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Technical Information
Proline Promag H 100

Electromagnetic flowmeter

The flowmeter for smallest flow rates with an ultra-compact transmitter

Application

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

Device properties
- Integrated temperature measurement
- Sensor housing made of stainless steel (3-A, EHEDG)
- Wetted materials CIP-/SIP-cleanable
- Robust, ultra-compact transmitter housing
- Highest degree of protection: IP69K
- Local display available

Your benefits

- Flexible installation concept – numerous hygienic process connections
- Maintenance-free – no moving parts
- Space-saving transmitter – full functionality on smallest footprint
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology

Endress+Hauser
People for Process Automation

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About this document

Symbols

Electrical symbols

Symbol	Meaning
⎓	Direct current
~	Alternating current
⎓~	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⊜	**Potential equalization connection (PE: protective earth)** Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system.

Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Procedures, processes or actions that are permitted.
✓✓	**Preferred** Procedures, processes or actions that are preferred.
✗	**Forbidden** Procedures, processes or actions that are forbidden.
ℹ	**Tip** Indicates additional information.
📖	Reference to documentation
📄	Reference to page
🖼	Reference to graphic
👁	Visual inspection

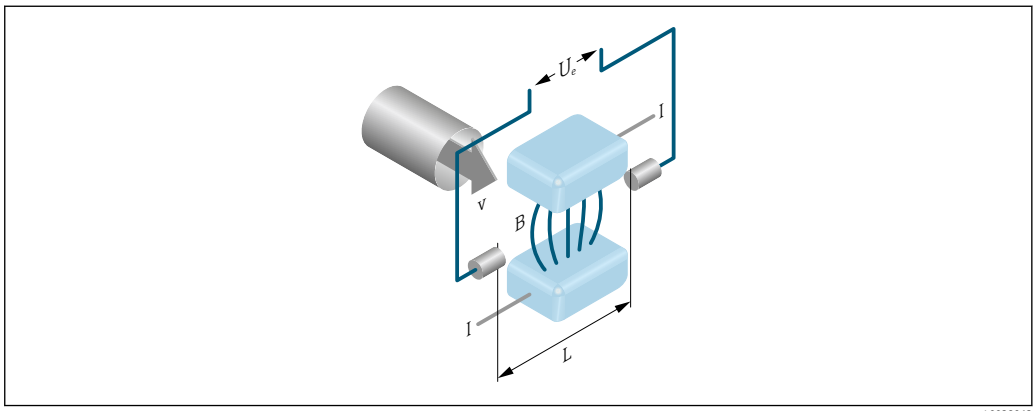
Symbols in graphics

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

Function and system design

Measuring principle

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



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

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

Formulae for calculation

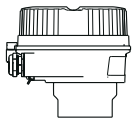
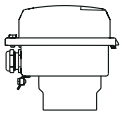
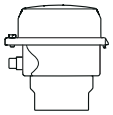
- Induced voltage $U_e = B \cdot L \cdot v$
- Volume flow $Q = A \cdot v$

Measuring system

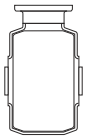
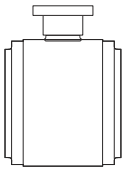
The device consists of a transmitter and a sensor.

The device is available as a compact version:
The transmitter and sensor form a mechanical unit.

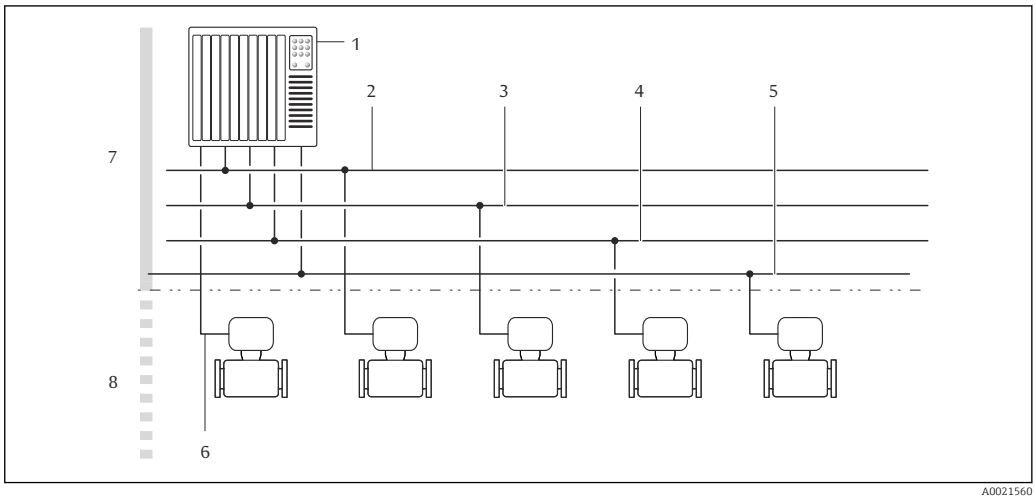
Transmitter

Proline 100  A0016693  A0016694  A0016695	Device versions and materials: ▪ Compact, aluminum, coated: Aluminum, AlSi10Mg, coated ▪ Compact, hygienic, stainless: Hygienic version, stainless steel 1.4301 (304) ▪ Ultra-compact, hygienic, stainless: Hygienic version, stainless steel 1.4301 (304) Configuration: ▪ Via operating tools (e.g. FieldCare, DeviceCare) ▪ Also for device version with 4-20 mA HART, pulse/frequency/switch output: Via web browser (e.g. Microsoft Internet Explorer) ▪ Also for device version with EtherNet/IP output: ▪ Via web browser (e.g. Microsoft Internet Explorer) ▪ Via Add-on Profile Level 3 for automation system from Rockwell Automation ▪ Via Electronic Data Sheet (EDS) ▪ Also for device version with PROFINET output: ▪ Via web browser (e.g. Microsoft Internet Explorer) ▪ Via device master file (GSD)

Sensor

Promag H  A0019897  A0019898	Nominal diameter range: DN 2 to 150 (1/12 to 6") Materials: ▪ 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); tantalum; platinum (only up to DN 25 (1")) ▪ Process connections: stainless steel, 1.4404 (F316L); PVDF; PVC adhesive sleeve ▪ Seals: ▪ DN 2 to 25 (1/12 to 1"): O-ring seal (EPDM, FKM, Kalrez), aseptic gasket seal (EPDM, FKM, silicone) ▪ DN 40 to 150 (1 ½ to 6"): aseptic gasket seal (EPDM, FKM, silicone) ▪ Grounding rings: stainless steel, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum

Equipment architecture



1 Possibilities for integrating measuring instruments into a system

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

Reliability

IT security

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

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

Input

Measured variable

Direct measured variables

- Volume flow (proportional to induced voltage)
- Temperature [1)]
- Electrical conductivity

Calculated measured variables

- Mass flow
- Corrected volume flow
- Corrected electrical conductivity [1)]

Measuring range

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

Electrical conductivity: ≥ 5 µS/cm for liquids in general

1) Available only for nominal diameters DN 15 to 150 (½ to 6") and with the order code for "Sensor option", option CI: "Medium temperature measurement".

Flow characteristic values in SI units

Nominal diameter		Recommended Flow rate	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Current output full scale value [1] (v ~ 2.5 m/s)	Pulse value [1] (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[dm³/min]	[dm³/min]	[dm³]	[dm³/min]
2	1/12	0.06 to 1.8	0.5	0.005	0.01
4	1/8	0.25 to 7	2	0.025	0.05
8	3/8	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	20 to 600 m³/h	150 m³/h	0.03 m³	2.5 m³/h

1) HART only

Flow characteristic values in US units

Nominal diameter		Recommended Flow rate	Factory settings		
		min./max. full scale value (v ~ 0.3/10 m/s)	Current output full scale value [1] (v ~ 2.5 m/s)	Pulse value [1] (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1/12	2	0.015 to 0.5	0.1	0.001	0.002
1/8	4	0.07 to 2	0.5	0.005	0.008
3/8	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

1) HART only

To calculate the measuring range, use the *Applicator* sizing tool → 94

Recommended measuring range

Flow limit → 46

Operable flow range	Over 1000 : 1

Input signal

External measured values

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

Various pressure transmitters and temperature measuring instruments can be ordered from Endress+Hauser: see "Accessories" section → 🖹 94

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

HART protocol

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

Digital communication

The measured values can be written by the automation system via:
- PROFIBUS DP
- Modbus RS485
- EtherNet/IP
- PROFINET

Output

Output signal

HART current output

Current output	4-20 mA HART (active)
Maximum output values	▪ DC 24 V (no flow) ▪ 22.5 mA
Load	0 to 700 Ω
Resolution	0.38 µA
Damping	Configurable: 0.07 to 999 s
Assignable measured variables	▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Electronic temperature

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	▪ DC 30 V ▪ 25 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	

Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	▪ Volume flow ▪ Mass flow ▪ Corrected volume flow
Frequency output	
Output frequency	Configurable: 0 to 10 000 Hz
Damping	Configurable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited

Assignable functions	▪ Off
	▪ On
	▪ Diagnostic behavior
	▪ Limit value:
	  ▪ Off
	  ▪ Volume flow
	  ▪ Mass flow
	  ▪ Corrected volume flow
	  ▪ Flow velocity
	  ▪ Conductivity
	  ▪ Corrected conductivity
	  ▪ Totalizer 1-3
	  ▪ Temperature
	  ▪ Electronic temperature
	▪ Flow direction monitoring
	▪ Status
	  ▪ Empty pipe detection
	  ▪ Low flow cut off

PROFIBUS DP

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

Modbus RS485

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

EtherNet/IP

Standards	In accordance with IEEE 802.3

PROFINET

Standards	In accordance with IEEE 802.3

Signal on alarm

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

Current output 4 to 20 mA

4 to 20 mA

Failure mode	Choose from: ▪ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ▪ 4 to 20 mA in accordance with US ▪ Min. value: 3.59 mA ▪ Max. value: 22.5 mA ▪ Definable value between: 3.59 to 22.5 mA ▪ Actual value ▪ Last valid value

Pulse/frequency/switch output

Pulse output	
Fault mode	Choose from: ▪ Actual value ▪ No pulses
Frequency output	
Fault mode	Choose from: ▪ Actual value ▪ 0 Hz ▪ Definable value between: 0 to 12 500 Hz
Switch output	
Fault mode	Choose from: ▪ Current status ▪ Open ▪ Closed

PROFIBUS DP

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

Modbus RS485

Failure mode	Choose from: ▪ NaN value instead of current value ▪ Last valid value

EtherNet/IP

Device diagnostics	Device condition can be read out in Input Assembly

PROFINET

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

Local display

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

Status signal as per NAMUR recommendation NE 107

Interface/protocol

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

Plain text display	With information on cause and remedial measures

Additional information on remote operation → 84

Web browser

Plain text display	With information on cause and remedial measures

Light emitting diodes (LED)

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

Low flow cut off

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

Protocol-specific data

HART

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

Dynamic variables	Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables. **Measured variables for PV (primary dynamic variable)** ▪ Off ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature **Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)** ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Corrected conductivity ▪ Temperature ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3
Device variables	Read out the device variables: HART command 9 The device variables are permanently assigned. A maximum of 8 device variables can be transmitted: ▪ 0 = volume flow ▪ 1 = mass flow ▪ 2 = corrected volume flow ▪ 3 = flow velocity ▪ 4 = conductivity ▪ 5 = corrected conductivity ▪ 6 = temperature ▪ 7 = electronic temperature ▪ 8 = totalizer 1 ▪ 9 = totalizer 2 ▪ 10 = totalizer 3

PROFIBUS DP

Manufacturer ID	0x11
Ident number	0x1560
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files available at: ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com

Output values (from measuring instrument to automation system)	**Analog input 1 to 4** ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronics temperature **Digital input 1 to 2** ▪ Empty pipe detection ▪ Low flow cut off ▪ Verification status **Totalizer 1 to 3** ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow

Input values
(from automation system to measuring instrument)
	Analog output 1 to 2 (fixed assignment)
	▪ External temperature
	▪ External density
	Digital output 1 to 2 (fixed assignment)
	▪ Digital output 1: switch positive zero return on/off
	▪ Digital output 2: start verification
	Totalizer 1 to 3
	▪ Totalize
	▪ Reset and hold
	▪ Preset and hold
	▪ Stop
	▪ Operating mode configuration:
	  ▪ Net flow total
	  ▪ Forward flow total
	  ▪ Reverse flow total

Supported functions	▪ Identification & maintenance Straightforward device identification on the part of the control system and nameplate ▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download. ▪ Condensed status Straightforward and self-explanatory diagnostic information by categorizing diagnostic messages that occur
Configuration of the device address	▪ DIP switches on the I/O electronics module ▪ Via operating tools (e.g. FieldCare)

Modbus RS485

Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0
Function codes	▪ 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	▪ ASCII ▪ RTU
Data access	Each device parameter can be accessed via Modbus RS485. For Modbus register information, see "Description of device parameters" documentation

EtherNet/IP

Protocol	▪ The CIP Networks Library Volume 1: Common Industrial Protocol ▪ The CIP Networks Library Volume 2: Ethernet/IP Adaptation of CIP		
Communication type	▪ 10Base-T ▪ 100Base-TX		
Device profile	Generic device (product type: 0x2B)		
Manufacturer ID	0x49E		
Device type ID	0x103A		
Baud rates	Automatic $^{10}/_{100}$ Mbit with half-duplex and full-duplex detection		
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs		
Supported CIP connections	Max. 3 connections		
Explicit connections	Max. 6 connections		
I/O connections	Max. 6 connections (scanner)		
Configuration options for measuring instrument	▪ DIP switches on the electronics module for IP addressing ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Electronic Data Sheet (EDS) integrated in the measuring instrument		
Configuration of the EtherNet interface	▪ Speed: 10 MBit, 100 MBit, auto (factory setting) ▪ Duplex: half-duplex, full-duplex, auto (factory setting)		
Configuration of the device address	▪ DIP switches on the electronics module for IP addressing (last octet) ▪ DHCP ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Ethernet/IP tools, e.g. RSLinx (Rockwell Automation)		
Device Level Ring (DLR)	No		
Fix input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	56
	T → O configuration:	0x64	32
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	56
	T → O configuration:	0x64	32

Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	32
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	32
Input Assembly	▪ Current device diagnostics ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3		
Configurable Input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	56
	T → O configuration:	0x65	88
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	56
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Configurable Input Assembly	▪ Volume flow ▪ Corrected volume flow ▪ Mass flow ▪ Electronics temperature ▪ Totalizer 1 to 3 ▪ Flow velocity ▪ Volume flow unit ▪ Corrected volume flow unit ▪ Mass flow unit ▪ Temperature unit ▪ Unit totalizer 1-3 ▪ Flow velocity unit ▪ Verification result ▪ Verification status The range of options increases if the measuring device has one or more application packages.		

Fix output	
Output Assembly	▪ Activation of reset totalizers 1-3 ▪ Activation of reference density compensation ▪ Activation of temperature compensation ▪ Reset totalizers 1-3 ▪ External density ▪ Density unit ▪ External temperature ▪ Activation verification ▪ Start the verification
Configuration	

Configuration Assembly	Only the most common configurations are listed below.
	▪ Software write protection
	▪ Mass flow unit
	▪ Mass unit
	▪ Volume flow unit
	▪ Volume unit
	▪ Corrected volume flow unit
	▪ Corrected volume unit
	▪ Density unit
	▪ Reference density unit
	▪ Temperature unit
	▪ Pressure unit
	▪ Length
	▪ Totalizer 1-3:
	  ▪ Assignment
	  ▪ Unit
	  ▪ Mode of operation
	  ▪ Failure mode
	▪ Alarm delay

PROFINET

Protocol	"Application layer protocol for decentral device periphery and distributed automation", version 2.3
Conformity class	B
Communication type	100 Mbps
Device profile	Application interface identifier 0xF600 Generic device
Manufacturer ID	0x11
Device type ID	0x843A
Device description files (GSD, DTM)	Information and files available at: ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com
Baud rates	Automatic 100 Mbit/s with full-duplex detection
Periods	From 8 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	▪ 1 x AR (Application Relation) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation)
Configuration options for measuring instrument	▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Manufacturer-specific software (FieldCare, DeviceCare) ▪ Web browser ▪ Device master file (GSD), can be read out via the integrated web server of the measuring instrument

Configuration of the device name	▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol
Output values (from measuring instrument to automation system)	**Analog Input module (slot 1 to 10)** ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow ▪ Flow velocity ▪ Conductivity ▪ Corrected conductivity ▪ Temperature ▪ Electronics temperature **Discrete Input module (slot 1 to 10)** ▪ Empty pipe detection ▪ Low flow cut off **Diagnostics Input module (slot 1 to 10)** ▪ Last diagnostics ▪ Current diagnostics **Totalizer 1 to 3 (slot 11 to 13)** ▪ Volume flow ▪ Mass flow ▪ Corrected volume flow **Heartbeat Verification module (fixed assignment)** Verification status (slot 17)

Input values
(from automation system to measuring instrument)
	Analog Output module (fixed assignment)
	▪ External density (slot 14)
	▪ External temperature (slot 15)
	Discrete Output module (fixed assignment)
	Activate/deactivate positive zero return (slot 16)
	Totalizer 1 to 3 (slot 11 to 13)
	▪ Totalize
	▪ Reset and hold
	▪ Preset and hold
	▪ Stop
	▪ Operating mode configuration:
	  ▪ Net flow total
	  ▪ Forward flow total
	  ▪ Reverse flow total
	Heartbeat Verification module (fixed assignment)
	Start verification (slot 17)

Supported functions	▪ Identification & maintenance
	Simple device identification via:
	  ▪ Control system
	  ▪ Nameplate
	▪ Measured value status
	The process variables are communicated with a measured value status
	▪ Blinking feature via the local display for simple device identification and assignment

Administration of software options

Input/output value	Process variable	Category	Slot
Output value	Mass flow	Process variable	1…10
	Volume flow		
	Corrected volume flow		
	Temperature		
	Conductivity		
	Corrected conductivity		
	Electronics temperature		
	Flow velocity		

Input/output value	Process variable	Category	Slot
	Current device diagnostics		
	Previous device diagnostics		
Input/output value	Totalizer	Totalizer	11…13
Input value	External density	Process monitoring	14
	External temperature		15
	Flow override		16
	Verification status	Heartbeat Technology verification [1]	17

1) Only available with the Heartbeat Technology application package.

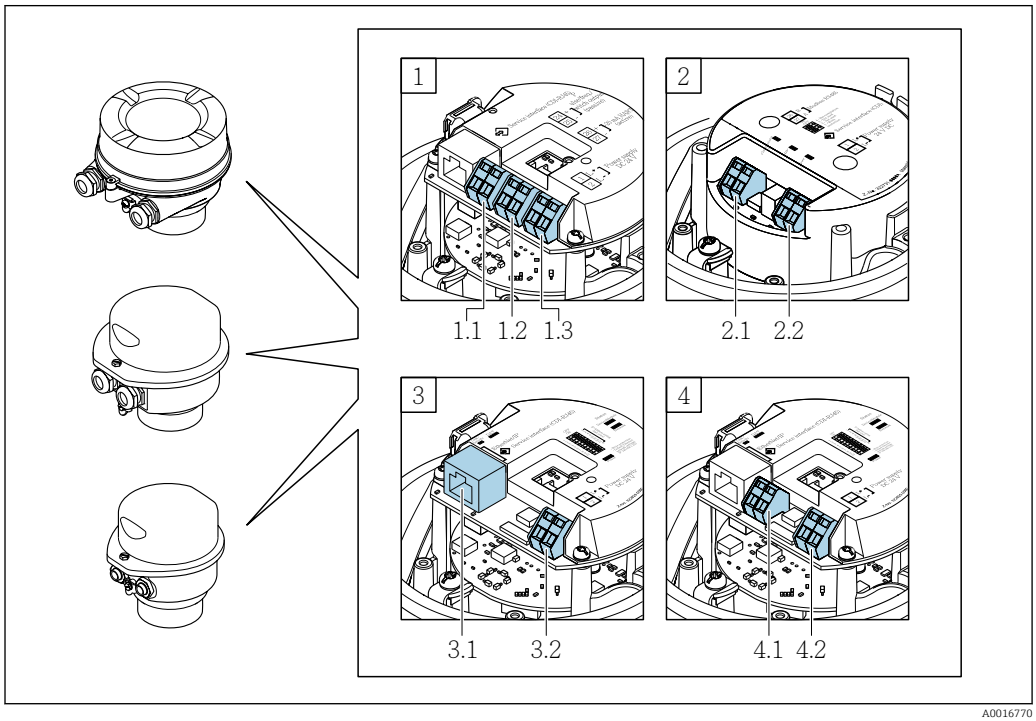
Startup configuration

Startup configuration (NSU)	If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used.
	The following configuration is taken from the automation system:
	▪ Management
	  ▪ Software revision
	  ▪ Write protection
	▪ System units
	  ▪ Mass flow
	  ▪ Mass
	  ▪ Volume flow
	  ▪ Volume
	  ▪ Corrected volume flow
	  ▪ Corrected volume
	  ▪ Density
	  ▪ Temperature
	  ▪ Conductivity
	▪ Sensor adjustment
	▪ Process parameters
	  ▪ Damping (flow, conductivity, temperature)
	  ▪ Flow override
	  ▪ Filter options
	▪ Low flow cut off
	  ▪ Assign process variable
	  ▪ Switch-on/switch-off point
	  ▪ Pressure shock suppression
	▪ Empty pipe detection
	  ▪ Assign process variable
	  ▪ Limit values
	  ▪ Response time
	▪ External compensation
	  ▪ Temperature source
	  ▪ Density source
	  ▪ Density value
	▪ Diagnostic settings
	▪ Diagnostic behavior for diverse diagnostic information

Power supply

Terminal assignment

Overview: housing version and connection versions



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

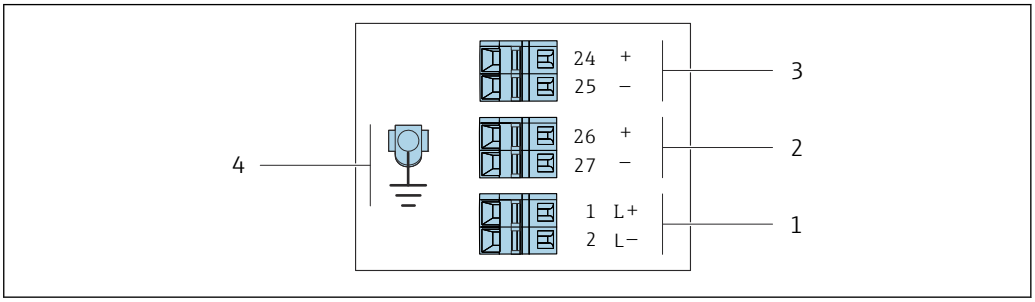
Transmitter

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

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Outputs	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
Options **A**, **B**	Device plug → 📄 27	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 📄 27	Device plug → 📄 27	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



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

1 Power supply: DC 24 V
2 Output 1: 4-20 mA HART (active)
3 Output 2: pulse/frequency/switch output (passive)
4 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

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

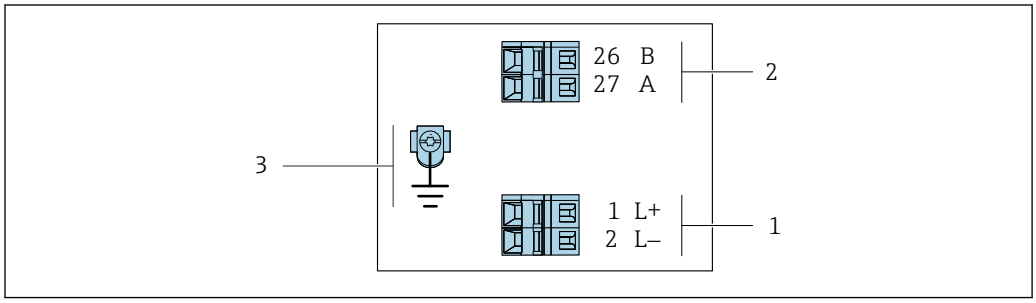
PROFIBUS DP connection version

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

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
Options **A**, **B**	Device plug → 🖹 26	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 26	Device plug → 🖹 26	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



3 PROFIBUS DP terminal assignment

1 Power supply: DC 24 V
2 PROFIBUS DP
3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

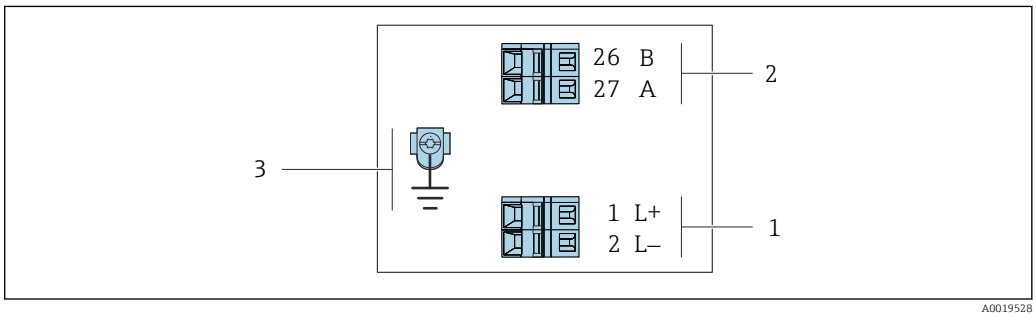
Order code for "Output"	Terminal number			
	Power supply		Output	
	2 (L-)	1 (L+)	26 (RxD/TxD-P)	27 (RxD/TxD-N)
Option **L**	DC 24 V		B	A
Order code for "Output": Option **L**: PROFIBUS DP, for use in non-hazardous areas and Zone 2/Div. 2				

Modbus RS485 connection version

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Terminals	Terminals	▪ Option **A**: coupling M20x1 ▪ Option **B**: thread M20x1 ▪ Option **C**: thread G ½" ▪ Option **D**: thread NPT ½"
Options **A**, **B**	Device plug → 🖹 26	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 26	Device plug → 🖹 26	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **B**: compact, hygienic, stainless ▪ Option **C**: ultra-compact, hygienic, stainless			



🖹 4 *Modbus RS485 terminal assignment*

1 *Power supply: DC 24 V*
2 *Modbus RS485*
3 *Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".*

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

Modbus RS485 connection version

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

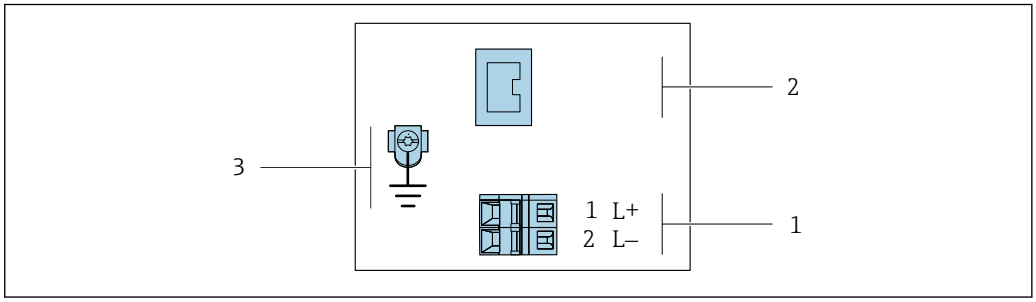
Order code for "Output", option **M**

EtherNet/IP connection version

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Device plug → 🖹 28	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 28	Device plug → 🖹 28	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **C**: ultra-compact, hygienic, stainless			



5 EtherNet/IP terminal assignment

1 Power supply: DC 24 V
2 EtherNet/IP
3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

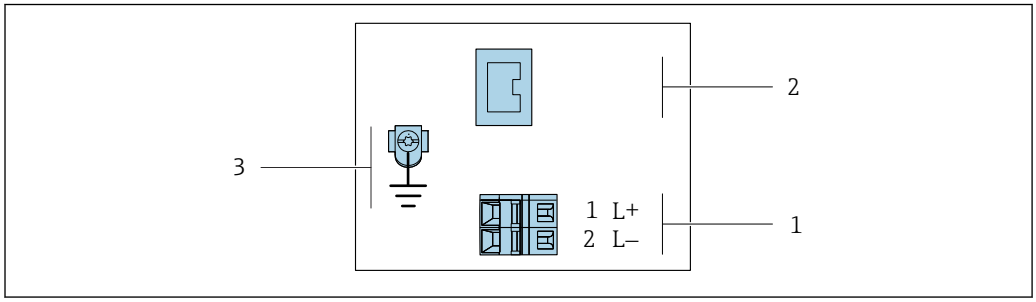
Order code for "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option **N**	DC 24 V		EtherNet/IP
Order code for "Output": Option **N**: EtherNet/IP			

PROFINET connection version

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

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

Order code for "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options **A**, **B**	Device plug → 🖹 26	Terminals	▪ Option **L**: plug M12x1 + thread NPT ½" ▪ Option **N**: plug M12x1 + coupling M20 ▪ Option **P**: plug M12x1 + thread G ½" ▪ Option **U**: plug M12x1 + thread M20
Options **A**, **B**, **C**	Device plug → 🖹 26	Device plug → 🖹 26	Option **Q**: 2 x plug M12x1
Order code for "Housing": ▪ Option **A**: compact, coated aluminum ▪ Option **C**: ultra-compact, hygienic, stainless			



6 *PROFINET terminal assignment*

1 *Power supply: DC 24 V*
2 *PROFINET*
3 *Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".*

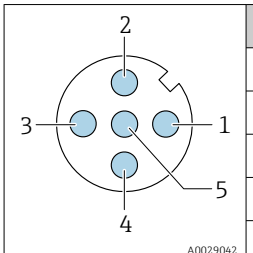
Order code for "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option **R**	DC 24 V		PROFINET
Order code for "Output": Option **R**: PROFINET			

Pin assignment, device plug

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

Supply voltage

For all connection versions (device side), male connection (plug)



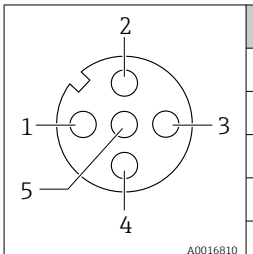
Pin	Assignment	
1	L+	DC 24 V
2		Not used
3		Not used
4	L-	DC 24 V
5		Grounding/shielding [1]
Coding		**Plug/socket**
A		Plug

1) Connection for protective ground and shielding from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

The following is recommended as a socket:
- Binder, series 763, part no. 79 3440 35 05
- Alternatively: Phoenix part no. 1682951 SAC-5P-5.0-PUR/M12FS SH
  - With the order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
  - With the order code for "Output", option **N**: EtherNet/IP
- When using the device in a hazardous location: Use a suitably certified socket.

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

Device plug for signal transmission (device side), female connection



Pin	Assignment	
1	+	4-20 mA HART (active)
2	-	4-20 mA HART (active)
3	+	Pulse/frequency/switch output (passive)
4	-	Pulse/frequency/switch output (passive)
5		Shielding [1]
Coding		**Plug/socket**
A		Socket

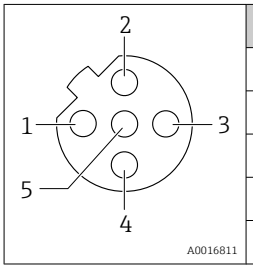
1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

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

PROFIBUS DP

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

Device plug for signal transmission (device side)



Pin	Assignment	
1		Not used
2	A	PROFIBUS DP
3		Not used
4	B	PROFIBUS DP
5		Shielding [1]

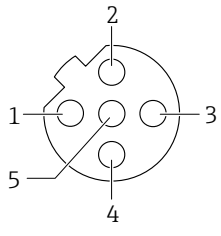
	Coding	Plug/socket
	B	Socket

1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".
Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

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

MODBUS RS485

Device plug for signal transmission (device side)



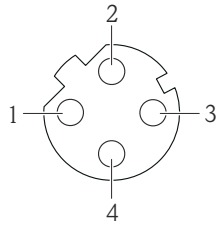
Pin		Assignment
1		Not used
2	A	Modbus RS485
3		Not used
4	B	Modbus RS485
5		Shielding [1]
Coding		**Plug/socket**
B		Socket

1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".
Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

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

EtherNet/IP

Device plug for signal transmission (device side)

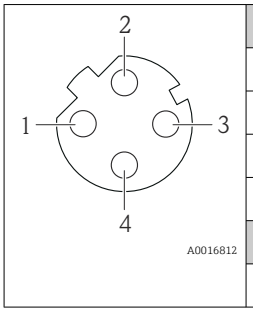


Pin		Assignment
1	+	Tx
2	+	Rx
3	-	Tx
4	-	Rx
Coding		**Plug/socket**
D		Socket

- There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug:
  - Binder, series 763, part no. 99 3729 810 04
  - Phoenix, part no. 1543223 SACC-M12MSD-4Q
  - When using the device in a hazardous location, use a suitably certified plug.

PROFINET

Device plug for signal transmission (device side)



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

- There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug:
  - Binder, series 763, part no. 99 3729 810 04
  - Phoenix, part no. 1543223 SACC-M12MSD-4Q
  - When using the device in a hazardous location, use a suitably certified plug.

Supply voltage

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

Transmitter

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

Power consumption

Transmitter

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

Current consumption

Transmitter

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

Device fuse

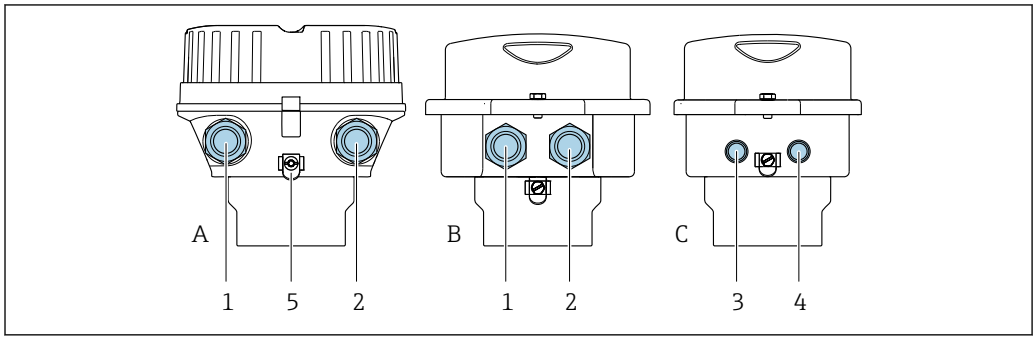
Fine-wire fuse (slow-blow) T2A

Power supply failure

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

Electrical connection

Transmitter connection



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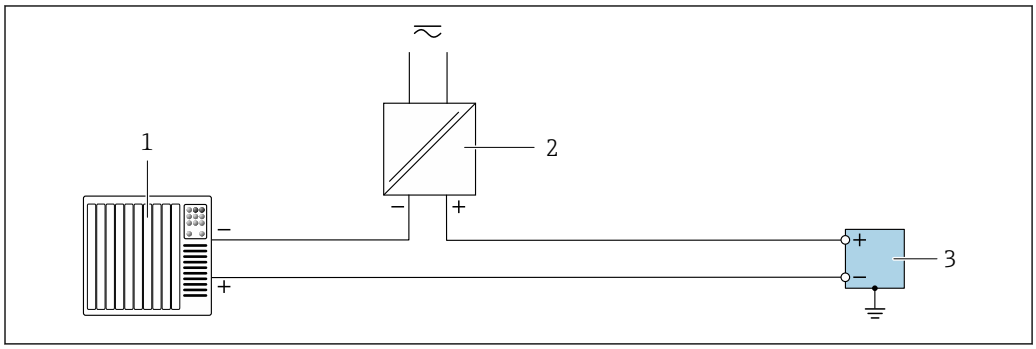
A Housing version: compact, coated, aluminum
B Housing version: compact, hygienic, stainless
C Housing version: ultra-compact, hygienic, stainless, M12 device plug
1 Cable entry or device plug for signal transmission
2 Cable entry or device plug for supply voltage
3 Device plug for signal transmission
4 Device plug for supply voltage
5 Ground terminal. Cable lugs, pipe clips or ground disks are recommended for optimization of the grounding/ shielding.

- Terminal assignment → 20
- Pin assignment, device plug → 26

In the case of device versions with a connector, the transmitter housing does not need to be opened to connect the signal cable or power supply cable.

Connection examples

Pulse output/frequency output/switch output



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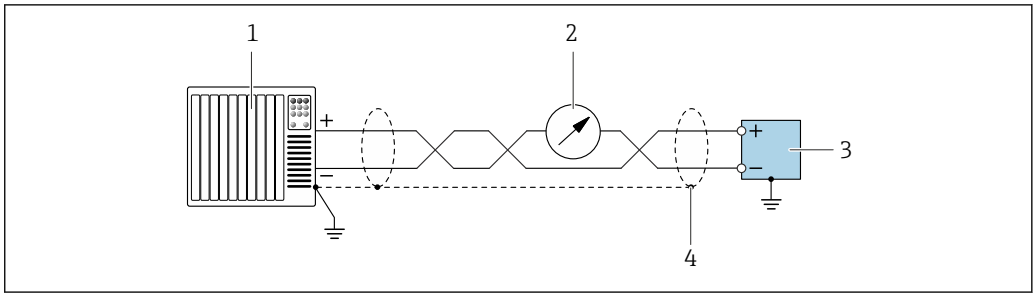
7 Connection example for pulse output/frequency output/switch output (passive)

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)

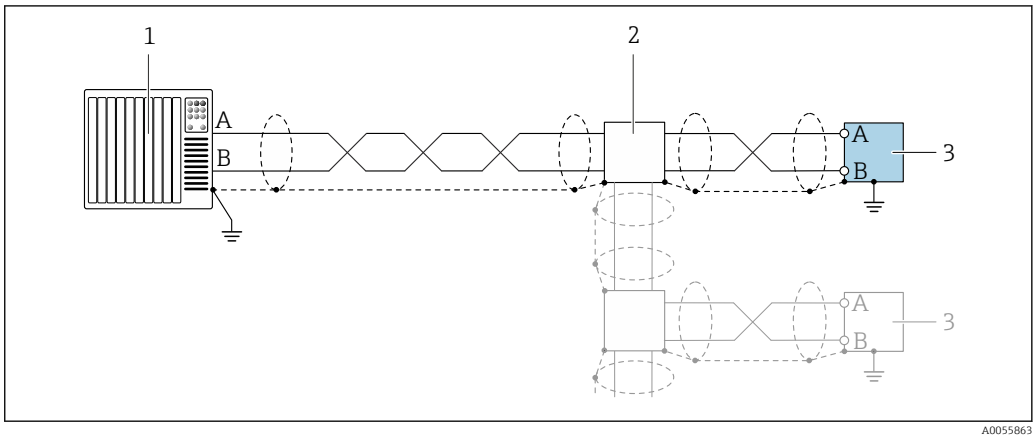
Current output 4 to 20 mA HART



8 *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 cable shield at one end. For installations in compliance with NAMUR NE 89, grounding of the cable shield on both sides is required.*

Modbus RS485



9 *Connection example for Modbus RS485*

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

PROFIBUS DP

See https://www.profibus.com "PROFIBUS Installation Guidelines".

PROFINET

See https://www.profibus.com "PROFINET Planning guideline".

EtherNet/IP

See https://www.odva.org"EtherNet/IP Media Planning & Installation Manual".

Potential equalization

Requirements

For potential equalization:
- Pay attention to in-house grounding concepts
- Take account of operating conditions, such as the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electric potential
- Use a ground cable with a minimum cross-section of 6 mm^2 (10 AWG) and a cable lug for potential equalization connections

Terminals

Transmitter
Spring terminals for wire cross-sections0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

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

Cable specification

Permitted temperature range

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

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

Standard installation cable is sufficient.

Signal cable

For custody transfer, all signal lines must be shielded cables (tinned copper braiding, optical coverage ≥ 85 %). The cable shield must be connected on both sides.

4 to 20 mA current output (without HART)

Standard installation cable is sufficient.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Current output 4 to 20 mA HART

Shielded twisted-pair cable.

See https://www.fieldcommgroup.org "HART PROTOCOL SPECIFICATIONS".

Modbus RS485

Shielded twisted-pair cable.

See https://modbus.org "MODBUS over Serial Line Specification and Implementation Guide".

PROFIBUS DP

Shielded twisted-pair cable. Cable type A is recommended.

See https://www.profibus.com "PROFIBUS Installation Guidelines".

PROFINET

Only PROFINET cables.

See https://www.profibus.com "PROFINET Planning guideline".

EtherNet/IP

Twisted-pair Ethernet CAT 5 or better.

See https://www.odva.org"EtherNet/IP Media Planning & Installation Manual".

Performance characteristics

Reference operating conditions

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

Maximum measurement error

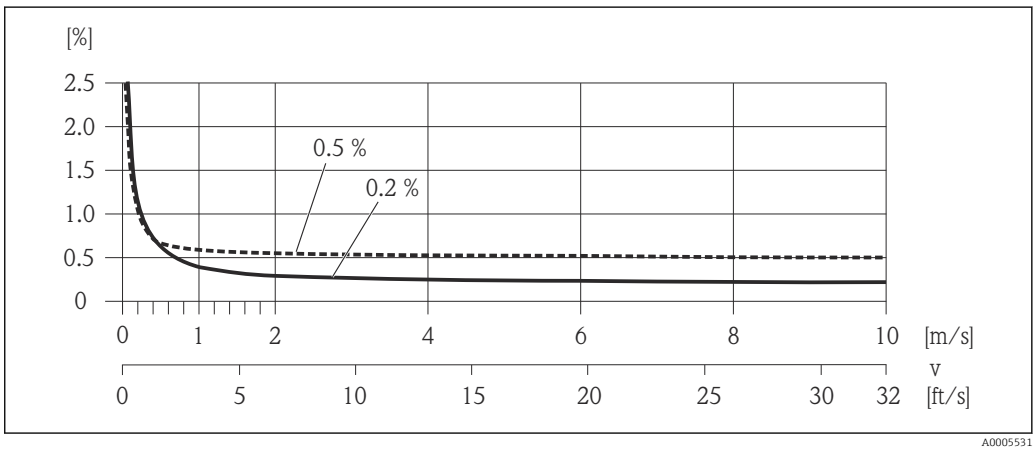
Maximum permissible error under reference operating conditions

o.r. = of reading

Volume flow

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

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



10 Maximum measurement error in % o.r.

Temperature
±3 °C (±5.4 °F)

Electrical conductivity
Max. measurement error not specified.

Accuracy of outputs

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

The outputs have the following base accuracy specifications.

Current output

Accuracy	Max. ±5 µA

Pulse/frequency output

o.r. = of reading

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

Repeatability

o.r. = of reading

Volume flow
Max. ±0.1 % o.r. ± 0.5 mm/s (0.02 in/s)

Temperature
±0.5 °C (±0.9 °F)

Electrical conductivity
- Max. ±5 % o.r.
- Max. ±1 % o.r. for DN 15 to 150 in conjunction with process connections made of stainless steel 1.4404 (F316L)

Temperature measurement response time

T_{90} < 15 s

Influence of ambient temperature

Current output

o.r. = of reading

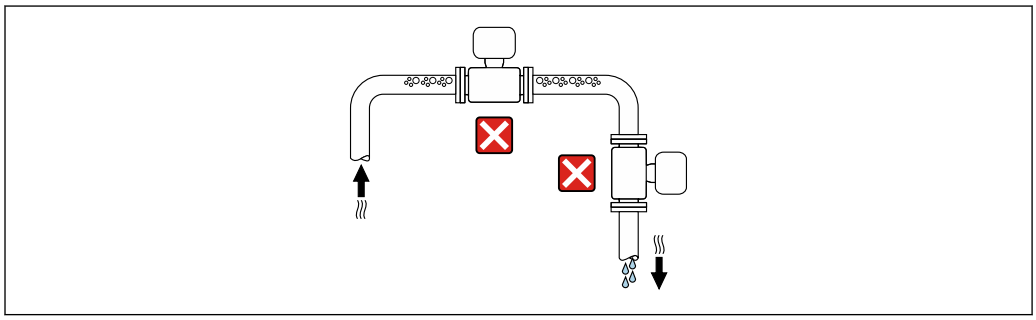
Temperature coefficient	Max. ±0.005 % o.r./°C

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

Mounting

Mounting location
- 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.



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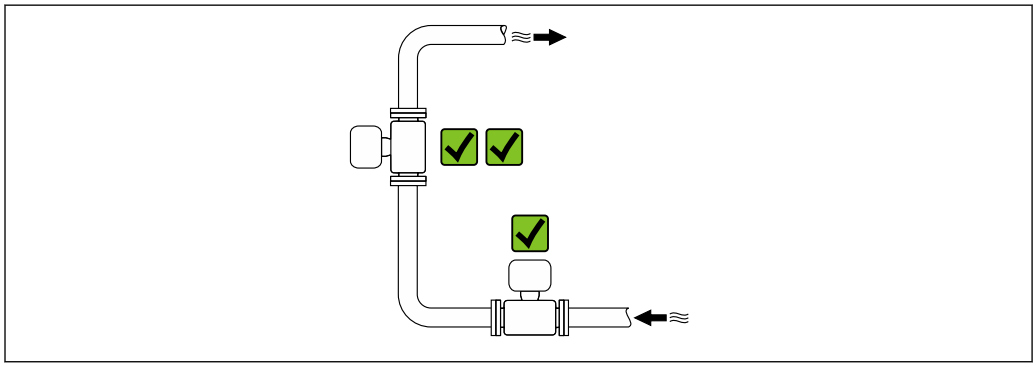
The device should ideally be installed in an ascending pipe.



A0042317

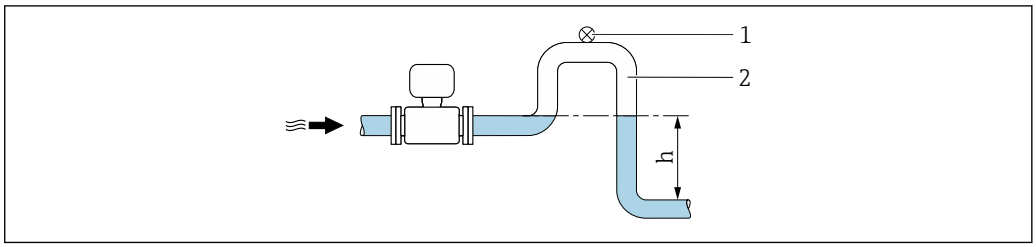
Installation upstream from a down pipe

NOTICE

Negative pressure in the measuring pipe can damage the liner!

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

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

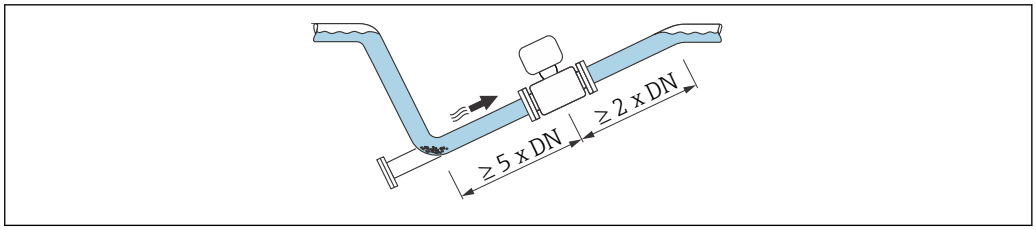


A0028981

1 Vent valve
2 Pipe siphon
h Length of down pipe

Installation with partially filled pipes

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



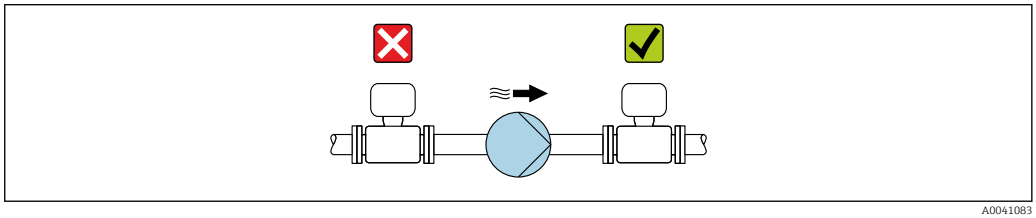
A0041088

Installation near pumps

NOTICE

Negative pressure in the measuring tube can damage the liner!

- ▶ In order to maintain the system pressure, install the device in the flow direction downstream from the pump.
- ▶ Install pulsation dampers if reciprocating, diaphragm or peristaltic pumps are used.



A0041083

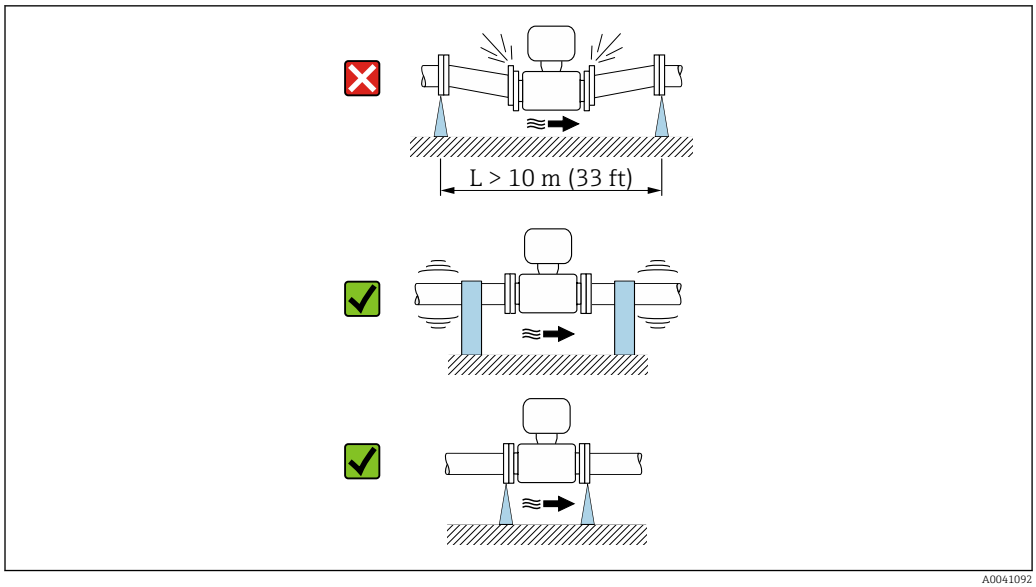
- Information on the liner's resistance to partial vacuum
- Information on the measuring system's resistance to vibration and shock → 39

Installation in event of pipe vibrations

NOTICE

Pipe vibrations can damage the device!

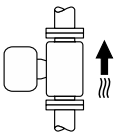
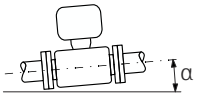
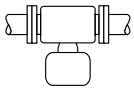
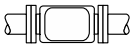
- ▶ Do not expose the device to strong vibrations.
- ▶ Support the pipe and fix it in place.
- ▶ Support the device and fix it in place.



Information on the measuring system's resistance to vibration and shock → 39

Orientation

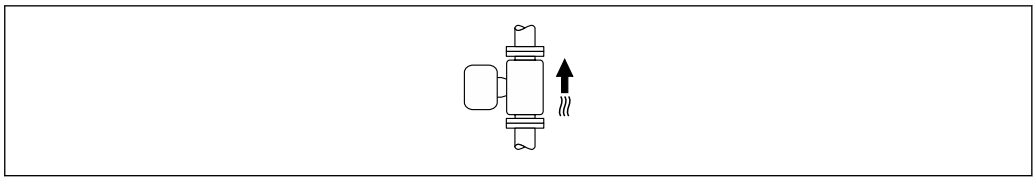
The direction of the arrow on the nameplate helps you to install the measuring device according to the flow direction (direction of medium flow through the piping).

Orientation		Recommendation
Vertical orientation	 A0015591	✓✓
Horizontal orientation	 A0041328	✓ 1)
Horizontal orientation, transmitter at bottom	 A0015590	✓✓ 2) 3) ✗ 4)
Horizontal orientation, transmitter at side	 A0015592	✗

1) The measuring device should be self-draining for hygiene applications. A vertical orientation is recommended for this. If only a horizontal orientation is possible, an angle of inclination α ≥ 10° is recommended.
2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
3) To prevent the electronics from overheating in the event of strong heat formation (e.g. CIP or SIP cleaning process), install the device with the transmitter part pointing downwards.
4) With the empty pipe detection function switched on: empty pipe detection only works if the transmitter housing is pointing upwards.

Vertical

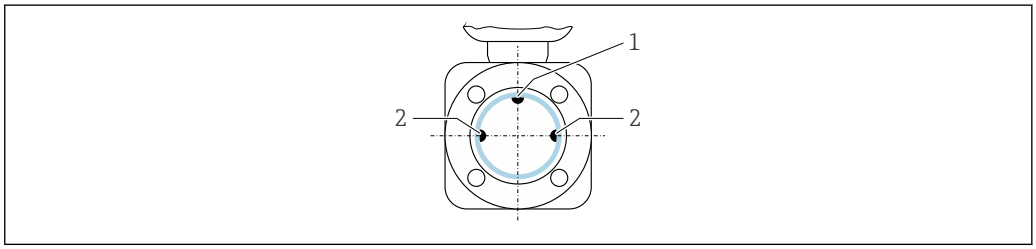
Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.



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

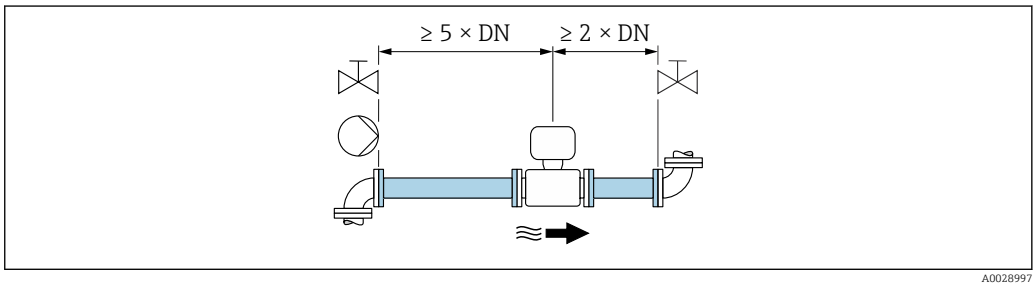
Measuring instruments with a nominal diameter < DN 15 (½") do not have an EPD electrode. In this case, empty pipe detection is performed via the measuring electrodes.

Inlet and outlet runs

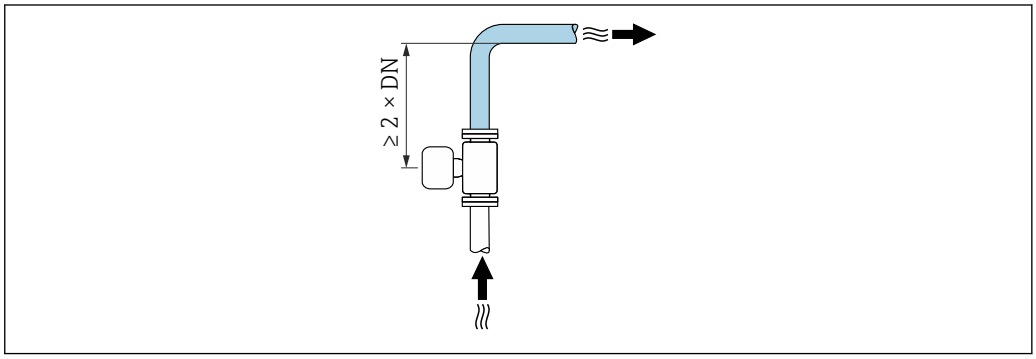
Installation with inlet and outlet runs

To avoid a vacuum and to maintain the specified level of measurement accuracy, install the device upstream from assemblies that produce turbulence (e.g. valves, T-sections) and downstream from pumps.

Maintain straight, unimpeded inlet and outlet runs.



A0028997



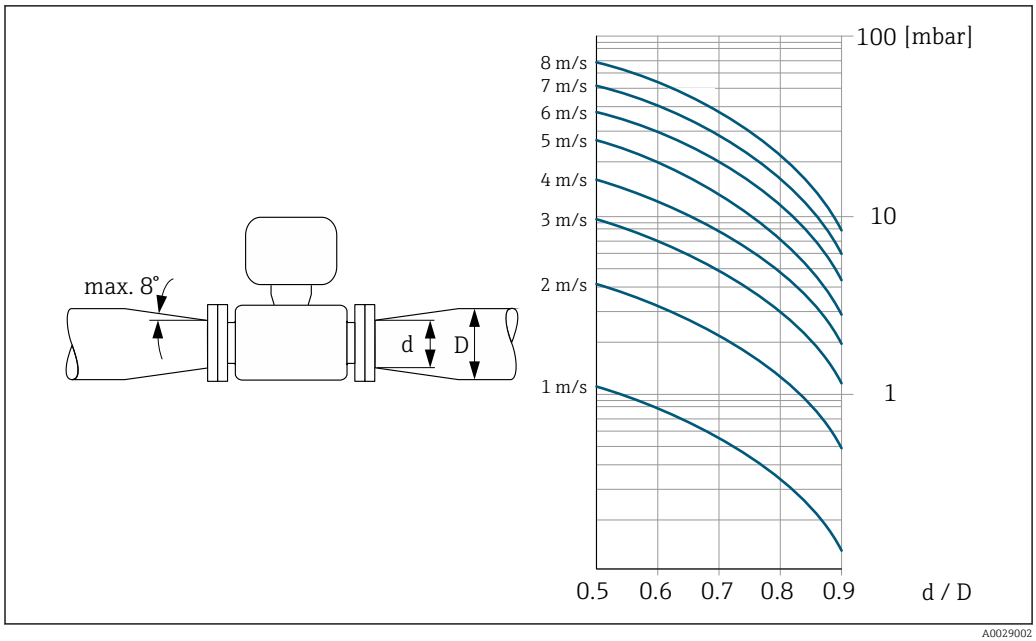
A0042132

Adapters

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

The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders:
- Calculate the ratio of the diameters d/D.
- From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.

- The nomogram only applies to liquids with a viscosity similar to that of water.
- If the medium has a high viscosity, a larger measuring tube diameter can be considered in order to reduce pressure loss.



Special mounting instructions

Hygienic compatibility

When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 90

Environment

Ambient temperature range

Transmitter	–40 to +60 °C (–40 to +140 °F)
Local display	–20 to +60 °C (–4 to +140 °F); readability of the local display may be impaired at temperatures outside the temperature range.
Sensor	–20 to +60 °C (–4 to +140 °F)
Liner	Do not exceed or fall below the permitted temperature range of the liner .

If operating outdoors:
- Install the measuring instrument in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

Storage temperature

The storage temperature corresponds to the operating temperature range of the transmitter and the sensor → 38.

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

Atmosphere

Additional protection against condensation and moisture: the sensor housing is potted with a gel.

Order code for "Sensor option", option CF "Harsh environment".

Degree of protection

Transmitter and sensor
- Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
- With the order code for "Sensor options", option CM: IP69 can also be ordered
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

Vibration-resistance and shock resistance

Vibration sinusoidal, in accordance with IEC 60068-2-6
- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

Vibration broad-band random, according to IEC 60068-2-64
- 10 to 200 Hz, 0.01 g^2/Hz
- 200 to 2 000 Hz, 0.003 g^2/Hz
- Total: 2.70 g rms

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

6 ms 50 g

Rough handling shocks according to IEC 60068-2-31

Mechanical load

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

Internal cleaning
- CIP cleaning
- SIP cleaning

Electromagnetic compatibility (EMC)
- As per IEC/EN 61326
- As per NAMUR Recommendation 21 (NE 21), NAMUR Recommendation 21 (NE 21) is fulfilled when installed in accordance with NAMUR Recommendation 98 (NE 98)
- As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
- Complies with emission limits for industry as per EN 55011 (Class A)
- Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784

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

Details are provided in the Declaration of Conformity.

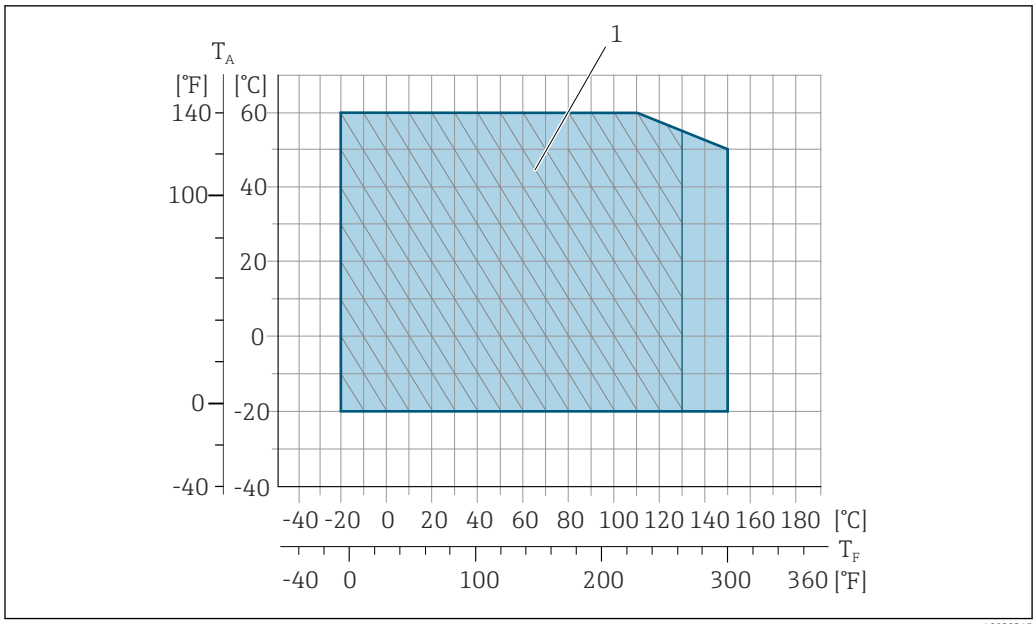
This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

The selection of a sensor with a steel housing is recommended for use in the vicinity of electrical power supply lines with strong currents.

Process

Medium temperature range

−20 to +150 °C (−4 to +302 °F)



T_A *Ambient temperature range*
T_F *Fluid temperature*
1 Harsh environment IP68 only for fluid temperature range –20 to +130 °C (–4 to +266 °F)

The permitted fluid temperature in custody transfer is 0 to +50 °C (+32 to +122 °F).

Conductivity

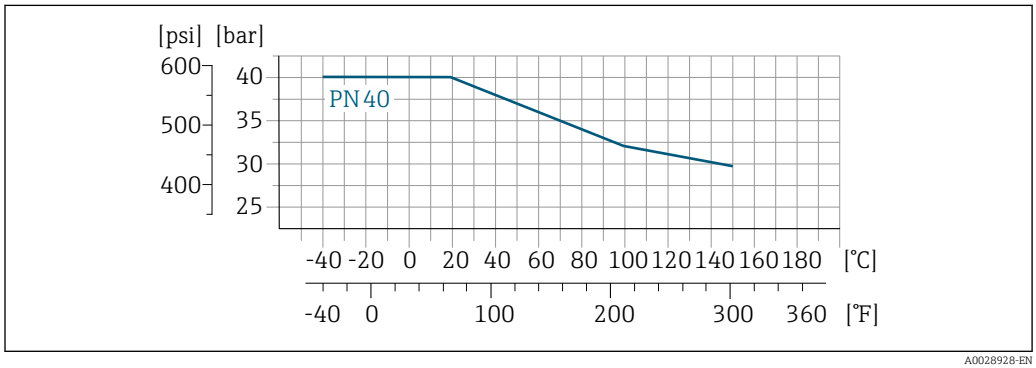
≥5 µS/cm for liquids in general.

Pressure/temperature ratings

The following graphics contain material load diagrams (reference curves) for different process connections in relation to the medium temperature.

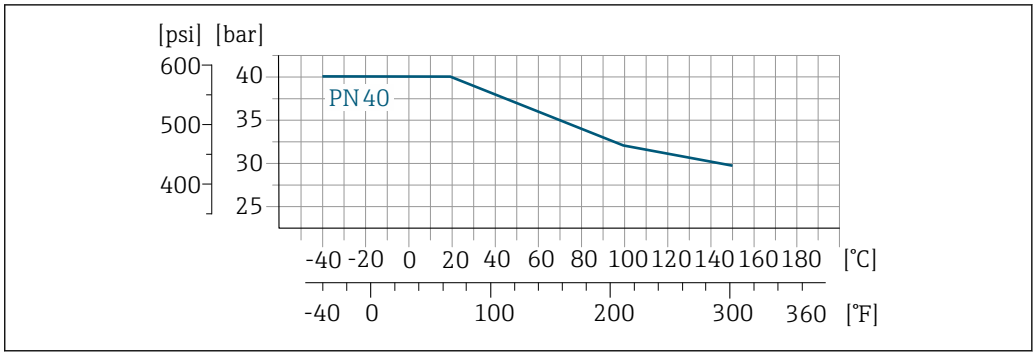
Process connections with O-ring seal, DN 2 to 25 (1/12 to 1")

Process connection: welding nipple similar to DIN EN ISO 1127, ISO 2037; coupling similar to ISO 228/DIN 2999, NPT

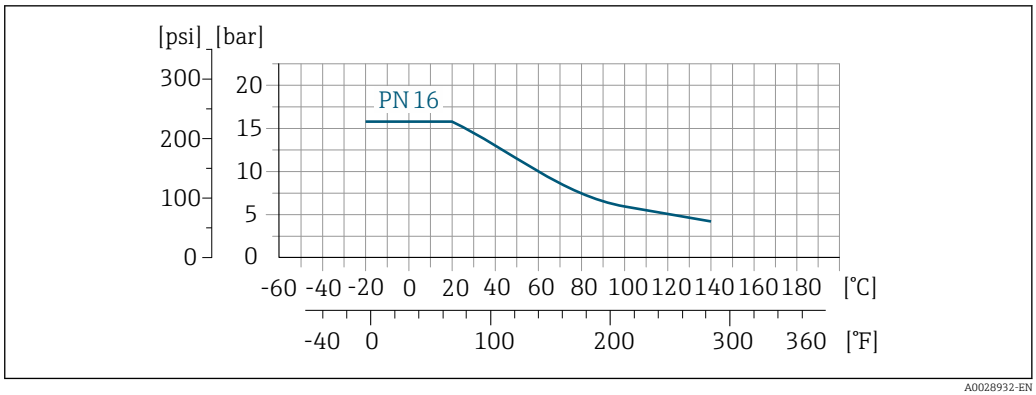


11 Process connection material: stainless steel, 1.4404 (F316L)

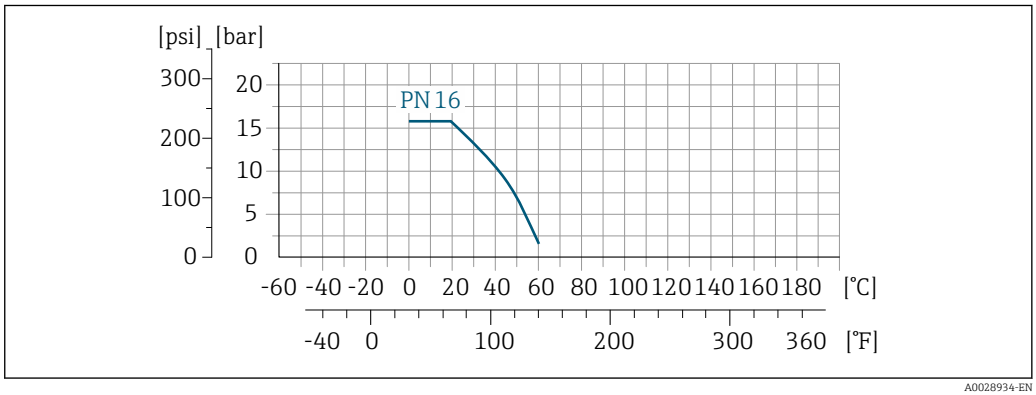
Process connection: flange similar to EN 1092-1 (DIN 2501), adhesive fitting



12 *Process connection material: stainless steel, 1.4404 (F316L)*

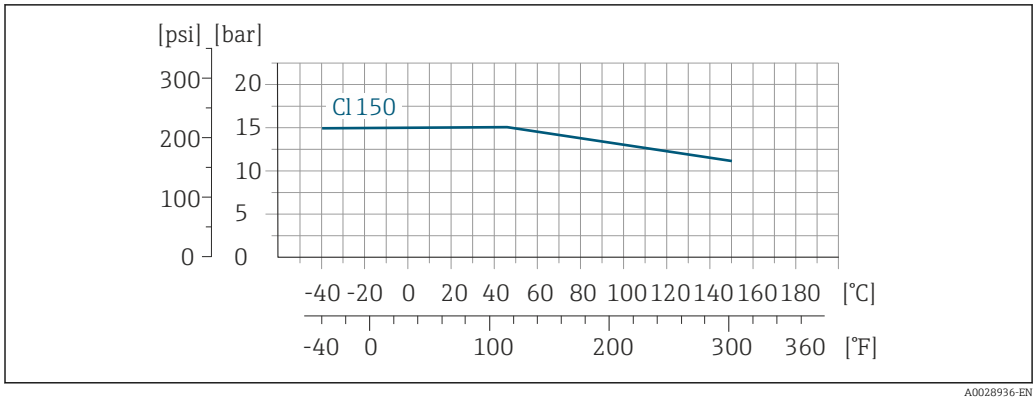


13 *Process connection material: PVDF*

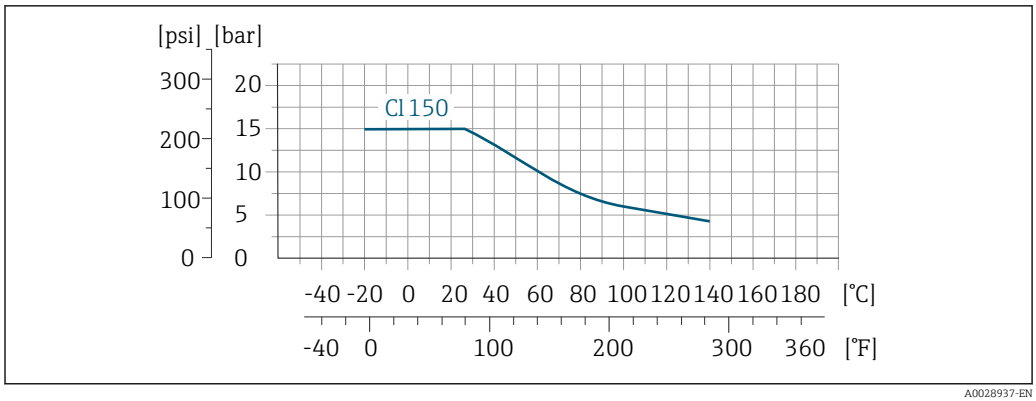


14 *Process connection material: PVC-U*

Process connection: flange similar to ASME B16.5

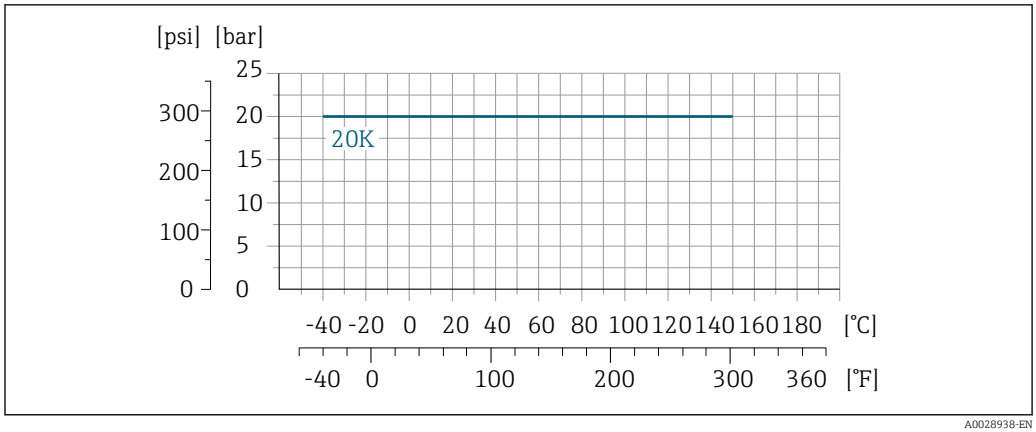


15 *Process connection material: stainless steel, 1.4404 (F316L)*

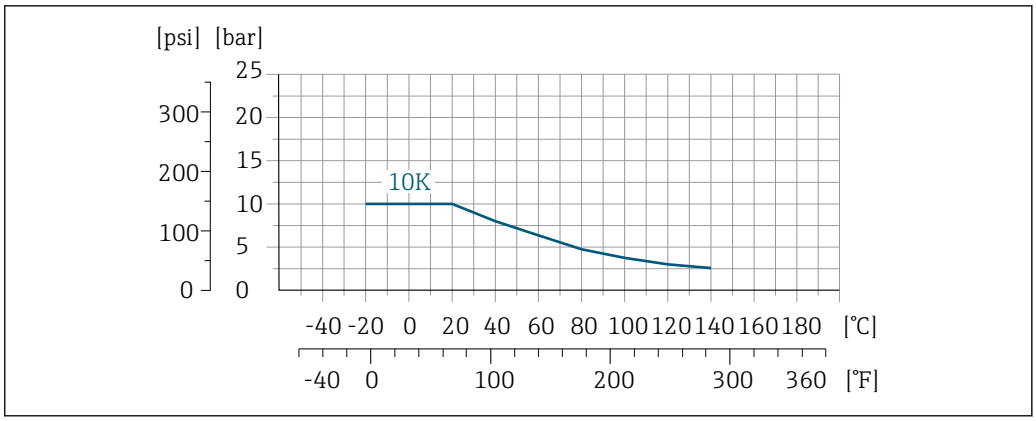


16 *Process connection material: PVDF*

Process connection: flange similar to JIS B2220



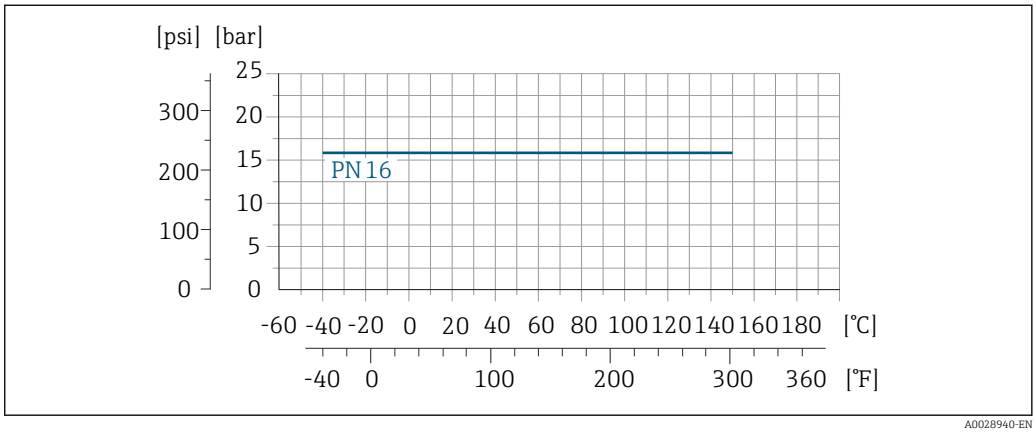
17 *Process connection material: stainless steel, 1.4404 (F316L)*



18 *Process connection material: PVDF*

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

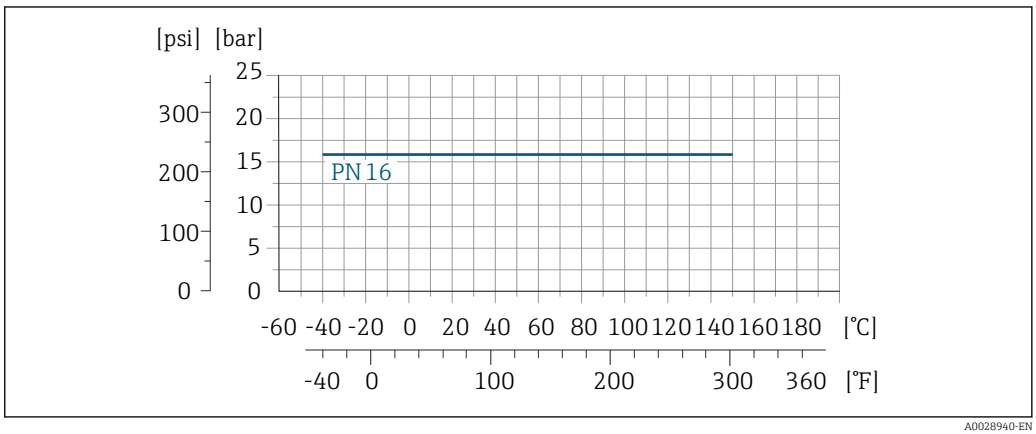
Process connection: welding nipple similar to EN 10357, ASME BPE, ISO 2037; clamp similar to ISO 2852, DIN 32676; coupling similar to DIN 11851, DIN 11864-1, SMS 1145; flange similar to DIN 11864-2



19 *Process connection material: stainless steel, 1.4404 (F316L)*

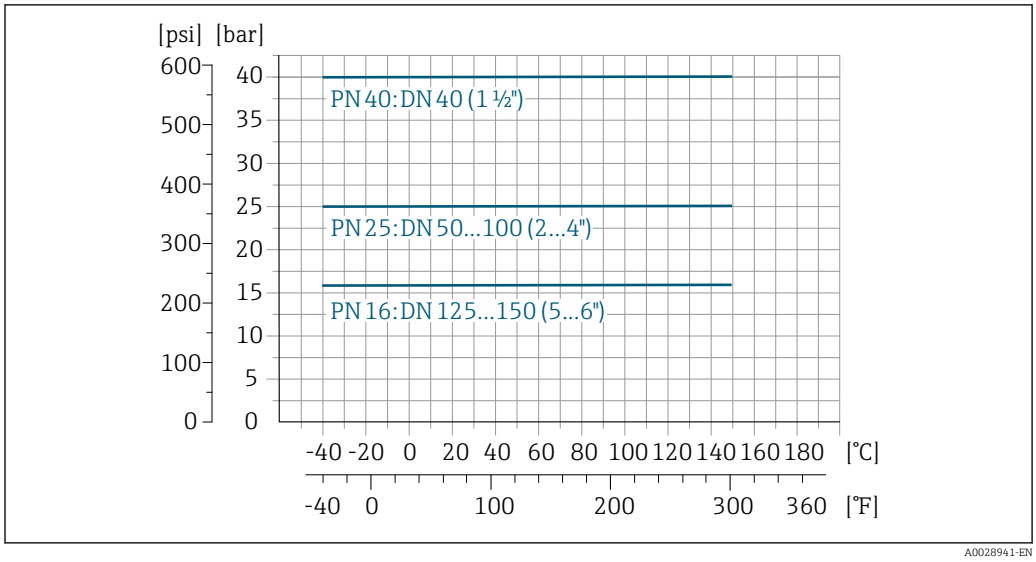
Process connections with aseptic gasket seal, DN 40 to 150 (1 ½ to 6")

Process connection: coupling similar to SMS 1145



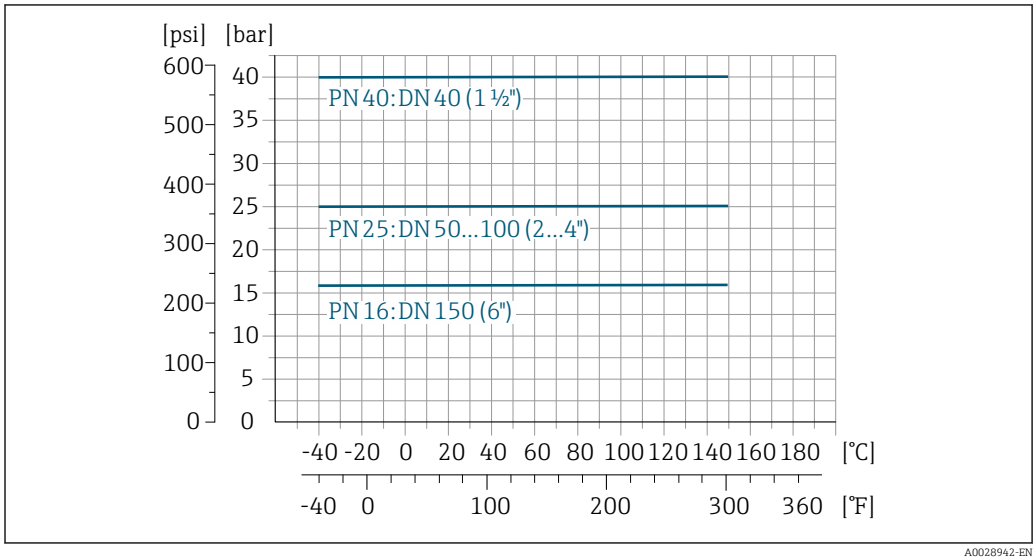
20 *Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: welding nipple similar to EN 10357; coupling similar to DIN 11851

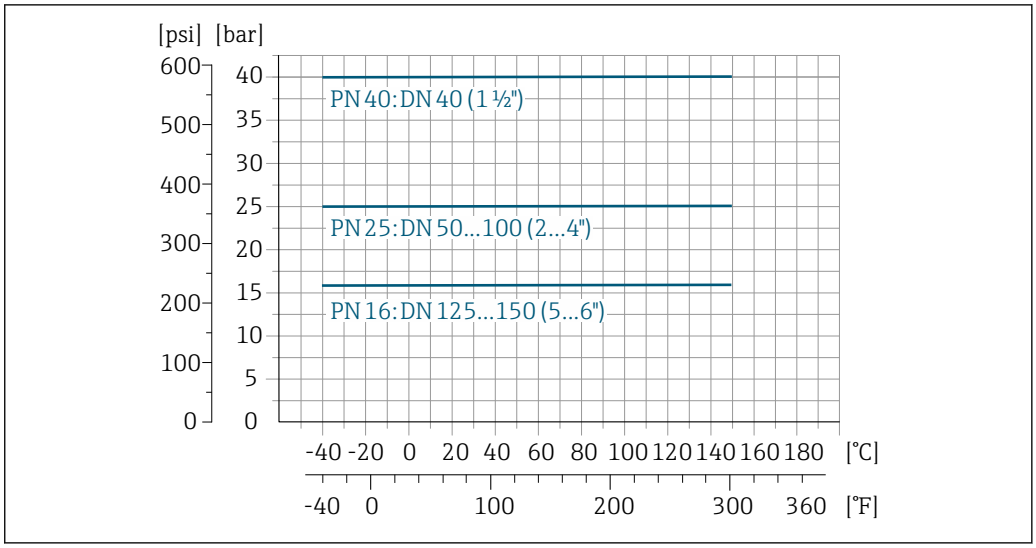


21 *Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: welding nipple similar to ASME BPE

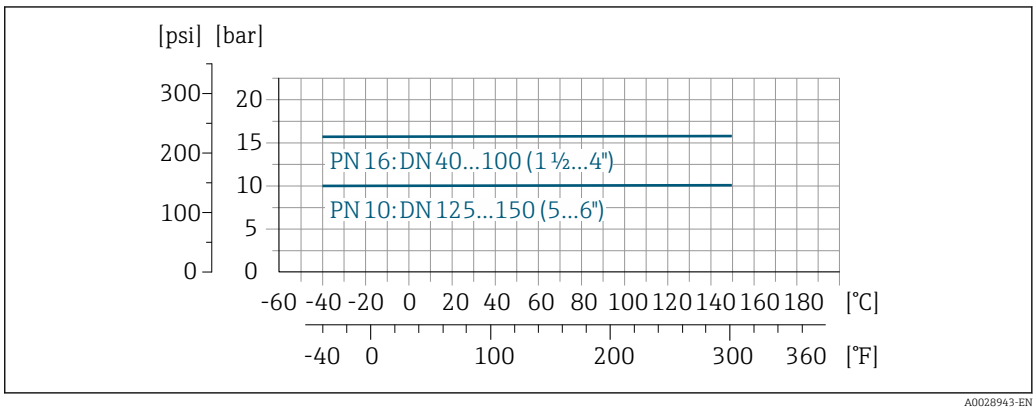


Process connection: welding nipple similar to ISO 2037



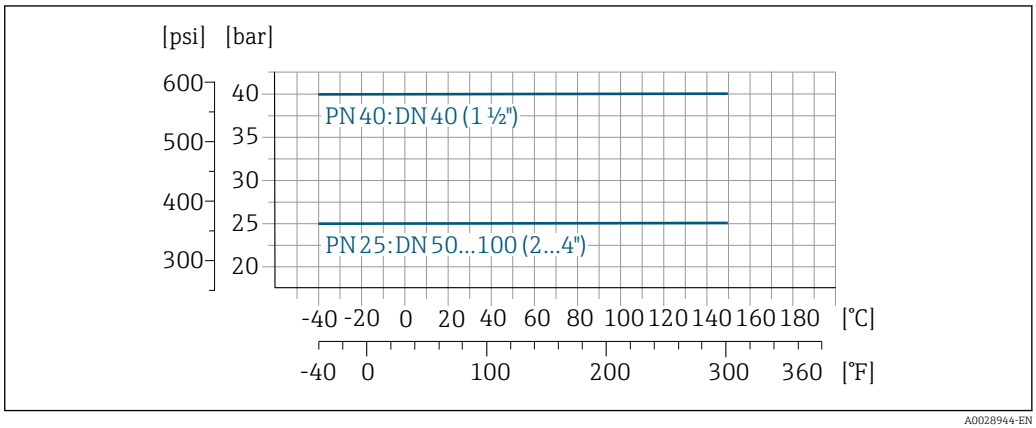
22 *Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: clamp similar to ISO 2852, DIN 32676



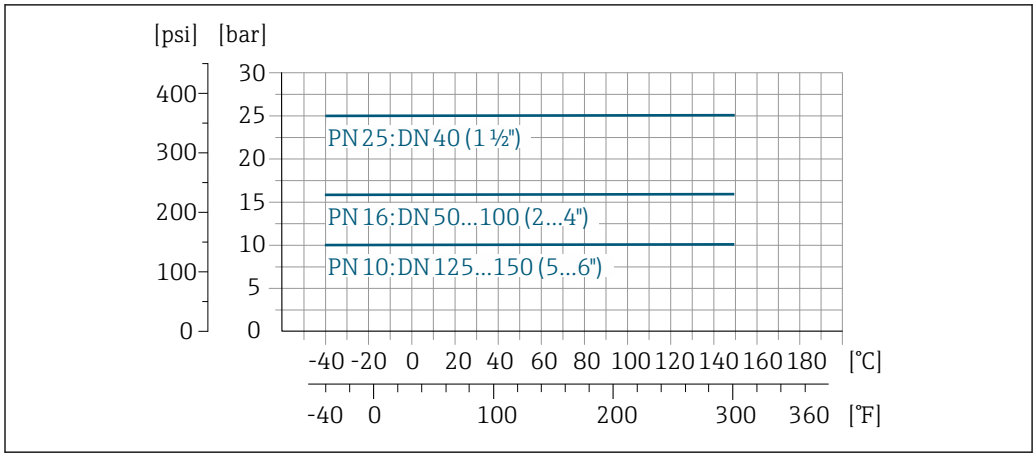
23 *Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: coupling similar to DIN 11864-1, ISO 2853



24 *Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: flange similar to DIN 11864-2



25 *Process connection material: stainless steel, 1.4404 (F316L)*

Pressure tightness

Liner: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for medium temperatures:				
[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)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the medium:
- 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. milk with a high fat content)

- A necessary increase in the flow velocity can be achieved 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.

Pressure loss

- No pressure loss occurs as of nominal diameter DN 8 (5/16") if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 → 38

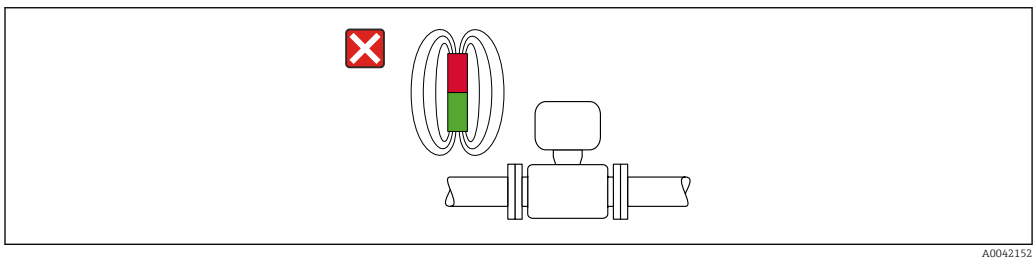
System pressure

Installation near pumps → 35

Vibrations

Installation in event of pipe vibrations → 35

Magnetism and static electricity

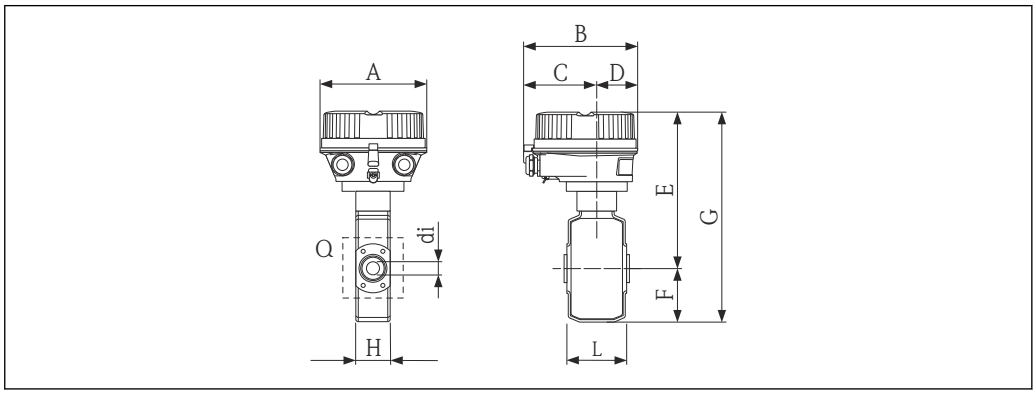


26 *Avoid magnetic fields*

Mechanical construction

Dimensions in SI units

Compact version

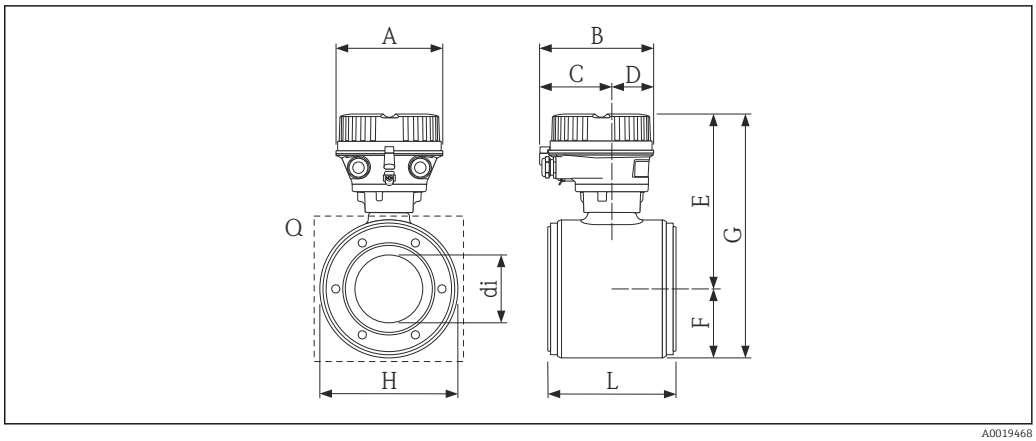


A0019463

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1] [mm]	F [mm]	G [1] [mm]	H [mm]	L [2] [mm]	Q [mm]	di [mm]
2	136	148	94	54	172	48	220	43	86	4 × M6	2.25
4	136	148	94	54	172	48	220	43	86	4 × M6	4.5
8	136	148	94	54	172	48	220	43	86	4 × M6	9
15	136	148	94	54	172	48	220	43	86	4 × M6	16
25	136	148	94	54	176	52	228	53	86	4 × M6	22.6

1) If using a display, order code for "Display; operation", option B: values + 28 mm
2) Total length (L) depends on the process connections.

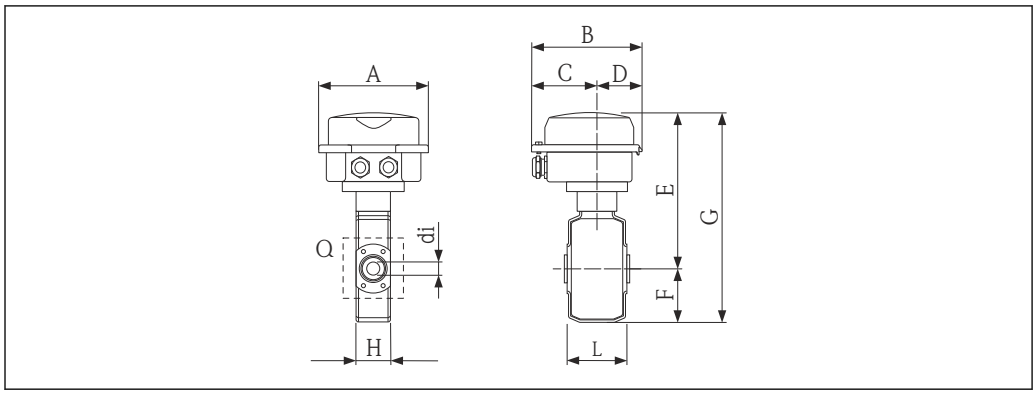


A0019468

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1] [mm]	F [mm]	G [1] [mm]	H [mm]	L [2] [mm]	Q [mm]	di [mm]
40	136	148	94	54	179.3	53.3	232.6	107	140	4 × M8	34.8
50	136	148	94	54	185.8	59.8	245.6	120	140	4 × M8	47.5
65	136	148	94	54	195.6	69.6	265.2	135	140	6 × M8	60.2
80	136	148	94	54	199.8	73.8	273.6	148	140	6 × M8	72.9
100	136	148	94	54	212.8	86.8	299.6	174	140	6 × M8	97.4
125	136	148	94	54	228.8	102.8	331.6	206	200	6 × M10	120.0
150	136	148	94	54	242.8	116.8	359.6	234	200	6 × M10	146.9

1) If using a display, order code for "Display; operation", option B: values + 28 mm
2) Total length (L) depends on the process connections.

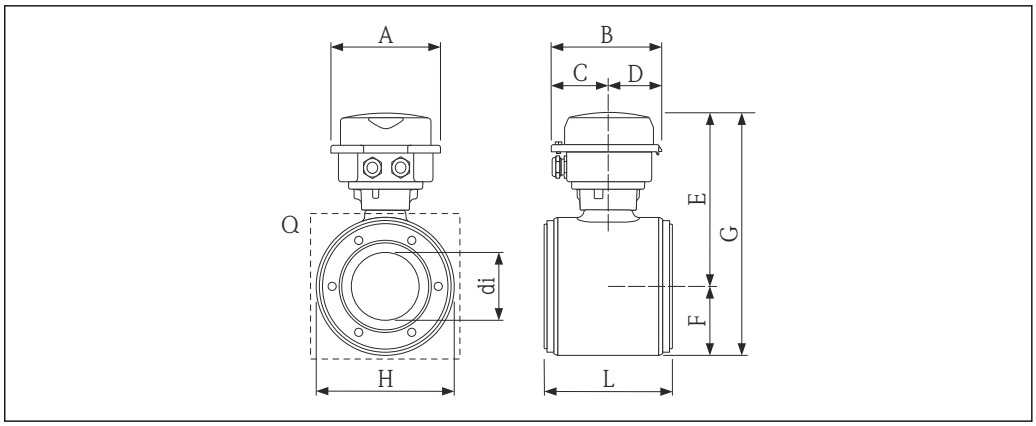


A0019464

Order code for "Housing", option B "Compact, hygienic, stainless"

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1] [mm]	F [mm]	G [1] [mm]	H [mm]	L [2] [mm]	Q [mm]	di [mm]
2	134	137	78	59	166	48	214	43	86	4 × M6	2.25
4	134	137	78	59	166	48	214	43	86	4 × M6	4.5
8	134	137	78	59	166	48	214	43	86	4 × M6	9
15	134	137	78	59	166	48	214	43	86	4 × M6	16
25	134	137	78	59	170	52	222	53	86	4 × M6	22.6

1) If using a display, order code for "Display; operation", option B: values + 14 mm
2) Total length (L) depends on the process connections.

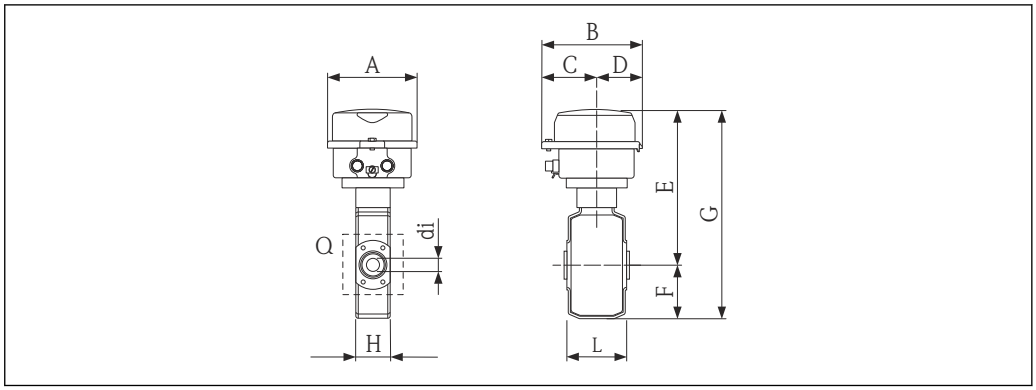


A0019470

Order code for "Housing", option B "Compact, hygienic, stainless"

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1)] [mm]	F [mm]	G [1)] [mm]	H [mm]	L [2)] [mm]	Q [mm]	di [mm]
40	134	137	78	59	173.3	53.3	226.6	107	140	4 × M8	34.8
50	134	137	78	59	179.8	59.8	239.6	120	140	4 × M8	47.5
65	134	137	78	59	189.6	69.6	259.2	135	140	6 × M8	60.2
80	134	137	78	59	193.8	73.8	267.6	148	140	6 × M8	72.9
100	134	137	78	59	206.8	86.8	293.6	174	140	6 × M8	97.4
125	134	137	78	59	222.8	102.8	325.6	206	200	6 × M10	120.0
150	134	137	78	59	236.8	116.8	353.6	234	200	6 × M10	146.9

1) If using a display, order code for "Display; operation", option B: values + 14 mm
2) Total length (L) depends on the process connections.

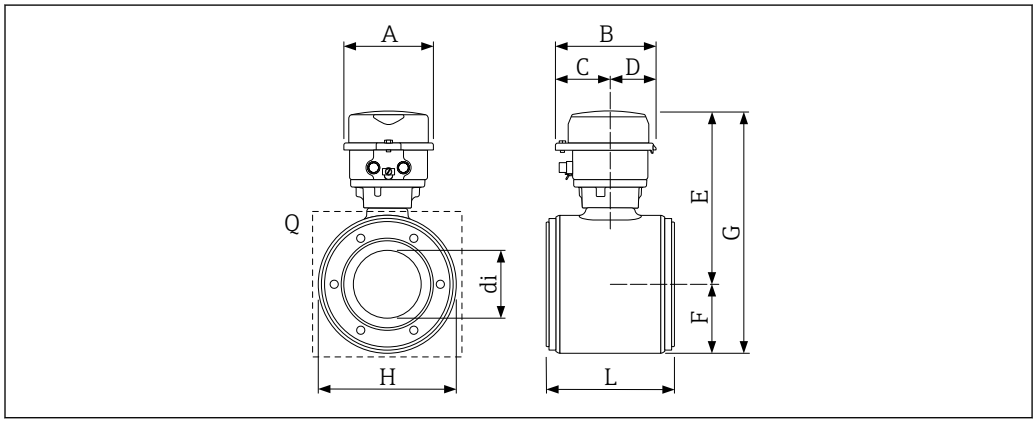


A0019466

Order code for "Housing", option C "Ultra-compact, hygienic, stainless"

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1] [mm]	F [mm]	G [1] [mm]	H [mm]	L [2] [mm]	Q [mm]	di [mm]
2	112	124	68	56	166	48	214	43	86	4 × M6	2.25
4	112	124	68	56	166	48	214	43	86	4 × M6	4.5
8	112	124	68	56	166	48	214	43	86	4 × M6	9
15	112	124	68	56	166	48	214	43	86	4 × M6	16
25	112	124	68	56	170	52	222	53	86	4 × M6	22.6

1) If using a display, order code for "Display; operation", option B: values + 14 mm
2) Total length (L) depends on the process connections.



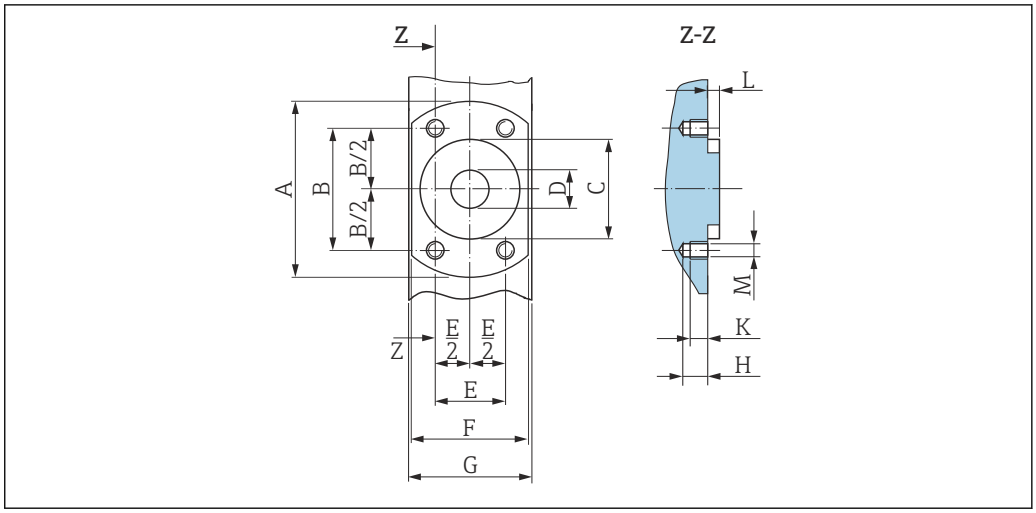
A0019471

Order code for "Housing", option C "Ultra-compact, hygienic, stainless"

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [1] [mm]	F [mm]	G [1] [mm]	H [mm]	L [2] [mm]	Q [mm]	di [mm]
40	112	124	68	56	173.3	53.3	226.6	107	140	4 × M8	34.8
50	112	124	68	56	179.8	59.8	239.6	120	140	4 × M8	47.5
65	112	124	68	56	189.6	69.6	259.2	135	140	6 × M8	60.2
80	112	124	68	56	193.8	73.8	267.6	148	140	6 × M8	72.9
100	112	124	68	56	206.8	86.8	293.6	174	140	6 × M8	97.4
125	112	124	68	56	222.8	102.8	325.6	206	200	6 × M10	120.0
150	112	124	68	56	236.8	116.8	353.6	234	200	6 × M10	146.9

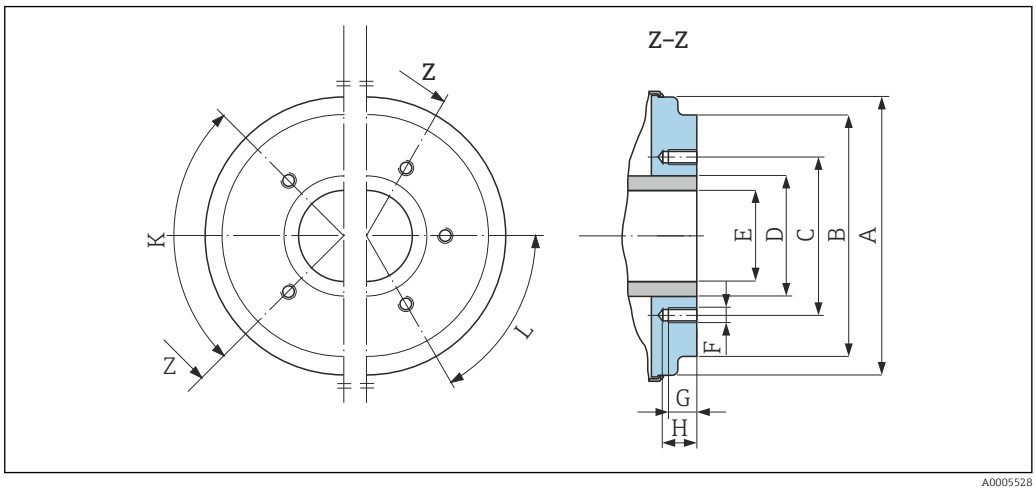
1) If using a display, order code for "Display; operation", option B: values + 14 mm
2) Total length (L) depends on the process connections.

Sensor flange connection



27 *Front view without process connections*

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	K [mm]	L [mm]	M [mm]
2	62	41.6	34	9	24	42	43	8.5	6	4	M6
4	62	41.6	34	9	24	42	43	8.5	6	4	M6
8	62	41.6	34	9	24	42	43	8.5	6	4	M6
15	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



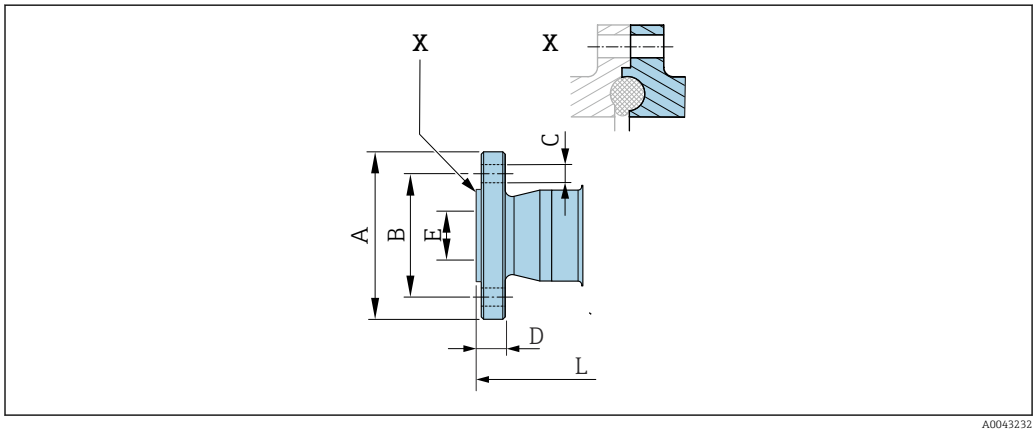
28 *Front view without process connections*

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	K 90° ±0.5° Tapped holes	L 60° ±0.5° Tapped holes
40	99.7	85.8	71.0	48.3	34.8	M8	12	17	4	–
50	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	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]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Tapped holes	
100	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	226.7	219.5	200.0	168.3	146.9	M10	15	20	–	6

Flange connections

Female with aseptic gasket seal



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

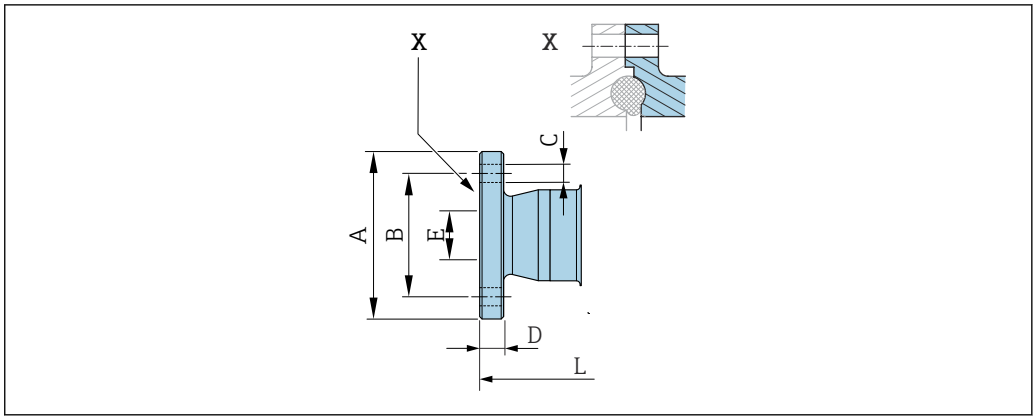
Flange DIN 11864-2, aseptic female, Form A
1.4404 (316L), suitable for pipe according to EN 10357 series A, female
Order code for "Process connection", option **DES/DQS**

DN [mm]	Suitable for pipe according to EN 10357 series A [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8 [1)]	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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (E) when cleaning with pigs.

1) With DN 10 flanges as standard

Flange with notch with aseptic gasket seal



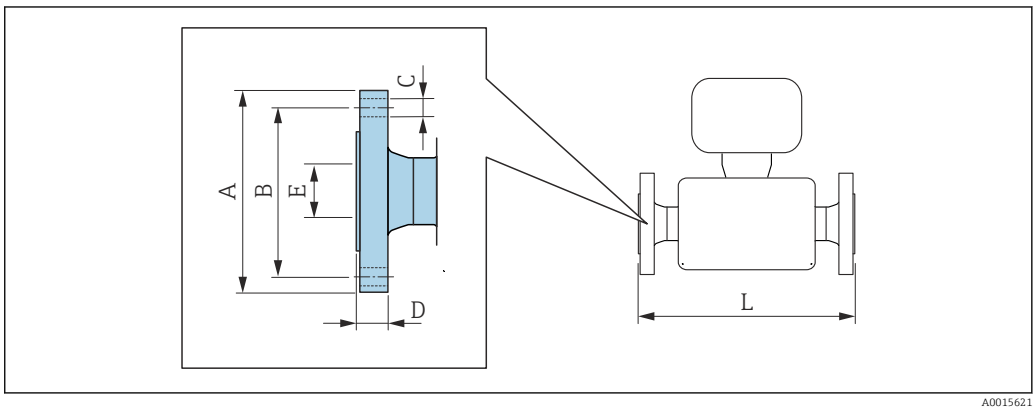
30 *Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.*

Flange DIN 11864-2, aseptic flange with notch, Form A
1.4404 (316L), suitable for pipe according to EN 10357 series A, flange with notch
Order code for "Process connection", option **DES/DRS**

DN [mm]	Suitable for pipe according to EN 10357 series A [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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (E) when cleaning with pigs.

Flanges with O-ring seal



Flange similar to EN 1092-1 (DIN 2501), Form B: PN 40
1.4404 (316L)
Order code for "Process connection", option **D5S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8 [1]	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
Surface roughness: Ra_{max} = 1.6 µm						

1) DN 2 to 8 with DN 15 flanges as standard

Flange similar to ASME B16.5: Class 150
1.4404 (316L)
Order code for "Process connection", option **A1S**

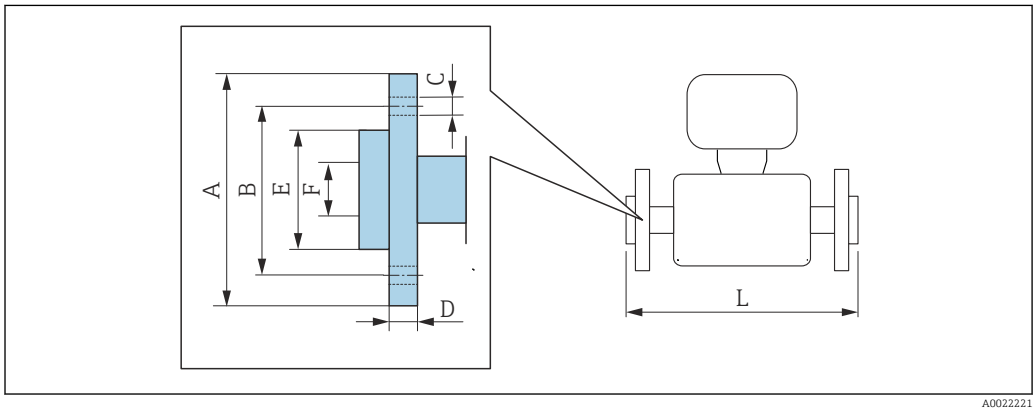
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8 [1]	90	60.3	4 × Ø15.7	11.2	15.7	218
15	90	60.3	4 × Ø15.7	11.2	15.7	218
25	110	79.4	4 × Ø15.7	14.2	26.7	230
Surface roughness: Ra_{max} = 1.6 µm						

1) DN 2 to 8 with DN 15 flanges as standard

Flange similar to JIS/t20615, 20 K
1.4404 (316L)
Order code for "Process connection", option **N4S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8 [1]	95	70	4 × Ø15	14	15	220
15	95	70	4 × Ø15	14	15	220
25	125	90	4 × Ø19	16	25	220
Surface roughness: Ra_{max} = 1.6 µm						

1) DN 2 to 8 with DN 15 flanges as standard



A0022221

Lap joint flange similar to EN 1092-1 (DIN 2501): PN 16
PVDF
Order code for "Process connection", option **D3P**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	L [mm]
2 to 8 [1]	95	65	4 x Ø14	14.5	45	17.3	200
15	95	65	4 x Ø14	14.5	45	17.3	200
25	115	85	4 x Ø14	16.5	68	28.5	200

Surface roughness: Ra_{max} = 1.6 µm
The required grounding rings can be ordered as accessories (order code: DK5HR-****).

1) DN 2 to 8 with DN 15 flanges as standard

Lap joint flange with grounding electrode similar to EN 1092-1 (DIN 2501): PN 16
PVDF
Order code for "Process connection", option **D4P**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	L [mm]
2 to 8 [1]	95	65	4 x Ø14	14.5	45	17.3	200
15	95	65	4 x Ø14	14.5	45	17.3	200
25	115	85	4 x Ø14	16.5	68	28.5	200

Surface roughness: Ra_{max} = 1.6 µm
Grounding rings are not necessary.

1) DN 2 to 8 with DN 15 flanges as standard

Lap joint flange similar to ASME B16.5: Class 150
PVDF
Order code for "Process connection", option **A1P**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	L [mm]
2 to 8 [1]	90	60.3	4 × Ø 15.7	15	35.1	15.7	200
15	90	60.3	4 × Ø 15.7	15	35.1	15.7	200
25	110	79.4	4 × Ø 15.7	16	50.8	26.7	200

Surface roughness: Ra_{max} = 1.6 µm
The required grounding rings can be ordered as accessories (order code: DK5HR-****).

1) DN 2 to 8 with DN 15 flanges as standard

Lap joint flange with grounding electrode similar to ASME B16.5: Class 150
PVDF
Order code for "Process connection", option **A4P**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	L [mm]
2 to 8 [1]	90	60.3	4 × Ø 15.7	15	35.1	15.7	200
15	90	60.3	4 × Ø 15.7	15	35.1	15.7	200
25	110	79.4	4 × Ø 15.7	16	50.8	26.7	200

Surface roughness: Ra_{max} = 1.6 µm
Grounding rings are not necessary.

1) DN 2 to 8 with DN 15 flanges as standard

Lap joint flange similar to JIS B2220: 10K
PVDF
Order code for "Process connection", option **N3P**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	L [mm]
2 to 8 [1]	95	70	4 × Ø 15.7	15	35.1	15	200
15	95	70	4 × Ø 15.7	15	35.1	15	200
25	125	90	4 × Ø 15.7	16	50.8	19	200

Surface roughness: Ra_{max} = 1.6 µm
The required grounding rings can be ordered as accessories (order code: DK5HR-****).

1) DN 2 to 8 with DN 15 flanges as standard

Lap joint flange with grounding electrode similar to JIS B2220: 10K
PVDF
Order code for "Process connection", option **N4P**

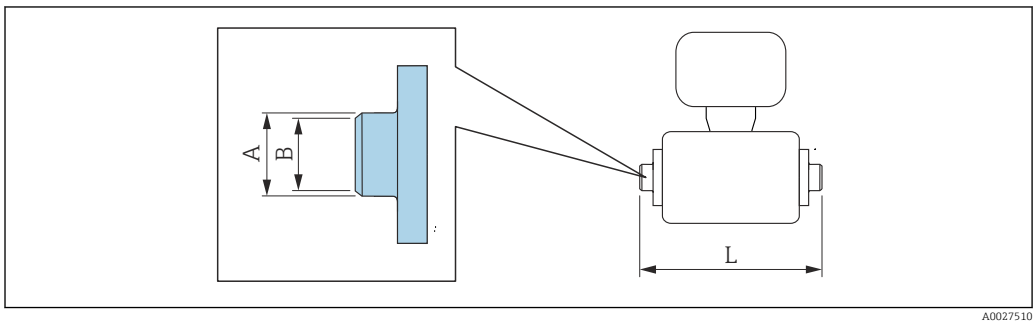
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	L [mm]
2 to 8 [1]	95	70	4 × Ø 15.7	15	35.1	15	200
15	95	70	4 × Ø 15.7	15	35.1	15	200
25	125	90	4 × Ø 15.7	16	50.8	19	200

Surface roughness: Ra_{max} = 1.6 µm
Grounding rings are not necessary.

1) DN 2 to 8 with DN 15 flanges as standard

Welding nipple

Welding nipple with aseptic gasket seal



A0027510

Welding nipple according to EN 10357
1.4404 (316L), suitable for pipe EN 10357 series A
Order code for "Process connection", option **DAS**

DN [mm]	Suitable for pipe EN 10357 series A [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

Welding nipple according to EN 10357
1.4404 (316L), suitable for pipe EN 10357 series A
Order code for "Process connection", option **DAS**

DN [mm]	Suitable for pipe EN 10357 series A [mm]	A [mm]	B [mm]	L [mm]
100	104 × 2	104	100	220
125	129 × 2	129	125	300
150	154 × 2	154	150	300

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Welding nipple according to ISO 2037
1.4404 (316L), suitable for pipe ISO 2037
Order code for "Process connection", option **IAS**

DN [mm]	Suitable for pipe ISO 2037 [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

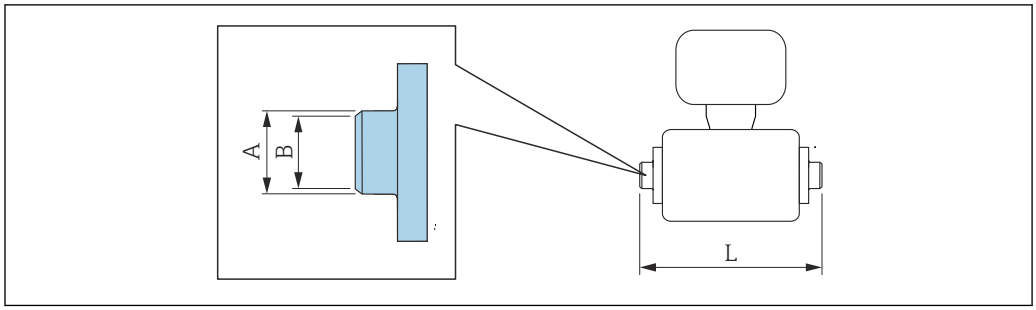
Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Welding nipple according to ASME BPE
1.4404 (316L), suitable for pipe according to ASME BPE and DIN 11866 series C
Order code for "Process connection", option **AAS**

DN [mm]	Suitable for pipe according to ASME BPE [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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Welding nipple with O-ring seal



A0027510

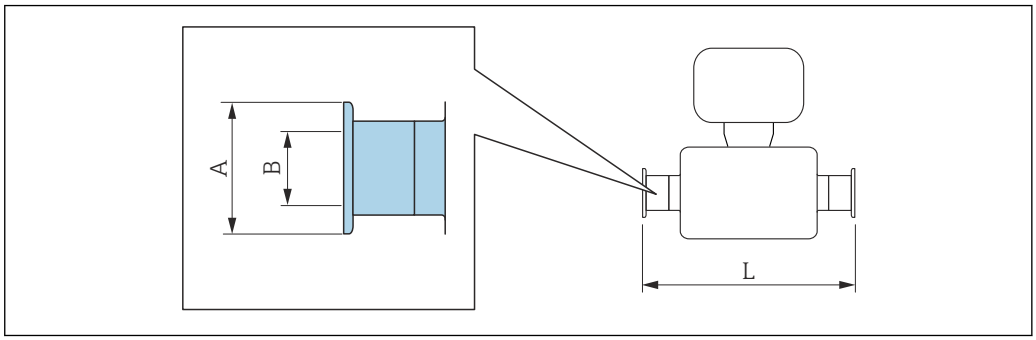
Welding nipple according to ISO 1127 **1.4404 (316L), suitable for pipe according to ISO 1127 series 1** *Order code for "Process connection", option* **A2S**				
DN [mm]	**Suitable for pipe according to ISO 1127 series 1 [mm]**	**A [mm]**	**B [mm]**	**L [mm]**
2 to 8	13.5 × 2.30	13.5	9	126.6
15	21.3 × 2.65	21.3	16	126.6
25	33.7 × 3.25	33.7	27.2	126.6
Surface roughness: Ra_{max} = 1.6 µm				

Welding nipple according to ISO 1127 **1.4404 (316L), suitable for pipe according to ISO 1127 series 1 and DIN 11866 series B** *Order code for "Process connection", option* **D1S**				
DN [mm]	**Suitable for pipe according to ISO 1127 series 1 and DIN 11866 series B [mm]**	**A [mm]**	**B [mm]**	**L [mm]**
2 to 8	13.5 × 1.6	13.5	10.3	126.6
15	21.3 × 1.6	21.3	18.1	126.6
25	33.7 × 2.0	33.7	29.7	126.6
Surface roughness: Ra_{max} = 1.6 µm				

Welding nipple according to ISO 2037 **1.4404 (316L), suitable for pipe ISO 203** *Order code for "Process connection", option* **I1S**				
DN [mm]	**Suitable for pipe ISO 2037 [mm]**	**A [mm]**	**B [mm]**	**L [mm]**
2 to 8	13.5 × 2.3	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
Surface roughness: Ra_{max} = 1.6 µm				

Clamp connections

Clamp connections with aseptic gasket seal



A0015625

Clamp according to DIN 32676 **1.4404 (316L)** *Order code for "Process connection", option* **DBS**				
DN [mm]	**Suitable for pipe [mm]**	**A [mm]**	**B [mm]**	**L [mm]**
2 to 8	14 × 2 (DN 10)	34	10	168
15	20 × 2 (DN 15)	34	16	168
25	30 × 2 (DN 25)	50.5	26	175
40	41 × 1.5	50.5	38	220
50	53 × 1.5	64	50	220
65	70 × 2	91	66	220
80	85 × 2	106	81	220
100	104 × 2	119	100	220
125	129 × 2	155	125	300
150	154 × 2	183	150	300
Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.				

Tri-Clamp **1.4404 (316L), suitable for pipe according to ASME BPE and DIN 11866 series C** *Order code for "Process connection", option* **FAS**				
DN [mm]	**Suitable for pipe according to ASME BPE [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

Tri-Clamp
1.4404 (316L), suitable for pipe according to ASME BPE and DIN 11866 series C
Order code for "Process connection", option **FAS**

DN [mm]	Suitable for pipe according to ASME BPE [mm]	A [mm]	B [mm]	L [mm]
150	152.4 × 2.77	166.9	146.9	300

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

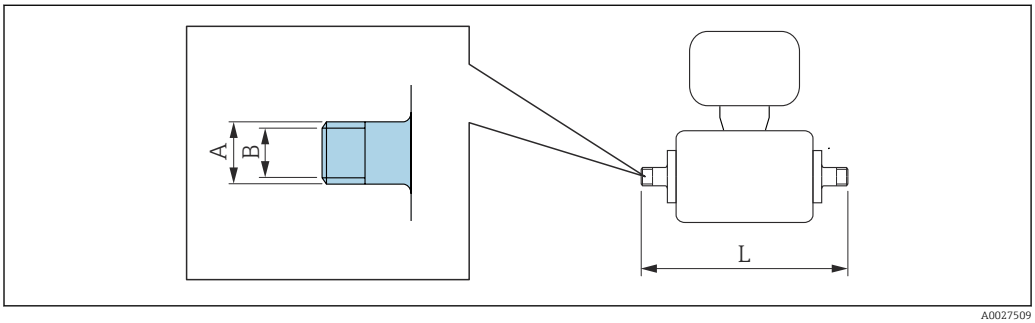
Clamp according to ISO 2852, Fig. 2
1.4404 (316L)
Order code for "Process connection", option **IBS**

DN [mm]	Suitable for pipe ISO 2037 [mm]	A [mm]	B [mm]	L [mm]
25	24.5 × 1.65	50.5	22.6	174.6
40	38 × 1.6	50.5	35.6	220
50	51 × 1.6	64	48.6	220
65	63.5 × 1.6	77.5	60.3	220
80	76.1 × 1.6	91	72.9	220
100	101.6 × 2	119	97.6	220
125	139.7 × 2	155	135.7	300
150	168.3 × 2.6	183	163.1	300

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Couplings

Thread with aseptic gasket seal



A0027509

Coupling DIN 11851, thread
1.4404 (316L), suitable for pipe EN 10357 series B
Order code for "Process connection", option **DCS**

DN [mm]	Suitable for pipe EN 10357 series B [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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling DIN 11851, thread
1.4404 (316L), suitable for pipe EN 10357 series A
Order code for "Process connection", option **DCS**

DN [mm]	Suitable for pipe EN 10357 series A [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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling DIN 11864-1, aseptic thread, Form A
1.4404 (316L), suitable for pipe EN 10357 series A
Order code for "Process connection", option **DDS**

DN [mm]	Suitable for pipe EN 10357 series A [mm]	A [mm/in]	B [mm]	L [mm]
2 to 8	13 × 1.5 (DN 10)	Rd 28 × 1/8	10	170
15	19 × 1.5	Rd 34 × 1/8	16	170
25	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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling ISO 2853, thread
1.4404 (316L)
Order code for "Process connection", option **ICS**

DN [mm]	Suitable for pipe ISO 2037 [mm]	DN Clamp ISO 2853 [mm]	A [mm/in]	B [mm]	L [mm]
40	38 × 1.6	38	Tr 50.5 × 3.175	35.6	256
50	51 × 1.6	51	Tr 64 × 3.175	48.6	256
65	63.5 × 1.6	63.5	Tr 77.5 × 3.175	60.3	266
80	76.1 × 1.6	76.1	Tr 91 × 3.175	72.9	276
100	101.6 × 2	101.6	Tr 118 × 3.175	97.6	286

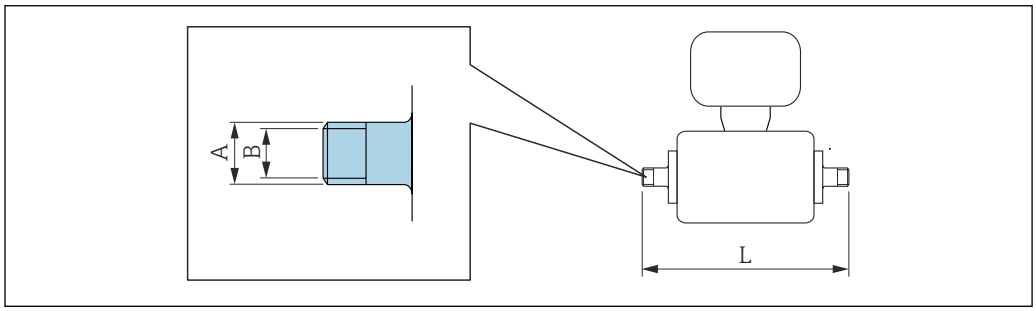
Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling SMS 1145, thread
1.4404 (316L)
Order code for "Process connection", option **SAS**

DN [mm]	Suitable for pipe [mm]	DN SMS 1145 [mm]	A [mm/in]	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

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Service", option HJ: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Thread with O-ring seal



A0027509

External thread according to ISO 228/DIN 2999
1.4404 (316L)
Order code for "Process connection", option **I2S**

DN [mm]	Suitable for internal thread ISO 228/DIN 2999 [in]	A [mm/in]	B [mm]	L [mm]
2 to 8	R 3/8	R 10.1 × 3/8	10	166
15	R 1/2	R 13.2 × 1/2	16	166
25	R 1	R 16.5 × 1	25	170

Surface roughness: Ra_{max} = 1.6 µm

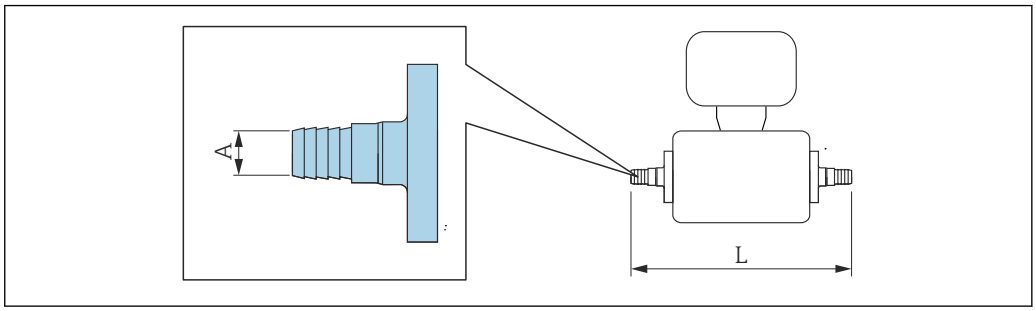
Internal thread according to ISO 228/DIN 2999
1.4404 (316L)
Order code for "Process connection", option **I3S**

DN [mm]	Suitable for external thread ISO 228/DIN 2999 [in]	A [mm/in]	B [mm]	L [mm]
2 to 8	Rp 3/8	Rp 13 × 3/8	9	176
15	Rp 1/2	Rp 14 × 1/2	16	176
25	Rp 1	Rp 17 × 1	27.2	188

Surface roughness: Ra_{max} = 1.6 µm

Hose adapter

Hose adapter with O-ring seal

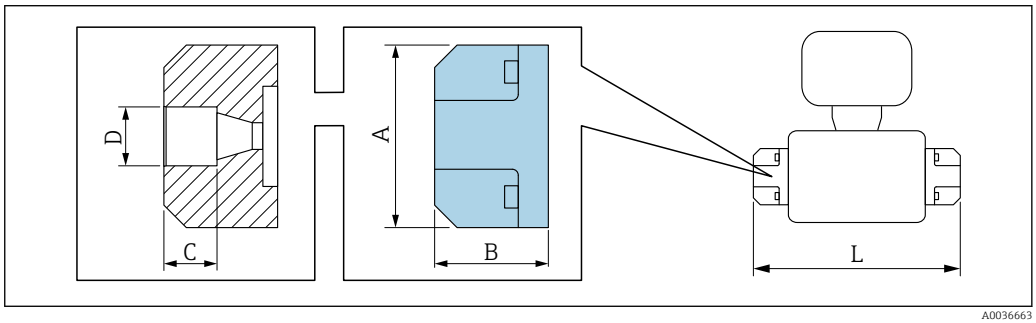


A0027511

Hose adapter **1.4404 (316L)** *Order code for "Process connection", options* **O1S, O2S, O3S**			
DN [mm]	**Suitable for internal diameter [mm]**	**A [mm]**	**L [mm]**
2 to 8	13	10	184
15	16	12.6	184
25	19	16	184
Surface roughness: Ra_{max} = 1.6 µm			

Adhesive sleeves

Adhesive sleeves with O-ring seal

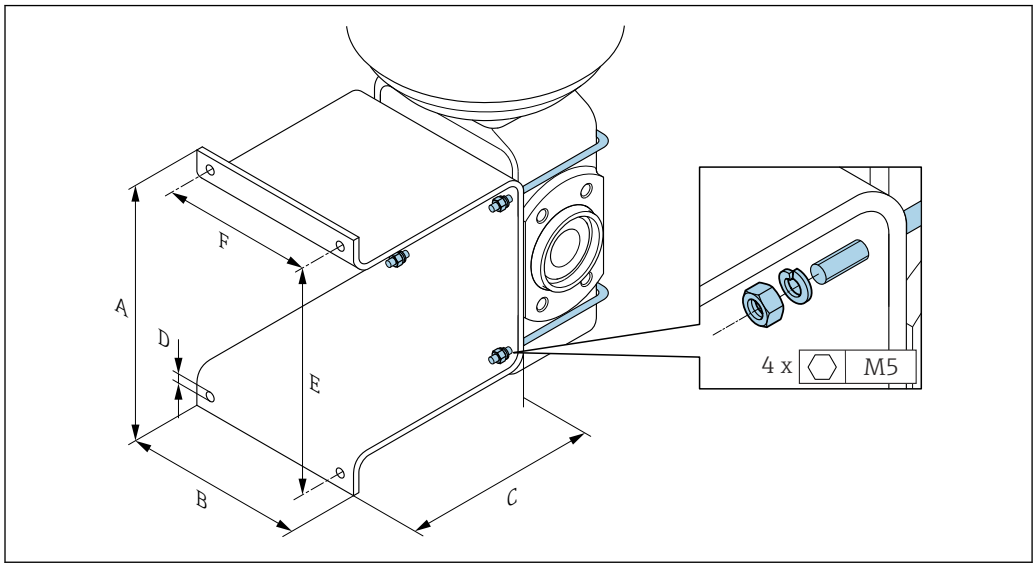


A0036663

Adhesive sleeve **PVC** *Order code for "Process connection", option* **O2V**						
DN [mm]	**Suitable for pipe [mm] / [in]**	**A [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**L [mm]**
2 to 8	20 × 2 (DIN 8062)	62	38.5	18	20.2	163
15			28.0			142
Surface roughness: Ra_{max} = 1.6 µm The required grounding rings can be ordered as accessories (order code: DK5HR-****).						

Mounting kits

Wall mounting kit

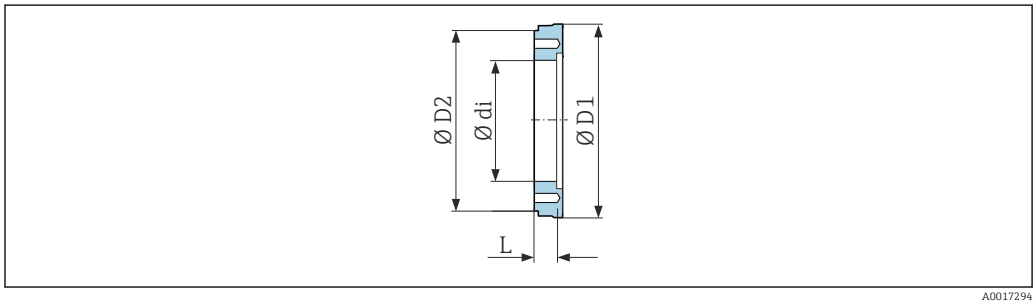


A0005537

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

Accessories

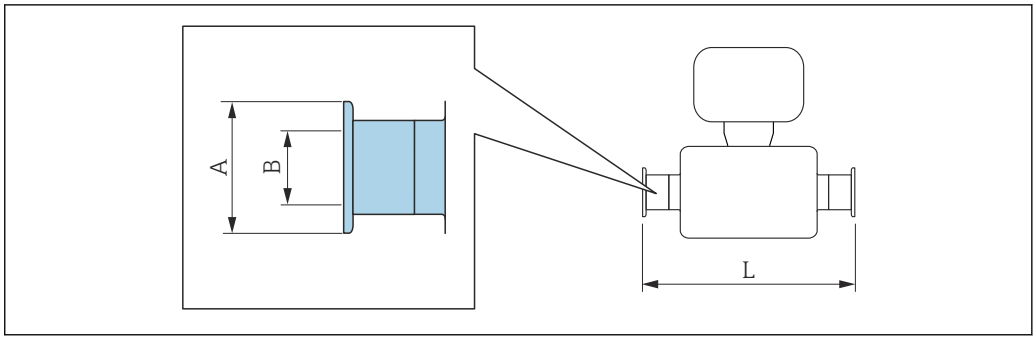
Spacer



A0017294

Order code: DK5HB-****				
DN [mm]	di [mm]	D1 [mm]	D2 [mm]	L [mm]
80	72.9	140.7	141	30
100	97.4	166.7	162	30

Clamp connections with aseptic gasket seal available for order



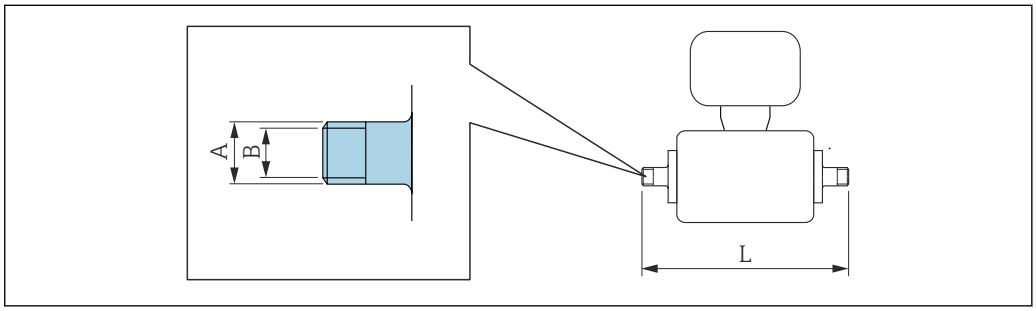
A0015625

Tri-Clamp
1.4404 (316L), suitable for pipe according to ASME BPE and BS 4825, reduction from pipe OD 1" (Tri-Clamp connection) to device DN 15
Order code: DKH-HF****

DN [mm]	Suitable for pipe according to ASME BPE and BS 4825 (reduction) [mm]	A [mm]	B [mm]	L [mm]
15	Pipe OD 1"	50.4	22.1	143

Surface roughness: Ra_{max} = 0.76 µm, optional order code for "Design", option CB: Ra_{max} = 0.38 µm electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Couplings with O-ring seal available for order



A0027509

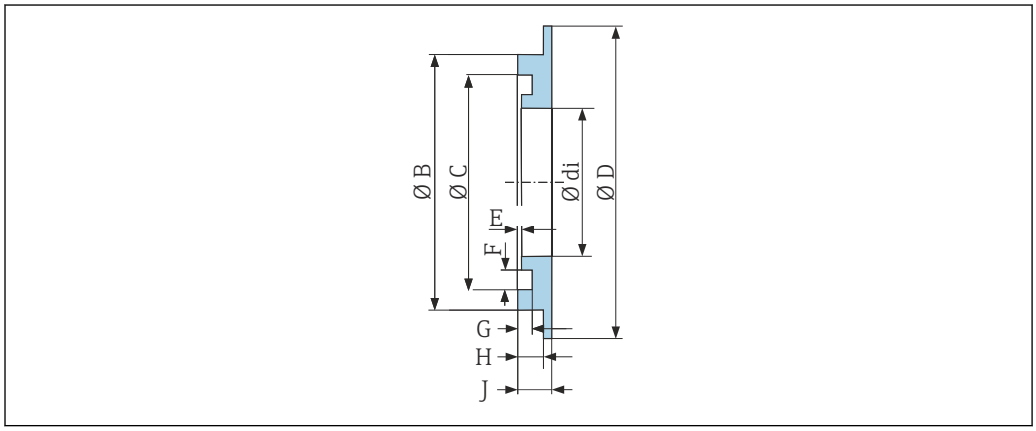
External thread
1.4404 (316L)
Order code: DKH-GD****

DN [mm]	Suitable for internal thread NPT [in]	A [mm/in]	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

Surface roughness: Ra_{max} = 1.6 µm

Internal thread 1.4404 (316L) Order code: DKH**-GC**				
DN [mm]	**Suitable for external thread NPT [in]**	**A [mm/in]**	**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
Surface roughness: Ra_{max} = 1.6 µm				

Grounding rings

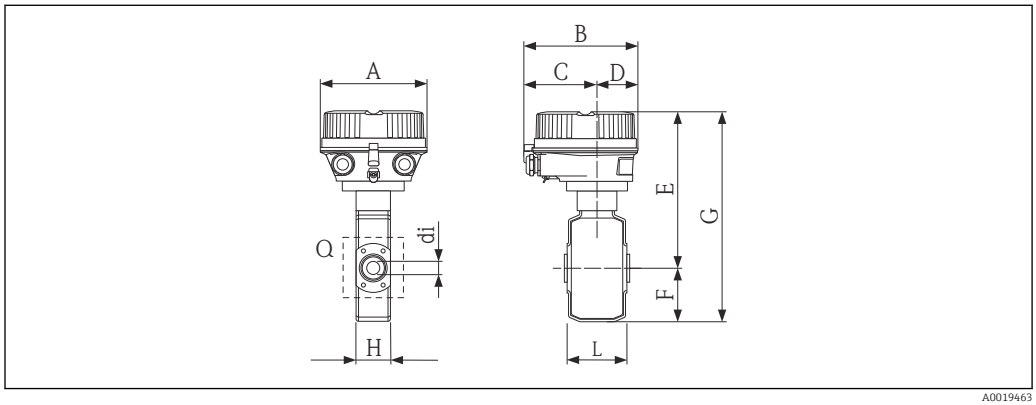


A0017673

For lap joint flange made of PVDF and PVC adhesive sleeve 1.4435 (316L), Alloy C22, tantalum Order code: DK5HR-****									
DN [mm]	**di [mm]**	**B [mm]**	**C [mm]**	**D [mm]**	**E [mm]**	**F [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

Dimensions in US units

Compact version

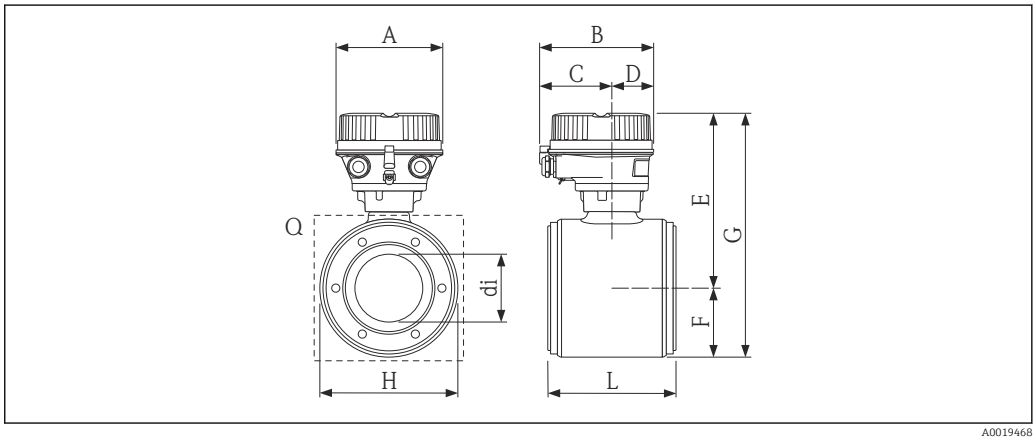


A0019463

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

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
1/12	5.35	5.83	3.70	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.09
5/32	5.35	5.83	3.70	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.18
5/16	5.35	5.83	3.70	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.35
½	5.35	5.83	3.70	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.63
1	5.35	5.83	3.70	2.13	6.90	2.04	8.94	2.07	3.39	4 × M6	0.89

1) If using a display, order code for "Display; operation", option B: values + 1.1 in
2) Total length (L) depends on the process connections.

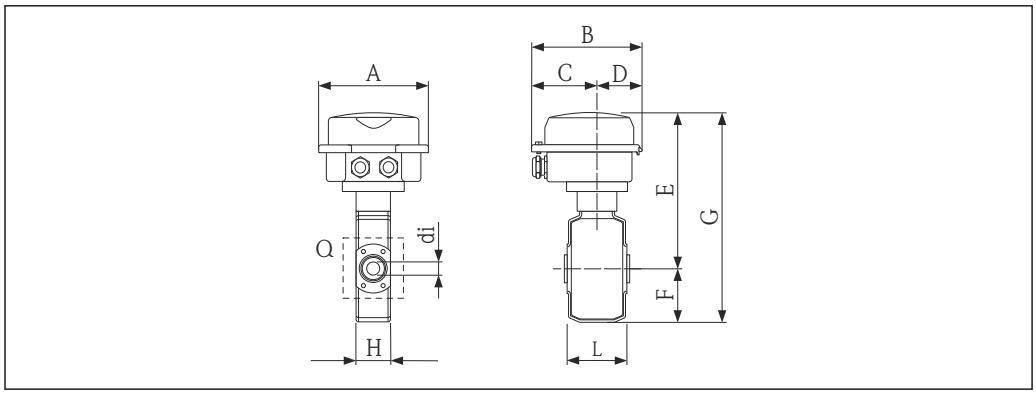


A0019468

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

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
1 ½	5.35	5.83	3.70	2.13	7.06	2.10	9.16	4.21	5.51	4 × M8	1.37
2	5.35	5.83	3.70	2.13	7.31	2.35	9.67	4.72	5.51	4 × M8	1.87
3	5.35	5.83	3.70	2.13	7.87	2.91	10.80	5.83	5.51	6 × M8	2.87
4	5.35	5.83	3.70	2.13	8.38	3.42	11.80	6.85	5.51	6 × M8	3.83
5	5.35	5.83	3.70	2.13	9.01	4.05	13.10	8.11	7.87	6 × M10	4.72
6	5.35	5.83	3.70	2.13	9.56	4.60	14.20	9.21	7.87	6 × M10	5.78

1) If using a display, order code for "Display; operation", option B: values + 1.1 in
2) Total length (L) depends on the process connections.

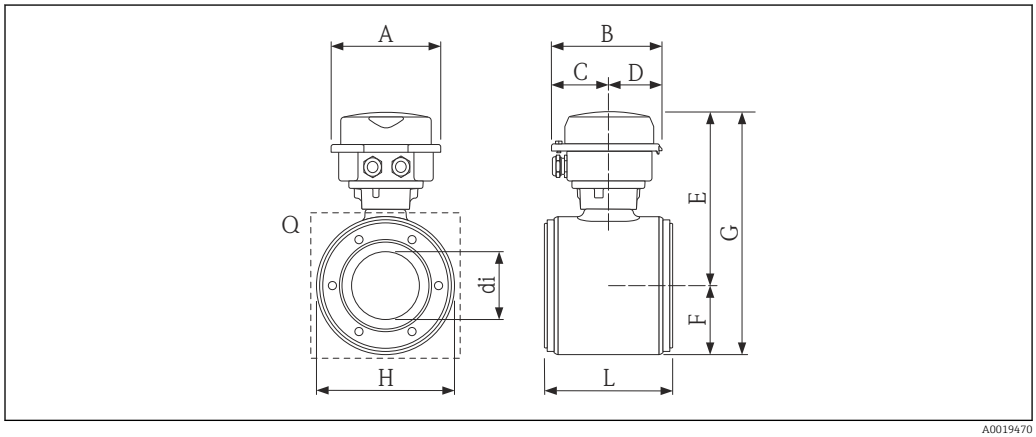


A0019464

Order code for "Housing", option B "Compact, hygienic, stainless"

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
1/12	5.28	5.39	3.07	2.32	6.51	1.88	8.39	1.69	3.39	4 × M6	0.09
5/32	5.28	5.39	3.07	2.32	6.51	1.88	8.39	1.69	3.39	4 × M6	0.18
5/16	5.28	5.39	3.07	2.32	6.51	1.88	8.39	1.69	3.39	4 × M6	0.35
½	5.28	5.39	3.07	2.32	6.51	1.88	8.39	1.69	3.39	4 × M6	0.63
1	5.28	5.39	3.07	2.32	6.66	2.04	8.70	2.07	3.39	4 × M6	0.89

1) If using a display, order code for "Display; operation", option B: values + 1.1 in
2) Total length (L) depends on the process connections.



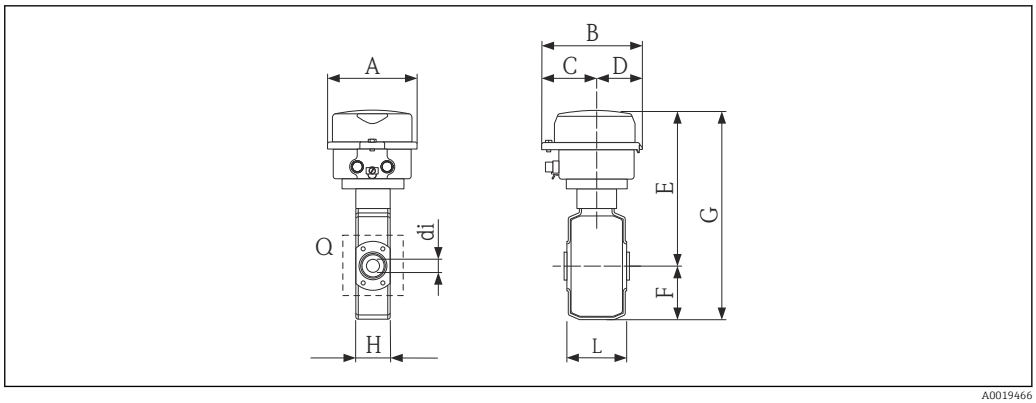
A0019470

Order code for "Housing", option B "Compact, hygienic, stainless"

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
1 ½	5.28	5.39	3.07	2.32	6.82	2.10	8.92	4.21	5.51	4 × M8	1.37
2	5.28	5.39	3.07	2.32	7.08	2.35	9.43	4.72	5.51	4 × M8	1.87
3	5.28	5.39	3.07	2.32	7.63	2.91	10.5	5.83	5.51	6 × M8	2.87

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
4	5.28	5.39	3.07	2.32	8.14	3.42	11.60	6.85	5.51	6 × M8	3.83
5	5.28	5.39	3.07	2.32	8.77	4.05	12.80	8.11	7.87	6 × M10	4.72
6	5.28	5.39	3.07	2.32	9.32	4.60	13.90	9.21	7.87	6 × M10	5.78

1) If using a display, order code for "Display; operation", option B: values + 1.1 in
2) Total length (L) depends on the process connections.

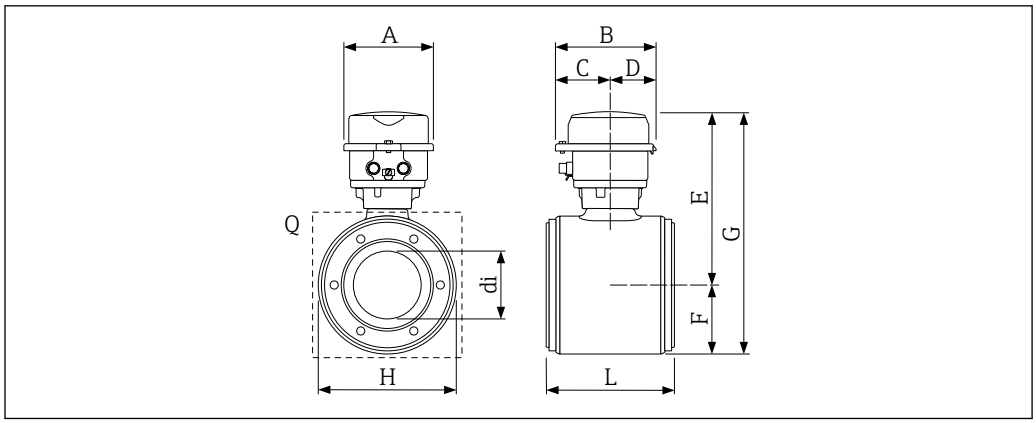


A0019466

Order code for "Housing", option C "Ultra-compact, hygienic, stainless"

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
1/12	4.41	4.88	2.68	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.09
5/32	4.41	4.88	2.68	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.18
5/16	4.41	4.88	2.68	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.35
½	4.41	4.88	2.68	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.63
1	4.41	4.88	2.68	2.20	6.66	2.04	8.70	2.07	3.39	4 × M6	0.89

1) If using a display, order code for "Display; operation", option B: values + 1.1 in
2) Total length (L) depends on the process connections.



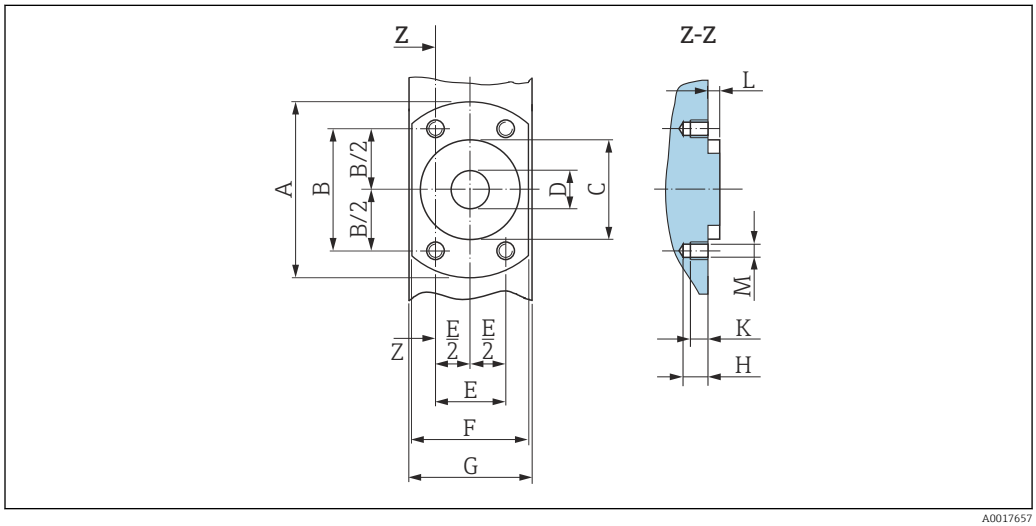
A0019471

Order code for "Housing", option C "Ultra-compact, hygienic, stainless"

DN [in]	A [in]	B [in]	C [in]	D [in]	E [1] [in]	F [in]	G [in]	H [in]	L [2] [in]	Q [mm]	di [in]
1 ½	4.41	4.88	2.68	2.20	6.82	2.10	8.92	4.21	5.51	4 × M8	1.37
2	4.41	4.88	2.68	2.20	7.08	2.35	9.43	4.72	5.51	4 × M8	1.87
3	4.41	4.88	2.68	2.20	7.63	2.91	10.50	5.83	5.51	6 × M8	2.87
4	4.41	4.88	2.68	2.20	8.14	3.42	11.60	6.85	5.51	6 × M8	3.83
5	4.41	4.88	2.68	2.20	8.77	4.05	12.80	8.11	7.87	6 × M10	4.72
6	4.41	4.88	2.68	2.20	9.32	4.60	13.90	9.21	7.87	6 × M10	5.78

1) If using a display, order code for "Display; operation", option B: values + 1.1 in
2) Total length (L) depends on the process connections.

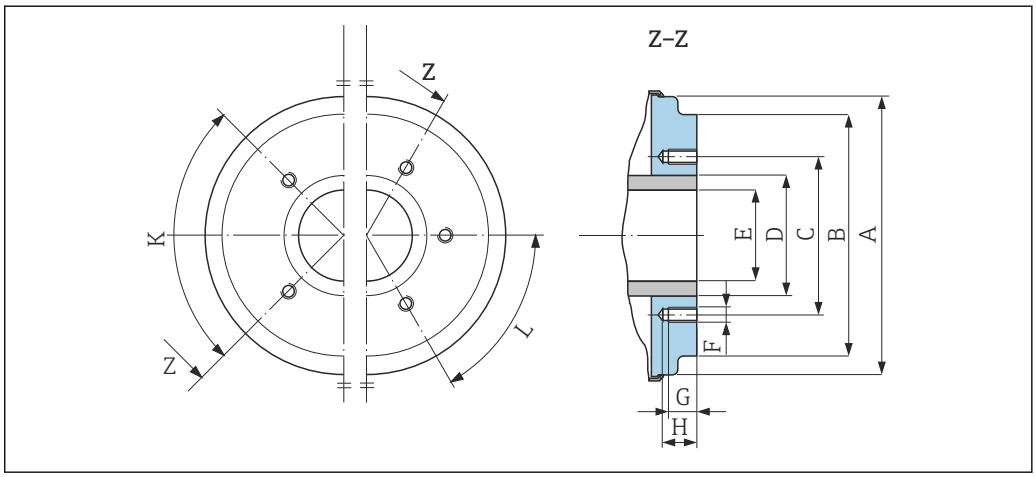
Sensor flange connection



A0017657

31 Front view without process connections

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	K [in]	L [in]	M [mm]
1/12	2.44	1.64	1.34	0.35	0.94	1.65	1.69	0.33	0.24	0.16	M6
5/32	2.44	1.64	1.34	0.35	0.94	1.65	1.69	0.33	0.24	0.16	M6
5/16	2.44	1.64	1.34	0.35	0.94	1.65	1.69	0.33	0.24	0.16	M6
½	2.44	1.64	1.34	0.63	0.94	1.65	1.69	0.33	0.24	0.16	M6
1	2.83	1.98	1.73	0.89	1.14	2.17	2.20	0.33	0.24	0.16	M6

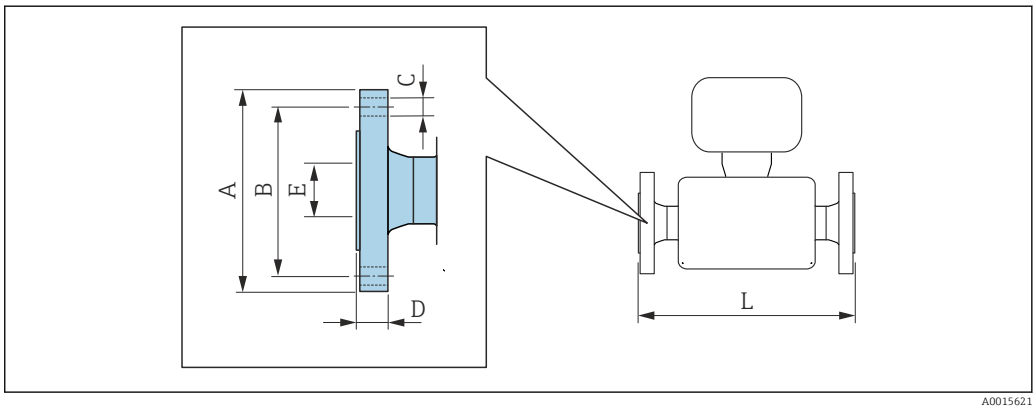


32 *Front view without process connections*

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [mm]	G [in]	H [in]	K 90° ±0.5° Tapped holes	L 60° ±0.5° Tapped holes
1 ½	3.93	3.38	2.80	1.90	1.37	M8	0.47	0.67	4	–
2	4.44	3.89	3.29	2.37	1.87	M8	0.47	0.67	4	–
3	5.54	5.26	4.49	3.50	2.87	M8	0.47	0.67	–	6
4	6.56	6.28	5.55	4.50	3.83	M8	0.47	0.67	–	6
5	7.82	7.54	6.73	5.50	4.72	M10	0.59	0.79	–	6
6	8.93	8.64	7.87	6.63	5.78	M10	0.59	0.79	–	6

Flange connections

Flanges with O-ring seal

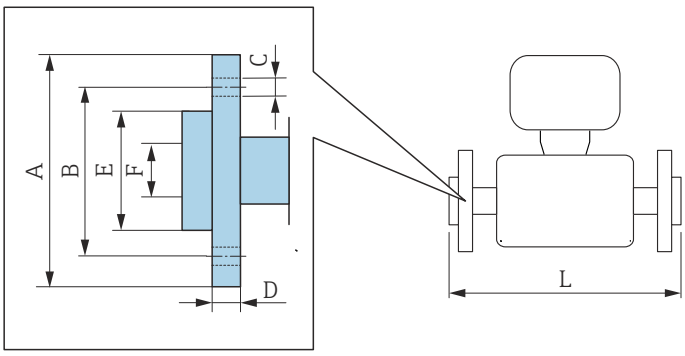


Flange similar to ASME B16.5: Class 150
1.4404 (316L)
Order code for "Process connection", option **A1S**

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
1/12 to 3/8 1)	3.50	2.38	4 × Ø0.62	0.44	0.62	8.59
½	3.50	2.38	4 × Ø0.62	0.44	0.63	8.59
1	4.25	3.12	4 × Ø0.62	0.56	1.05	9.05

Surface roughness: Ra_{max} = 63 µin

1) DN 1/12 to 3/8 with DN ½" flanges as standard



A0022221

Lap joint flange similar to ASME B16.5: Class 150
PVDF
Order code for "Process connection", option **A1P**

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	L [in]
1/12 to 3/8 1)	3.74	2.36	4 × Ø 0.62	0.59	1.38	0.63	7.87
½	3.74	2.36	4 × Ø 0.62	0.59	1.38	0.63	7.87

Surface roughness: Ra_{max} = 63 µin
The required grounding rings can be ordered as accessories (order code: DK5HR-****).

1) DN 1/12 to 3/8 with DN ½" flanges as standard

Lap joint flange similar to ASME B16.5: Class 150
PVDF
Order code for "Process connection", option **A4P**

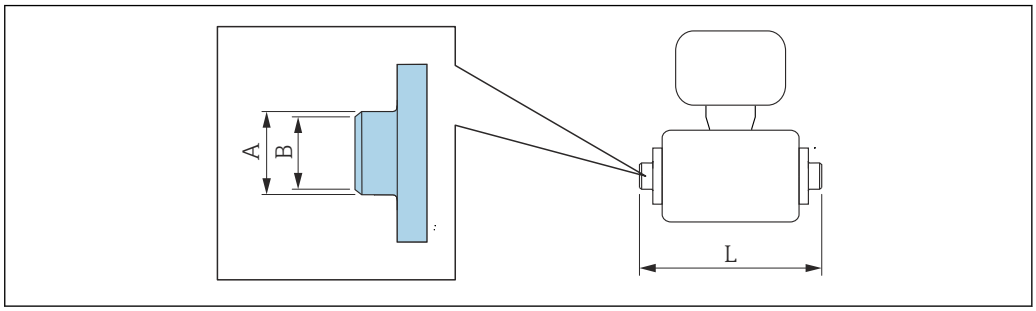
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	L [in]
1/12 to 3/8 1)	3.74	2.36	4 × Ø 0.62	0.59	1.38	0.63	7.87
½	3.74	2.36	4 × Ø 0.62	0.59	1.38	0.63	7.87

Surface roughness: Ra_{max} = 63 µin
Grounding rings are not necessary.

1) DN 1/12 to 3/8 with DN ½" flanges as standard

Welding nipple

Welding nipple with aseptic gasket seal

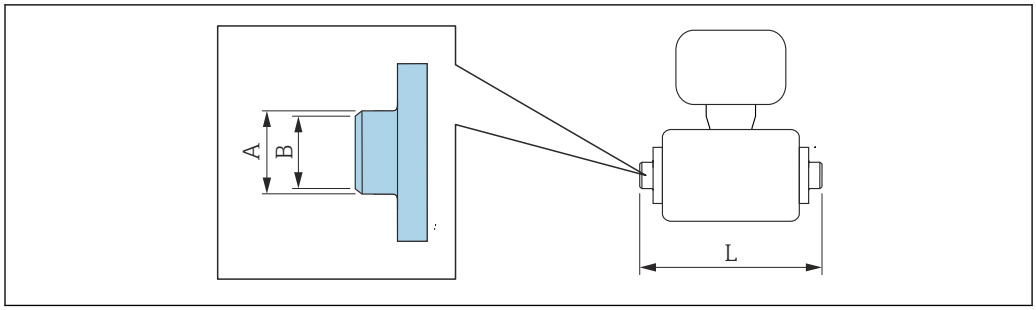


A0027510

Welding nipple according to ISO 2037 1.4404 (316L), suitable for pipe ISO 2037 *Order code for "Process connection", option* **IAS**				
DN [in]	**Suitable for pipe ISO 2037 [in]**	**A [in]**	**B [in]**	**L [in]**
1/12 to 3/8	0.50 × 0.06	0.47	0.39	4.65
½	0.75 × 0.06	0.71	0.63	4.65
1	1.00 × 0.06	0.98	0.89	4.65
1 ½	1.50 × 0.05	1.50	1.40	8.66
2	2.00 × 0.05	2.01	1.91	8.66
3	3.00 × 0.06	3.00	2.87	8.66
4	2.50 × 0.08	4.00	3.84	8.66
5	4.00 × 0.08	5.50	5.34	15.00
6	6.63 × 0.10	6.63	6.42	15.00
Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.				

Welding nipple according to ASME BPE 1.4404 (316L), suitable for pipe according to ASME BPE and DIN 11866 series C *Order code for "Process connection", option* **AAS**				
DN [in]	**Suitable for pipe according to ASME BPE [in]**	**A [in]**	**B [in]**	**L [in]**
1/12 to 3/8	0.50 × 0.06	0.50	0.35	4.65
½	0.75 × 0.06	0.75	0.63	4.65
1	1.00 × 0.06	1.00	0.89	4.65
1 ½	1.50 × 0.06	1.50	1.37	8.66
2	2.00 × 0.06	2.00	1.87	8.66
3	3.00 × 0.06	3.00	2.87	8.66
4	4.00 × 0.08	4.00	3.83	8.66
6	6.00 × 0.11	6.00	5.78	11.80
Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.				

Welding nipple with O-ring seal

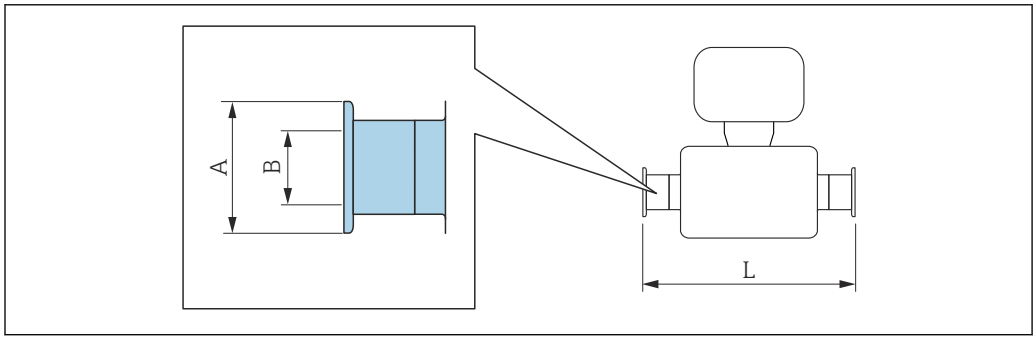


A0027510

Welding nipple according to ISO 1127 **1.4404 (316L), suitable for pipe according to ISO 1127 series 1** *Order code for "Process connection", option* **A2S**				
DN **[in]**	**Suitable for pipe according to ISO 1127 series 1** **[in]**	**A** **[in]**	**B** **[in]**	**L** **[in]**
1/12 to 3/8	0.53 × 0.09	0.53	0.35	4.99
½	0.84 × 0.10	0.84	0.63	4.99
Surface roughness: Ra_{max} = 63 µin				

Clamp connections

Clamp connections with aseptic gasket seal



A0015625

Tri-Clamp **1.4404 (316L), suitable for pipe according to ASME BPE and DIN 11866 series C** *Order code for "Process connection", option* **FAS**				
DN **[in]**	**Suitable for pipe according to ASME BPE** **[in]**	**A** **[in]**	**B** **[in]**	**L** **[in]**
1/12 to 3/8	½	1	0.37	5.63
½	¾	1	0.62	5.63
1	1	2	0.87	5.63
1 ½	1.50 × 0.06	1.98	1.37	8.66
2	2.00 × 0.06	2.52	1.87	8.66
3	3.00 × 0.06	3.58	2.87	8.66
4	4.00 × 0.08	4.68	3.83	8.66
6	6.00 × 0.11	6.57	5.90	11.80
Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.				

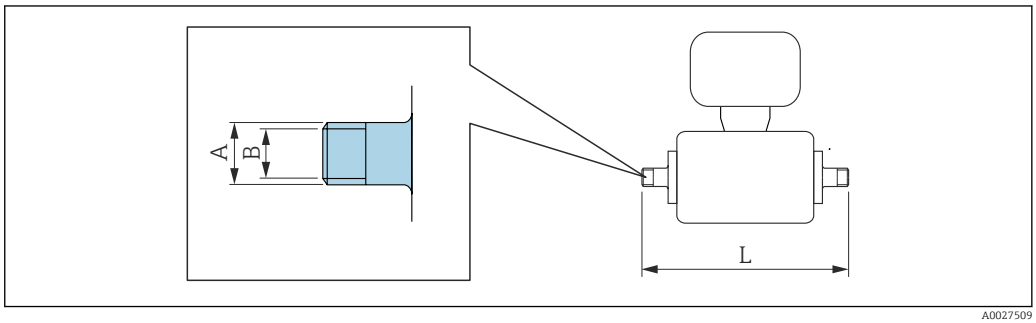
Clamp according to ISO 2852, Fig. 2
1.4404 (316L)
Order code for "Process connection", option **IBS**

DN [in]	Suitable for pipe ISO 2037 [in]	DN Clamp ISO 2852 [in]	A [in]	B [in]	L [in]
1	0.96 × 0.06	1	2.00	0.89	6.87
1 ½	1.50 × 0.06	1.50	1.99	1.40	8.66
2	2.00 × 0.06	2.01	2.52	1.91	8.66
3	3.00 × 0.06	3.00	3.58	2.87	8.66
4	2.50 × 0.08	4.00	4.69	3.84	8.66
5	4.00 × 0.08	5.50	6.10	5.34	11.80
6	6.63 × 0.10	6.63	7.20	6.42	11.80

Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Couplings

Thread with aseptic gasket seal



A0027509

Coupling DIN 11851, thread
1.4404 (316L), suitable for pipe EN 10357 series B
Order code for "Process connection", option **DCS**

DN [in]	Suitable for pipe EN 10357 series B [in]	A [in]	B [in]	L [in]
1/12 to 5/16	0.47 × 0.04 (DN 1/8)	Rd 1.10 × 1/8	0.39	6.85
½	0.71 × 0.06	Rd 1.34 × 1/8	0.63	6.85
1	1.10 × 0.04 or 1.10×0.06	Rd 2.05 × 1/6	1.02	7.48

Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling DIN 11851, thread
1.4404 (316L), suitable for pipe EN 10357 series A
Order code for "Process connection", option **DCS**

DN [in]	Suitable for pipe EN 10357 series A [in]	A [in]	B [in]	L [in]
1 ½	1.65 × 0.06	Rd 2.56 × 1/6	1.50	10.20
2	2.13 × 0.06	Rd 3.07 × 1/6	1.97	10.20
3	3.35 × 0.08	Rd 4.33 × ¼	3.19	11.00
4	4.09 × 0.08	Rd 5.12× ¼	3.94	11.40
5	5.08 × 0.08	Rd 6.30 × ¼	4.92	15.00

Coupling DIN 11851, thread
1.4404 (316L), suitable for pipe EN 10357 series A
Order code for "Process connection", option **DCS**

DN [in]	Suitable for pipe EN 10357 series A [in]	A [in]	B [in]	L [in]
6	6.06 × 0.08	Rd 6.30 × ¼	5.91	15.40

Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling ISO 2853, thread
1.4404 (316L)
Order code for "Process connection", option **ICS**

DN [in]	Suitable for pipe EN 10357 (DIN 11850) [in]	DN Clamp ISO 2853 [in]	A [in]	B [in]	L [in]
1 ½	1.50 × 0.06	1.50	Tr 2.00 × 0.13	1.40	10.80
2	2.00 × 0.06	2.01	Tr 2.52 × 0.13	1.91	10.80
3	3.00 × 0.06	3.00	Tr 3.58 × 0.13	2.87	10.90
4	2.50 × 0.08	4.00	Tr 4.65 × 0.13	3.84	11.30

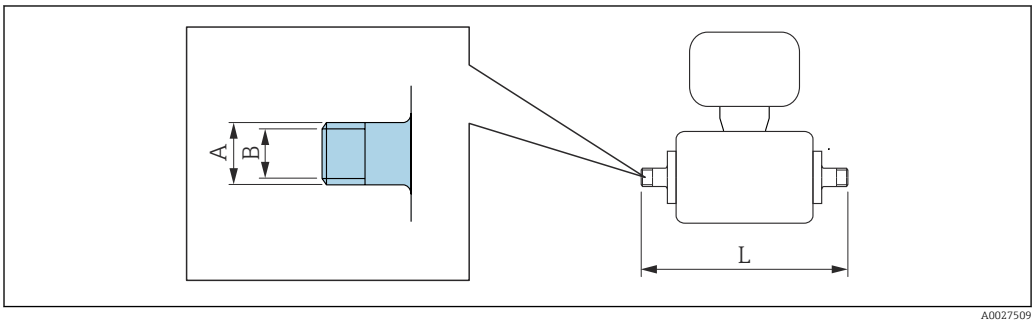
Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Coupling SMS 1145, thread
1.4404 (316L)
Order code for "Process connection", option **SAS**

DN [in]	Suitable for pipe [in]	DN SMS 1145 [in]	A [in]	B [in]	L [in]
1	1	1	Rd1.57 × 0.17	0.89	5.81
1 ½	1.50 × 0.06	1.50	Rd 2.36 × ⅙	1.37	10.10
2	2.00 × 0.06	2.00	Rd 2.76 × ⅙	1.87	10.10
3	3.00 × 0.06	3.00	Rd 3.86 × ⅙	2.86	10.90
4	4.00 × 0.08	4.00	Rd 5.20 × ⅙	3.83	11.30

Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Service", option HJ: Ra_{max} = 15 µin electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Thread with O-ring seal



A0027509

External thread according to ISO 228/DIN 2999
1.4404 (316L)
Order code for "Process connection", option **I2S**

DN [in]	Suitable for internal thread ISO 228/DIN 2999 [in]	A [in]	B [in]	L [in]
1/12 to 3/8	R 3/8	R 0.40 × 3/8	0.39	6.53
1/2	R 1/2	R 0.52 × 1/2	0.63	6.53
1	R 1	R 0.66 × 1	0.98	6.69

Surface roughness: Ra_{max} = 63 µin

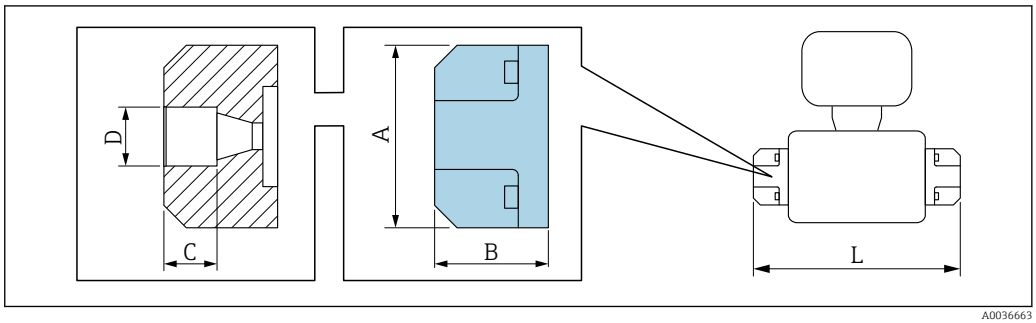
Internal thread according to ISO 228/DIN 2999
1.4404 (316L)
Order code for "Process connection", option **I3S**

DN [in]	Suitable for external thread ISO 228/DIN 2999 [in]	A [in]	B [in]	L [in]
1/12 to 3/8	Rp 3/8	Rp 0.51 × 3/8	0.35	6.93
1/2	Rp 1/2	Rp 0.55 × 1/2	0.63	6.93
1	Rp 1	Rp 0.67 × 1	1.07	7.41

Surface roughness: Ra_{max} = 63 µin

Adhesive sleeves

Adhesive sleeves with O-ring seal



A0036663

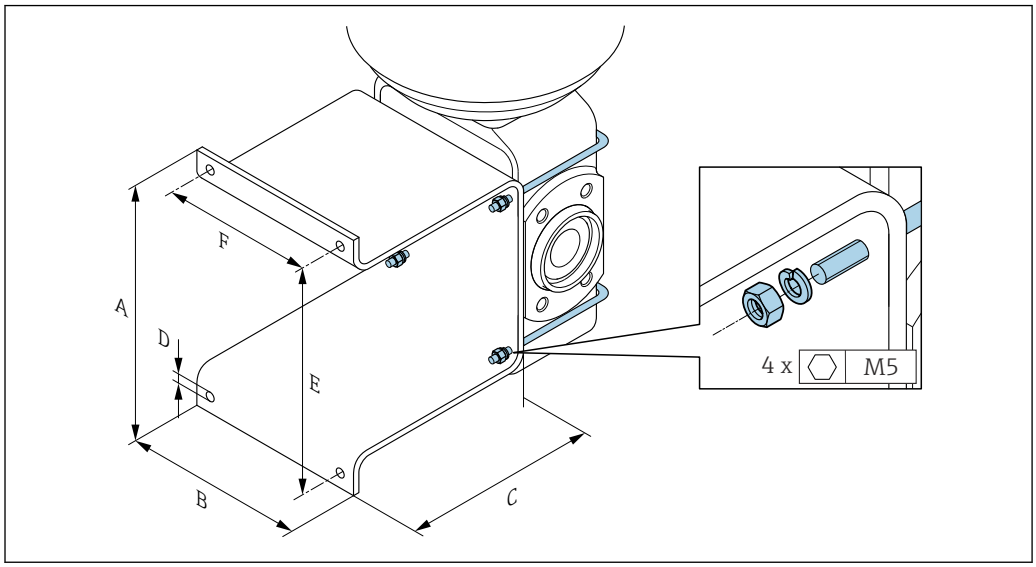
Adhesive sleeve
PVC
Order code for "Process connection", option **O1V**

DN [in]	Suitable for pipe [in]	A [in]	B [in]	C [in]	D [in]	L [in]
1/12 to 3/8	1/2	2.44	1.52	0.71	0.85	6.42

Surface roughness: Ra_{max} = 63 µin
The required grounding rings can be ordered as accessories (order code: DK5HR-****).

Mounting kits

Wall mounting kit

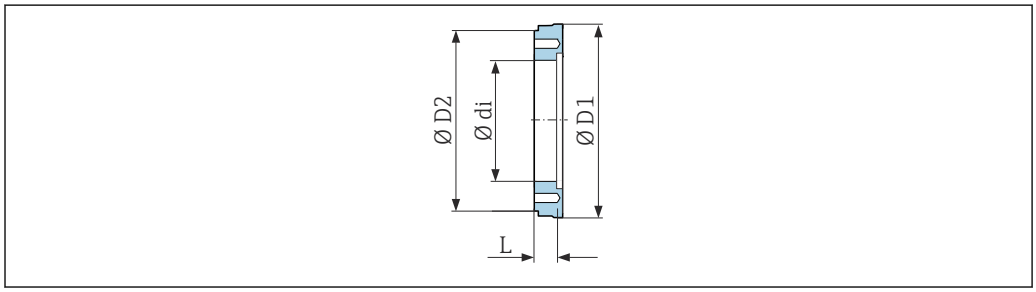


A0005537

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

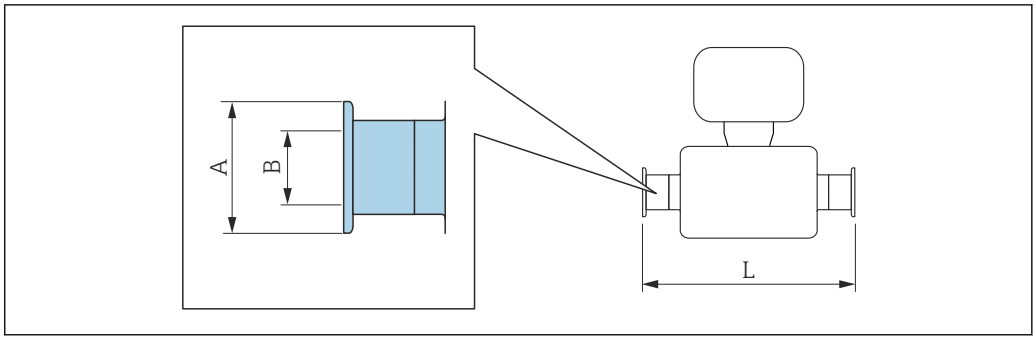
Spacer



A0017294

Order code: DK5HB-****				
DN [in]	di [in]	D1 [in]	D2 [in]	L [in]
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



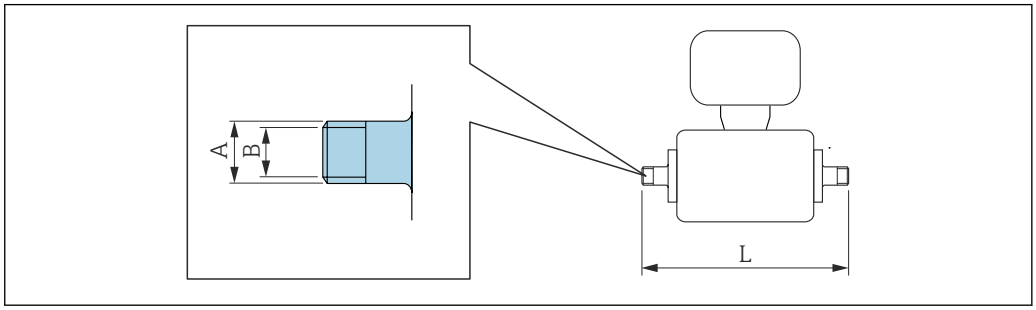
33 *Hygienic clamp adapter connection suitable for pipes with connection according to ASME BPE (reduction)*

Tri-Clamp
1.4404 (316L), suitable for pipe according to ASME BPE and BS 4825, reduction from pipe OD 1" (Tri-Clamp connection) to device DN 15
Order code: DKH-HF****

DN [in]	Suitable for pipe according to ASME BPE and BS 4825 (reduction) [in]	A [in]	B [in]	L [in]
½	Pipe OD 1"	2	0.87	5.63

Surface roughness: Ra_{max} = 31.5 µin, optional order code for "Design", option CB: Ra_{max} = 15 µin electropolished
Please note the internal diameters of the measuring pipe and process connection (B) when cleaning with pigs.

Couplings with O-ring seal available for order



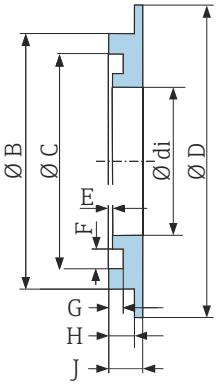
External thread
1.4404 (316L)
Order code: DKH-GD****

DN [in]	Suitable for internal 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_{max} = 63 µin

Internal thread 1.4404 (316L) Order code: DKH**-GC**				
DN [in]	Suitable for external 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_{max} = 63 µin				

Grounding rings



A0017673

For lap joint flange made of PVDF and PVC adhesive sleeve 1.4435 (316L), Alloy C22, tantalum Order code: DK5HR-****									
DN [in]	di [in]	B [in]	C [in]	D [in]	E [in]	F [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

Weight

All values (weight exclusive of packaging material) refer to devices with flanges of the standard pressure rating.
The weight may be lower than indicated depending on the pressure rating and design.
Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Compact version

- Including the transmitter
- Weight specifications apply to standard pressure ratings and without packaging material.

Nominal diameter		Weight	
[mm]	[in]	[kg]	[lbs]
2	1/12	2.00	4.41
4	5/32	2.00	4.41
8	5/16	2.00	4.41
15	½	1.90	4.19
25	1	2.80	6.17

Nominal diameter		Weight	
[mm]	[in]	[kg]	[lbs]
40	1 ½	4.10	9.04
50	2	4.60	10.1
65	–	5.40	11.9
80	3	6.00	13.2
100	4	7.30	16.1
125	5	12.7	28.0
150	6	15.1	33.3

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 [2]	0.89 [2]
25	–	PN 16/40	26.0 [3]	1.02 [3]
40	1 ½	PN 16/25/40	35.3	1.39
50	2	PN 16/25	48.1	1.89
65	–	PN 16/25	59.9	2.36
80	3	PN 16/25	72.6	2.86
100	4	PN 16/25	97.5	3.84
125	5	PN 10/16	120.0	4.72
150	6	PN 10/16	146.5	5.77

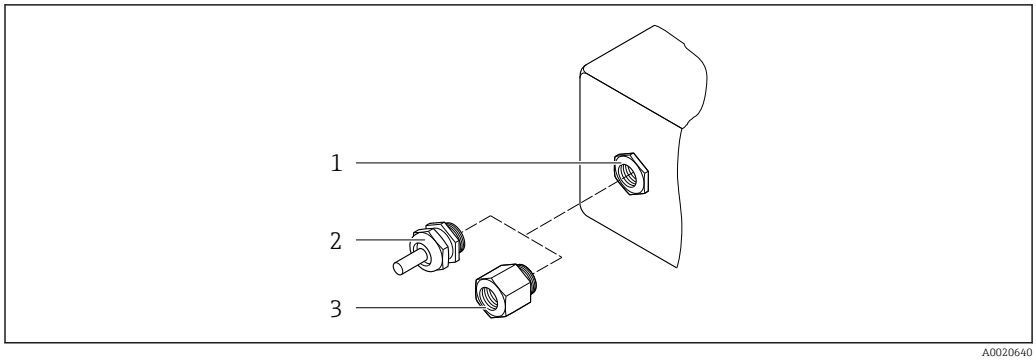
1) Depending on process connection and seals used
2) Order code 5H**22
3) Order code 5H**26

Materials

Transmitter housing

- Order code for "Housing", option **A** "Compact, aluminum coated":
  Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, hygienic, stainless":
  Hygienic version, stainless steel 1.4301 (304)
- Order code for "Housing", option **C** "Ultra-compact, hygienic, stainless":
  Hygienic version, stainless steel 1.4301 (304)
- Window material for optional local display (→ 🖹 84):
  - For order code for "Housing", option **A**: glass
  - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands



34 *Possible cable entries/cable glands*

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

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

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

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

Order code for "Housing", option B "Compact, hygienic, stainless"

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

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

Device plug

Electrical connection	Material
Plug M12x1	▪ Socket: Stainless steel, 1.4404 (316L) ▪ Contact housing: Polyamide ▪ Contacts: Gold-plated brass

Sensor housing

Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel 1.4301 (304)

Liner

PFA (USP Class VI, FDA 21 CFR 177.2600)

Process connections

- Stainless steel, 1.4404 (F316L)
- PVDF
- PVC adhesive sleeve

Electrodes

- Standard: 1.4435 (316L)
- Optional: Alloy C22, tantalum, platinum (only up to DN 25 (1"))

Seals

- O-ring seal, DN 2 to 25 (1/12 to 1"): EPDM, FKM [2], Kalrez
- Aseptic [3] gasket seal, DN 2 to 150 (1/12 to 6"): EPDM, FKM [2], VMQ (silicone)

Accessories

Grounding rings

- Standard: 1.4435 (316L)
- Optional: Alloy C22, tantalum

Wall mounting kit

Stainless steel, 1.4301 (304) [4]

Centering star

1.4435 (F316L)

Fitted electrodes

- 2 measuring electrodes for signal detection
- 1 empty pipe detection electrode for empty pipe detection/temperature measurement (only DN 15 to 150 (½ to 6"))

Process connections

With O-ring seal:
- Welding nipple (DIN EN ISO 1127, ODT/SMS, ISO 2037)
- Flange (EN (DIN), ASME, JIS)
- Flange from PVDF (EN (DIN), ASME, JIS)
- Male thread
- Female thread
- Hose connection
- PVC adhesive sleeve

With aseptic gasket seal:
- Welding nipple (EN 10357 (DIN 11850), ASME BPE, ISO 2037)
- Clamp (ISO 2852, ISO 2853, DIN 32676, L14 AM7)
- Coupling (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145)
- Flange DIN 11864-2

For information on the different materials used in the process connections → 🖹 83

Surface roughness

Electrodes:
- Stainless steel, 1.4435 (316L) electropolished ≤ 0.5 µm (19.7 µin)
- Alloy C22, 2.4602 (UNSN06022); tantalum ≤ 0.5 µm (19.7 µin)

(All data refer to parts in contact with the medium)

Liner with PFA:
≤ 0.4 µm (15.7 µin)

(All data refer to parts in contact with the medium)

2) USP Class VI, FDA 21 CFR 177.2600, 3A
3) In this context, aseptic means hygienic design
4) Does not meet the hygienic design installation guidelines.

Stainless steel process connections:
- With O-ring seal: ≤ 1.6 µm (63 µin)
- With aseptic seal: Ra_{max} = 0.76 µm (31.5 µin)
  Optional: Ra_{max} = 0.38 µm (15 µin) electropolished

(All data refer to parts in contact with the medium)

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks
- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning
- Individual menus for applications
- Menu guidance with brief explanations of the individual parameter functions

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

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

Local display

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

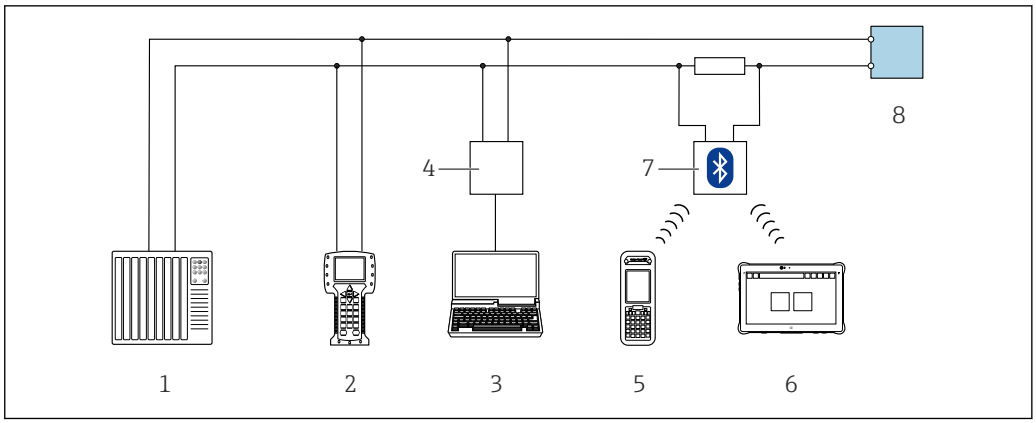
The local display is only available with the following device order code:
Order code for "Display; operation", option **B**: 4-line; illuminated, via communication

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

Remote operation

Via HART protocol

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

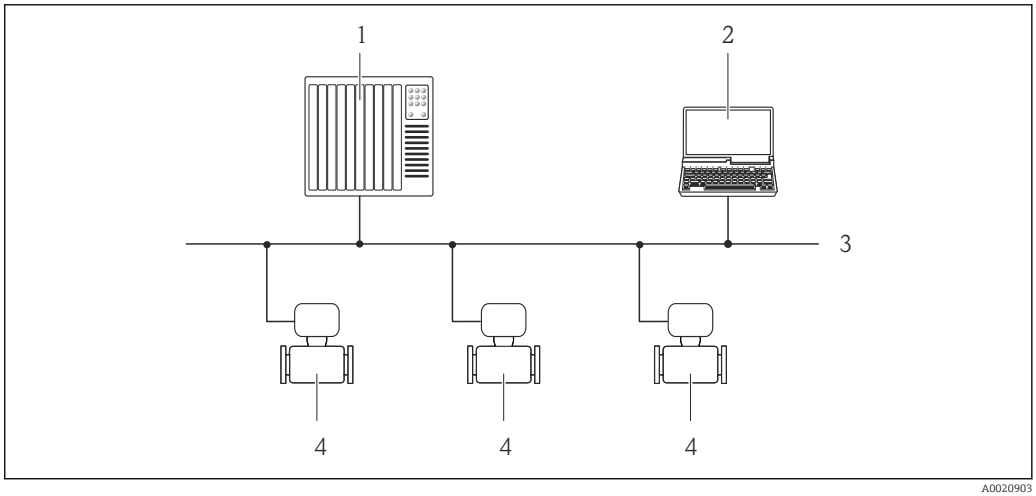


35 *Options for remote operation via HART protocol*

1 *Control system (e.g. PLC)*
2 *Field Communicator 475*
3 *Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)*
4 *Commubox FXA195 (USB)*
5 *Field Xpert SFX350 or SFX370*
6 *Field Xpert SMT70*
7 *VIATOR Bluetooth modem with connecting cable*
8 *Transmitter*

Via PROFIBUS DP network

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



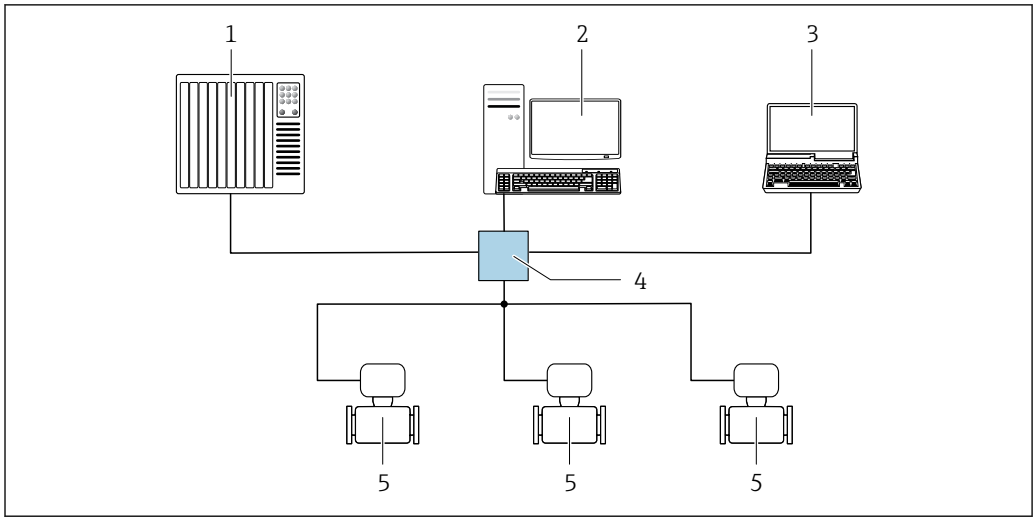
36 *Options for remote operation via PROFIBUS DP network*

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

Via EtherNet/IP network

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

Star topology



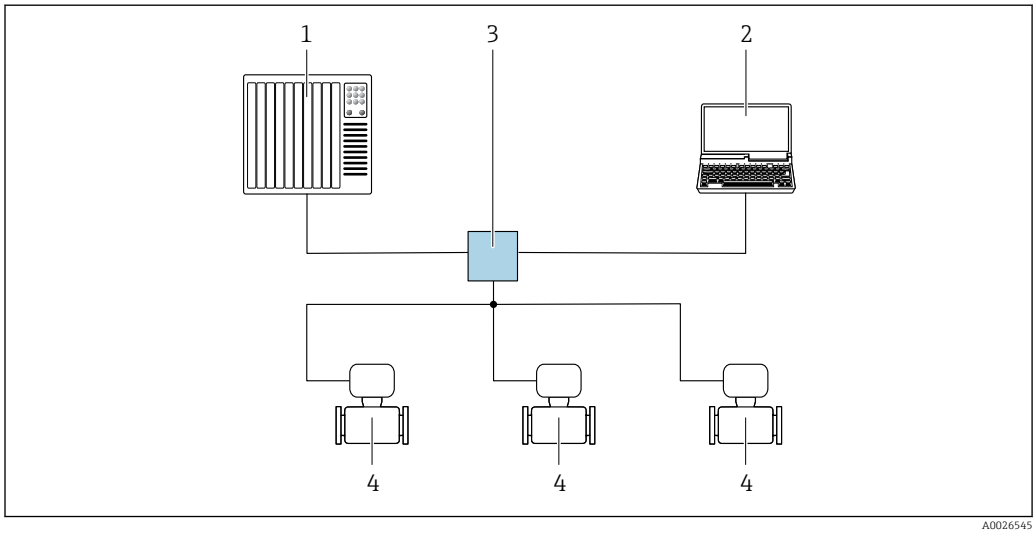
37 Options for remote operation via EtherNet/IP network: star topology

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

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



38 Options for remote operation via PROFINET network: star topology

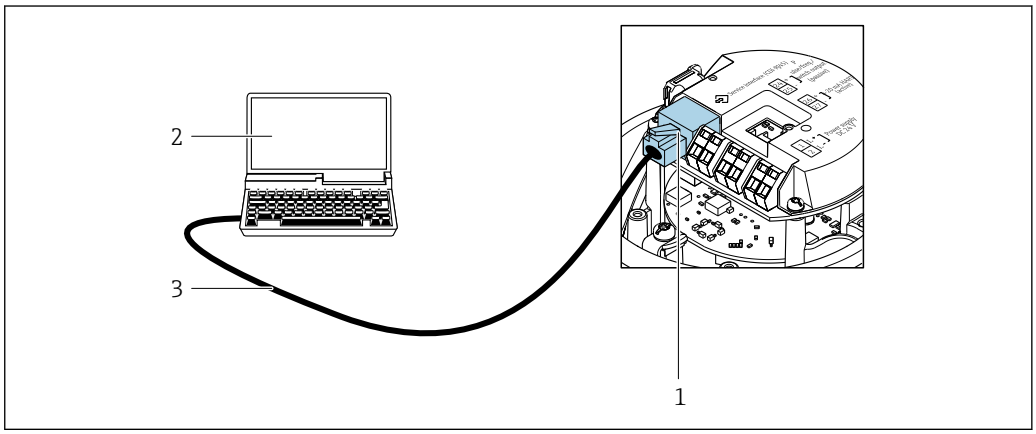
1 *Automation system, e.g. Simatic S7 (Siemens)*
2 *Computer with Web browser (e.g. Internet Explorer) for accessing the integrated Web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"*
3 *Standard Ethernet switch, e.g. Scalance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

Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:
- Order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
- Order code for "Output", option **L**: PROFIBUS DP
- Order code for "Output", option **N**: EtherNet/IP
- Order code for "Output", option **R**: PROFINET

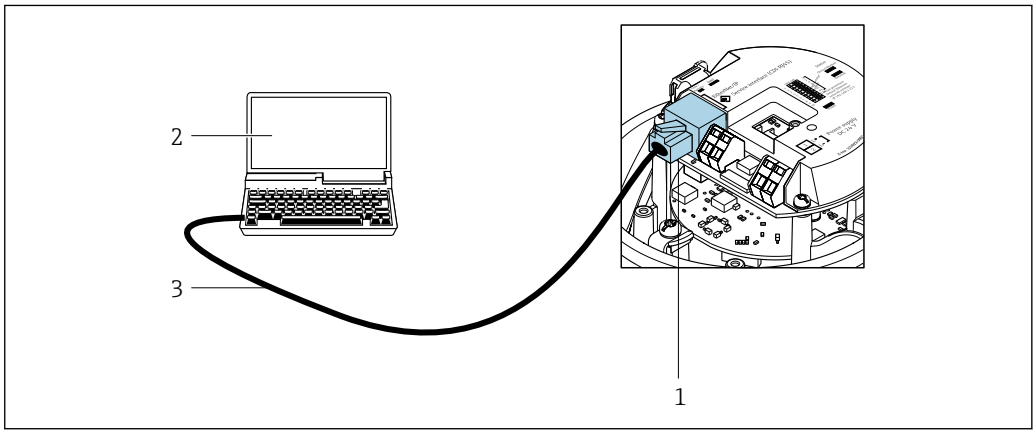
HART



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

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

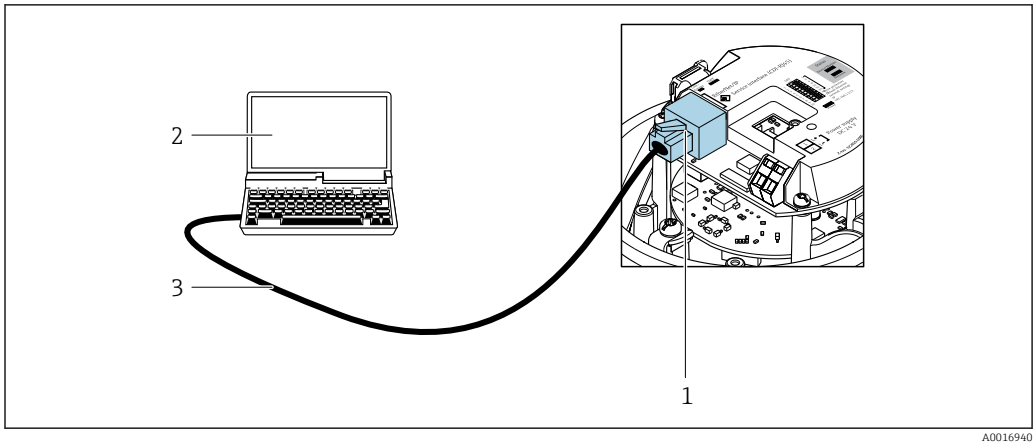
PROFIBUS DP



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

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

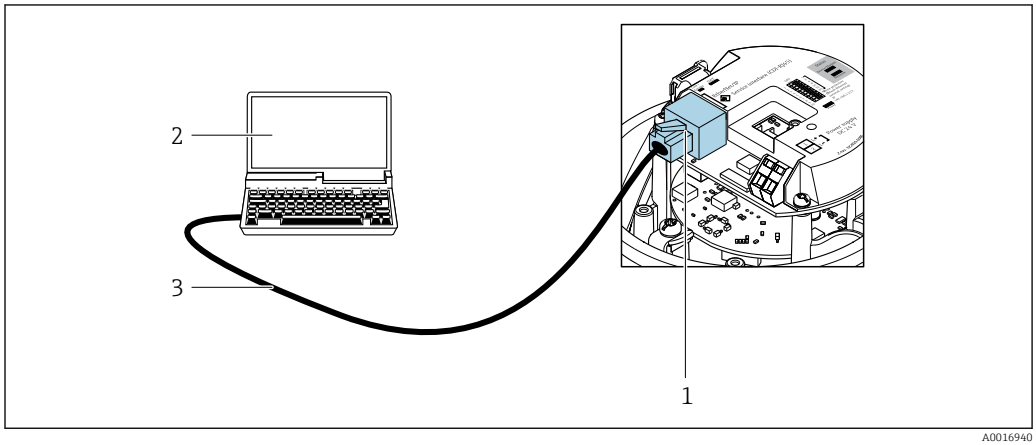
EtherNet/IP



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

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

PROFINET



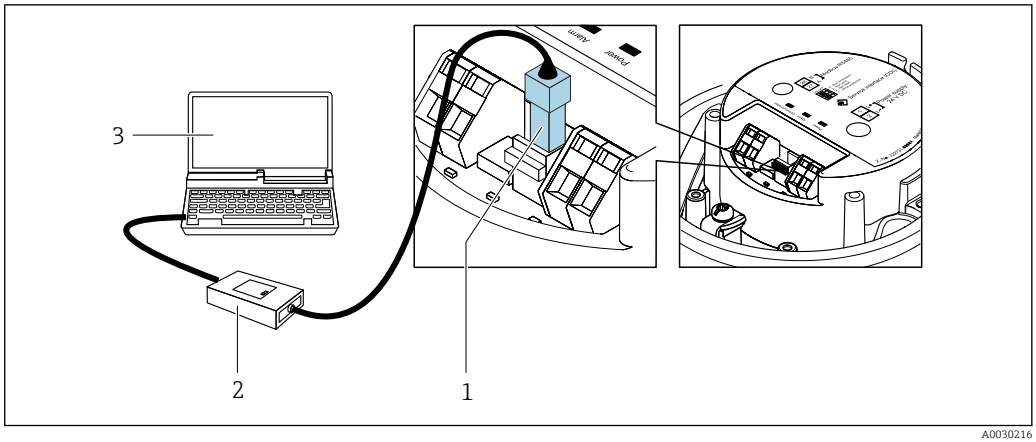
42 Connection for order code for "Output", option R: PROFINET

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

Via service interface (CDI)

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

Modbus RS485



A0030216

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

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

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

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

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

UKCA marking

The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

Contact address Endress+Hauser UK:
Endress+Hauser Ltd.
Floats Road
Manchester M23 9NF
United Kingdom
www.uk.endress.com

RCM marking

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

Ex approval

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

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

ATEX, IECEx

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

Ex nA

Category	Type of protection
II3G	Ex nA IIC T6-T1 Gc

cCSAus

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

NI

Category	Type of protection
Class I Division 2 Groups ABCD	NI (Non-incendive version), NIFW parameter [1]

1) Entity and NIFW parameter according to Control Drawings

Sanitary compatibility

- 3-A SSI 28-06 or more recent
  - Confirmation by affixing the 3-A logo for measuring devices with the order code for "Additional approval", option LP "3-A".
  - The 3-A approval refers to the measuring device.
  - When installing the measuring device, ensure that no liquid can accumulate on the outside of the measuring device.
    Remote transmitters must be installed in accordance with the 3-A Standard.
  - Accessories (e.g. weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard.
    Each accessory can be cleaned. Disassembly may be necessary under certain circumstances.
- EHEDG Type EL Class I
  - Confirmation by affixing the EHEDG symbol for measuring devices with the order code for "Additional approval", option LT "EHEDG".
  - EPDM is not a suitable seal material for fluids 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).
- Pasteurized Milk Ordinance (PMO)

Pharmaceutical compatibility

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

HART certification

HART interface

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:
- Certified according to HART 7
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFIBUS

PROFIBUS interface

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
- Certified according to PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

EtherNet/IP certification

The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:
- Certified in accordance with the ODVA Conformance Test
- EtherNet/IP Performance Test
- EtherNet/IP PlugFest compliance
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFINET

PROFINET interface

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:
- Certified according to:
  - Test specification for PROFINET devices
  - PROFINET Security Level 1– Netload Class 2 0 Mbps
- The device can also be operated with certified devices of other manufacturers (interoperability)
- The device supports PROFINET S2 system redundancy.

Pressure Equipment Directive

The measuring devices can be ordered with or without PED or PESR. If a device with PED or PESR is required, this must be ordered explicitly. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary. A UK order option must be selected for PESR under the order code for "Approvals".

- With the marking
  a) PED/G1/x (x = category) or
  b) PESR/G1/x (x = category)
  on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"
  a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
  b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices bearing this marking (PED or PESR) are suitable for the following types of medium:
  Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
- Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of
  a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or
  b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105.
  The scope of application is indicated
  a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or
  b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.

External standards and guidelines

- EN 60529
  Degrees of protection provided by enclosure (IP code)
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- IEC/EN 61326-2-3
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 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).

Ordering information

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

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: direct input of 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

Application packages

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

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

Cleaning

Order code for "Application package", option EC "ECC electrode cleaning "

The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe_3O_4) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to avoid build-up of very conductive matter and thin layers (typical of magnetite).

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

Heartbeat Technology

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

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

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

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

Accessories

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

Device-specific accessories

For the 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	For the regular replacement of seals for the sensor.
Spacer	If replacing a DN 80/100 sensor in an existing installation, a spacer is needed if the new sensor is shorter.
Welding jig	Welding socket as process connection: welding jig for installation in pipe.
Grounding rings	Are used to ground the medium in lined measuring tubes to ensure proper measurement. Grounding rings can be ordered via the device order structure or configured and ordered as an accessory via the DK5HR order structure.
Mounting kit	Consists of: ▪ 2 process connections ▪ Screws ▪ Seals
Wall mounting kit	Wall mounting kit for measuring device (only DN 2 to 25 (1/12 to 1"))

Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB port. Technical Information TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. Technical Information TI00405C

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
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. Operating Instructions BA00061S

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring instruments: ▪ Choice of measuring instruments for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy. ▪ Graphic display of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: Via the Internet: 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. Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IIoT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, 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 tool from Endress+Hauser. It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices. Innovation brochure IN01047S

System components

Accessories	Description
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick. ▪ Technical Information TI00133R ▪ Operating Instructions BA00247R
iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature. "Fields of Activity" document FA00006T

Documentation

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

Standard documentation

Supplementary information on the semi-standard options is available in the relevant Special Documentation in the TSP database.

Brief Operating Instructions

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

Operating Instructions

Measuring device	Documentation code				
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promag H 100	BA01171D	BA01237D	BA01175D	BA01173D	BA01421D

Description of device parameters

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

Supplementary device-dependent documentation

Safety instructions

Contents	Documentation code
ATEX/IECEx Ex nA	XA01090D

Special Documentation

Contents	Documentation code
Modbus RS485 register information	SD01148D
Heartbeat Technology	SD01149D

Installation instructions

Contents	Note
Installation instructions for spare part sets and accessories	Documentation code: specified for each individual accessory → 93.

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