example for potential equalization with grounding electrodes



1 *Hexagonal-headed bolts of process connection*
2 *Integrated grounding electrodes*
3 *Seal*
4 *Sensor*

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
- M12 plug-in connector (IO-Link only)

Overvoltage protection

Mains voltage fluctuations	→ *Supply voltage*, 🖹 26
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 specifications

Requirements for connecting cable 34
Ground cable requirements 34
Connecting cable requirements 34

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

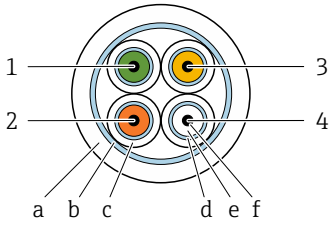
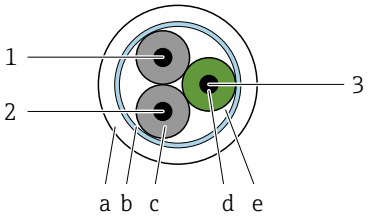
- Current output 4 to 20 mA HART:
  A shielded cable is recommended, observe the grounding concept of the facility.
- Pulse/frequency/switch output:
  Standard installation cable
- IO-Link:
  Twisted three- or four-core cable M12 A-coded according to IEC 61076-2-101 recommended with
  - Conductor cross-section: 0.34 mm² (AWG22)
  - Max. cable length: 20 m
- 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 mm² (0.0093 in²)

Connecting cable requirements

Connecting cable only necessary for remote version.

Electrode cable	Coil current cable
 A0054679	 A0054680
1 GND (green): Ground-wire 0.38 mm²(AWG 21) *2 E1 (brown): "Electrode E1" - core 0.38 mm²(AWG 21)* *3 E (yellow): grounding 0.38 mm² (AWG 21)* *4 E2 (white): "Electrode E2"- core 0.38 mm² (AWG 21)* *a Outer jacket* *b Cable shield* *c Core jacket* *d Core shield* *e Core insulation* *f Core*	*1 ER+ (black): coil current core 0.75 mm² (AWG 18)* *2 ER– (black): coil current core 0.75 mm² (AWG 18)* *3 NC (yellow-green): not connected 0.75 mm² (AWG 18)* *a Outer jacket* *b Cable shield* *c Core insulation* *d Core* *e Core reinforcement*

Electrode cable

Design	3×0.38 mm² (21 AWG) with common, braided copper shield (ø ~ 9.5 mm (0.37 in)) and individual shielded cores If using the empty pipe detection (EPD) function: 4×0.38 mm² (21 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)
Operating temperature	–20 to +80 °C (–4 to +176 °F)

Coil current cable

Design	3×0.75 mm² (18 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)
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 38
Maximum measurement error 38
Repeatability 39
Temperature measurement response time 39
Influence of ambient temperature 39

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
- Reference temperature for conductivity measurement: 25 °C (77 °F)

To obtain measured errors, use the *Applicator* sizing tool → *Service-specific accessory* , 📄 114

Maximum measurement error

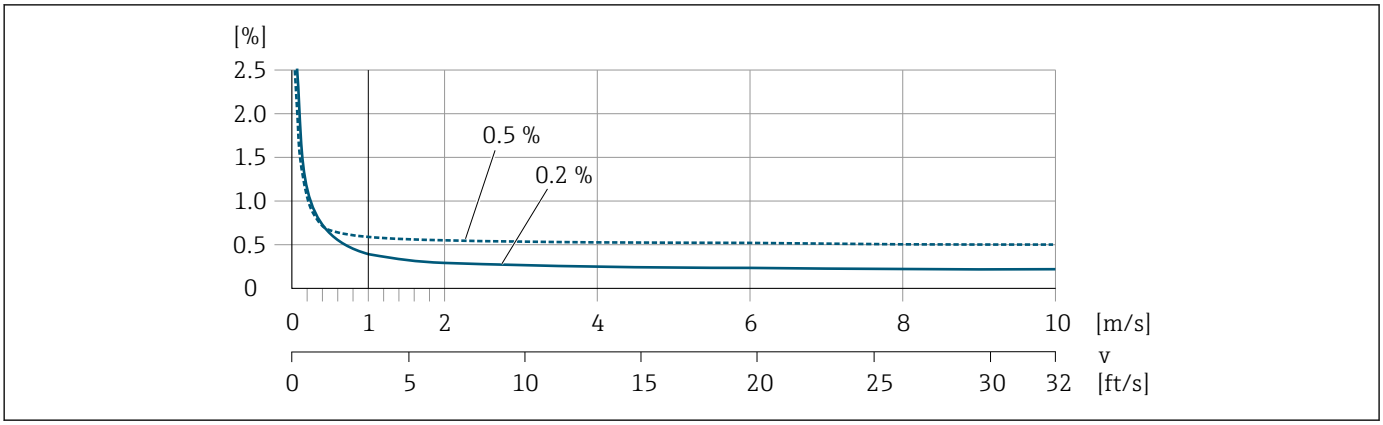
o. r. = of reading

Maximum permissible error under reference operating conditions

Volume flow

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

Fluctuations in the supply voltage have no effect within the specified range.



8 Maximum measurement error in % o.r.

Temperature

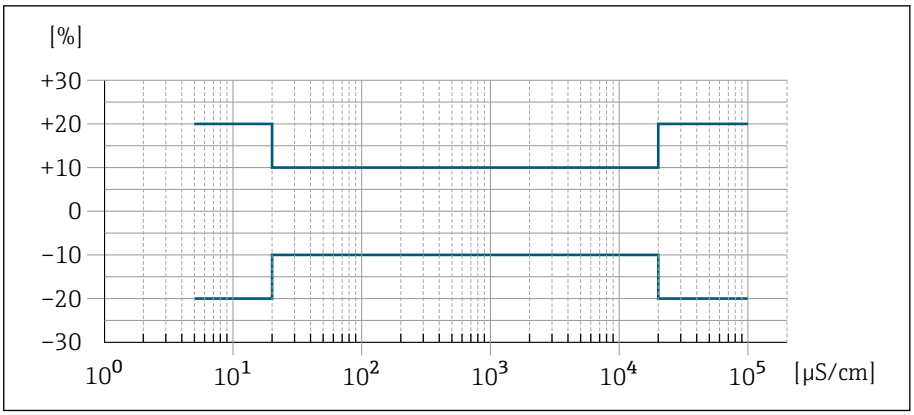
±3 °C (±5.4 °F)

Electrical conductivity

Order code for "Conductivity measurement", option CX

The values apply for:
- Measurements at a reference temperature of +25 °C (+77 °F).
  If the temperature differs, the temperature coefficient of the medium must be taken into account (typically 2.1%/K).
- Device version: compact (transmitter and sensor form a mechanical unit)
- Devices in a metal pipe or in a non-metal pipe with installed ground disks.
- Devices whose potential equalization has been established according to the specifications in the related Operating Instructions.

Conductivity [µS/cm]	Measurement error [%] o. r.
5 to 20	± 20%
20 to 20 000	± 10%
20 000 to 100 000	± 20%



9 *Measurement error for order code "Conductivity measurement", option CX*

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) ▪ Max. ±1 % o. r. for DN 15 to 150 in conjunction with stainless steel process connections, 1.4404 (F316L)
Temperature	±0.5 °C (±0.9 °F)

Temperature measurement response time

T_{90} < 15 s

Influence of ambient temperature

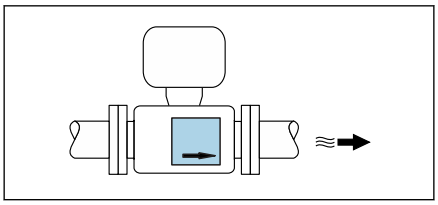
Current output	Temperature coefficient max. 1 µA/°C
Pulse/frequency output	No additional effect. Is included in the accuracy.

Installation procedure

Installation conditions 42

Installation conditions

Flow direction

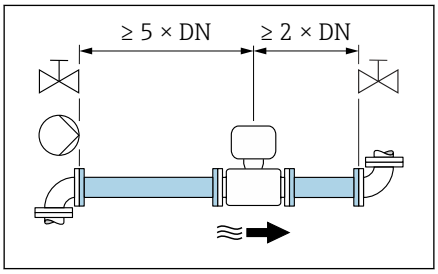


A0041163

Install the device in the direction of flow.

Note the direction of arrow on the nameplate.

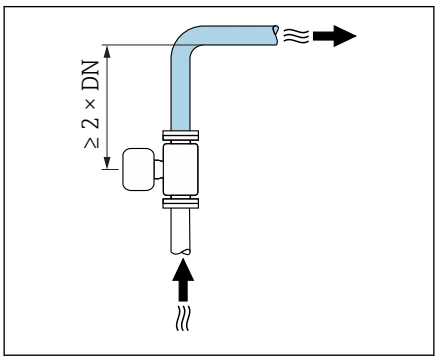
Installation with inlet runs and outlet runs



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

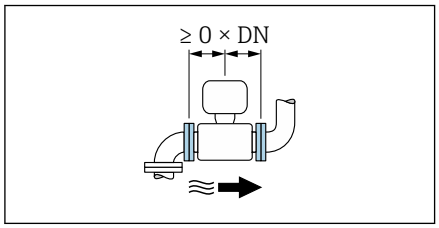
Depending on the device design and installation location, the inlet and outlet runs can be reduced or omitted entirely.

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

Devices and possible order options

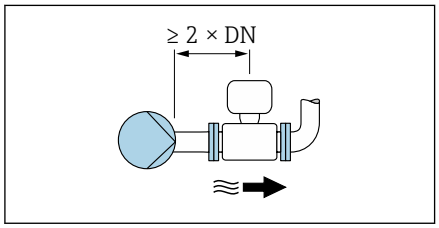
Order code for "Electrodes"		
Option	**Description**	**Design**
J	1.4435/316L, pointed for 0 x DN inlet/ outlet runs	0 x DN full-bore design [1]
L	1.4435/316L for 0 x DN inlet/outlet runs	
M	Alloy C22 for 0 x DN inlet/outlet runs	

1) "Full-bore" indicates a measuring tube cross-section corresponding to the nominal diameter without constriction. This means there is no pressure loss.



A0032859

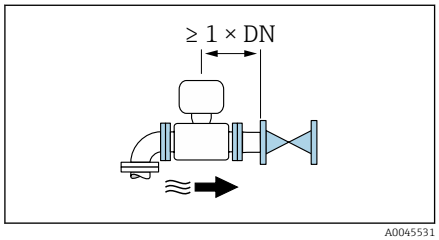
Installation before or after bends
Installation without inlet and outlet runs is possible.



A0045530

Installation downstream of pumps
Installation without inlet and outlet runs is possible.

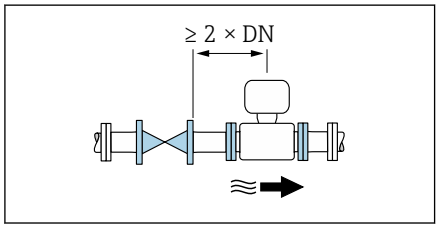
An inlet run of ≥ 2 x DN is recommended.



A0045531

Installation upstream of valves
Installation without inlet and outlet runs is possible.

An outlet run of ≥ 1 x DN is recommended.

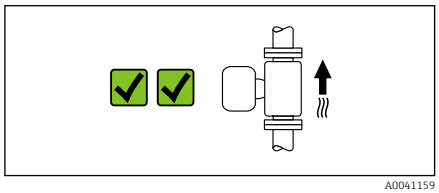


A0045786

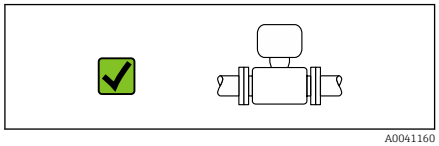
Installation downstream of valves
The device can be installed without inlet and outlet runs if the valve is 100% open during operation.

An inlet run of ≥ 2 x DN is recommended if the valve is 100% open during operation.

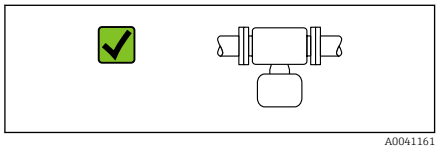
Orientations


A0041159

Vertical orientation, upward direction of flow
For all applications.

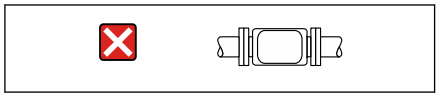

A0041160

Horizontal orientation, transmitter at top
This orientation is suitable for the following applications:
- For medium and 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 medium and high process temperatures, in order to maintain the maximum ambient temperature for the transmitter.
- To prevent the electronics module from overheating in the case of a sharp rise in temperature , install the measuring instrument with the transmitter component pointing downwards.

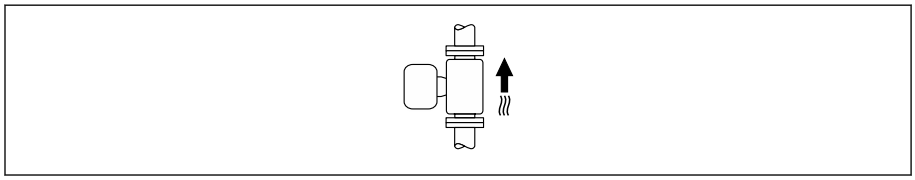
This orientation is not suitable for the following applications:
If empty pipe detection is to be used.


A0041162

Horizontal orientation, transmitter at side
This orientation is not suitable

Vertical

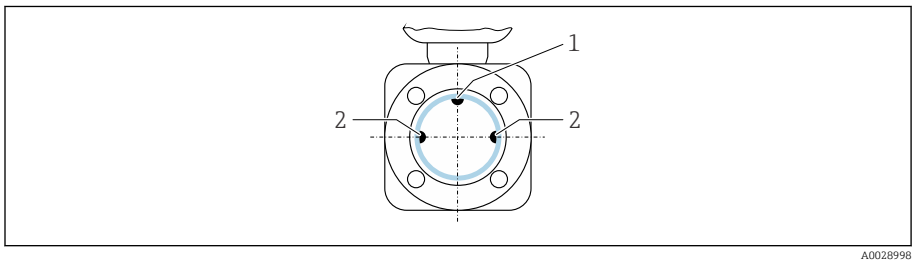
Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.



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.

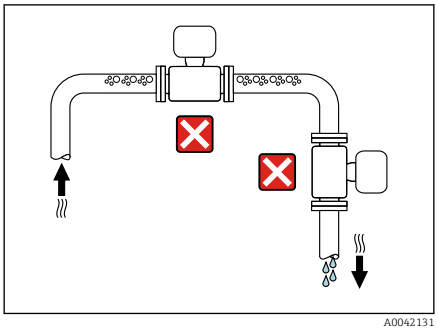


A0028998

1 EPD electrode for empty pipe detection, available from ≥ DN 15 (½")
2 Measuring electrodes for signal detection

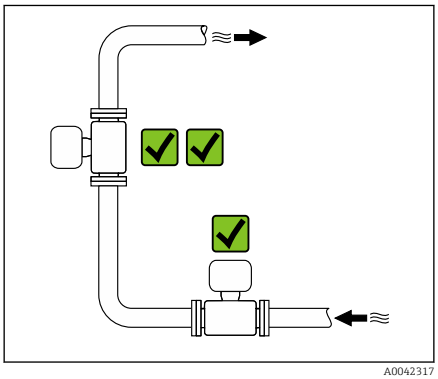
Measuring instruments with a nominal diameter < DN 15 (½") do not have an EPD electrode. In this case, empty pipe detection is performed via the measuring electrodes.

Mounting locations



A0042131

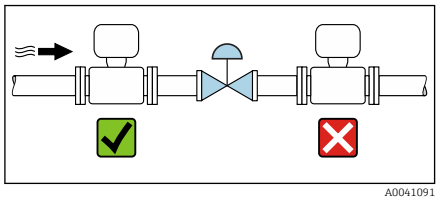
- Do not install the device at the highest point of the pipe.
- Do not install the device upstream from a free pipe outlet in a down pipe.



A0042317

The device should ideally be installed in an ascending pipe.

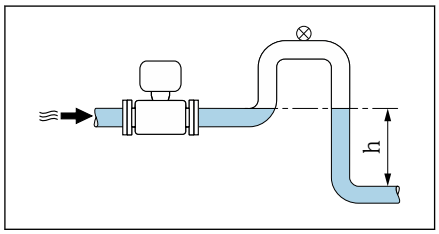
Installation near control valves



A0041091

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

Installation upstream from a down pipe



A0041089

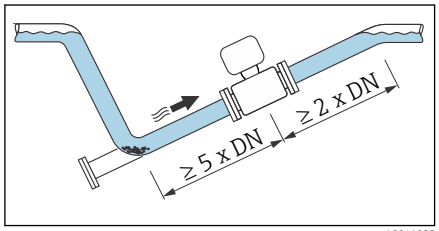
NOTICE

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.

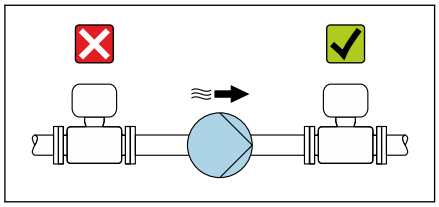
Installation with partially filled pipes



A0041088

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

Installation near pumps



A0041083

NOTICE

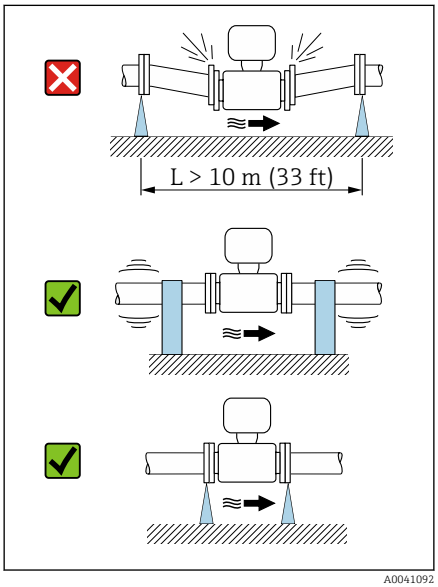
A vacuum in the measuring tube can damage the liner!

- ▶ 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 measuring system's resistance to vibration and shock
→ *Vibration resistance and shock resistance*, 📄 50

Pipe vibrations

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



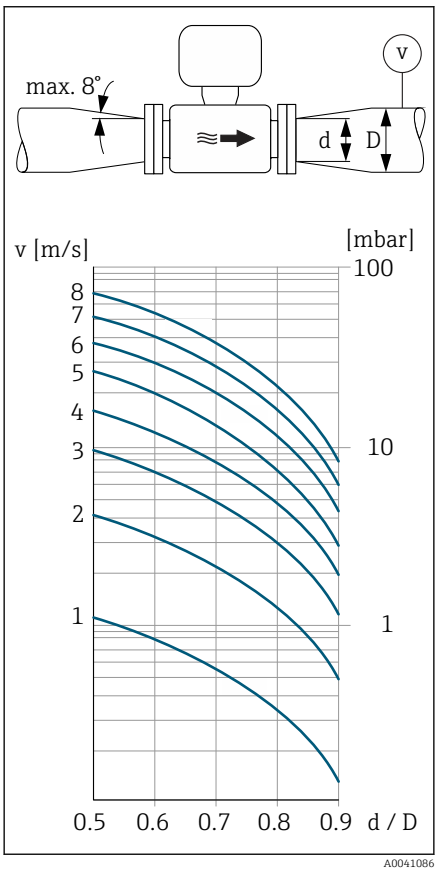
A0041092

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.

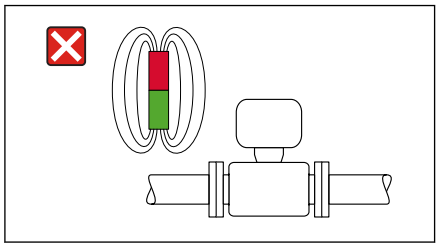
- The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders. It only applies to liquids with a viscosity similar to that of water.
- If the medium has a high viscosity, a larger measuring tube diameter can be considered in order to reduce pressure loss.

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 plastic flanges: seals are **always** required.

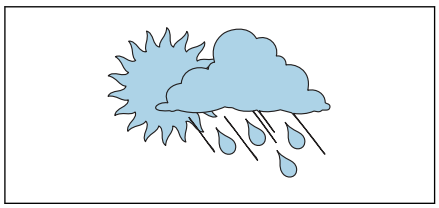
Magnetism and static electricity



A0042152

Do not install the device near magnetic fields, e.g. Engines, 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*, 112.

Environment

Ambient temperature range 50
Storage temperature 50
Relative humidity 50
Operating height 50
Degree of protection 50
Vibration resistance and shock resistance 50
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) The readability of the display may be impaired at temperatures outside the temperature range.
Sensor	−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 (e.g. Endress+Hauser HAW series)

Degree of protection

Transmitter	▪ IP66/67, Type 4X enclosure, suitable for pollution degree 4 ▪ Open housing: IP20, Type 1 enclosure, suitable for pollution degree 2
Sensor	IP66/67, Type 4X enclosure, suitable for pollution degree 4

Vibration resistance and shock resistance

Compact version

Vibration, sinusoidal Following IEC 60068-2-6	2 to 8.4 Hz 8.4 to 2 000 Hz	3.5 mm peak 1 g peak
Vibration, broad-band random Following IEC 60068-2-64	10 to 200 Hz 200 to 2 000 Hz	0.003 g^2/Hz 0.001 g^2/Hz (1.54 g rms)
Shocks, half-sine Following IEC 60068-2-27	6 ms 30 g	

Shock
Due to rough handling similar to IEC 60068-2-31.

Remote version (sensor)

Vibration, sinusoidal Following IEC 60068-2-6	2 to 8.4 Hz 8.4 to 2 000 Hz	7.5 mm peak 2 g peak
Vibration, broad-band random Following IEC 60068-2-6	10 to 200 Hz 200 to 2 000 Hz	0.01 g^2/Hz 0.003 g^2/Hz (2.7 g rms)

Shocks, half-sine Following IEC 60068-2-6	6 ms 50 g

Shock
Due to rough handling similar to IEC 60068-2-31.

Electromagnetic compatibility (EMC)

As per IEC/EN 61326 and
- HART, Modbus RS485: NAMUR Recommendation NE 21
- IO-Link: IO-Link Interface and System Specification

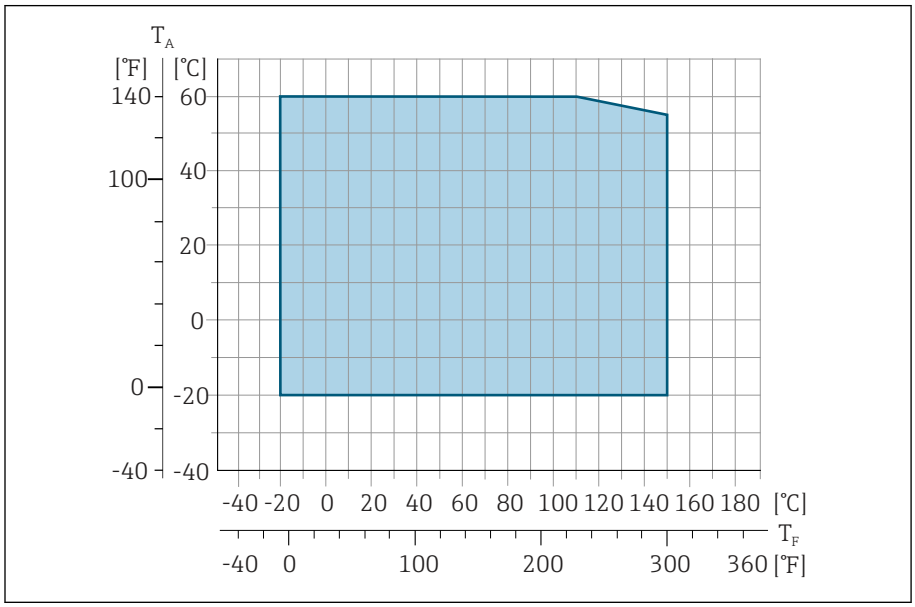

For more information: Declaration of Conformity

Process

Medium temperature range 54
Conductivity 54
Flow limit 55
Pressure/temperature ratings 56
Pressure tightness 58
Pressure loss 58

Medium temperature range

−20 to +150 °C (−4 to +302 °F)



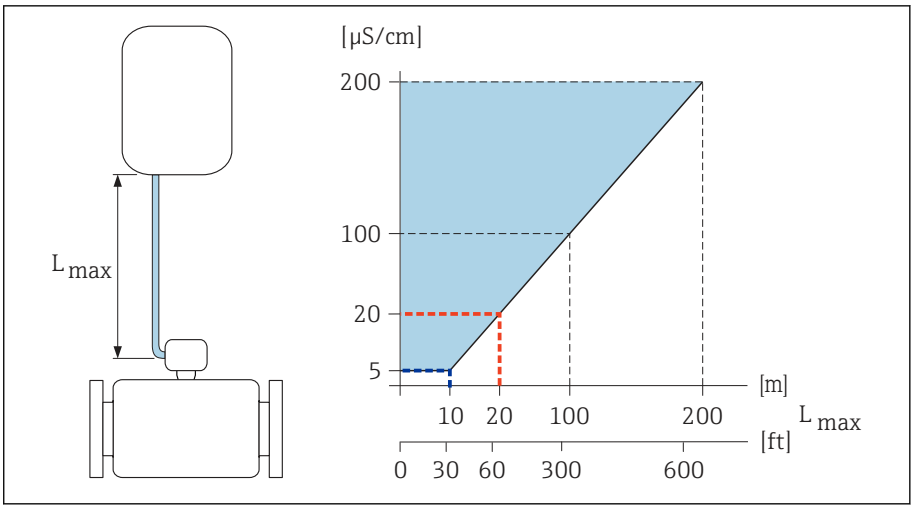
T_A *Ambient temperature*
T_F *Medium temperature*

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.



10 *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.
- In the case of media with a high solids content, a sensor with a nominal diameter > DN 8 (3/8") can improve the signal stability and cleanability due to the larger electrodes.

2 to 3 m/s (6.56 to 9.84 ft/s)	Optimum flow velocity
v < 2 m/s (6.56 ft/s)	For low conductivity values
v > 2 m/s (6.56 ft/s)	For media producing buildup, e.g. high-fat milk

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.

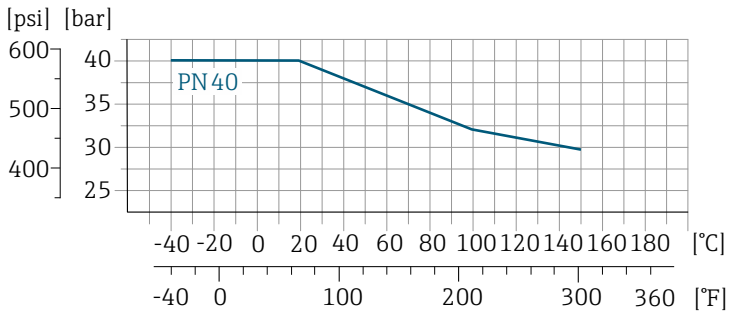
Process connections with O-ring seal, DN 2 to 25 (1/12 to 1")

Maximum permitted medium pressure as a function of the medium temperature.

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

Fixed flange similar to EN 1092-1

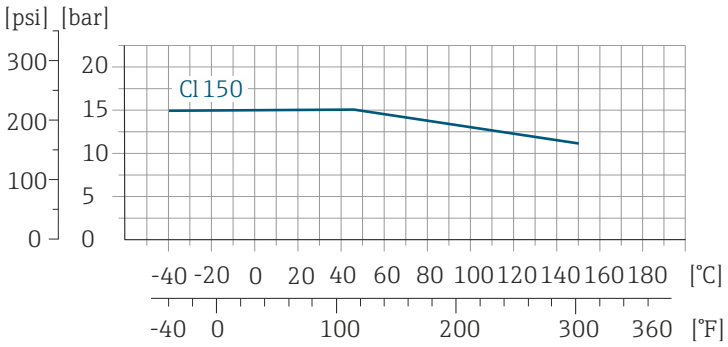
Stainless steel



A0028928-EN

Fixed flange similar to ASME B16.5

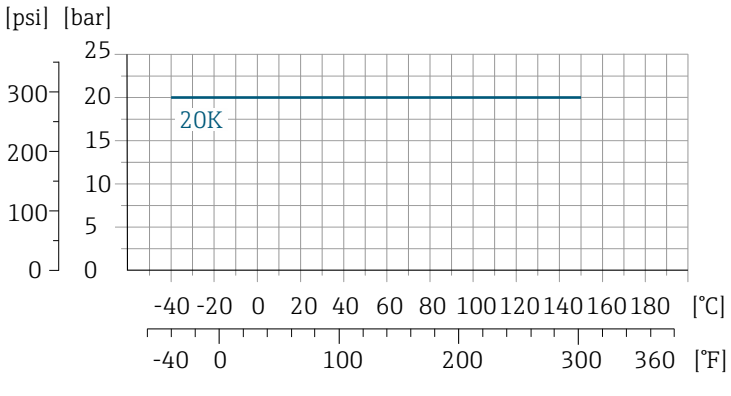
Stainless steel



A0028936-EN

Fixed flange similar to JIS B2220

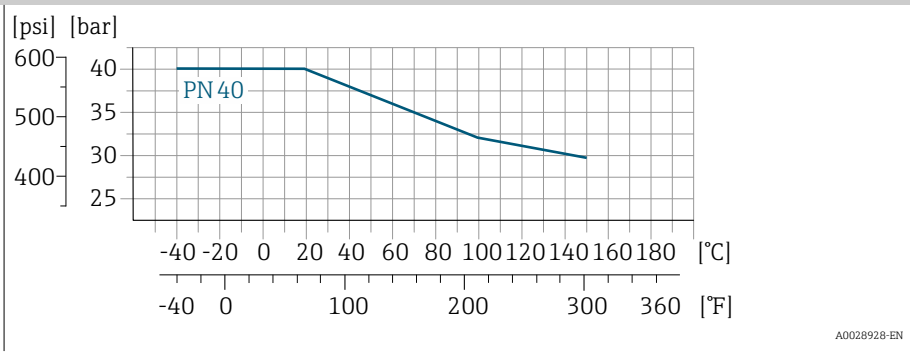
Stainless steel



A0028938-EN

Coupling similar to ISO 288/DIN 2999, NPT
Welding socket similar to DIN EN ISO 1127, ISO 2037

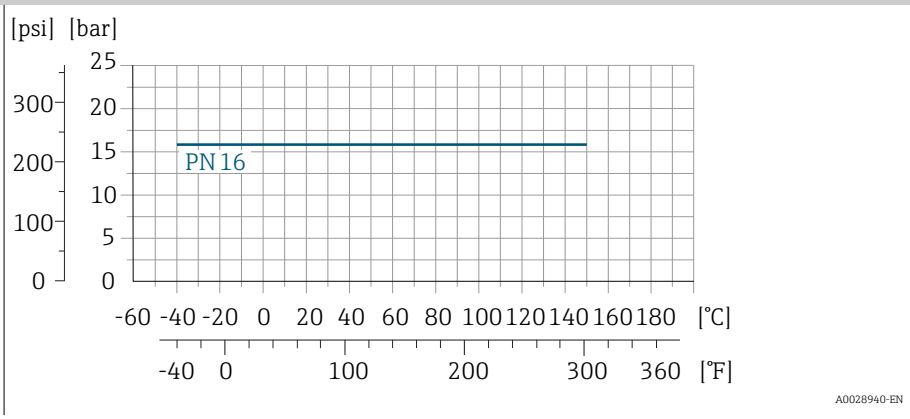
Stainless steel



Process connections with aseptic gasket seal, DN 2 to 25 (1/12 to 1")

Welding socket similar to EN 10357 (DIN 11850)
Thread similar to DIN 11851
Thread similar to DIN 11864-1
Flange DIN 11864-2 Form

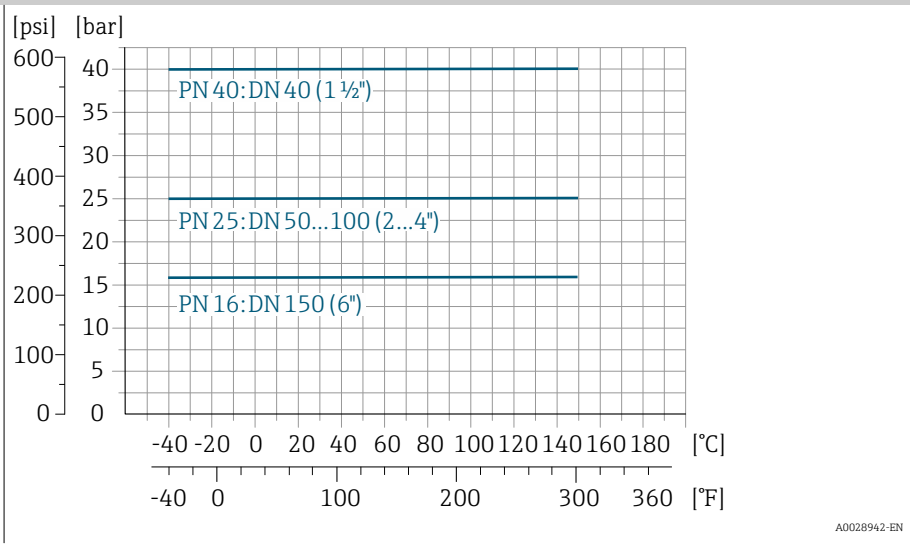
Stainless steel

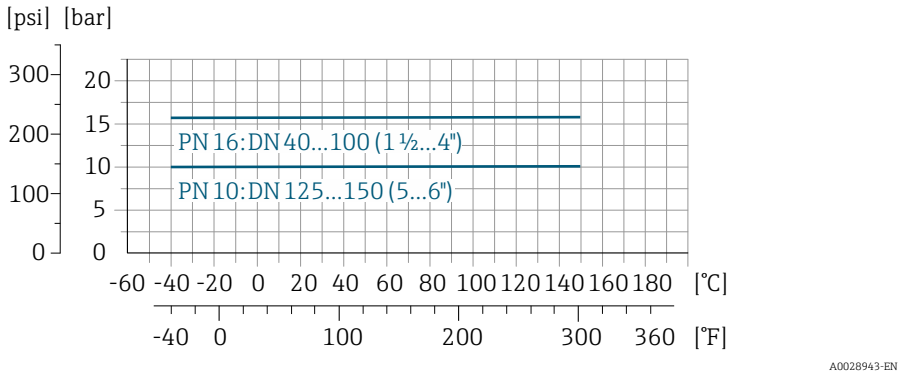


Process connections with aseptic gasket seal, DN 40 to 150 (1 ½ to 6")

Welding socket similar to ASME BPE
Welding socket similar to EN 10357 (DIN 11850)
Welding socket similar to ISO 2037
Thread similar to DIN 11851

Stainless steel



Flange DIN 11864-2 Form A, flange with notch Thread similar to DIN 11864-1	
Stainless steel	

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

Pressure tightness

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

PFA	Nominal diameter		Absolute pressure in [mbar] ([psi])				
	[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 °C (+212 °F)	+130 °C (+266 °F)	+150 °C (+302 °F)
	2 to 150	1/12 to 6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Pressure loss

- No pressure loss: as of DN 8 (5/16"), with transmitter installed in a pipe with the same nominal diameter.
- Pressure loss information when adapters are used → *Adapters*, 46

Mechanical construction

Weight 60
Measuring tube specification 60
Materials 61
Fitted electrodes 62
Surface roughness 62

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.

Nominal diameter		Weight	
[mm]	[in]	[kg]	[lbs]
2	1/12	4.7	10.4
4	5/32	4.7	10.4
8	5/16	4.7	10.4
15	½	4.6	10.1
25	1	5.5	12.1
40	1 ½	6.8	15.0
50	2	7.3	16.1
65	–	8.1	17.9
80	3	8.7	19.2
100	4	10.0	22.1
125	5	15.4	34.0
150	6	17.8	39.3

Measuring tube specification

Nominal diameter		Pressure rating [1]	Process connection internal diameter	
		EN (DIN)	PFA	
[mm]	[in]	[bar]	[mm]	[in]
2	1/12	PN 16/40	2.25	0.09
4	5/32	PN 16/40	4.5	0.18
8	5/16	PN 16/40	9.0	0.35
15	½	PN 16/40	16.0	0.63
–	1	PN 16/40	22.6	0.89
25	–	PN 16/40	26.0	1.02
40	1 ½	PN 16/25/40	34.8	1.37
50	2	PN 16/25	47.5	1.87
65	–	PN 16/25	60.2	2.37
80	3	PN 16/25	72.9	2.87
100	4	PN 16/25	97.4	3.83
125	5	PN 10/16	120.0	4.72
150	6	PN 10/16	146.9	5.78

1) Depending on process connection and seals used

Materials

Transmitter housing	
Order code for "Housing"	▪ Option A: Compact, coated aluminum ▪ Option B: Compact, coated aluminum + polycarbonate inspection window ▪ Option M: Compact, polycarbonate ▪ Option N: Remote, polycarbonate ▪ Option P: Remote, aluminum, coated ▪ Option T: Remote, aluminum, coated + polycarbonate inspection window
Window material	▪ Order code for "Housing", option A: glass ▪ Order code for "Housing", option G: polycarbonate ▪ Order code for "Housing", option M: polycarbonate ▪ Order code for "Housing", option N: polycarbonate ▪ Order code for "Housing", option P: glass ▪ Order code for "Housing", option T: polycarbonate
Neck adapter	Order code for "Housing", option A, G and M: Aluminum, coated
Sensor connection housing	
	Stainless steel 1.4301 (304)
Cable glands and entries	
Cable gland M20×1.5	Plastic
Adapter for cable entry with internal thread G ½" or NPT ½"	Nickel-plated brass
M12 plug-in connector	Stainless steel 1.4301 (304)
Connecting cable for remote version	
	Electrode and coil current cable: PVC cable with copper shield
Sensor housing	
	Stainless steel: 1.4301 (304)
Measuring tubes	
	Stainless steel: 1.4301 (304)
Liner	
	PFA
Electrodes	
	▪ Stainless steel: 1.4435 (316L) ▪ Alloy C22: 2.4602 (UNS N06022)
Seals	
	▪ O-ring seal, DN 2 to 25 (1/12 to 1"): EPDM, FKM, Kalrez ▪ Aseptic (hygienic design) gasket seal, DN 2 to 150 (1/12 to 6"): EPDM, FKM, VMQ (silicone)
Process connections	
	Stainless steel, 1.4404 (F316L)

Centering star	
	Stainless steel 1.4435 (316L)

Accessories	
Weather protection cover	Stainless steel, 1.4404 (316L)
Pipe mounting kit (welding jig)	Stainless steel 1.4301 (304)
Wall mounting kit	Stainless steel, 1.4404 (316L) Does not meet the hygienic design installation guidelines.

Fitted electrodes

Standard electrodes:
- Measuring electrodes
- Empty pipe detection electrode (only DN 15 to 150 (½ to 6"))

Surface roughness

Data relates to surfaces in contact with the medium.

Stainless steel electrodes, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022):
≤ 0.3 to 0.5 µm (11.8 to 19.7 µin)

Liner with PFA:
≤ 0.4 µm (15.7 µin)

Stainless steel process connections:
- With O-ring seal: Ra ≤ 1.6 µm (63 µin)
- With aseptic seal: R_{amax} = 0.76 µm (30 µin),

Dimensions in SI units

Compact version 64
Order code for "Housing", option A and G "Aluminum, coated" 64
Order code for "Housing", option M "Compact, polycarbonate" 65

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Transmitter remote version 66
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Sensor flange connection 68

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Flange DIN 11864-2 Form A, flange with groove 70
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Flange similar to ASME B16.5, Class 150 72
Flange according to JIS B2220, 20K 72

Clamp connections 73
Tri-Clamp 73

Welding nipple 74
Welding socket similar to EN 10357 74
Welding nipple similar to ISO 1127 74
Welding nipple similar to ISO 2037 74
Welding nipple similar to ASME BPE 76

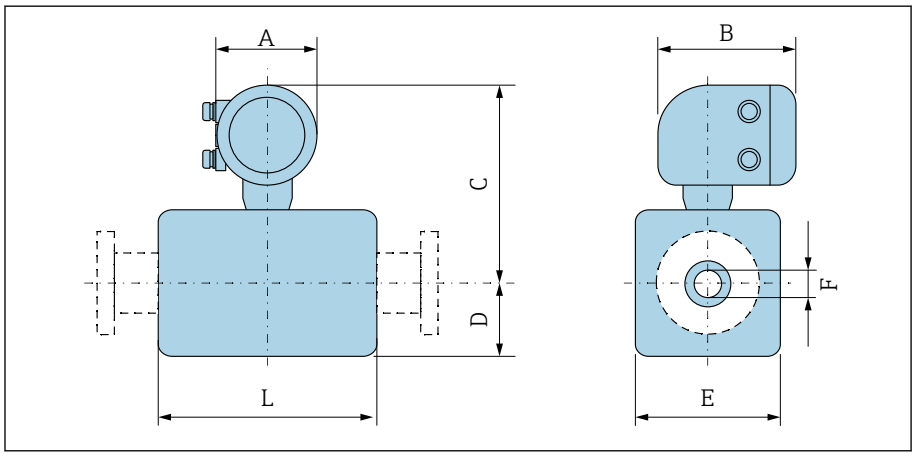
Couplings 77
Threaded coupling similar to DIN 11851 77
Threaded hygienic connection similar to DIN 11864-1, Form A 78
Thread similar to SMS 1145 78
External thread similar to ISO 228/DIN 2999 79

Mounting kit 80
Wall mounting kit 80

Accessories 81
Grounding rings 81
Spacer 81
Male thread with O-ring seal 82
Female thread with O-ring seal 82
Tri-Clamp 83
Weather protection cover 83

Compact version

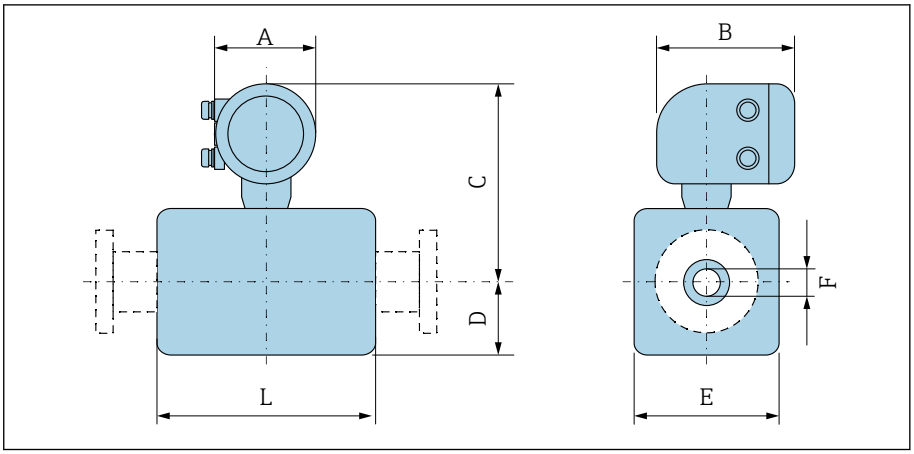
Order code for "Housing", option A and G "Aluminum, coated"



DN		A [1]	B	C	D	E	F	L [2]
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
2	1/12	139	178	235	48	43	2.25	86
4	1/32	139	178	235	48	43	4.5	86
8	5/16	139	178	235	48	43	9	86
15	½	139	178	235	48	43	16	86
–	1	139	178	239	52	56	22.6	86
25	–	139	178	239	52	56	26.0	86
40	1 ½	139	178	242	54	107	34.8	140
50	2	139	178	249	60	120	47.5	140
65	–	139	178	256	68	135	60.2	140
80	3	139	178	263	74	148	72.9	140
100	4	139	178	276	87	174	97.4	140
125	–	139	178	292	103	206	120.0	200
150	6	139	178	306	117	234	146.9	200

1) Depending on the cable gland used: values up to + 30 mm
2) Total length depends on the process connections.

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

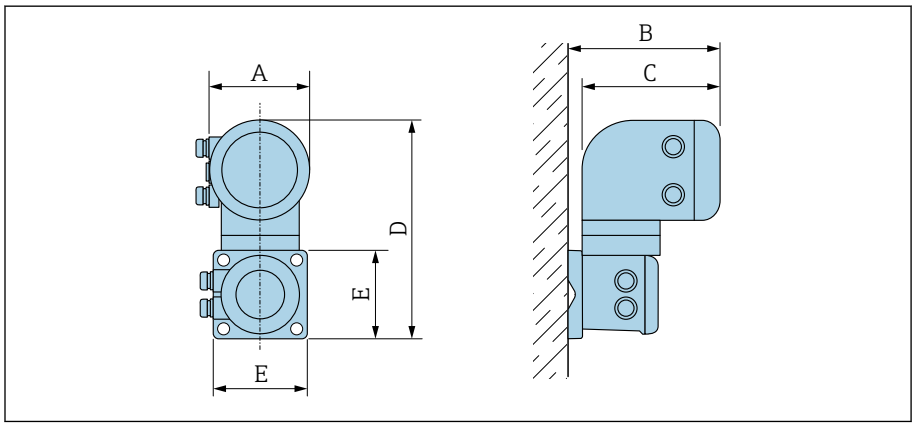


DN		A [1]	B	C	D	E	F	L [2]
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
2	1/12	132	172	232	55	43	2.25	86
4	1/32	132	172	232	55	43	4.5	86
8	5/16	132	172	232	55	43	9	86
15	½	132	172	232	55	43	16	86
–	1	132	172	237	55	56	22.6	86
25	–	132	172	237	55	56	26.0	86
40	1 ½	132	172	240	54	107	34.8	140
50	2	132	172	247	60	120	47.5	140
65	–	132	172	254	67	135	60.2	140
80	3	132	172	260	74	148	72.9	140
100	4	132	172	273	87	174	97.4	140
125	–	132	172	289	103	206	120.0	200
150	6	132	172	303	117	234	146.9	200

1) Depending on the cable gland used: values up to + 30 mm
2) Total length depends on the process connections.

Remote version

Transmitter remote version

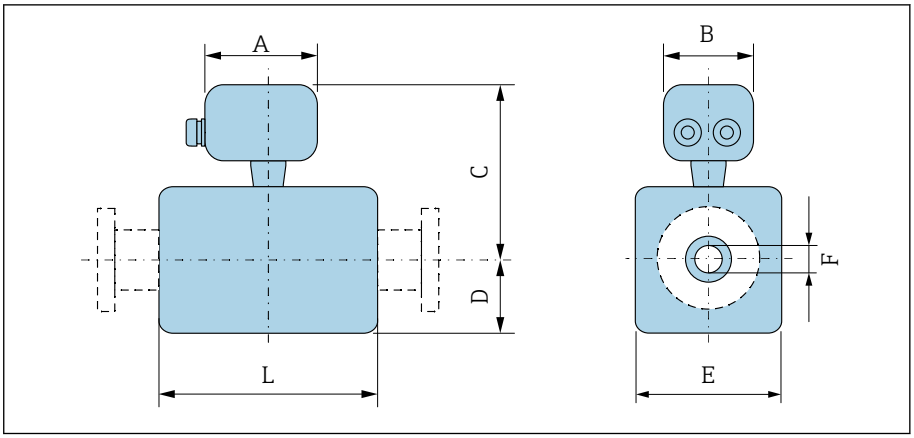


A0042715

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 and T "Remote, coated aluminum"	139	185	178	309	130

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

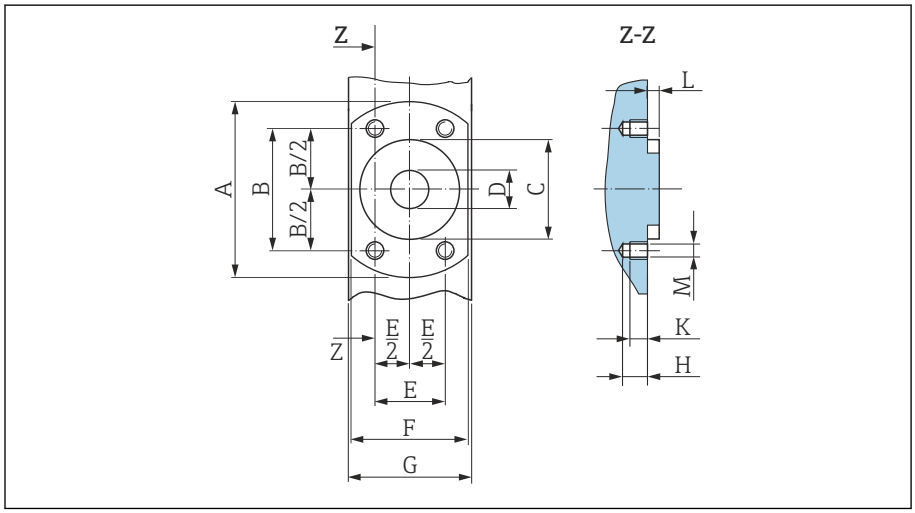
Sensor remote version



DN		A [1]	B	C	D	E	F	L [2]
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
2	1/12	126	70	129	48	43	2.25	86
4	1/32	126	70	129	48	43	4.5	86
8	5/16	126	70	129	48	43	9	86
15	½	126	70	129	48	43	16	86
–	1	126	70	133	52	56	22.6	86
25	–	126	70	133	52	56	26.0	86
40	1 ½	126	70	136	53	107	34.8	140
50	2	126	70	143	60	120	47.5	140
65	–	126	70	150	67	135	60.2	140
80	3	126	70	157	74	148	72.9	140
100	4	126	70	170	87	174	97.4	140
125	–	126	70	186	103	206	120.0	200
150	6	126	70	200	117	234	146.9	200

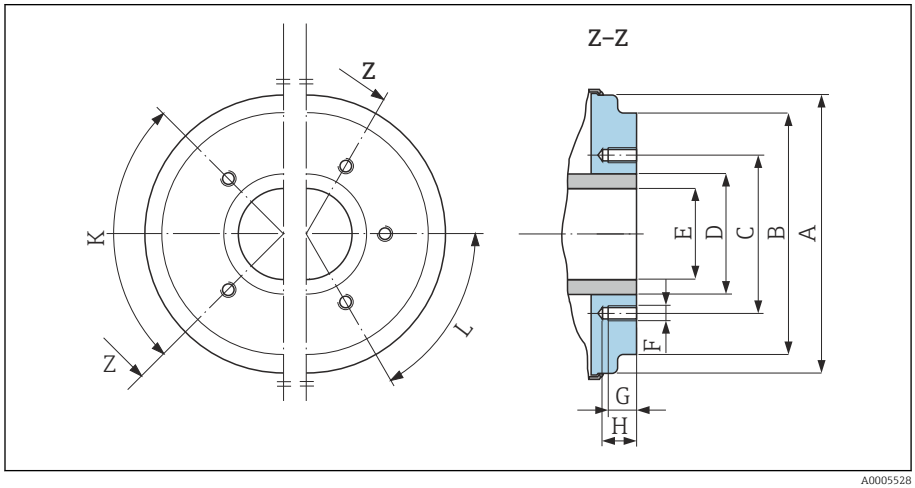
1) Depending on the cable gland used: values up to + 30 mm
2) Total length depends on the process connections.

Sensor flange connection



11 *Front view without process connections*

DN		A	B	C	D	E	F	G	H	K	L	M
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
2	1/12	62	41.6	34	9	24	42	43	8.5	6	4	M6
4	1/32	62	41.6	34	9	24	42	43	8.5	6	4	M6
8	5/16	62	41.6	34	9	24	42	43	8.5	6	4	M6
15	½	62	41.6	34	16	24	42	43	8.5	6	4	M6
25	–	72	50.2	44	26	29	55	56	8.5	6	4	M6



12 *Front view without process connections*

DN		A	B	C	D	E	F	G	H	K	L
										90° ±0.5°	60° ±0.5°
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Tapped holes	
40	1 ½	99.7	85.8	71.0	48.3	34.8	M8	12	17	4	–
50	2	112.7	98.8	83.5	60.3	47.5	M8	12	17	4	–
65	–	127.7	114.8	100.0	76.1	60.2	M8	12	17	–	6
80	3	140.7	133.5	114.0	88.9	72.9	M8	12	17	–	6

DN		A	B	C	D	E	F	G	H	K	L
										90° ±0.5°	60° ±0.5°
[mm]	[in]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Tapped holes	
100	4	166.7	159.5	141.0	114.3	97.4	M8	12	17	–	6
125	–	198.7	191.5	171.0	139.7	120.0	M10	15	20	–	6
150	6	226.7	219.5	200.0	168.3	146.9	M10	15	20	–	6

Flange connections

Flange DIN 11864-2 Form A, flange with groove

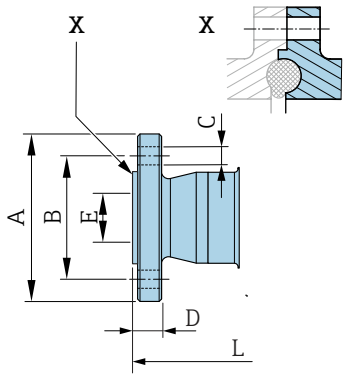
Stainless steel: order code for "Process connection", option DQS

Suitable for pipe similar to EN 10357 series A, flange with groove

DN 2 to 8 as standard with DN 10 flanges

Surface roughness: Ra_{max} = 0.76 µm

Please note the internal diameters of the measuring pipe and process connection (E) when cleaning with pigs.



A0043232

DN [mm]	Pipe [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8	13 × 1.5 (DN 10)	54	37	4 × Ø9	10	10	183
15	19 × 1.5 (DN 15)	59	42	4 × Ø9	10	16	183
25	29 × 1.5 (DN 25)	70	53	4 × Ø9	10	26	183

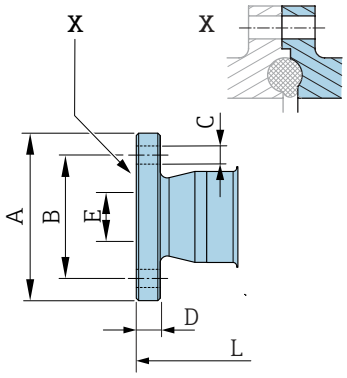
Flange DIN 11864-2 Form A, flange with notch

Stainless steel: order code for "Process connection", option DRS

Suitable for pipe similar to EN 10357 series A, flange with notch

Surface roughness: Ra_{max} = 0.76 µm

Please note the internal diameters of the measuring pipe and process connection (E) when cleaning with pigs.



A0042819

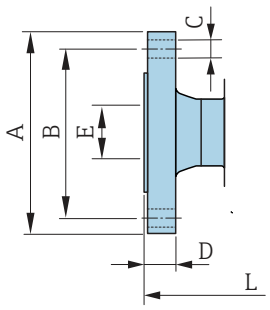
DN [mm]	Pipe [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
40	41 × 1.5	82	65	4 × Ø9	10	38	246
50	53 × 1.5	94	77	4 × Ø9	10	50	246
65	70 × 2	113	95	8 × Ø9	10	66	246
80	85 × 2	133	112	8 × Ø11	10	81	270
100	104 × 2	159	137	8 × Ø11	10	100	278
125	129 × 2	183	161	8 × Ø11	10	125	362
150	154 × 2	213	188	8 × Ø14	10	150	362

Flange similar to EN 1092-1 (DIN 2501/DIN 2512N): PN 40

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

Surface roughness: EN 1092-1 Form B1 (DIN 2526 Form C), Ra ≤ 1.6 µm

DN 2 to 8 with DN 15 flanges as standard



A0042813

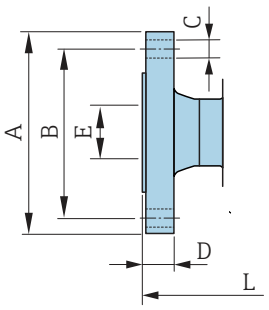
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8	95	65	4 × Ø14	16	17.3	198.4
15	95	65	4 × Ø14	16	17.3	198.4
25	115	85	4 × Ø14	18	28.5	198.4

Flange similar to ASME B16.5, Class 150

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

Surface roughness: Ra ≤ 1.6 µm

DN 2 to 8 as standard with DN 15 flanges



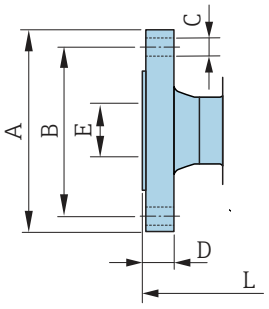
A0042813

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8	90	60.3	4 × Ø15.7	11.2	15.7	218
15	90	60.3	4 × Ø15.7	11.2	15.7	218
25	110	79.4	4 × Ø15.7	14.2	26.7	230

Flange according to JIS B2220, 20K

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

Surface roughness: Ra ≤ 1.6 µm



A0042813

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8	95	70	4 × Ø15	14	15	220
15	95	70	4 × Ø15	14	15	220
25	125	90	4 × Ø19	16	25	220

Clamp connections

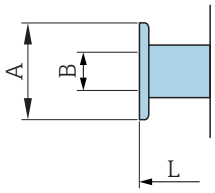
Tri-Clamp

1.4404/316L: order code for "Process connection", option FAS

Suitable for pipe similar to ASME BPE (DIN 11866 series C)

Surface roughness: Ra_{max} = 0.76 µm

Pay attention to the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.



A0043179

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	12.7 × 1.65	25	9.4	143
15	19.1 × 1.65	25	15.8	143
25	25.4 × 1.65	50.4	22.1	143
40	38.1 × 1.65	50.4	34.8	220
50	50.8 × 1.65	63.9	47.5	220
65	63.5 × 1.65	77.4	60.2	220
80	76.2 × 1.65	90.9	72.9	220
100	101.6 × 2.11	118.9	97.4	220
150	152.4 × 2.77	166.9	146.9	300

Welding nipple

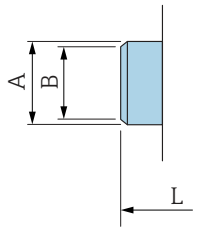
Welding socket similar to EN 10357

1.4404/316L: order code for "Process connection", option DAS

Suitable for pipe EN 10357 series A

Surface roughness: Ra_{max} = 0.76 µm

Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.



A0043180

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	13 × 1.5	13	10	132.6
15	19 × 1.5	19	16	132.6
25	29 × 1.5	29	26	132.6
40	41 × 1.5	41	38	220
50	53 × 1.5	53	50	220
65	70 × 2	70	66	220
80	85 × 2	85	81	220
100	104 × 2	104	100	220
125	129 × 2	129	125	300
150	154 × 2	154	150	300

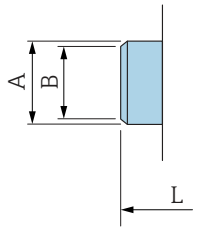
Welding nipple similar to ISO 1127

1.4404/316l: Order code for "Process connection", option A2S

Suitable for pipe ISO 1127, series 1

Surface roughness: Ra_{max} = 0.76 µm

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (dimension B).



A0043180

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	13.5 × 2.30	13.5	9	126.6
15	21.3 × 2.65	21.3	16	126.6
25	33.7 × 3.25	33.7	27.2	126.6

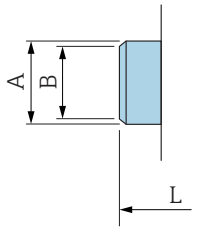
Welding nipple similar to ISO 2037

1.4404/316L: order code for "Process connection", option IAS

Suitable for pipe ISO 1127 (series 1 to 3, differ per nominal diameter)

Surface roughness: Ra_{max} = 0.76 µm

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (dimension B).



A0043180

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	12.7 × 1.65	12	10	118.2
15	19.05 × 1.65	18	16	118.2
25	25.4 × 1.60	25	22.6	118.2
40	38 × 1.2	38	35.6	220
50	51 × 1.2	51	48.6	220
65	63.5 × 1.6	63.5	60.3	220
80	76.1 × 1.6	76.1	72.9	220
100	101.6 × 2	101.6	97.6	220
125	139.7 × 2	139.7	135.7	380
150	168.3 × 2.6	168.3	163.1	380

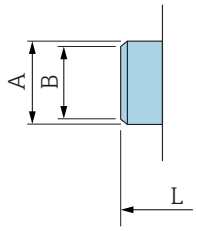
Welding nipple similar to ASME BPE

1.4404/316L: order code for "Process connection", option AAS

Suitable for pipe similar to ASME BPE (DIN 11866 Range C)

Surface roughness: Ra_{max} = 0.76 µm

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (dimension B).



A0043180

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	12.7 × 1.65	12.7	9	118.2
15	19.1 × 1.65	19.1	16	118.2
25	25.4 × 1.65	25.4	22.6	118.2
40	38.1 × 1.65	38.1	34.8	220
50	50.8 × 1.65	50.8	47.5	220
65	63.5 × 1.65	63.5	60.2	220
80	76.2 × 1.65	76.2	72.9	220
100	101.6 × 1.65	101.6	97.4	220
150	152.4 × 2.77	152.4	146.9	300

Couplings

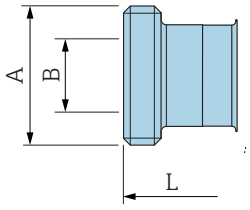
Threaded coupling similar to DIN 11851

1.4404/316L: order code for "Process connection", option DCS

Suitable for pipe EN 10357 series B (DN 2 to 25)

Surface roughness: Ra_{max} = 0.76 µm

Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.



A0048695

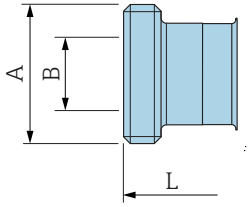
DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	12 × 1 (DN 10)	Rd 28 × 1/8	10	174
15	18 × 1.5	Rd 34 × 1/8	16	174
25	28 × 1 or 28×1.5	Rd 52 × 1/6	26	190

1.4404/316L: order code for "Process connection", option DCS

Suitable for pipe EN 10357 series A (DN 40 to 150)

Surface roughness: Ra_{max} = 0.76 µm

Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.



A0048695

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
40	41 × 1.5	Rd 65 × 1/6	38	260
50	53 × 1.5	Rd 78 × 1/6	50	260
65	70 × 2	Rd 95 × 1/6	66	270
80	85 × 2	Rd 110 × 1/4	81	280
100	104 × 2	Rd 130 × 1/4	100	290
125	129 × 2	Rd 160 × 1/4	125	380
150	154 × 2	Rd 160 × 1/4	150	390

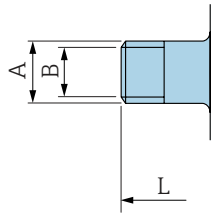
Threaded hygienic connection similar to DIN 11864-1, Form A

1.4404/316L: order code for "Process connection", option DDS

Suitable for pipe EN 10357 series A

Surface roughness: Ra_{max} = 0.76 µm

Pay attention to the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.



A0043253

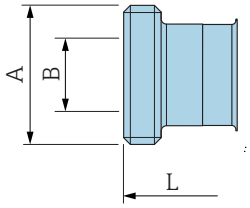
DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	Pipe 13 × 1.5 (DN 10)	Rd 28 × 1/8	10	170
15	Pipe 19 × 1.5	Rd 34 × 1/8	16	170
25	Pipe 29 × 1.5	Rd 52 × 1/6	26	184
40	41 × 1.5	Rd 65 × 1/6	38	256
50	53 × 1.5	Rd 78 × 1/6	50	256
65	70 × 2	Rd 95 × 1/6	66	266
80	85 × 2	Rd 110 × 1/4	81	276
100	104 × 2	Rd 130 × 1/4	100	286

Thread similar to SMS 1145

1.4404/316l: Order code for "Process connection", option SAS

Surface roughness: Ra_{max} = 0.76 µm

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (B).



A0043257

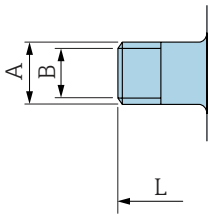
DN [mm]	Pipe [mm]	DN SMS 1145 [mm]	A [mm]	B [mm]	L [mm]
25	1	25	Rd 40 × 1/6	22.6	147.6
40	38.1 × 1.65	38	Rd 60 × 1/6	34.8	256
50	50.8 × 1.65	51	Rd 70 × 1/6	47.5	256
65	63.5 × 1.65	63.5	Rd 85 × 1/6	60.2	266
80	76.2 × 1.65	76	Rd 98 × 1/6	72.6	276
100	101.6 × 1.65	101.6	Rd 132 × 1/6	97.4	286

External thread similar to ISO 228/DIN 2999

1.4404/316L: order code for "Process connection", option I2S

Suitable for internal thread ISO 228/DIN 2999

Surface roughness: Ra ≤ 1.6 µm

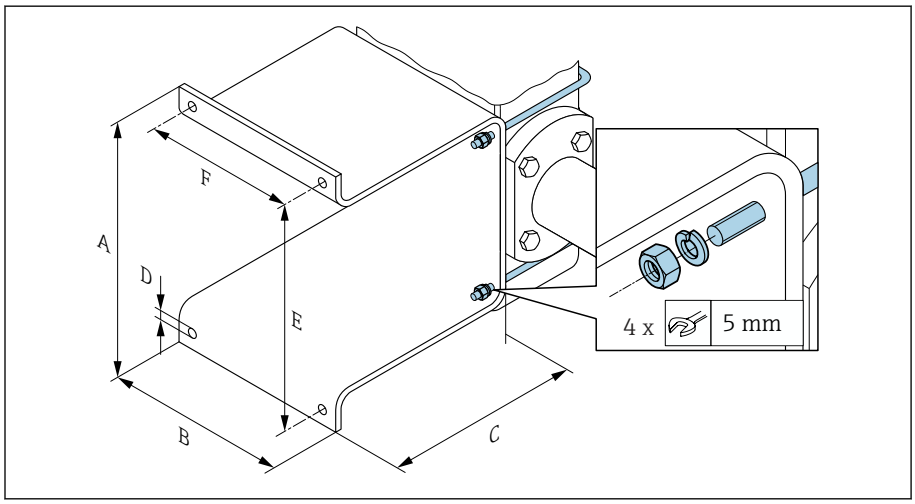


A0043253

DN [mm]	Pipe [mm]	A [mm]	B [mm]	L [mm]
2 to 8	R ⅜	R 10.1 × ⅜	10	166
15	R ½	R 13.2 × ½	16	166
25	R 1	R 16.5 × 1	25	170

Mounting kit

Wall mounting kit



A0054890

A [mm]	B [mm]	C [mm]	Ø D [mm]	E [mm]	F [mm]
137	110	120	7	125	88

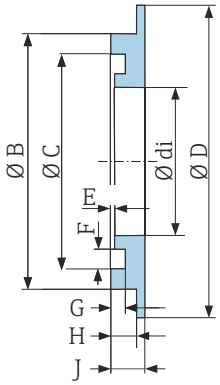
Accessories

Grounding rings

Order code: DK5HR-****

1.4435 (316L), Alloy C22, tantalum

For lap joint flange made of PVDF and PVC adhesive sleeve

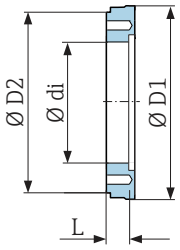


A0017673

DN [mm]	di [mm]	B [mm]	C [mm]	D [mm]	D [mm]	E [mm]	G [mm]	H [mm]	J [mm]
2 to 8	9	22	17.6	33.9	0.5	3.5	1.9	3.4	4.5
15	16	29	24.6	33.9	0.5	3.5	1.9	3.4	4.5
25	26	39	34.6	43.9	0.5	3.5	1.9	3.4	4.5

Spacer

Order code: DK5HB-****



A0017294

DN [mm]	di [mm]	D1 [mm]	D2 [mm]	L [mm]
80	72.9	140.7	141	30
100	97.4	166.7	162	30

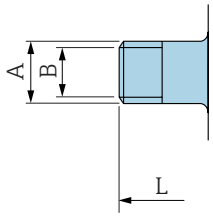
Male thread with O-ring seal

Order code: DKH**-GD**

1.4404/316L

Suitable for female thread NPT

Surface roughness: Ra ≤ 1.6 µm



A0043253

DN [mm]	Thread [mm]	A [mm]	B [mm]	L [mm]
2 to 8	NPT 3/8	R 15.5 × 3/8	10	186
15	NPT ½	R 20 × ½	16	186
25	NPT 1	R 25 × 1	25	196

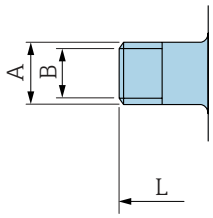
Female thread with O-ring seal

Order code: DKH**-GC**

1.4404/316L

Suitable for male thread NPT

Surface roughness: Ra ≤ 1.6 µm



A0043253

DN [mm]	Thread [mm]	A [mm]	B [mm]	L [mm]
2 to 8	NPT 3/8	R 13 × 3/8	8.9	176
15	NPT ½	R 14 × ½	16	176
25	NPT 1	R 17 × 1	27.2	188

Tri-Clamp

Order code: DKH**-HF**

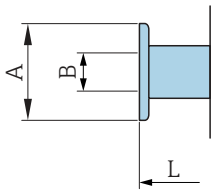
1.4404 (316L)

Suitable for pipe according to BS 4825/ASME BPE (constriction of OD 1" according to DN15)

Surface roughness: Ra_{max} = 0.76 µm

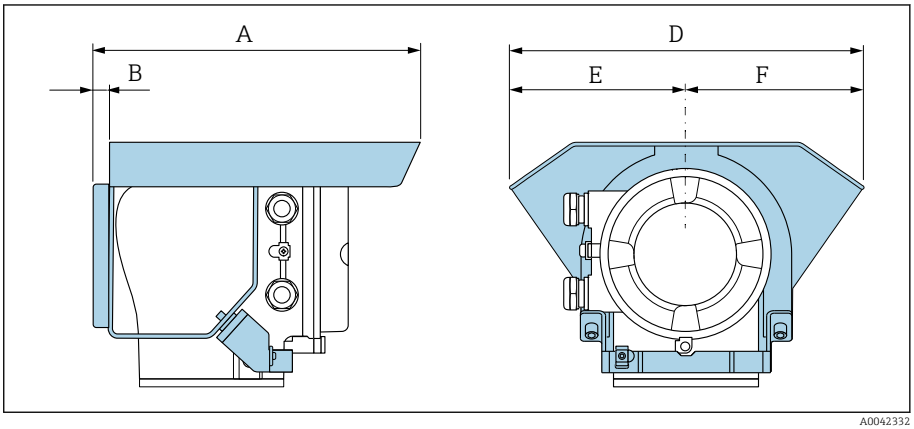
Pay attention to the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

	DN [mm]	Piping	A [mm]	B [mm]	L [mm]
	15	OD 1"	50.4	22.1	143



A0043179

Weather protection cover



A0042332

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

Dimensions in US units

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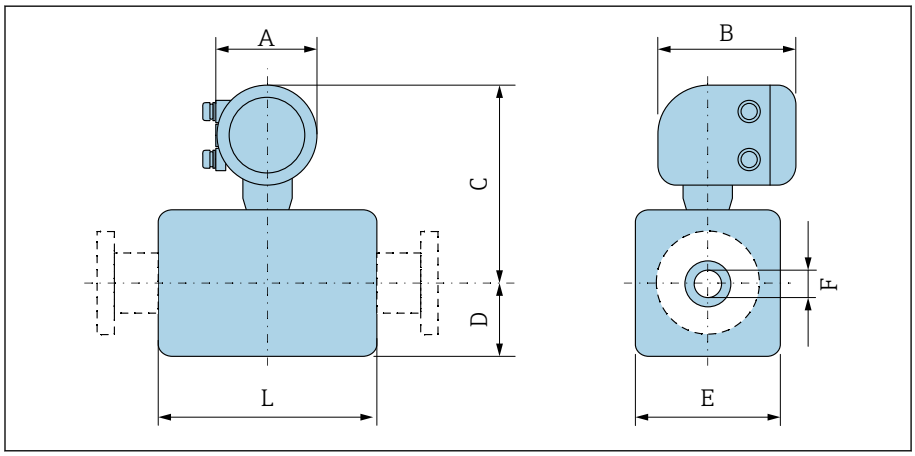
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Compact version

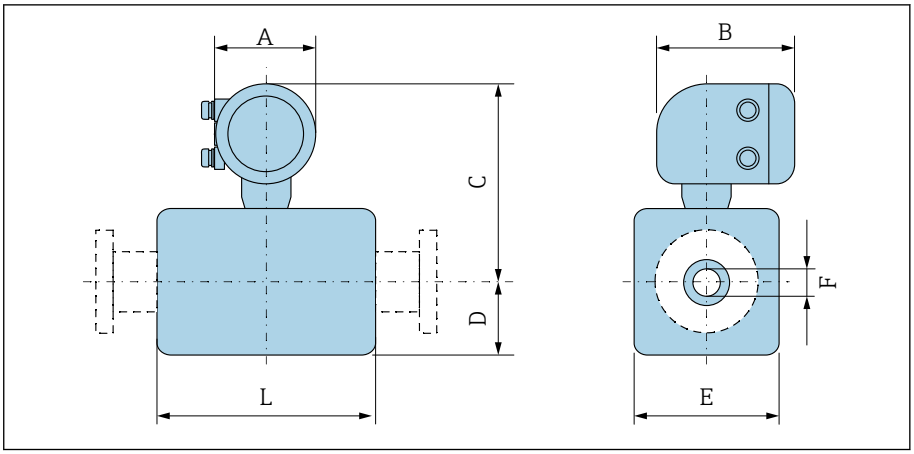
Order code for "Housing", option A and G "Aluminum, coated"



DN		A [1]	B	C	D	E	F	L [2]
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
2	1/12	5.47	7.01	9.25	1.89	1.69	0.089	3.39
4	1/32	5.47	7.01	9.25	1.89	1.69	0.18	3.39
8	5/16	5.47	7.01	9.25	1.89	1.69	0.35	3.39
15	½	5.47	7.01	9.25	1.89	1.69	0.63	3.39
–	1	5.47	7.01	9.41	2.05	2.2	0.89	3.39
25	–	5.47	7.01	9.41	2.05	2.2	1.02	3.39
40	1 ½	5.47	7.01	9.53	2.13	4.21	1.37	5.51
50	2	5.47	7.01	9.8	2.36	4.72	1.87	5.51
65	–	5.47	7.01	10.08	2.68	5.31	2.37	5.51
80	3	5.47	7.01	10.35	2.91	5.83	2.87	5.51
100	4	5.47	7.01	10.87	3.43	6.85	3.83	5.51
125	–	5.47	7.01	11.5	4.06	8.11	4.72	7.87
150	6	5.47	7.01	12.05	4.61	9.21	5.78	7.87

1) Depending on the cable gland used: values up to +1.18 in
2) Total length depends on the process connections.

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

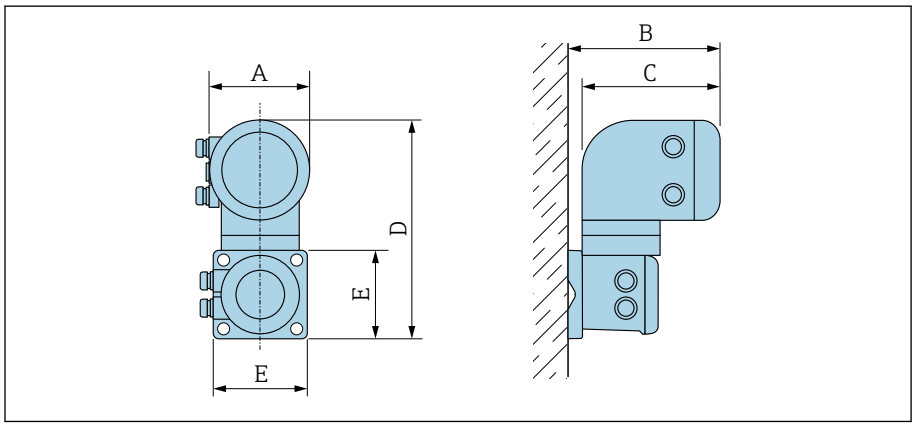


DN		A [1]	B	C	D	E	F	L [2]
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
2	1/12	5.2	6.77	9.13	2.17	1.69	0.089	3.39
4	1/32	5.2	6.77	9.13	2.17	1.69	0.18	3.39
8	5/16	5.2	6.77	9.13	2.17	1.69	0.35	3.39
15	½	5.2	6.77	9.13	2.17	1.69	0.63	3.39
–	1	5.2	6.77	9.33	2.17	2.2	0.89	3.39
25	–	5.2	6.77	9.33	2.17	2.2	1.02	3.39
40	1 ½	5.2	6.77	9.45	2.13	4.21	1.37	5.51
50	2	5.2	6.77	9.72	2.36	4.72	1.87	5.51
65	–	5.2	6.77	10	2.64	5.31	2.37	5.51
80	3	5.2	6.77	10.24	2.91	5.83	2.87	5.51
100	4	5.2	6.77	10.75	3.43	6.85	3.83	5.51
125	–	5.2	6.77	11.38	4.06	8.11	4.72	7.87
150	6	5.2	6.77	11.93	4.61	9.21	5.78	7.87

1) Depending on the cable gland used: values up to +1.18 in
2) Total length depends on the process connections.

Remote version

Transmitter remote version

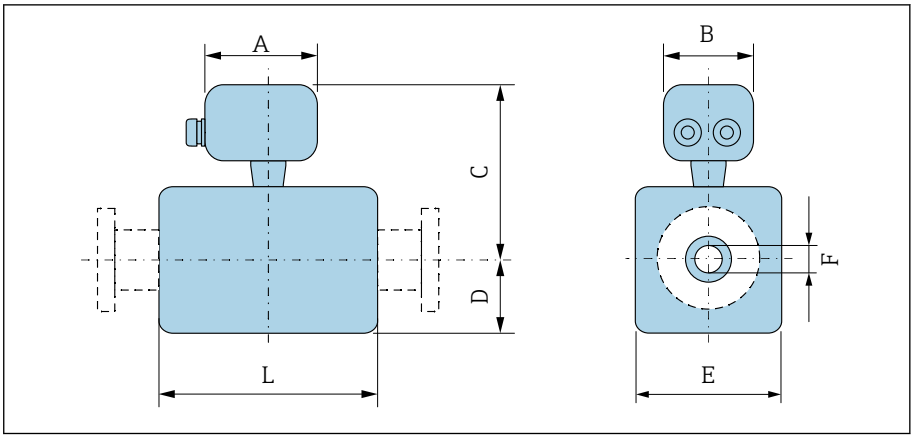


A0042715

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 and T "Remote, coated aluminum"	5.47	7.28	7.01	12.17	5.12

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

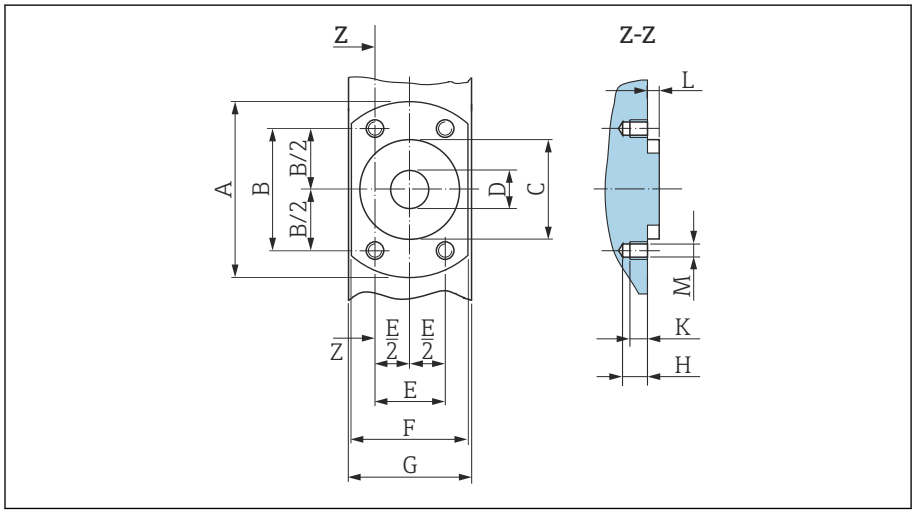
Sensor remote version



DN		A [1]	B	C	D	E	F	L [2]
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
2	1/12	4.96	2.76	5.08	1.89	1.69	0.089	3.39
4	1/32	4.96	2.76	5.08	1.89	1.69	0.18	3.39
8	5/16	4.96	2.76	5.08	1.89	1.69	0.35	3.39
15	½	4.96	2.76	5.08	1.89	1.69	0.63	3.39
–	1	4.96	2.76	5.24	2.05	2.2	0.89	3.39
25	–	4.96	2.76	5.24	2.05	2.2	1.02	3.39
40	1 ½	4.96	2.76	5.35	2.09	4.21	1.37	5.51
50	2	4.96	2.76	5.63	2.36	4.72	1.87	5.51
65	–	4.96	2.76	5.91	2.64	5.31	2.37	5.51
80	3	4.96	2.76	6.18	2.91	5.83	2.87	5.51
100	4	4.96	2.76	6.69	3.43	6.85	3.83	5.51
125	–	4.96	2.76	7.32	4.06	8.11	4.72	7.87
150	6	4.96	2.76	7.87	4.61	9.21	5.78	7.87

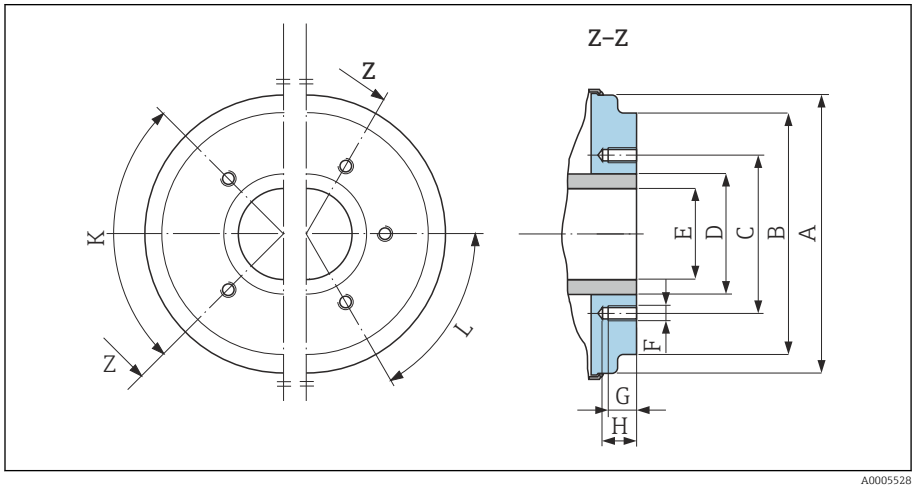
1) Depending on the cable gland used: values up to +1.18 in
2) Total length depends on the process connections.

Sensor flange connection



13 *Front view without process connections*

DN		A	B	C	D	E	F	G	H	K	L	M
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[mm]
2	1/12	2.44	1.64	1.34	0.35	0.94	1.65	1.69	0.33	0.24	0.16	M6
4	1/32	2.44	1.64	1.34	0.35	0.94	1.65	1.69	0.33	0.24	0.16	M6
8	5/16	2.44	1.64	1.34	0.35	0.94	1.65	1.69	0.33	0.24	0.16	M6
15	½	2.44	1.64	1.34	0.63	0.94	1.65	1.69	0.33	0.24	0.16	M6
25	–	2.83	1.98	1.73	1.02	1.14	2.17	2.2	0.33	0.24	0.16	M6



14 *Front view without process connections*

DN		A	B	C	D	E	F	G	H	K	L
										90° ±0.5°	60° ±0.5°
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[mm]	[in]	[in]	Tapped holes	
40	1 ½	3.93	3.38	2.8	1.9	1.37	M8	0.47	0.67	4	–
50	2	4.44	3.89	3.29	2.37	1.87	M8	0.47	0.67	4	–
65	–	5.03	4.52	3.94	3	2.37	M8	0.47	0.67	–	6
80	3	5.54	5.26	4.49	3.5	2.87	M8	0.47	0.67	–	6

DN		A	B	C	D	E	F	G	H	K	L
										90° ±0.5°	60° ±0.5°
[mm]	[in]	[in]	[in]	[in]	[in]	[in]	[mm]	[in]	[in]	Tapped holes	
100	4	6.56	6.28	5.55	4.5	3.83	M8	0.47	0.67	–	6
125	–	7.82	7.54	6.73	5.5	4.72	M10	0.59	0.79	–	6
150	6	8.93	8.64	7.87	6.63	5.78	M10	0.59	0.79	–	6

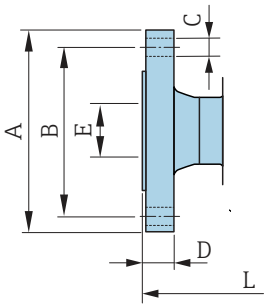
Flange connections

Flange similar to ASME B16.5, Class 150

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

Surface roughness: Ra ≤ 63 µin

DN 1/12" to 5/16 " with DN ½" flanges as standard



A0042813

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
1/12 to 5/16	3.54	2.37	4 × Ø0.62	0.44	0.62	8.58
½	3.54	2.37	4 × Ø0.62	0.44	0.62	8.58
1	4.33	3.13	4 × Ø0.62	0.56	1.05	9.06

Clamp connections

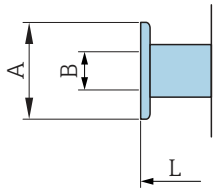
Tri-Clamp

1.4404/316L: order code for "Process connection", option FAS

Suitable for pipe similar to ASME BPE (DIN 11866 Range C)

Surface roughness: Ra_{max} = 30 µin

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (B).



A0043179

DN [in]	Pipe [in]	A [in]	B [in]	L [in]
1/12 to 5/16	0.5 × 0.065	0.98	0.37	5.63
½	0.75 × 0.065	0.98	0.62	5.63
1	1 × 0.065	1.98	0.87	5.63
1 ½	1.5 × 0.065	1.98	1.37	8.66
2	2 × 0.065	2.52	1.87	8.66
3	3 × 0.065	3.58	2.87	8.66
4	4 × 0.083	4.68	3.83	8.66
6	6 × 0.109	6.57	5.78	11.81

Welding nipple

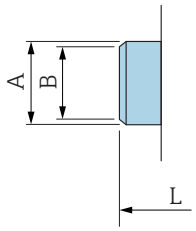
Welding nipple similar to ISO 1127

1.4404/316l: Order code for "Process connection", option A2S

Suitable for pipe ISO 1127, series 1

Surface roughness: Ra_{max} = 30 µin

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (dimension B).



DN [in]	Pipe [in]	A [in]	B [in]	L [in]
1/12 to 5/16	0.53 × 0.09	0.53	0.35	4.99
½	0.84 × 0.10	0.84	0.63	4.99

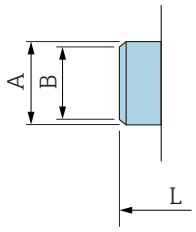
Welding nipple similar to ISO 2037

1.4404/316L: order code for "Process connection", option IAS

Suitable for pipe ISO 1127 (series 1 to 3, differ per nominal diameter)

Surface roughness: Ra_{max} = 30 µin

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (dimension B).



DN [in]	Piping [in]	A [in]	B [in]	L [in]
1/12 to 5/16	0.5 × 0.065	0.47	0.39	4.65
½	0.75 × 0.065	0.71	0.63	4.65
1	1 × 0.06	0.98	0.89	4.65
1 ½	1.5 × 0.05	1.5	1.4	8.66
2	2 × 0.05	2	1.91	8.66
3	3 × 0.06	3	2.87	8.66
4	4 × 0.08	4	3.84	8.66
5	5.5 × 0.08	5.5	5.34	14.96
6	6.63 × 0.1	6.63	6.42	14.96

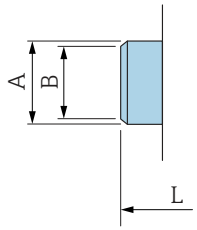
Welding nipple similar to ASME BPE

1.4404/316L: order code for "Process connection", option AAS

Suitable for pipe similar to ASME BPE (DIN 11866 Range C)

Surface roughness: Ra_{max} = 30 µin

When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (dimension B).



A0043180

DN [in]	Pipe [in]	A [in]	B [in]	L [in]
1/12 to 5/16	0.5 × 0.065	0.5	0.35	4.65
½	0.75 × 0.065	0.75	0.63	4.65
1	1 × 0.065	1	0.89	4.65
1 ½	1.5 × 0.065	1.5	1.37	8.66
2	2 × 0.065	2	1.87	8.66
3	3 × 0.065	3	2.87	8.66
4	4 × 0.065	4	3.83	8.66
6	6 × 0.109	6	5.78	11.81

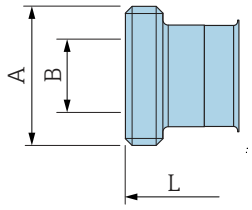
Couplings

Thread similar to SMS 1145

1.4404/316l: Order code for "Process connection", option SAS

Surface roughness: Ra_{max} = 30 µin

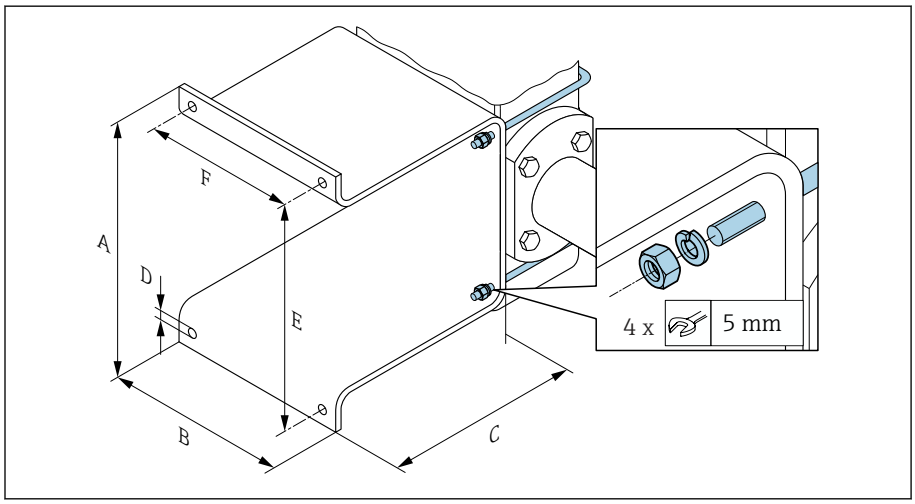
When cleaning with pigs, pay attention to the internal diameters of the measuring pipe and process connection (B).



DN [in]	Pipe [in]	DN SMS 1145 [in]	A [in]	B [in]	L [in]
1	1	1	Rd 1.57 × 0.17	0.89	5.81
1 ½	1.5 × 0.06	1.5	Rd 2.36 × ⅙	1.37	10.1
2	2 × 0.06	2	Rd 2.76 × ⅙	1.87	10.1
3	3 × 0.06	3	Rd 3.86 × ⅙	2.86	10.9
4	4 × 0.08	4	Rd 5.20 × ⅙	3.83	11.3

Mounting kits

Wall mounting kit



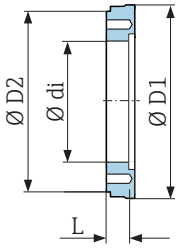
A0054890

A [in]	B [in]	C [in]	Ø D [in]	E [in]	F [in]
5.39	4.33	4.72	0.28	4.92	3.46

Accessories

Spacer

Order code: DK5HB-****

	DN [in]	di [in]	D1 [in]	D2 [in]	L [in]
 A0017294	3	2.87	5.54	5.55	1.30
	4	3.83	6.56	6.38	1.30

Clamp connections with aseptic gasket seal available for order

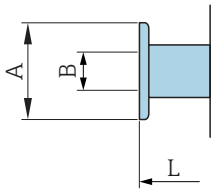
Order code: DKH**-HF**

1.4404 (316L)

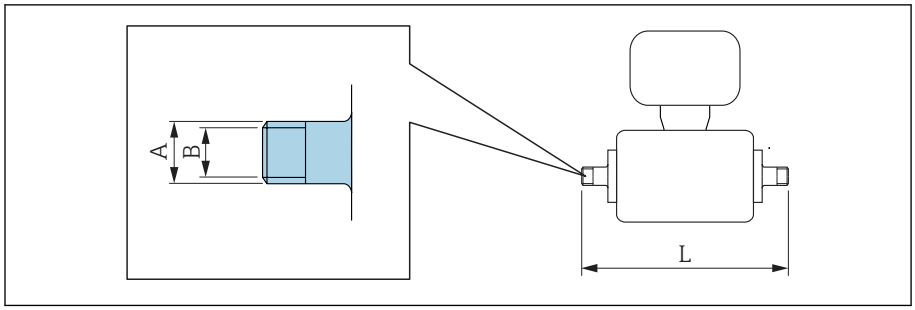
Suitable for pipe according to BS 4825/ASME BPE (constriction of OD 1" according to DN15)

Surface roughness: Ra_{max} = 30 µin

Pay attention to the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

	DN [in]	Piping	A [in]	B [in]	L [in]
 A0043179	½	OD 1"	1.98	0.87	5.63

Couplings with O-ring seal available for order



Male thread
1.4404 (316L)
Order code: DKH-GD****

DN [in]	Suitable for female thread NPT [in]	A [in]	B [in]	L [in]
1/12 to 3/8	NPT 3/8	R 0.61 × 3/8	0.39	7.39
½	NPT ½	R 0.79 × ½	0.63	7.39
1	NPT 1	R 1 × 1	1.00	7.73

Surface roughness: Ra ≤ 63 µin

Female thread
1.4404 (316L)
Order code: DKH-GC****

DN [in]	Suitable for male thread NPT [in]	A [in]	B [in]	L [in]
1/12 to 3/8	NPT 3/8	R 0.51 × 3/8	0.35	6.93
½	NPT ½	R 0.55 × ½	0.63	6.93
1	NPT 1	R 0.67 × 1	1.07	7.41

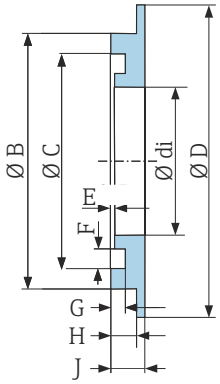
Surface roughness: Ra ≤ 63 µin

Grounding rings

Order code: DK5HR-****

1.4435 (316L), Alloy C22, tantalum

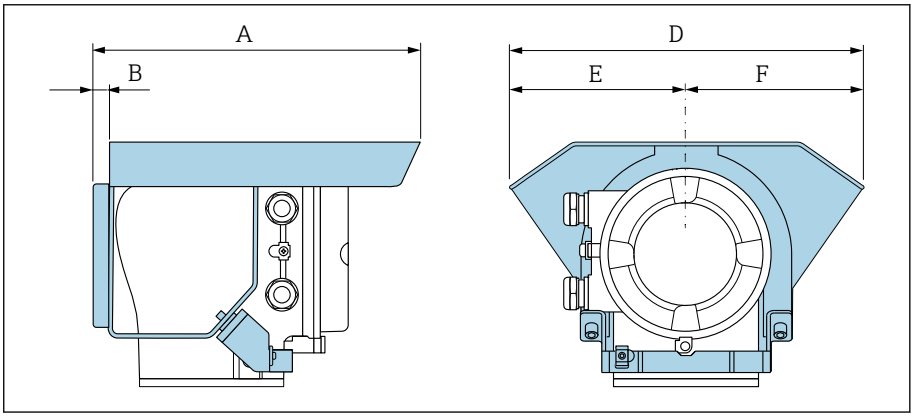
For lap joint flange made of PVDF and PVC adhesive sleeve



A0017673

DN [in]	di [in]	B [in]	C [in]	D [in]	D [in]	E [in]	G [in]	H [in]	J [in]
1/12 to 3/8	0.35	0.87	0.69	1.33	0.02	0.14	0.07	0.13	0.18
½	0.63	1.14	0.97	1.33	0.02	0.14	0.07	0.13	0.18
1	0.89	1.44	1.23	1.73	0.02	0.14	0.07	0.13	0.18

Weather protection cover



A0042332

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

Local display

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Operation concept

Operation method	Operation via local display with touchscreen [1] Operation via: ▪ SmartBlue app [2] ▪ Commubox FXA291
Reliable operation	▪ Operation in local language ▪ Uniform operating philosophy in device and in the SmartBlue App ▪ Write protection ▪ 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: ▪ Open remedial actions via local display and SmartBlue app ▪ Diverse simulation options ▪ Logbook of events that have occurred

1) Only for HART and Modbus RS485 communication protocols
2) Optional via order code "Display; operation", options H, J or K

IO-Link

The device-specific parameters are configured via IO-Link. There are specific configuration or operating programs from different manufacturers available to the user for this purpose. The device description file (IODD) is provided for the device.

IO-Link operating concept
Operator-oriented menu structure for user-specific tasks. Efficient diagnostic behavior increases measurement availability:
- Diagnostic messages
- Remedial action
- Simulation options

IODD download
Two options to download the IODD :
- www.endress.com/download
- https://ioddfinder.io-link.com/

www.endress.com/download

1. Select "Device Drivers".
2. Select the "IO Device Description (IODD)" entry under "Type".
3. Select "Product root".
4. Click "Search".
   ↳ A list of search results is displayed.

Select the appropriate version and download.

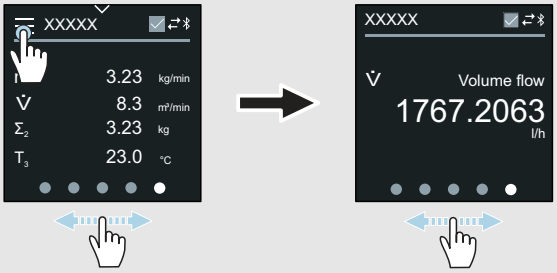
https://ioddfinder.io-link.com/

1. Enter "Endress" as the manufacturer and select.
2. Select product name.
   ↳ A list of search results is displayed.

Select the appropriate version and download.

For detailed IO-Link information, see "IO-Link" Special Documentation for the device
→ *Related documentation*, 🖹 6

Operation options

Local display	 A0042957 15 *Only for HART and Modbus RS485 communication protocols* Display elements: ▪ LCD touch screen [1)] ▪ Depends on the orientation, automatic alignment of the local display ▪ Configuration of display format for measured variables and status variables Operating elements: ▪ Touch screen [1)] ▪ 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. ▪ Based on Bluetooth ▪ No separate driver required ▪ Available for mobile handheld terminals, tablets and smartphones ▪ Suitable for convenient and secure access to devices in hard-to-reach locations or in hazardous areas ▪ Can be used within a 20 m (65.6 ft) radius of the device ▪ Encrypted and secure data transmission ▪ No data loss during commissioning and maintenance ▪ Diagnostic information and process information in real time

1) Only for HART and Modbus RS485 communication protocols

Operating tools

Operating tools	Operating unit	Interface	Additional information
DeviceCare SFE100	▪ Notebook ▪ PC ▪ Tablet with Microsoft Windows system	▪ CDI service interface ▪ Fieldbus protocol	Innovation brochure IN01047S
FieldCare SFE500	▪ Notebook ▪ PC ▪ Tablet with Microsoft Windows system	▪ CDI service interface ▪ Fieldbus protocol	Operating Instructions BA00027S and BA00059S
SmartBlue app	▪ Devices with iOS: iOS9.0 or higher ▪ Devices with Android: Android 4.4 KitKat or higher	Bluetooth	Endress+HauserSmartBlue App: ▪ Google Playstore (Android) ▪ 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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Non-Ex approval

- cCSAus
- EAC
- UKCA

Pressure Equipment Directive

- CRN
- PED Cat. II/III
- PESR Cat. II/III

Sanitary compatibility

- 3-A approval
  - Confirmation by affixing the 3-A symbol for measuring instruments with the order code for "Additional approval", option LP "3-A".
  - When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument. Remote transmitters must be installed in accordance with the 3-A Standard.
  - Accessories (e.g. weather protection cover, pipe mounting kit) must be installed in accordance with the 3-A Standard. Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG-certified (Type EL Class I)
  - Confirmation by affixing the EHEDG symbol for measuring instruments with the order code for "Additional approval", option LT "EHEDG".
  - EPDM is not a suitable seal material for media with a fat content > 8%.
  - To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedg.org).
  - To meet the requirements for EHEDG certification, the orientation of the device must ensure drainability.
  - The EHEDG cleanability test requires a flow velocity of 1.5 m/s in the process line. This velocity must be ensured for EHEDG-compliant cleaning.
- Food Contact Materials Regulation (EC) 1935/2004
  A declaration for a specific serial number that confirms compliance with the requirements of (EC) 1935/2004 is only generated for measuring instruments with the order code for "Test, certificate", option J1 "EU Food Contact Materials (EC) 1935/2004.
- FDA 21 CFR 177.1550
  A declaration for a specific serial number that confirms compliance with FDA requirements is only generated for measuring instruments with the order code for "Test, certificate", option J2 "US Food Contact Materials FDA CFR 21".
- Food Contact Materials Regulation GB 4806
  A declaration for a specific serial number that confirms compliance with the requirements of GB 4806 is only generated for measuring instruments with the order code for "Test, certificate", option J3 "CN Food Contact Materials GB 4806.
- The requirements of the Food Contact Material regulations must be observed when selecting the material versions.
- Seals
  FDA-compliant (except Kalrez seals)

Please refer to the applicable Declaration of Conformity for binding information regarding the applicable conformities.

Pharmaceutical compatibility

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

Please refer to the applicable Declaration of Conformity for binding information regarding the applicable conformities.

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 certification

- IO-Link
  Self-certification with Manufacturer Declaration
- CRN approval
  Some device versions have a CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.
- EN10204-3.1 material certificate, wetted parts and sensor housing (order code for "Test, certificate", option JA)
- Pressure test, internal process, test report (order code for "Test, certificate", option JB)
- Surface roughness test ISO4287/Ra, (wetted parts), test report (option JE)
- Compliance with requirements derived from cGMP, Declaration (option JG)

External standards and guidelines

- IEC/EN 60529
  Degrees of protection provided by enclosure (IP code)
- IEC/EN 60068-2-6
  Environmental influences: Test procedure - Test Fc: vibration (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.
- GB 30439.5
  Safety requirements for industrial automation products - Part 5: Flowmeter safety 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 61131-9
  Interface for communication with small sensors and actuators via a point-to -point connection
- 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

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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 according to DIN ISO 9001:2015 Clause 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 report.
- Simple testing process with local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high total test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk evaluation.

Heartbeat Monitoring

Availability depends on the product structure.

Heartbeat Monitoring continuously provides data characteristic of the measuring principle to an external condition monitoring system, facilitating preventive maintenance or process analysis. This data enables the operator to:
- Draw conclusions - using this data and other information - about the measuring performance over time.
- Schedule servicing in time.
- Monitor the process quality or product quality .

High-speed filling <5s

Availability depends on the selected product structure.

The "High-speed filling <5s" option is for customers with fast filling/dosing applications with a start/stop time (batch) of less than 5 seconds.

With this option, the following parameters are automatically set during production:
- Measuring period: 20 ms (factory setting: 60 ms)
- Integration time: 5 ms (factory setting: 20 ms)
- Filter setting: binominal filter (factory setting: dynamic flow)
- Pulse settings: Pulse width 0.1 ms, Value per pulse 1 ml (0.0338 fl oz)
- Median: 0
- Damping: 0

A minimum conductivity of ≥ 50 µS/cm is required for high-speed filling applications.

Application examples include:
High-speed dosing applications (batches) with high repeatability requirements (e.g.: sack filling, other filling applications)

Accessories

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Device-specific accessories

Transmitter

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

Sensor

Accessories	Description
Adapter set	Adapter connections for installing a Promag H instead of a Promag 30/33 A or Promag 30/33 H (DN 25). Consists of: ▪ 2 process connections ▪ Screws ▪ Seals
Seal set	Replacement of seals
Centering star	A centering star is needed if an installed device with DN 80 or DN 100 must be replaced and the new sensor is shorter.
Welding jig	If using process connections with welding jigs: Welding jig for installation in piping.
Grounding rings	Ground medium in lined measuring pipes. Installation Instructions EA00070D
Ground disks	Ground medium in lined measuring pipes. Installation Instructions EA00070D
Wall mounting kit	Wall mounting kit (only DN 2 to 25 (1/12 to 1"))
Mounting kit	Consists of: ▪ 2 process connections ▪ Screws ▪ Seals

Communication-specific accessories

Accessory	Description
Commubox FXA195 USB/HART modem	Intrinsically safe HART communication with FieldCare and FieldXpert 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. Technical Information TI405C/07
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. 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. ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F
Fieldgate FXA42	Transmission of measured values from connected 4 to 20 mA analog and digital devices. ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42
Field Xpert SMT50	The Field Xpert SMT50 table PC for device configuration enables mobile plant asset management. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle. ▪ Technical Information TI01555S ▪ Operating Instructions BA02053S ▪ Product page: www.endress.com/smt50
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. ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ 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. ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77
FieldPort SFP20	The FieldPort SFP20 is a USB interface for the configuration of Endress+Hauser IO-Link devices, and also of devices from other vendors. Combined with the IO-Link CommDTM (DeviceCare, FieldCare, Field Xpert) and the IODD Interpreter, the FieldPort complies with the FDT/DTM standards.
IO-Link master BL20	IO-Link master from Turck for DIN rails supports PROFINET, EtherNet/IP and Modbus TCP. With web server for easy configuration.

Service-specific accessory

Accessory	Description	Order code
Applicator	Software for selecting and sizing Endress+Hauser devices.	https://portal.endress.com/webapp/applicator
Netilion	IIoT ecosystem: Unlock knowledge With the Netilion IIoT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem that enables you to gain useful insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.	www.netilion.endress.com
FieldCare	FDT-based plant asset management software from Endress+Hauser. Management and configuration of Endress+Hauser devices. Operating Instructions BA00027S and BA00059S	▪ Device driver: www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)
DeviceCare	Software for connecting and configuring Endress+Hauser devices. ▪ Technical Information: TI01134S ▪ Innovation brochure: IN01047S	▪ Device driver: www.endress.com → Download Area ▪ CD-ROM (contact Endress+Hauser) ▪ DVD (contact Endress+Hauser)

System components

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



www.addresses.endress.com

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