Technical Information
Proline Promag H 100

Electromagnetic flowmeter

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

Application

- The measuring principle is virtually independent of pressure, density, temperature and viscosity
- For the smallest flow quantities and demanding hygienic applications

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

Endress+Hauser

People for Process Automation

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About this document

Symbols used

Electrical symbols

Symbol	Meaning
⎓	Direct current
∼	Alternating current
⏦	Direct current and alternating current
⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏛	**Protective Earth (PE)** A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: • Inner ground terminal: Connects the protectiv earth to the mains supply. • Outer ground terminal: Connects the device to the plant grounding system.

Symbols for certain types of information

Symbol	Meaning
✔	**Permitted** Procedures, processes or actions that are permitted.
✔✔	**Preferred** Procedures, processes or actions that are preferred.
✘	**Forbidden** Procedures, processes or actions that are forbidden.
🛈	**Tip** Indicates additional information.
📖	Reference to documentation.
📄	Reference to page.
🖾	Reference to graphic.
👁	Visual inspection.

Symbols in graphics

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

Function and system design

Measuring principle

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

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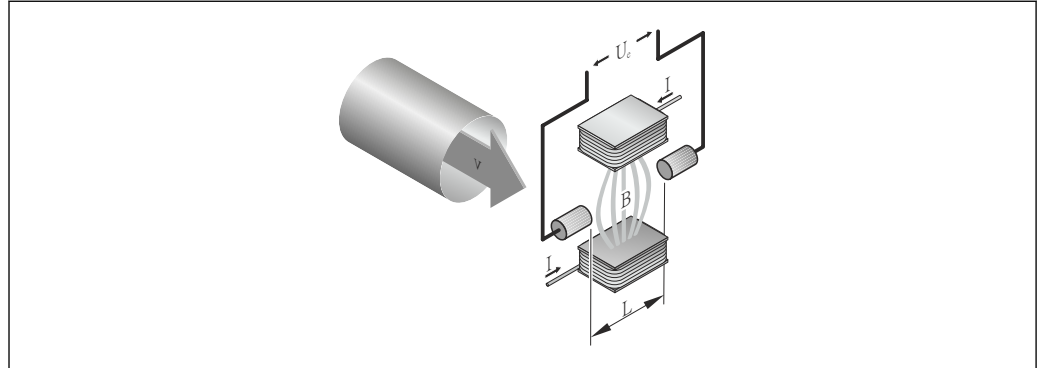
Ue   Induced voltage
B   Magnetic induction (magnetic field)
L   Electrode spacing
I   Current
v   Flow velocity

In the electromagnetic measuring principle, the flowing medium is the moving conductor. The voltage induced (U_e) is proportional to the flow velocity (v) and is supplied to the amplifier by means of two measuring electrodes. The flow volume (Q) is calculated via the pipe cross-section (A). The DC magnetic field is created through a switched direct current of alternating polarity.
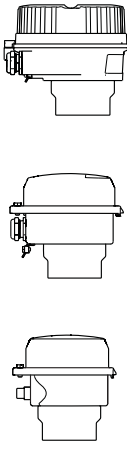
Formulae for calculation
- Induced voltage $U_e = B \cdot L \cdot v$
- Volume flow $Q = A \cdot v$
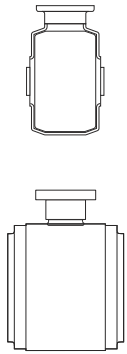
Measuring system	The device consists of a transmitter and a sensor.

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

Transmitter

Promag 100	Device versions and materials:

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A0016695
	• 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)
	• Additionally for device version with local display:
	  Via Web browser (e.g. Microsoft Internet Explorer)
	• 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	Nominal diameter range: DN 2 to 150 (1/12 to 6")

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A0019898
	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 molded seal (EPDM, FKM, silicone)
	  – DN 40 to 150 (1 ½ to 6"): aseptic molded seal (EPDM, FKM, silicone)
	• Grounding rings: stainless steel, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum

Equipment architecture
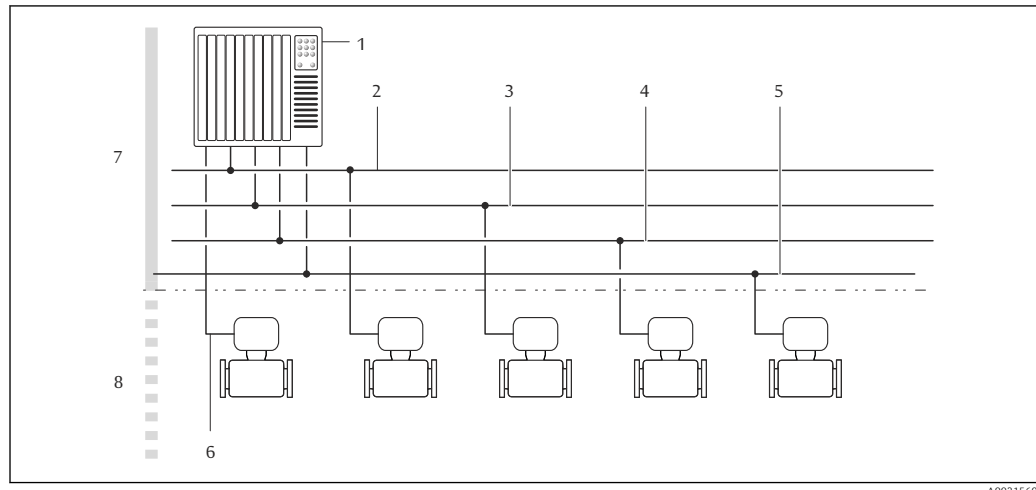
▣ 1   Possibilities for integrating measuring devices into a system

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

Safety

IT security

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

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

Input

Measured variable

Direct measured variables

• Volume flow (proportional to induced voltage)
• Temperature (DN 15 to 150 (½ to 6"))
• Electrical conductivity

Calculated measured variables

• Mass flow
• Corrected volume flow
• Corrected electrical conductivity

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

Flow characteristic values in SI units

Nominal diameter		Recommended flow	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	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 → 🖹 92

Recommended measuring range

"Flow limit" section → 🖹 46

Operable flow range	Over 1000 : 1

Input signal	**External measured values**

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

ⓘ Various pressure transmitters and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section → 🖺 93

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

HART protocol

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

Digital communication

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

Output

Output signal	**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	Adjustable: 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	Adjustable: 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	Adjustable: 0 to 10 000 Hz
Damping	Adjustable: 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	Adjustable: 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

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

4-20 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 • Freely definable value between: 3.59 to 22.5 mA • Actual value • Last valid value

HART

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

Pulse/frequency/switch output

Pulse output	
Failure mode	Choose from: • Actual value • No pulses
Frequency output	
Failure mode	Choose from: • Actual value • 0 Hz • Defined value: 0 to 12 500 Hz
Switch output	
Failure 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	In accordance with "Application Layer protocol for decentral device periphery and distributed automation", 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

Operating tool

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

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.

Galvanic isolation   The following connections are galvanically isolated from each other:
- Outputs
- Power supply

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	0x1561
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files under: • www.endress.com On the product page for the device: Documents/Software → Device drivers • www.profibus.org

Output values (from measuring device to automation system)	**Analog input 1 to 4** • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Corrected conductivity • Temperature • Electronic 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 device)	**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 Simplest device identification on the part of the control system and nameplate • PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download • Condensed status Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur
Configuration of the device address	• 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

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 device	• DIP switches on the electronics module for IP addressing • Manufacturer-specific software (FieldCare) • Add-on Profile Level 3 for Rockwell Automation control systems • Web browser • Electronic Data Sheet (EDS) integrated in the measuring device
Configuration of the EtherNet interface	• 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 • Electronic temperature • Totalizer 1 to 3 • Flow velocity • Volume flow unit • Corrected volume flow unit • Mass flow unit • Temperature unit • Unit totalizer 1-3 • Flow velocity unit • Verification result • Verification status 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 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
	  – Measuring mode
	  – Failsafe mode
	• Alarm delay

PROFINET

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

Configuration of the device name	• DIP switches on the electronics module, for device name assignment (last part) • DCP protocol
Output values (from measuring device to automation system)	**Analog Input module (slot 1 to 10)** • Volume flow • Mass flow • Corrected volume flow • Flow velocity • Conductivity • Corrected conductivity • Temperature • Electronic 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 diagnosis **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 device)
	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 onsite 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		
	Electronic 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 Verification [1]	17

1) Only available with the "Heartbeat" 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 param.
	  – 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 |
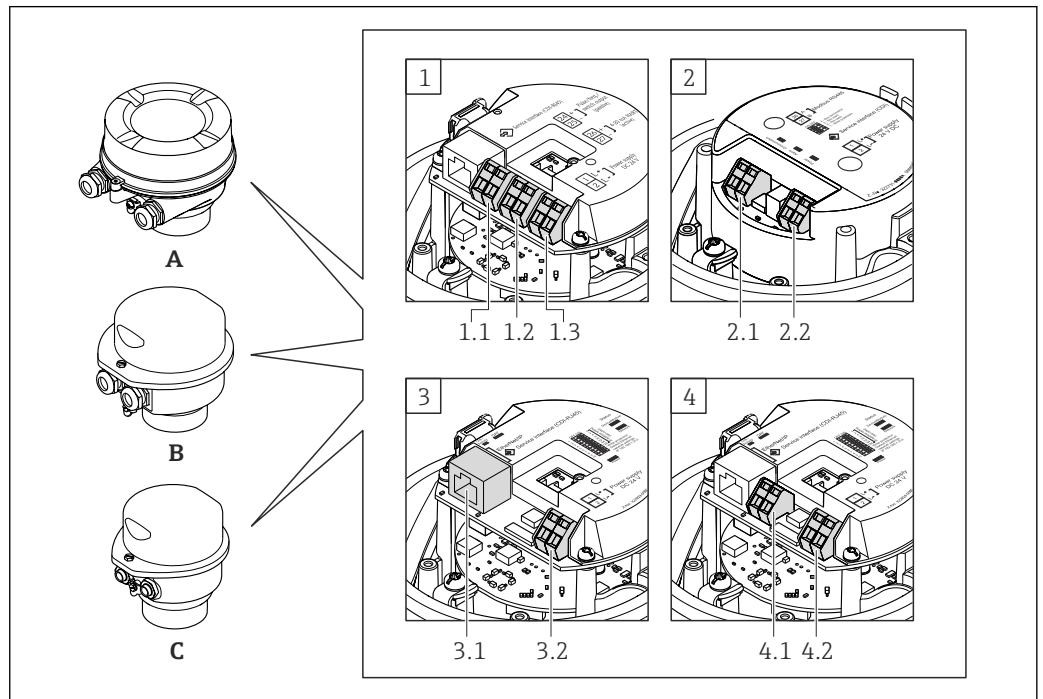
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A   *Housing version: compact, aluminum coated*
B   *Housing version: compact, hygienic, stainless*
C   *Housing version: ultra-compact, hygienic, stainless*
1   *Connection version: 4-20 mA HART, pulse/frequency/switch output*
1.1 Signal transmission: 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 plugs → 🕮 24	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 plugs → 🕮 24	Device plugs → 🕮 24	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			

A0016888

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

1   Power supply: DC 24 V
2   Output 1: 4-20 mA HART (active)
3   Output 2: pulse/frequency/switch output (passive)

Order code 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

> [i] 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 plugs → 🕮 24	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 plugs → 🕮 24	Device plugs → 🕮 24	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			

A0022716

🔲 *3   PROFIBUS DP terminal assignment*

1   Power supply: DC 24 V
2   PROFIBUS DP

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 plugs → 🗎 24	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 plugs → 🗎 24	Device plugs → 🗎 24	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*

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

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 plugs → 🖹 24	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 plugs → 🖹 24	Device plugs → 🖹 24	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

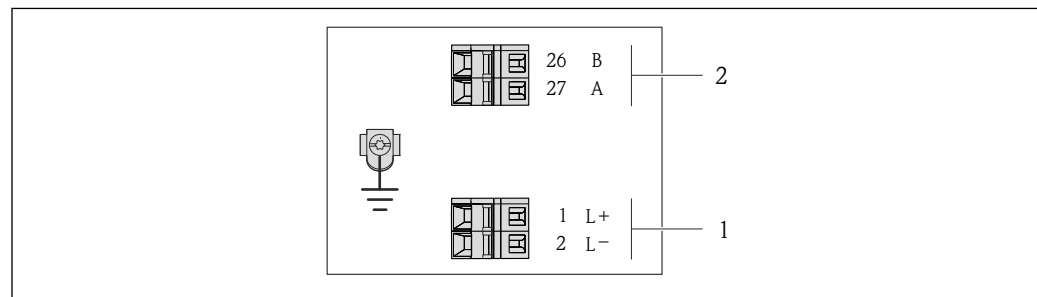| Order code for "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option **N**	DC 24 V		EtherNet/IP
Order code for "Output": Option **N**: EtherNet/IP			

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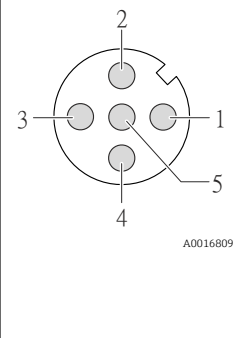
Order code for "Output"	Terminal number		
	Power supply		Output
	2 (L-)	1 (L+)	Device plug M12x1
Option **R**	DC 24 V		PROFINET
Order code for "Output": Option **R**: PROFINET			

Pin assignment, device plug   ℹ️ Order codes for the M12x1 connectors, see the "Order code for **electrical connection**" column:
  • 4-20 mA HART, pulse/frequency/switch output → 🖺 20
    • PROFIBUS DP→ 🖺 21
    • Modbus RS485 → 🖺 22
    • EtherNet/IP → 🖺 23
    • PROFINET→ 🖺 24

Supply voltage
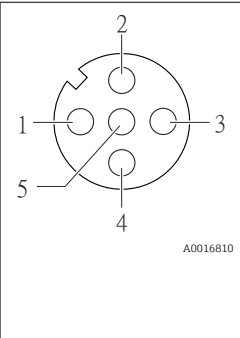
For all connection versions (device side)

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

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

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

Device plug for signal transmission (device side)
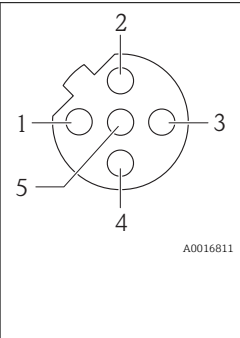
Pin		Assignment
1	+	4-20 mA HART (active)
2	-	4-20 mA HART (active)
3	+	Pulse/frequency/switch output (passive)
4	-	Pulse/frequency/switch output (passive)
5		Grounding/shielding
Coding		Plug/socket
A		Socket

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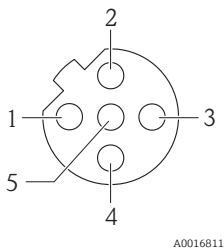
For use in the non-hazardous area and Zone 2/Div. 2.

Device plug for signal transmission (device side)

Pin		Assignment
1		Not assigned
2	A	PROFIBUS DP
3		Not assigned
4	B	PROFIBUS DP
5		Grounding/shielding
Coding		Plug/socket
B		Socket
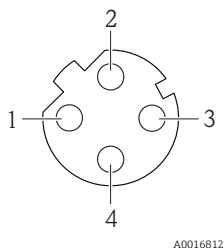
- Recommended plug: Binder, series 763, part no. 79 4449 20 05
- When using the device in a hazardous location, use a suitably certified plug.

MODBUS RS485

Device plug for signal transmission (device side)

Pin		Assignment
1		Not assigned
2	A	Modbus RS485
3		Not assigned
4	B	Modbus RS485
5		Grounding/shielding
Coding		**Plug/socket**
B		Socket
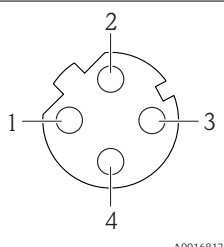
A0016811

- 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

A0016812

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

A0016812

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

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

Transmitter

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

Power consumption	**Transmitter**

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

Current consumption	**Transmitter**

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

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

Electrical connection	**Connecting the transmitter**
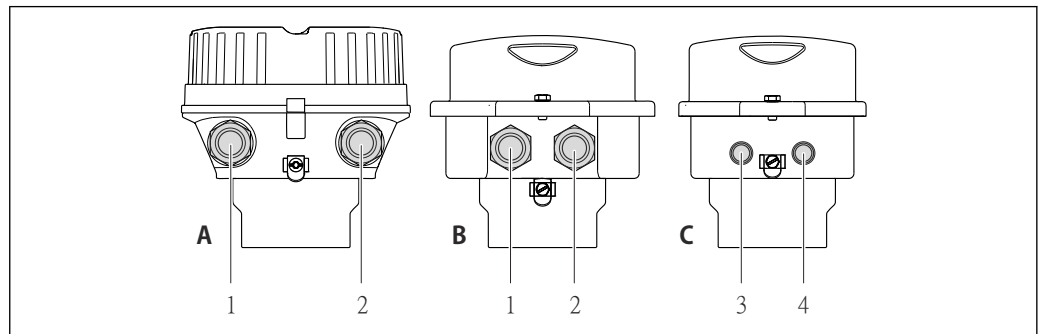
A   Housing version: compact, aluminum coated
B   Housing version: compact hygienic, stainless
1   Cable entry or device plug for signal transmission
2   Cable entry or device plug for supply voltage
C   Housing version: ultra-compact, hygienic, stainless, M12 device plug
3   Device plug for signal transmission
4   Device plug for supply voltage

• Terminal assignment → 🖹 19
• Pin assignment, device plug → 🖹 24

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

Connection examples

Current output 4-20 mA HART
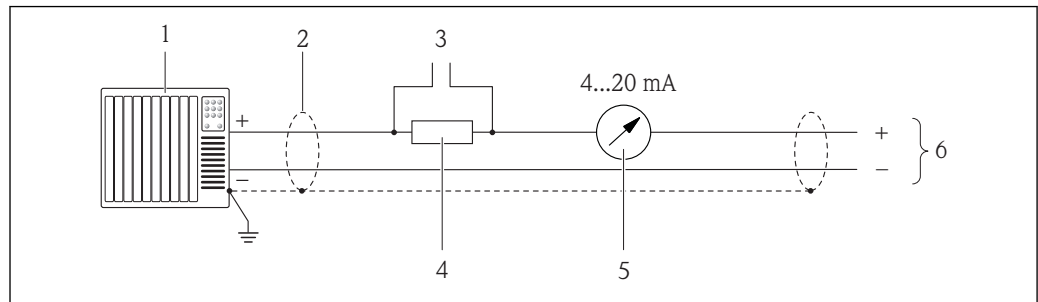
🖾 *7   Connection example for 4-20 mA HART current output (active)*

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

Pulse/frequency output
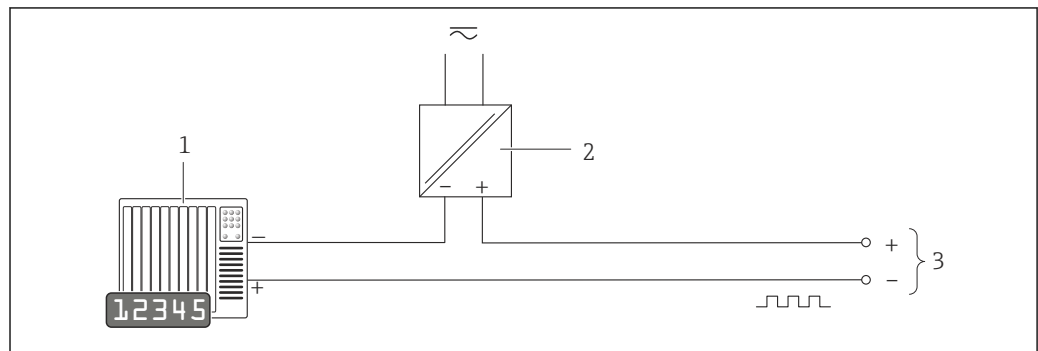
🖾 *8   Connection example for pulse/frequency output (passive)*

1   Automation system with pulse/frequency input (e.g. PLC)
2   Power supply
3   Transmitter: observe input values → 🖹 8

Switch output
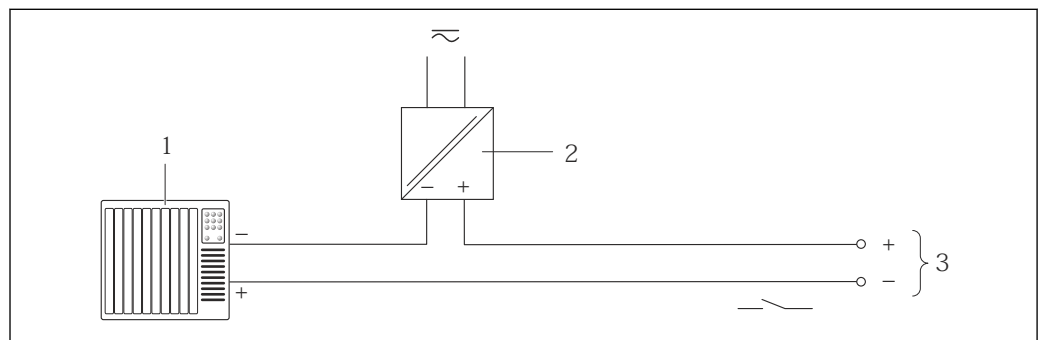
🖾 *9   Connection example for switch output (passive)*

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

PROFIBUS DP
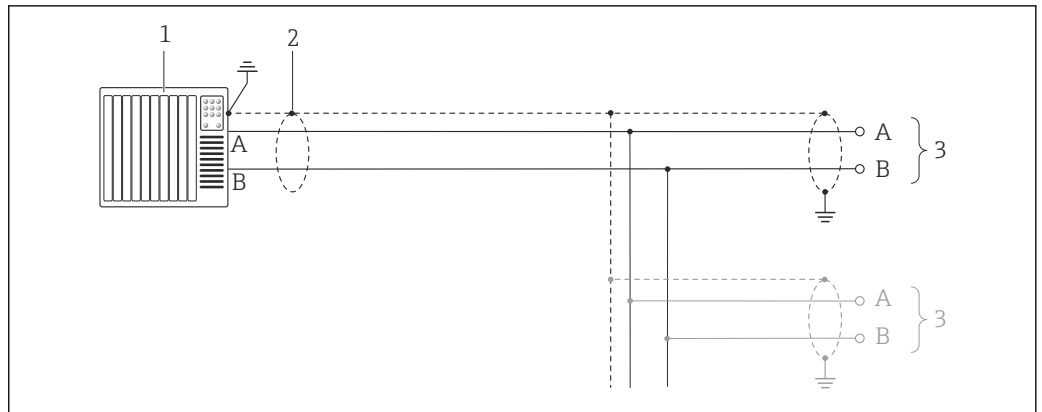
A0021429

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

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

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

Modbus RS485
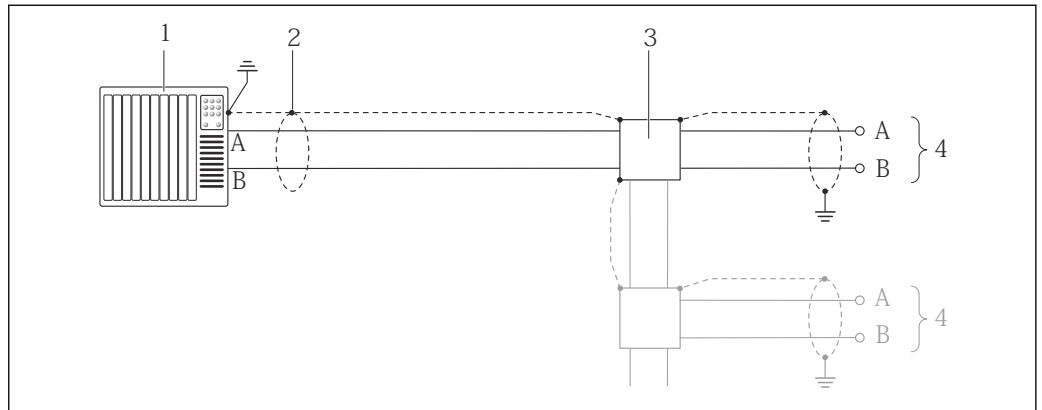
A0016803

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

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

EtherNet/IP
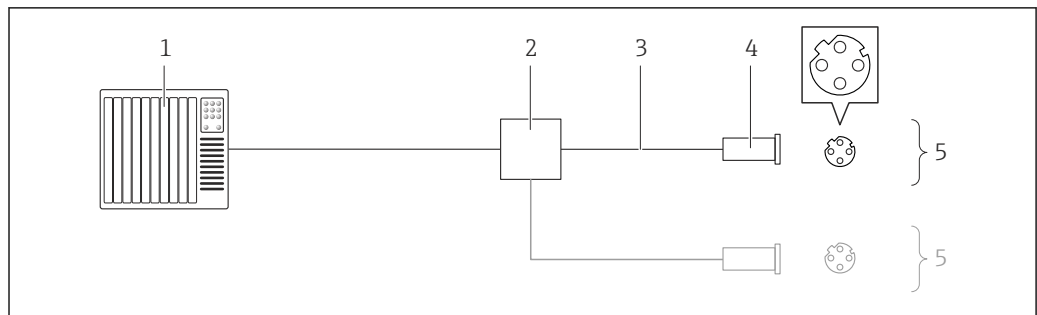
🔲 *12 Connection example for EtherNet/IP*

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

PROFINET
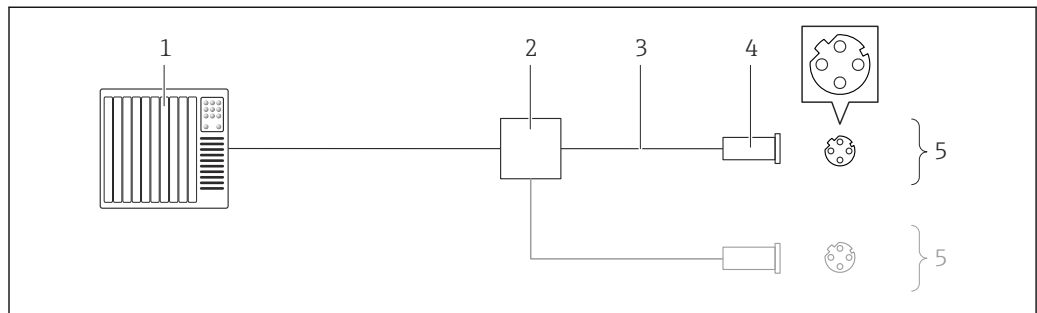
🔲 *13 Connecting cable for PROFINET*

1 *Control system (e.g. PLC)*
2 *Ethernet switch*
3 *Observe cable specifications*
4 *Connector*
5 *Transmitter*

HART input
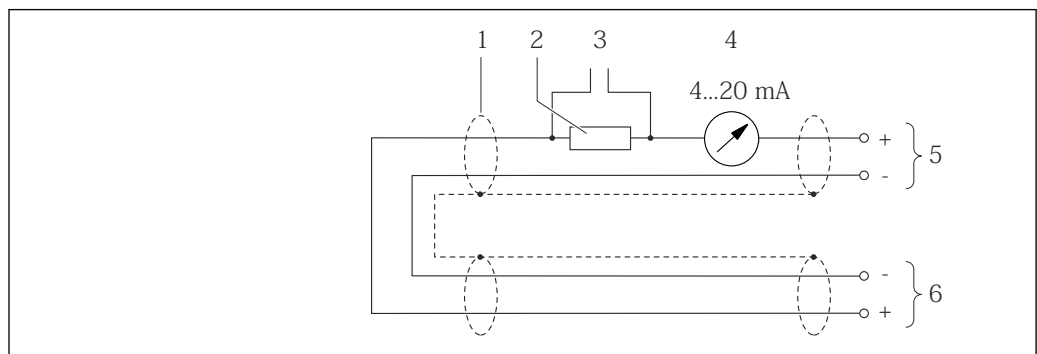
🔲 *14 Connection example for HART input (burst mode) via current output (active)*

1 *Cable shield, observe cable specifications*
2 *Resistor for HART communication (≥ 250 Ω): observe maximum load*
3 *Connection for HART operating devices*
4 *Analog display unit*
5 *Transmitter*
6 *Sensor for external measured variable*
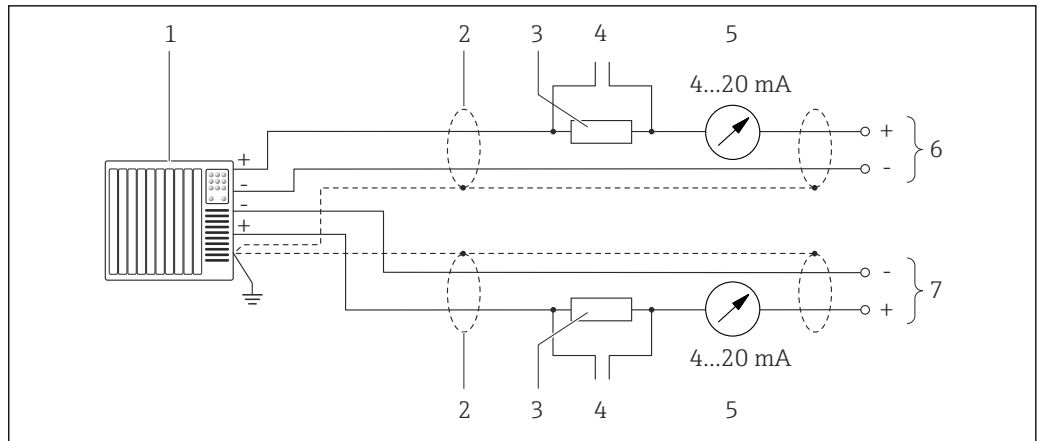
⊡ 15 *Connection example for HART input (master mode) via current output (active)*

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

Potential equalization	**Requirements**

Requirements

Please consider the following to ensure correct measurement:
- Same electrical potential for the fluid and sensor
- Company-internal grounding concepts
- Pipe material and grounding

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

Connection example, standard scenario

Metal process connections

Potential equalization is generally via the metal process connections that are in contact with the medium and mounted directly on the sensor. Therefore there is generally no need for additional potential equalization measures.

Connection example in special situations

Plastic process connections

In the case of plastic process connections, additional grounding rings or process connections with an integrated grounding electrode must be used to ensure potential matching between the sensor and the fluid. If there is no potential matching, this can affect the measuring accuracy or cause the destruction of the sensor as a result of the electrochemical decomposition of the electrodes.

Note the following when using grounding rings:
- Depending on the option ordered, plastic disks are used instead of grounding rings on some process connections. These plastic disks only act as "spacers" and do not have any potential matching function. Furthermore, they also perform a significant sealing function at the sensor/connection interface. Therefore, in the case of process connections without metal grounding rings, these plastic disks/seals should never be removed and should always be installed!
- Grounding rings can be ordered separately as an accessory from Endress+Hauser . When ordering make sure that the grounding rings are compatible with the material used for the electrodes, as otherwise there is the danger that the electrodes could be destroyed by electrochemical corrosion!
- Grounding rings, including seals, are mounted inside the process connections. Therefore the installation length is not affected.

Potential equalization via additional grounding ring
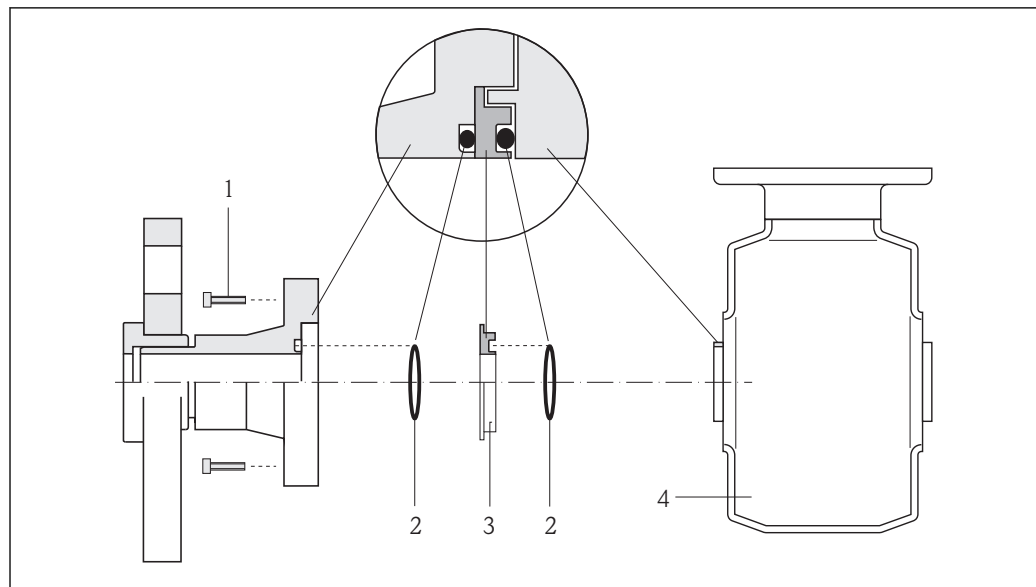
A0002651

1   Hexagonal-headed bolts of process connection
2   O-ring seals
3   Plastic disk (spacer) or grounding ring
4   Sensor

Potential equalization via grounding electrodes on process connection
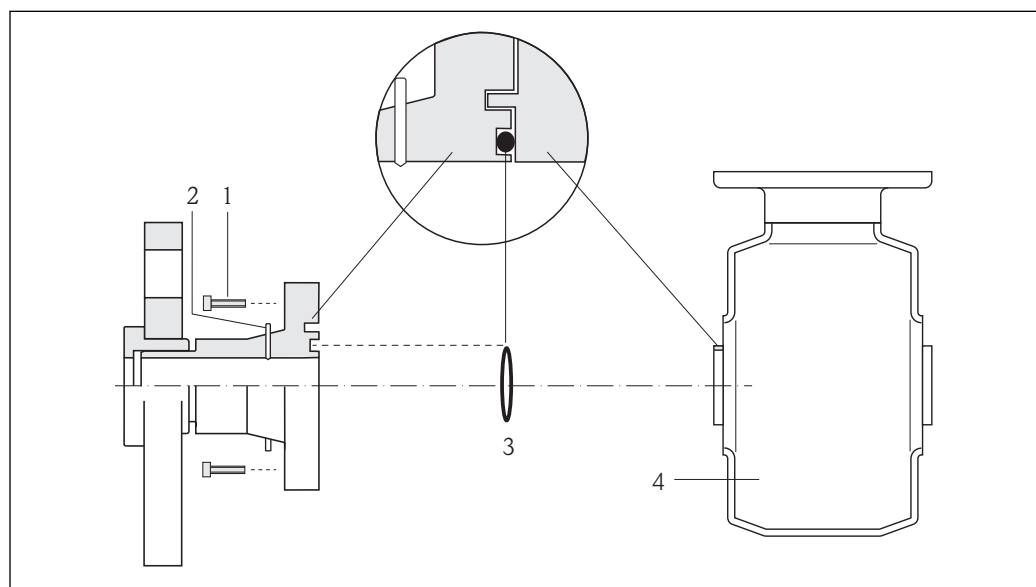
A0017293

1   Hexagonal-headed bolts of process connection
2   Integrated grounding electrodes
3   O-ring seal
4   Sensor

Terminals	**Transmitter** Spring terminals for wire cross-sections0.5 to 2.5 mm^2 (20 to 14 AWG)

Cable entries	• Cable gland: M20 × 1.5 with cable ϕ6 to 12 mm (0.24 to 0.47 in)
	• Thread for cable entry:
	  – NPT ½"
	  – G ½"
	  – M20

Cable specification	**Permitted temperature range**

- −40 ℃ (−40 ℉) to +80 ℃ (+176 ℉)
- Minimum requirement: cable temperature range ≥ ambient temperature +20 K

Power supply cable

Standard installation cable is sufficient.

Signal cable

Current output

For 4-20 mA HART: Shielded cable recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

PROFIBUS DP

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

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	<30 pF/m
Wire cross-section	>0.34 mm² (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shield	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

Modbus RS485

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

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	<30 pF/m
Wire cross-section	>0.34 mm² (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shield	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

EtherNet/IP

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

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

PROFINET

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

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

Performance characteristics

Reference operating conditions	**In accordance with DIN EN 29104** • Medium temperature: +28 ± 2 °C (+82 ± 4 °F) • Ambient temperature: +22 ± 2 °C (+72 ± 4 °F) • Warm-up period: 30 min **Installation** • Inlet run > 10 × DN • Outlet run > 5 × DN • Sensor and transmitter grounded. • The sensor is centered in the pipe. To calculate the measuring range, use the *Applicator* sizing tool → 🖿 92
Maximum measured error	**Error limits under reference operating conditions** o.r. = of reading **Volume flow** • ±0.5 % o.r. ± 1 mm/s (0.04 in/s) • Optional: ±0.2 % o.r. ± 2 mm/s (0.08 in/s) Fluctuations in the supply voltage do not have any effect within the specified range.
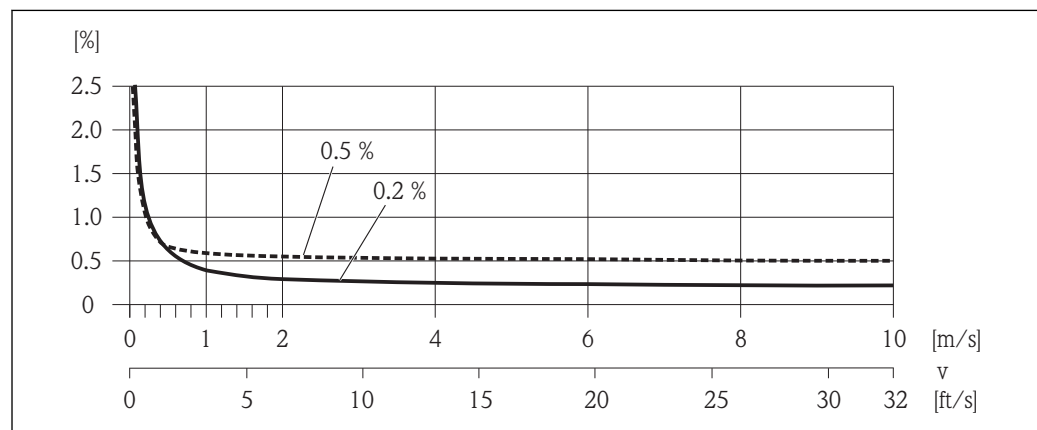
🖾 *16   Maximum measured error in % o.r.*

Temperature
±3 °C (±5.4 °F)

Electrical conductivity
Max. measured error not specified.

Accuracy of outputs

In the case of analog outputs, the output accuracy must also be considered for the measured error; in contrast, this need not be considered in the case of 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. (across 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.

Temperature measurement response time

T_{90} < 15 s

Influence of ambient temperature

Current output

o.r. = of reading

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

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.

Installation

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

Mounting location
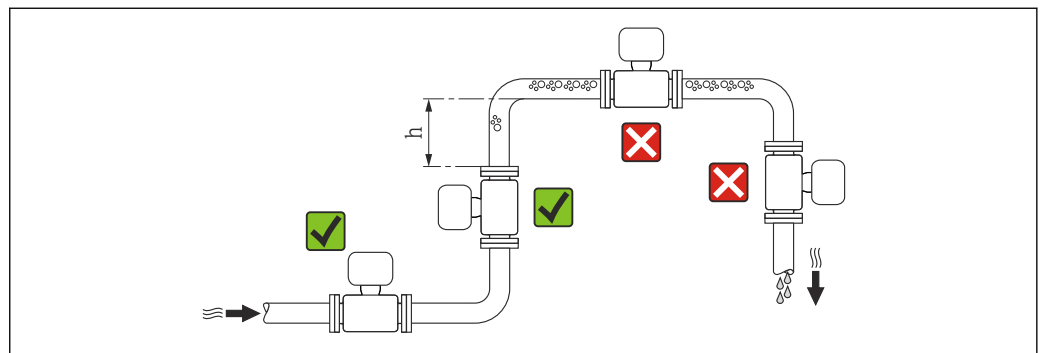
A0023343

Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: h ≥ 2 × DN

To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:
• Highest point of a pipeline.
• Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

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

ℹ️ For information on the liner's resistance to partial vacuum
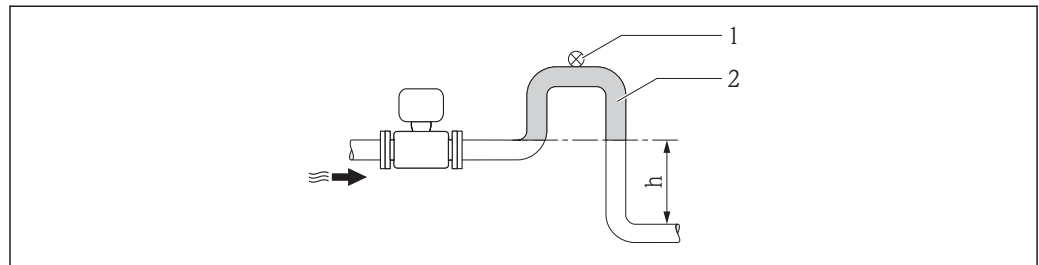
🔲 *17   Installation in a down pipe*

1   Vent valve
2   Pipe siphon
h   Length of down pipe

Installation in partially filled pipes

A partially filled pipe with a gradient necessitates a drain-type configuration. The empty pipe detection (EPD) function offers additional protection by detecting empty or partially filled pipes.
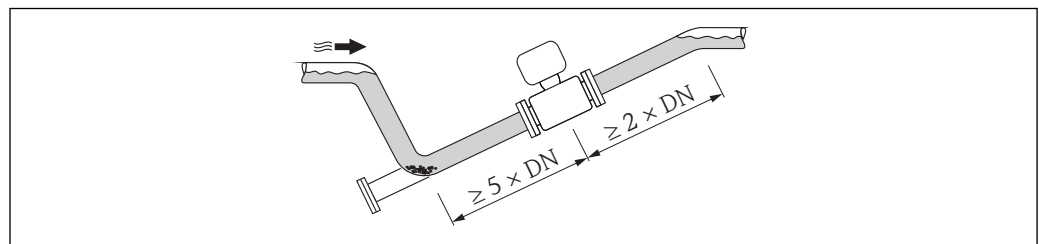
Orientation

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

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube.

The measuring device also offers the empty pipe detection function to detect partially filled measuring pipes in the event of outgassing fluids or variable process pressures.

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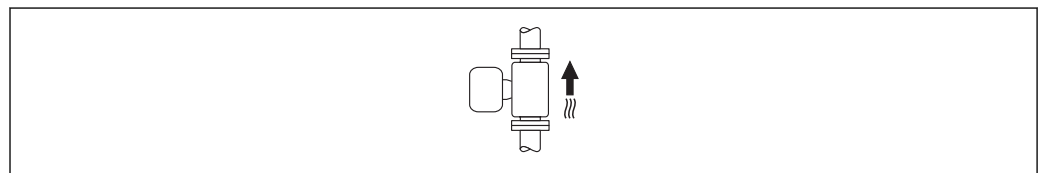
Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.

Horizontal
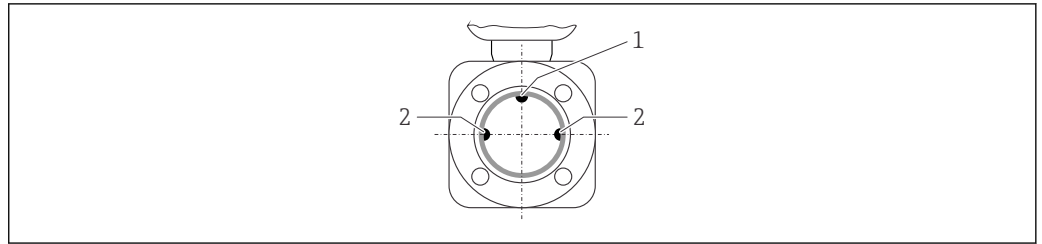
1   EPD electrode for empty pipe detection
2   Measuring electrodes for signal detection

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

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

Observe the following inlet and outlet runs to comply with accuracy specifications:
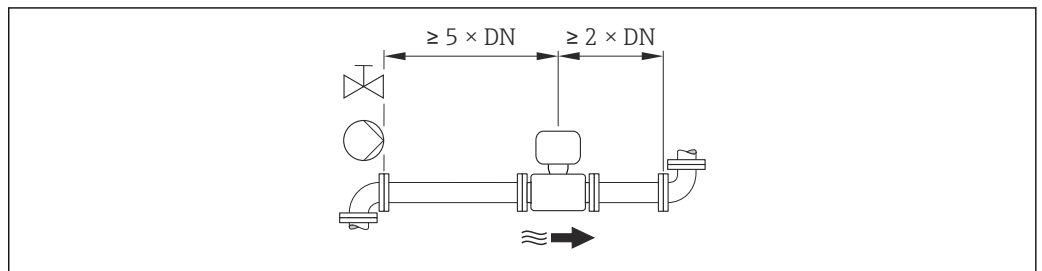
Adapters   Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.

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

The nomogram only applies to liquids with a viscosity similar to that of water.
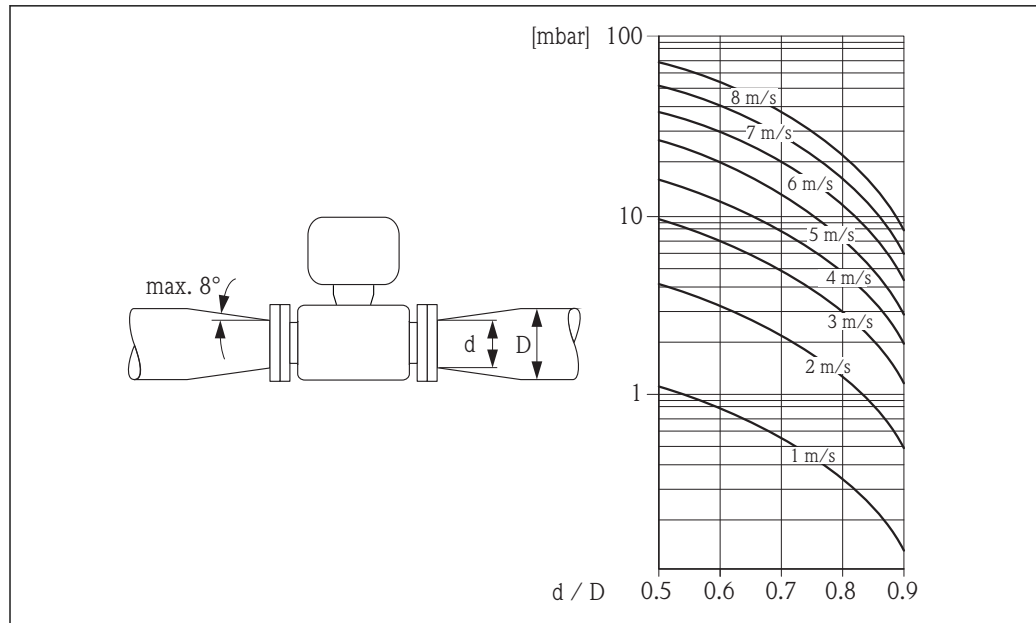
A0016359

Environment

Ambient temperature range

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

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

Temperature tables

The following interdependencies between the permitted ambient and fluid temperatures apply when operating the device in hazardous areas:

Ex nA, $_C$CSA$_{US}$ NI

SI units

T_a [°C]	T6 [85 °C]	T5 [100 °C]	T4 [135 °C]	T3 [200 °C]	T2 [300 °C]	T1 [450 °C]
30	50	95	130	150	150	150
50	–	95	130	150	150	150
60	–	95	110	110	110	110

US units

T_a [°F]	T6 [185 °F]	T5 [212 °F]	T4 [275 °F]	T3 [392 °F]	T2 [572 °F]	T1 [842 °F]
86	122	203	266	302	302	302
122	–	203	266	302	302	302
140	–	203	230	230	230	230

Storage temperature	The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.→ 🖹 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.
Degree of protection	**Transmitter and sensor**
	• As standard: IP66/67, type 4X enclosure
	• With the order code for "Sensor options", option **CM**: IP69K can also be ordered
	• When housing is open: IP20, type 1 enclosure
	• Display module: IP20, type 1 enclosure
Shock resistance	As per IEC/EN 60068-2-31
Vibration resistance	Acceleration up to 2 g based on IEC 60068-2-6
Mechanical load	• Protect the transmitter housing against mechanical effects, such as shock or impact.
	• Never use the transmitter housing as a ladder or climbing aid.
Interior cleaning	• Cleaning in place (CIP)
	• Sterilization in place (SIP)
Electromagnetic compatibility (EMC)	• Depends on the communication protocol:
	– HART, PROFIBUS DP, Modbus RS485, EtherNet/IP: As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
	– PROFINET: as per IEC/EN 61326
	• Complies with emission limits for industry as per EN 55011 (Class A)
	• Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784

ℹ️ 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.

📖 For details, refer to the Declaration of Conformity.

Process

Medium temperature range	−20 to +150 °C (−4 to +302 °F)
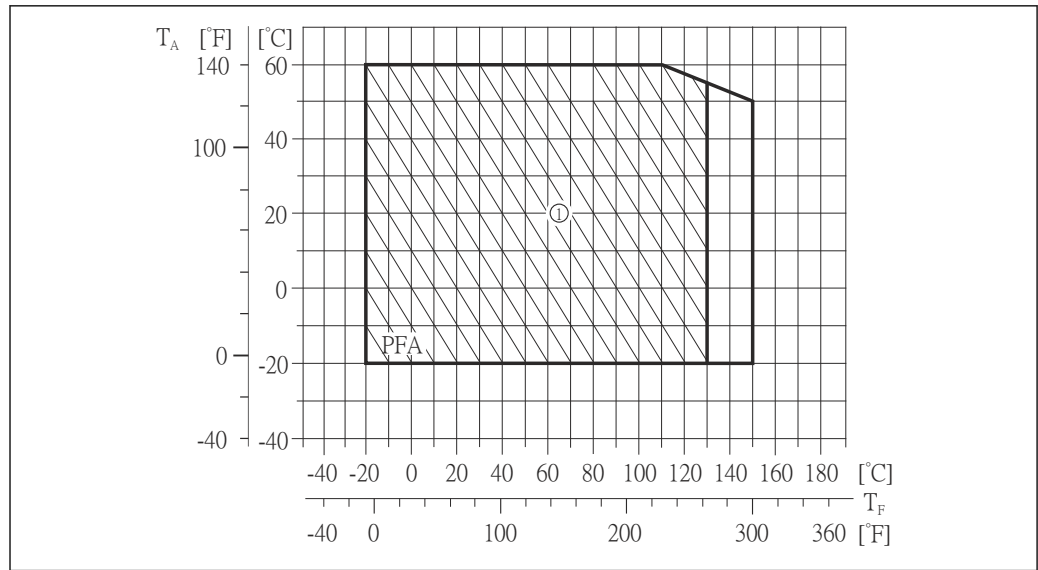
T_A   Ambient temperature range

T_F   Medium temperature

1   Harsh environment and IP68 only up to +130 ℃ (+266 ℉)

| 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: weld-in nipple according to DIN EN ISO 1127, ODT/SMS, ISO 2037; coupling according to ISO 228 / DIN 2999, NPT
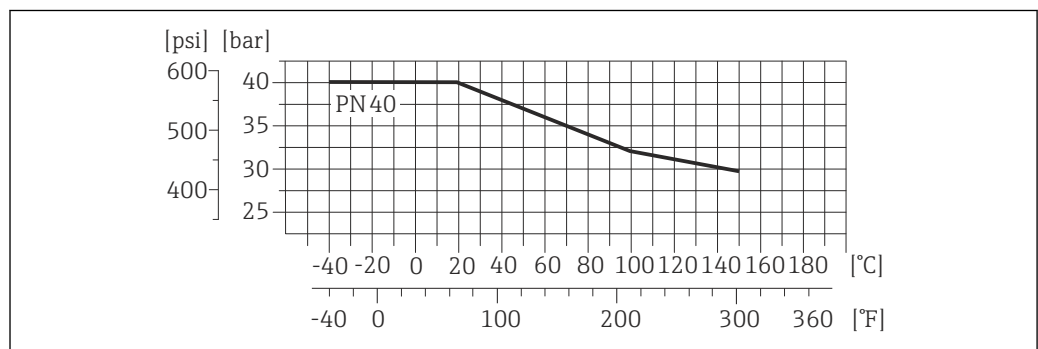
⊞ *18   Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: flange according to EN 1092-1 (DIN 2501), adhesive sleeve
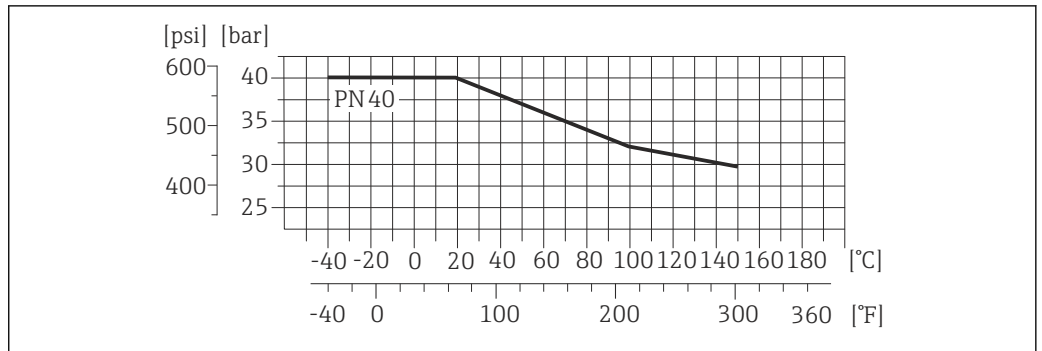
⊠ 19   Process connection material: stainless steel, 1.4404 (F316L)
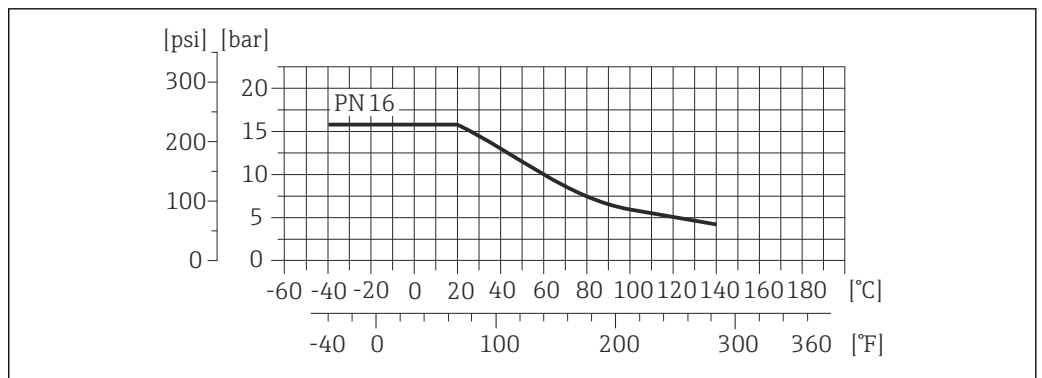
⊠ 20   Process connection material: PVDF
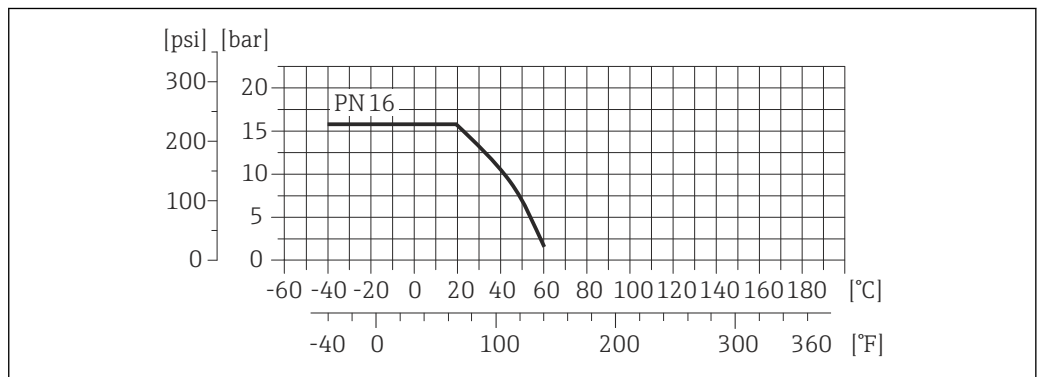
⊠ 21   Process connection material: PVC-U

Process connection: flange according to ASME B16.5
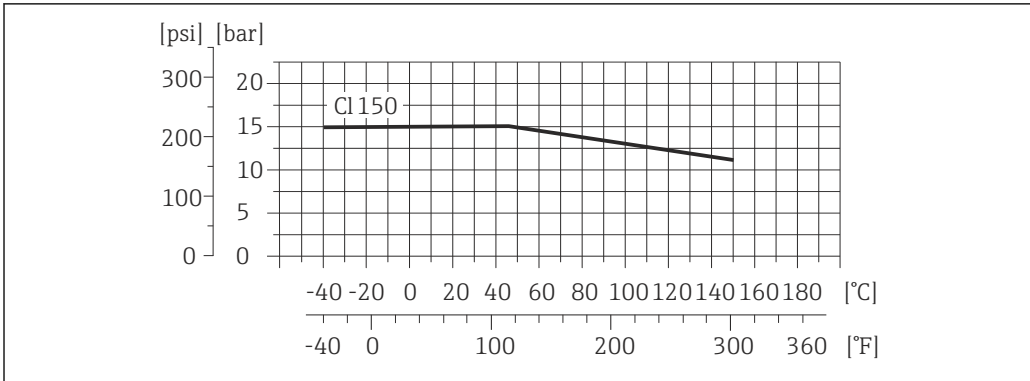
22   Process connection material: stainless steel, 1.4404 (F316L)
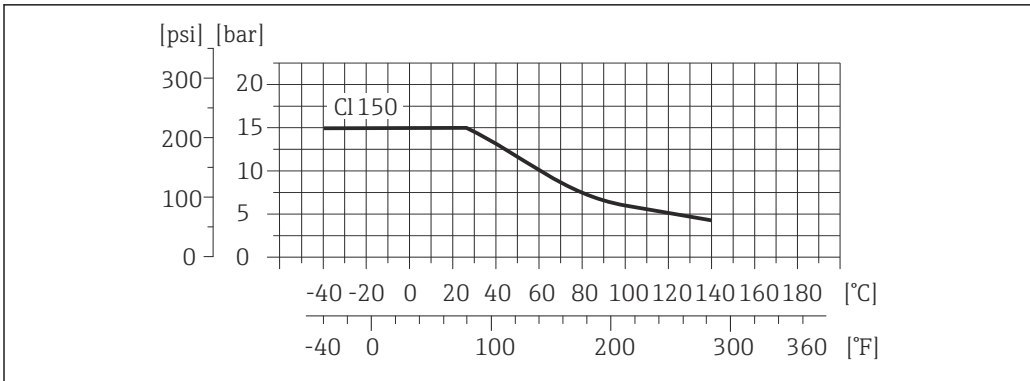
23   Process connection material: PVDF

Process connection: flange according to JIS B2220
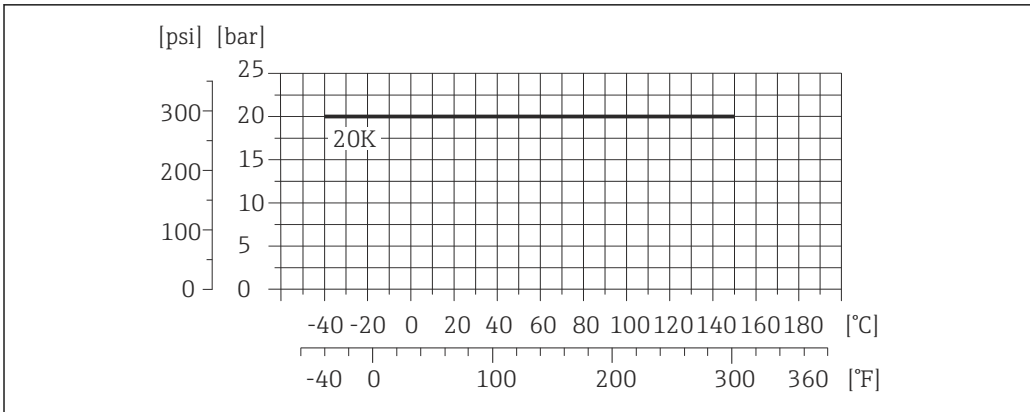
24   Process connection material: stainless steel, 1.4404 (F316L)
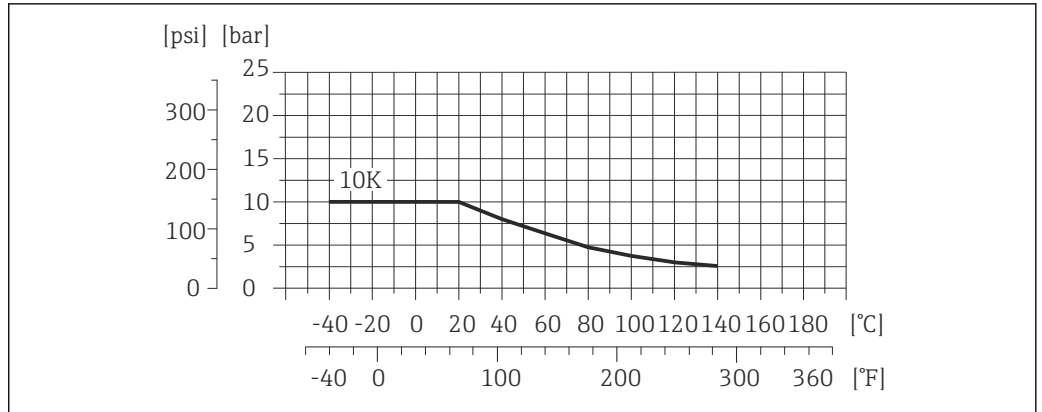
25   Process connection material: PVDF

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

Process connection: weld-in nipple according to EN 10357 (DIN 11850), ASME BPE, ISO 2037; Clamp according to ISO 2852, DIN 32676, L14 AM7; coupling according to SC DIN 11851, DIN 11864-1, SMS 1145; flange according to DIN 11864-2
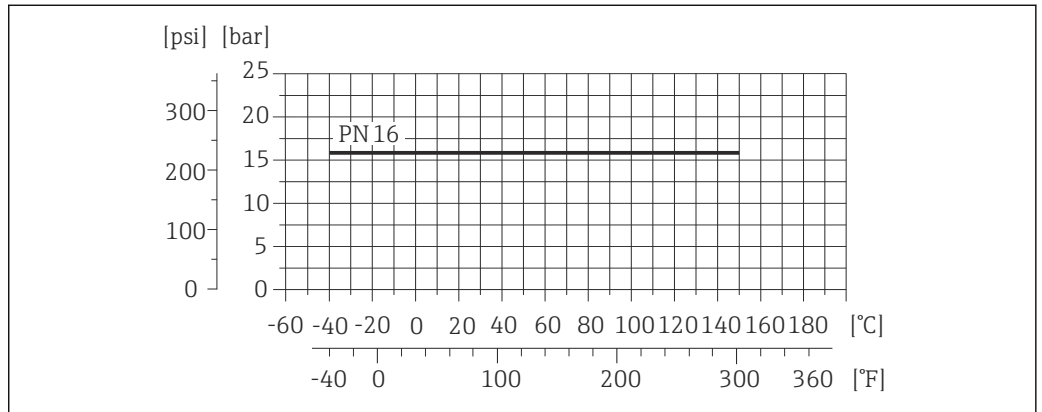
26   Process connection material: stainless steel, 1.4404 (F316L)

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

Process connection: coupling according to SMS 1145
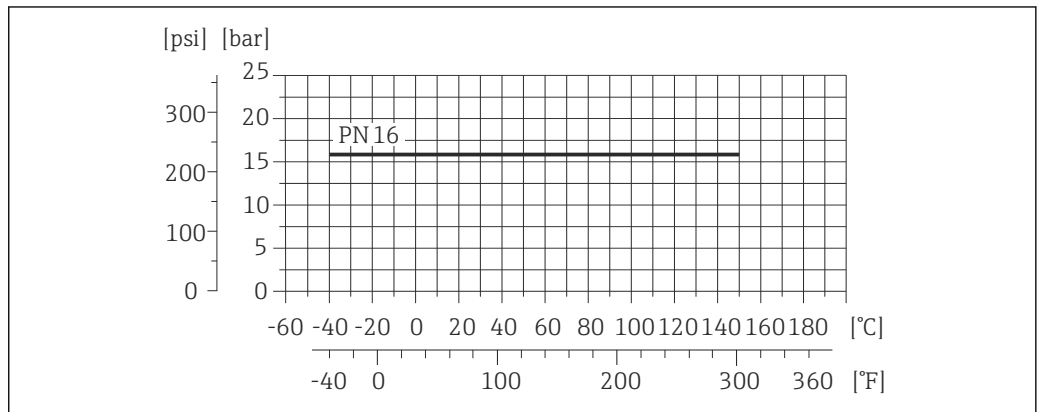
27   Process connection material: stainless steel, 1.4404 (F316L)

Process connection: weld-in nipple according to EN 10357 (DIN 11850); coupling according to SC DIN 11851
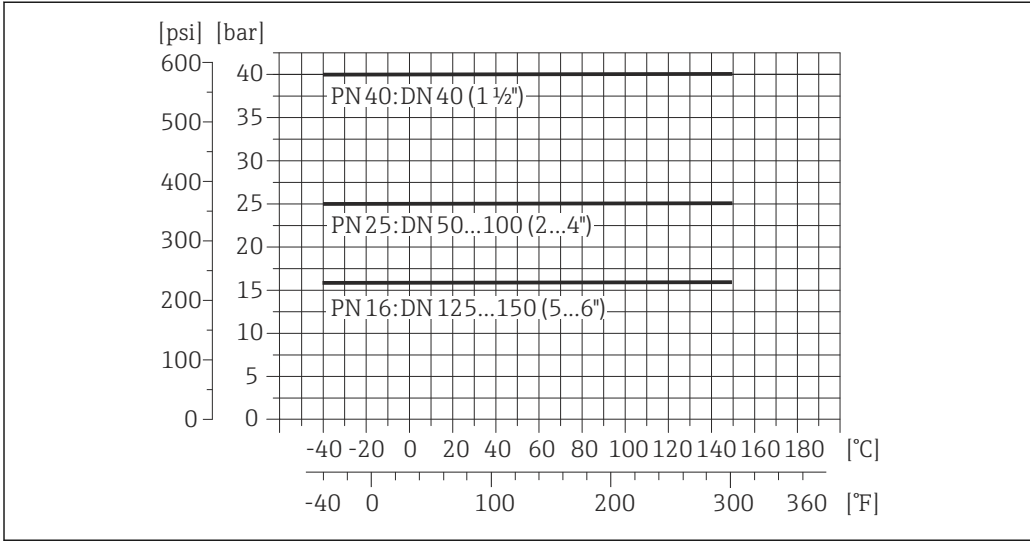
⊠ 28   Process connection material: stainless steel, 1.4404 (F316L)

Process connection: weld-in nipple according to ASME BPE
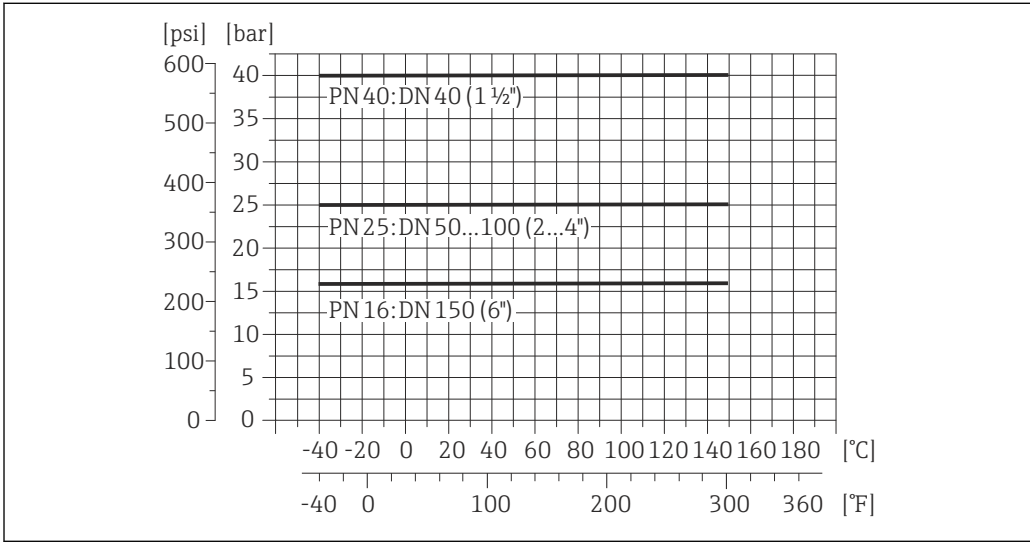
Process connection: weld-in nipple according to ISO 2037
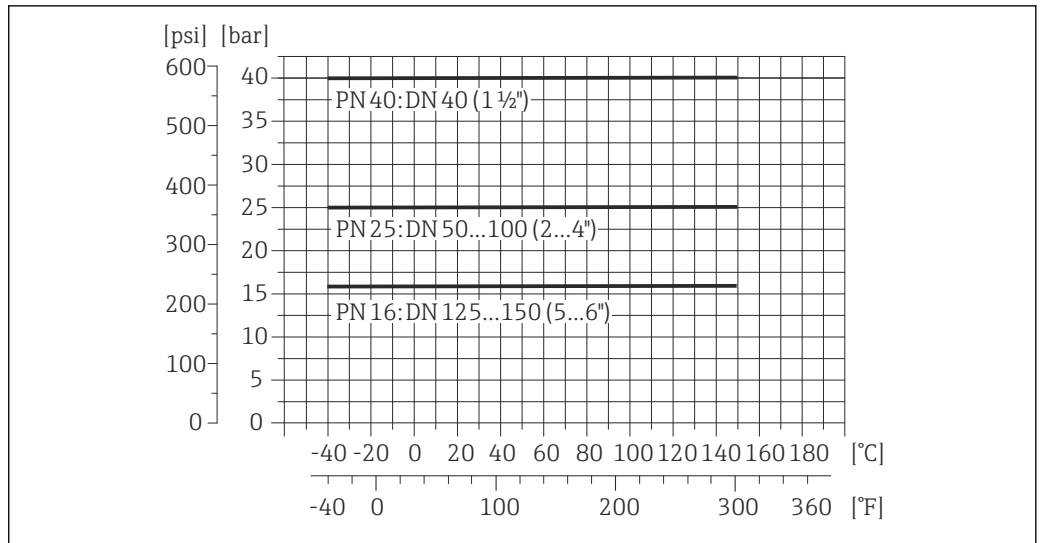
A0021195-EN

⊠ *29   Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: Clamp according to ISO 2852, DIN 32676, L14 AM7
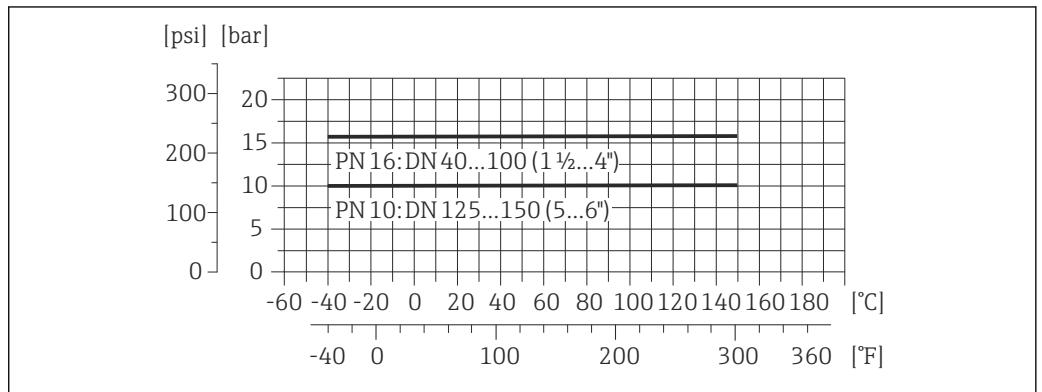
A0021197-EN

⊠ *30   Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: coupling according to DIN 11864-1, ISO 2853
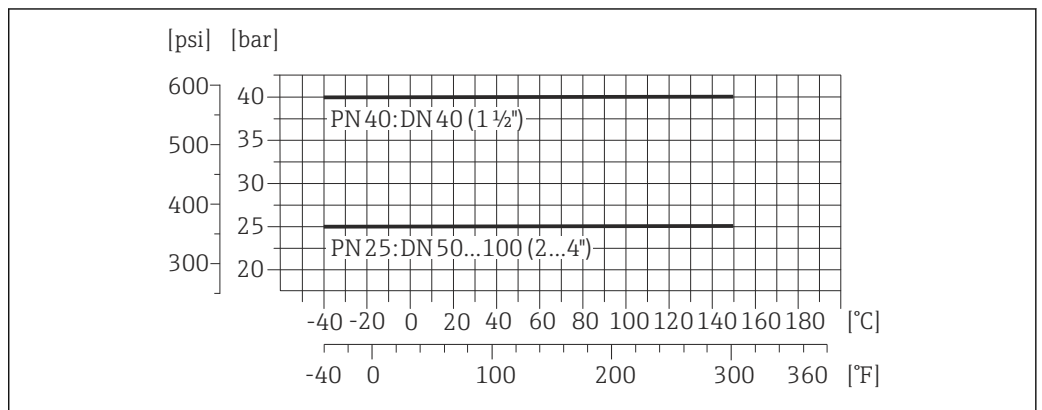
A0021194-EN

⊠ *31   Process connection material: stainless steel, 1.4404 (F316L)*

Process connection: flange according to DIN 11864-2
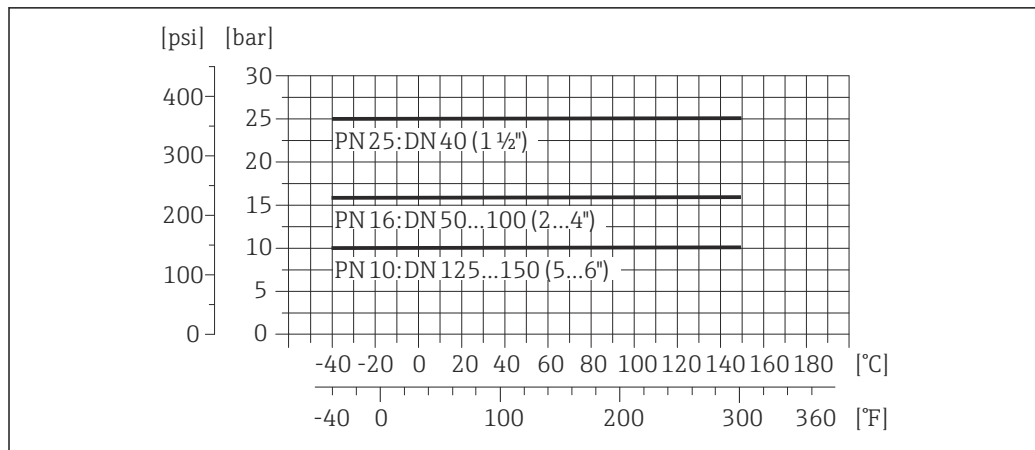
🖾 32   Process connection material: stainless steel, 1.4404 (F316L)

Pressure tightness

Liner: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:				
[mm]	[in]	+25 °C (+77 °F)	+80 °C (+176 °F)	+100 °C (+212 °F)	+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 flow velocity is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:
• v < 2 m/s (6.56 ft/s): For low conductivity values
• v > 2 m/s (6.56 ft/s): For media that produce buildup (z.B. milk with high fat content)

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

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

Pressure loss

• No pressure loss occurs as of nominal diameter DN 8 (3/8") if the sensor is installed in a pipe with the same nominal diameter.
• Pressure losses for configurations incorporating adapters according to DIN EN 545 → 🖺 37

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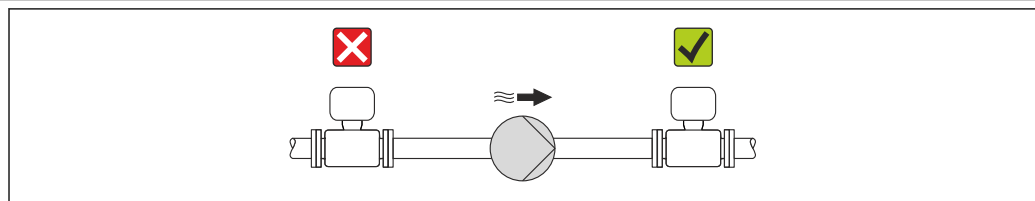
Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

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

• For information on the liner's resistance to partial vacuum → 🖺 46
• For information on the shock resistance of the measuring system → 🖺 39
• For information on the vibration resistance of the measuring system → 🖺 39

Vibrations

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

• For information on the shock resistance of the measuring system → 🖺 39
• For information on the vibration resistance of the measuring system → 🖺 39
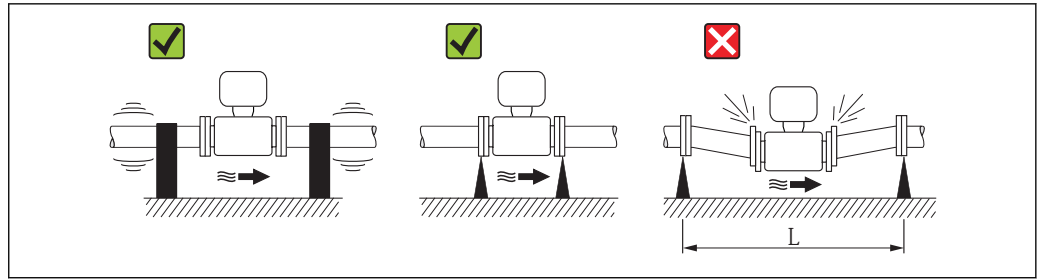
⊠ 33   *Measures to avoid device vibrations (L > 10 m (33 ft))*

Mechanical construction

Dimensions in SI units

Compact version

Order code for "Housing", option A "Compact, coated aluminum"
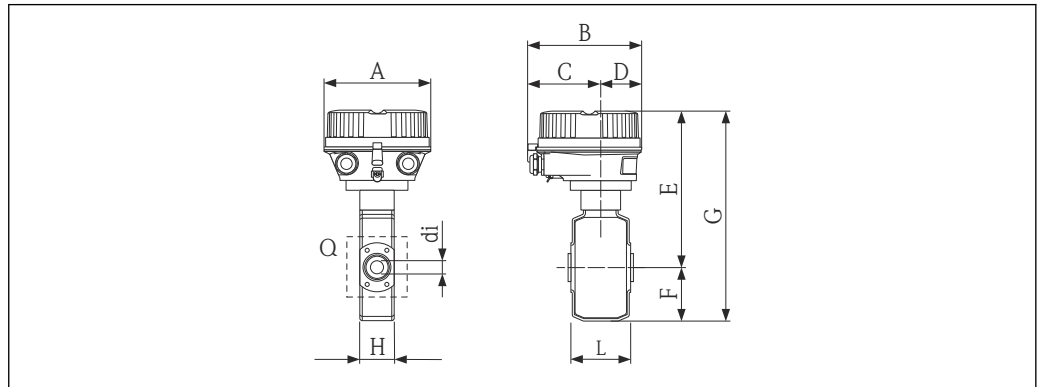
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm] [1]	F [mm]	G [mm] [1]	H [mm]	L [mm] [2]	Q [mm]	di [mm]
2	136	147.5	93.5	54	172	48	220	43	86	4 × M6	2.25
4	136	147.5	93.5	54	172	48	220	43	86	4 × M6	4.5
8	136	147.5	93.5	54	172	48	220	43	86	4 × M6	9
15	136	147.5	93.5	54	172	48	220	43	86	4 × M6	16
25	136	147.5	93.5	54	176	52	228	53	86	4 × M6	26

1)   If using a display, order code for "Display; Operation", option B: values + 28 mm
2)   Total length (L) depends on the process connections.
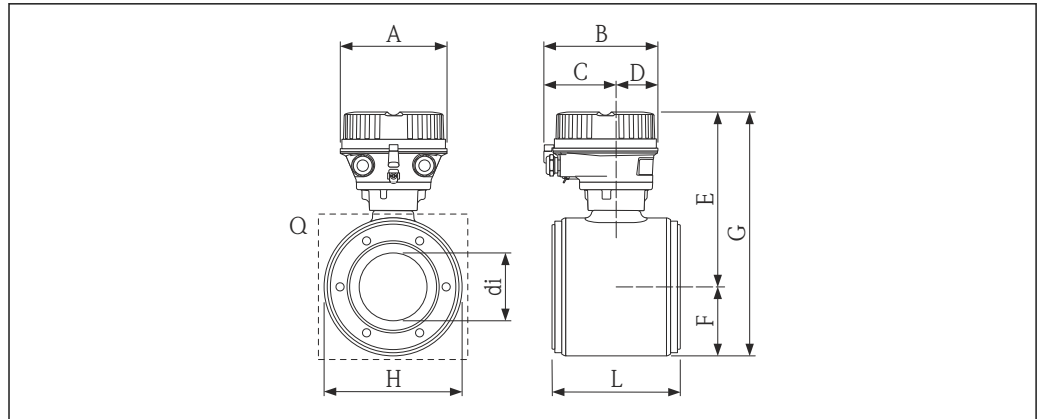
A0019468

DN	A	B	C	D	E [1]	F	G [1]	H	L [2]	Q	di
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
40	136	147.5	93.5	54	179.3	53.3	232.6	107	140	4 × M8	34.8
50	136	147.5	93.5	54	185.8	59.8	245.6	120	140	4 × M8	47.5
65	136	147.5	93.5	54	195.6	69.6	265.2	135	140	6 × M8	60.2
80	136	147.5	93.5	54	199.8	73.8	273.6	148	140	6 × M8	72.9
100	136	147.5	93.5	54	212.8	86.8	299.6	174	140	6 × M8	97.4
125	136	147.5	93.5	54	228.8	102.8	331.6	206	200	6 × M10	120.0
150	136	147.5	93.5	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.

Order code for "Housing", option B "Compact hygienic, stainless"
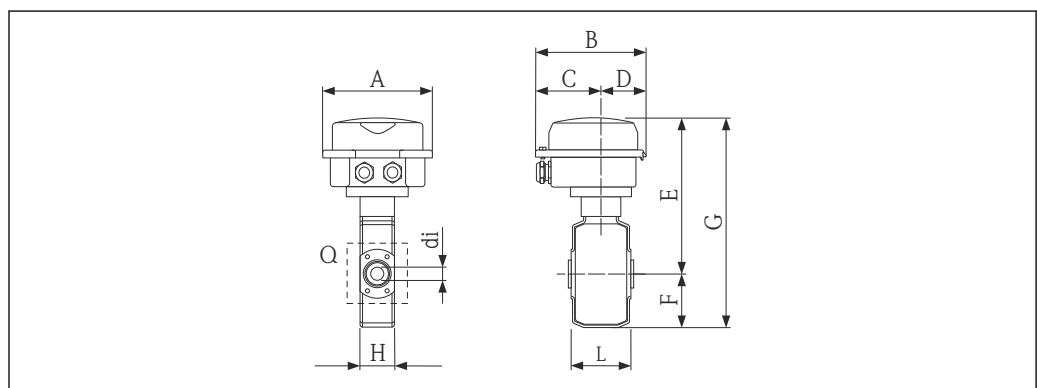
A0019464

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm] [1]	F [mm]	G [mm] [1]	H [mm]	L [mm] [2]	Q [mm]	di [mm]
2	133.5	136.8	78	58.8	166	48	214	43	86	4 × M6	2.25
4	133.5	136.8	78	58.8	166	48	214	43	86	4 × M6	4.5
8	133.5	136.8	78	58.8	166	48	214	43	86	4 × M6	9
15	133.5	136.8	78	58.8	166	48	214	43	86	4 × M6	16
25	133.5	136.8	78	58.8	170	52	222	53	86	4 × M6	26

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
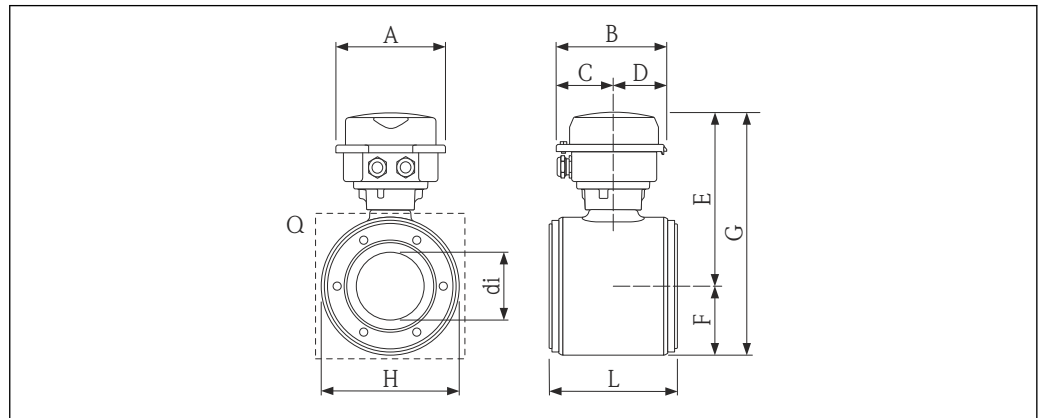
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm] [1]	F [mm]	G [mm] [1]	H [mm]	L [mm] [2]	Q [mm]	di [mm]
40	133.5	136.8	78	58.8	173.3	53.3	226.6	107	140	4 × M8	34.8
50	133.5	136.8	78	58.8	179.8	59.8	239.6	120	140	4 × M8	47.5
65	133.5	136.8	78	58.8	189.6	69.6	259.2	135	140	6 × M8	60.2
80	133.5	136.8	78	58.8	193.8	73.8	267.6	148	140	6 × M8	72.9
100	133.5	136.8	78	58.8	206.8	86.8	293.6	174	140	6 × M8	97.4
125	133.5	136.8	78	58.8	222.8	102.8	325.6	206	200	6 × M10	120.0
150	133.5	136.8	78	58.8	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.

Order code for "Housing", option C "Ultra-compact hygienic, stainless"
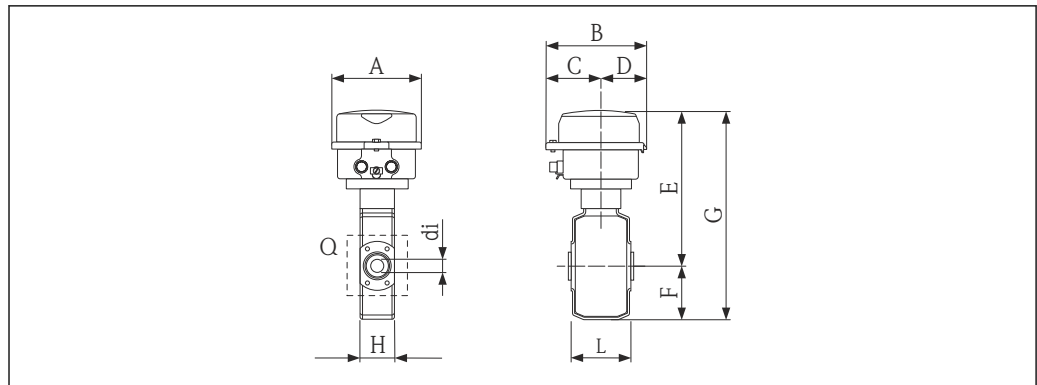
A0019466

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	111.4	123.6	67.7	55.9	166	48	214	43	86	4 × M6	2.25
4	111.4	123.6	67.7	55.9	166	48	214	43	86	4 × M6	4.5
8	111.4	123.6	67.7	55.9	166	48	214	43	86	4 × M6	9
15	111.4	123.6	67.7	55.9	166	48	214	43	86	4 × M6	16
25	111.4	123.6	67.7	55.9	170	52	222	53	86	4 × M6	26

1)   If using a display, order code for "Display; Operation", option B: values + 14 mm
2)   Total length (L) depends on the process connections.
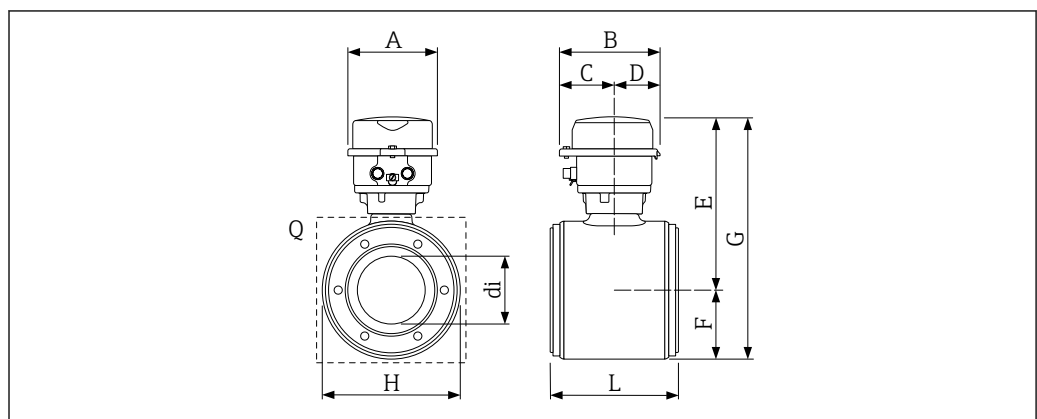
A0019471

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	111.4	123.6	67.7	55.9	173.3	53.3	226.6	107	140	4 × M8	34.8
50	111.4	123.6	67.7	55.9	179.8	59.8	239.6	120	140	4 × M8	47.5
65	111.4	123.6	67.7	55.9	189.6	69.6	259.2	135	140	6 × M8	60.2

DN	A	B	C	D	E [1]	F	G [1]	H	L [2]	Q	di
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
80	111.4	123.6	67.7	55.9	193.8	73.8	267.6	148	140	6 × M8	72.9
100	111.4	123.6	67.7	55.9	206.8	86.8	293.6	174	140	6 × M8	97.4
125	111.4	123.6	67.7	55.9	222.8	102.8	325.6	206	200	6 × M10	120.0
150	111.4	123.6	67.7	55.9	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
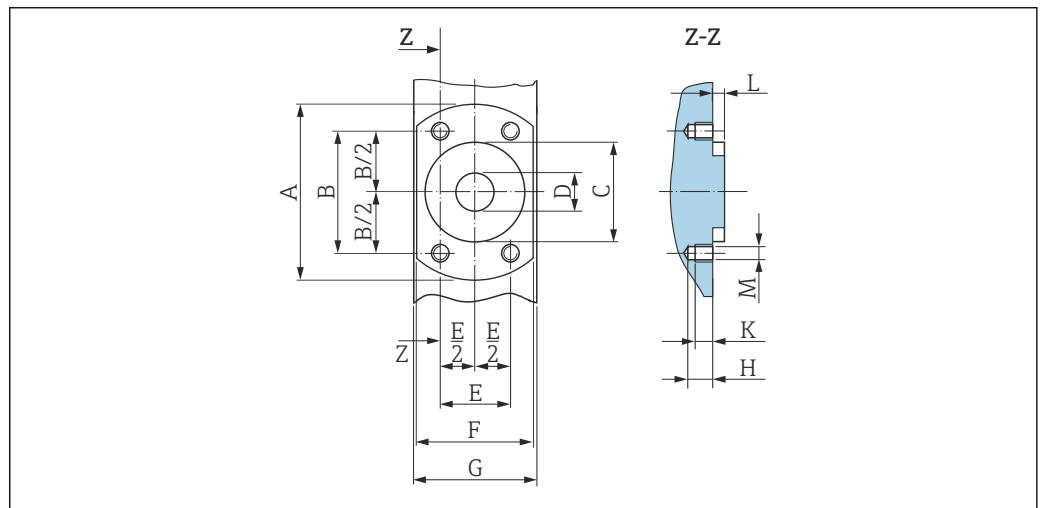
🖾 34   *Front view without process connections*

DN	A	B	C	D	E	F	G	H	K	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[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
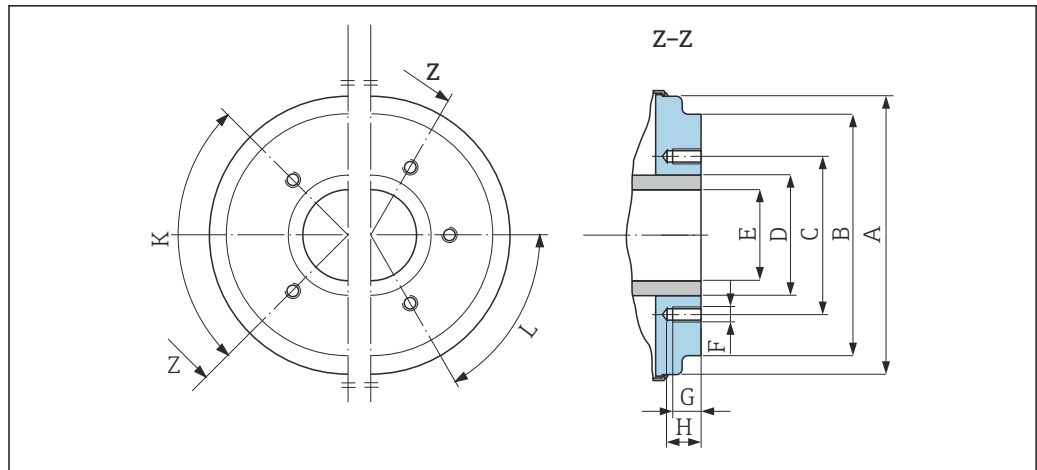
🖻 *35 Front view without process connections*

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	
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
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

Flanges

Flanges with aseptic molded seal
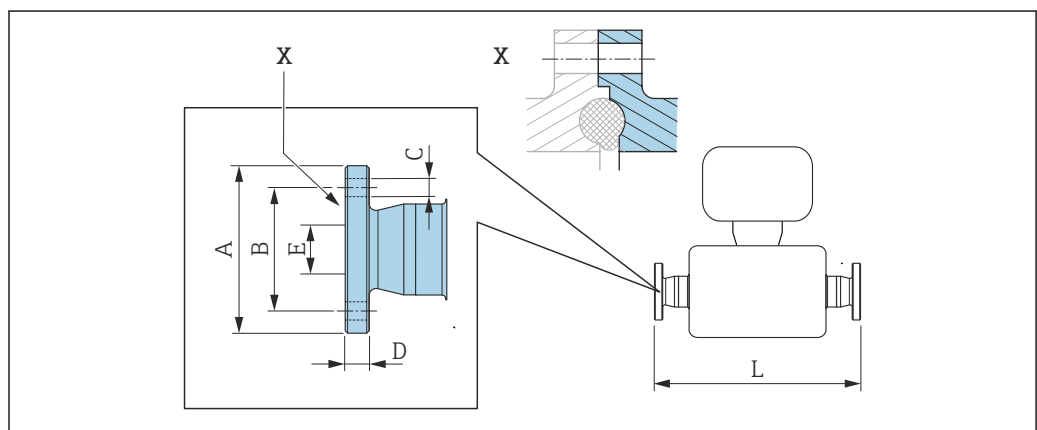
🖻 *36 Detail X: Asymmetrical process connection; the part shown in gray is provided by the supplier.*

Flange DIN 11864-2, aseptic female, Form A
1.4404 (316L)
Order code for "Process connection", option **DES**

DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
2 to 8	13 × 1.5 (DN 10)	54	37	4 × Ø9	10	10	183
15	19 × 1.5 (DN 15)	59	42	4 × Ø9	10	16	183
25	29 × 1.5 (DN 25)	70	53	4 × Ø9	10	26	183

Surface roughness: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (E) when cleaning with pigs.

Flange DIN 11864-2, aseptic flange, Form A
1.4404 (316L)
Order code for "Process connection", option **DES**

DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [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: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (E) when cleaning with pigs.

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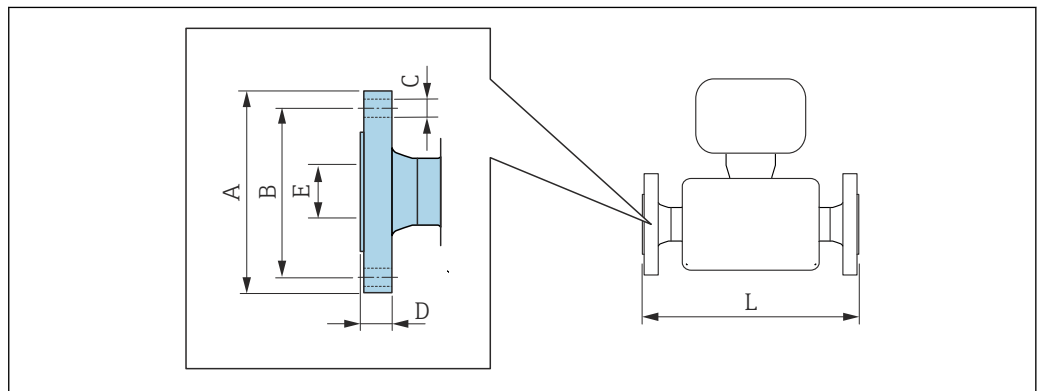
Flange according to EN 1092-1 (DIN 2501), Form B: PN 40
1.4404 (316L)
Order code for "Process connection", option **D5S**

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

Flange according 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]
25	115	85	4 × Ø14	18	28.5	198.4
Surface roughness: $R_a \leq 1.6$ µm						

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

Flange according 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: $R_a \leq 1.6$ µm						

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

Flange according to JIS B2220: 20K
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: $R_a \leq 1.6$ µm						

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

A0022221

Lap joint flange according 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: $R_a \leq 1.6$ 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 according 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: $R_a \leq 1.6$ µm
Grounding rings are not necessary.

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

Lap joint flange according 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: $R_a \leq 1.6$ 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 according 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: $R_a \leq 1.6$ µm
Grounding rings are not necessary.

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

Lap joint flange according 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: $R_a \leq 1.6$ 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 according 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: $R_a \leq 1.6$ µm
Grounding rings are not necessary.

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

Welding nipple

Welding nipple with aseptic molded seal

Welding nipple according to EN 10357 (DIN 11850)
1.4404 (316L)
Order code for "Process connection", option **DAS**

DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [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 (DIN 11850)
1.4404 (316L)
Order code for "Process connection", option **DAS**

| DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [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: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Welding nipple according to ISO 2037
1.4404 (316L)
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: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Welding nipple according to ASME BPE
1.4404 (316L)
Order code for "Process connection", option **AAS**

DN [mm]	Suitable for pipe 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	149.9	149.9	300

Surface roughness: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Welding nipple with O-ring seal

A0027510

Welding nipple according to ODT/SMS				
1.4404 (316L)				
Order code for "Process connection", option **A2S**				
DN [mm]	Suitable for pipe ODT/SMS [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: $R_a \leq 1.6$ μm				

Welding nipple according to DIN EN ISO 1127				
1.4404 (316L)				
Order code for "Process connection", option **D1S**				
DN [mm]	Suitable for pipe DIN EN ISO 1127 [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: $R_a \leq 1.6$ μm				

Welding nipple according to ISO 2037				
1.4404 (316L)				
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: $R_a \leq 1.6$ μm				

Clamp connections

Clamp connections with aseptic molded seal
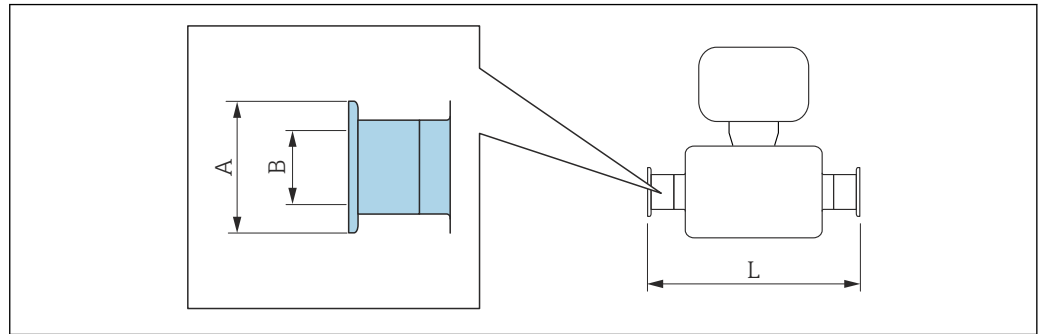
Clamp according to DIN 32676
1.4404 (316L)
Order code for "Process connection", option **DBS**

DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [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: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Tri-Clamp
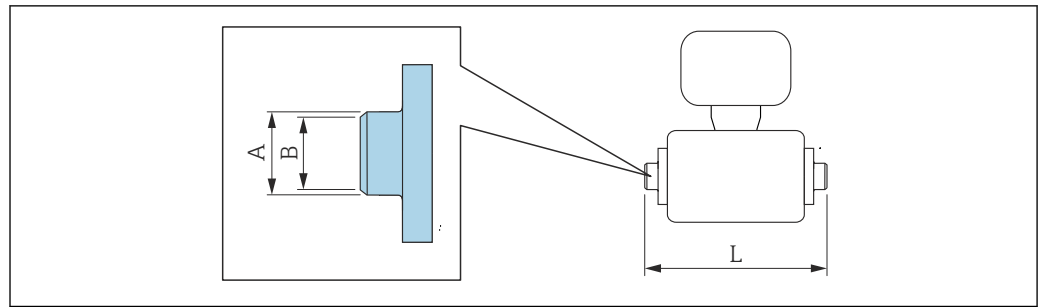**1.4404 (316L)**
Order code for "Process connection", option **FAS**

DN [mm]	Suitable for pipe as per 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
150	152.4 × 2.77	166.9	146.9	300

Surface roughness: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube 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: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Cable glands

Threaded adapter with aseptic molded seal
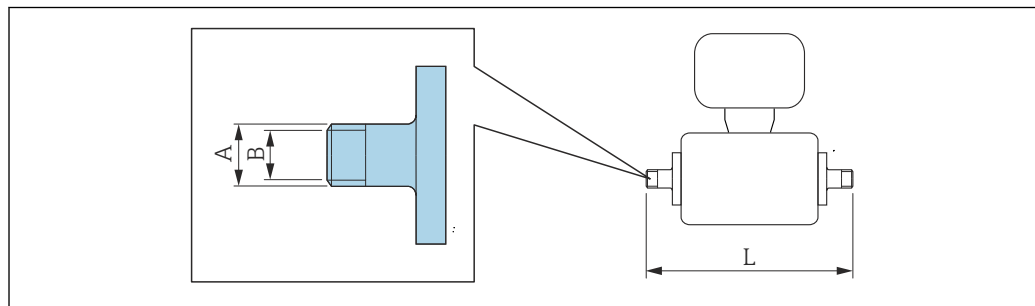
A0027509

Coupling SC DIN 11851, threaded adapter
1.4404 (316L)
Order code for "Process connection", option DCS

DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [mm]	A [mm/in]	B [mm]	L [mm]
2 to 8	12 × 1 (DN 10)	Rd 28 × $\frac{1}{8}$	10	174
15	18 × 1.5 (ODT ¾")	Rd 34 × $\frac{1}{8}$	16	174
25	28 × 1 or 28×1.5	Rd 52 × $\frac{1}{6}$	26	190
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: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Coupling DIN 11864-1, aseptic threaded hygienic connection, Form A
1.4404 (316L)
Order code for "Process connection", option **DDS**

DN [mm]	Suitable for pipe EN 10357 (DIN 11850) [mm]	A [mm/in]	B [mm]	L [mm]
2 to 8	Pipe 13 × 1.5 (DN 10)	Rd 28 × ⅛	10	170
15	Pipe 19 × 1.5	Rd 34 × ⅛	16	170
25	Pipe 29 × 1.5	Rd 52 × ⅙	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: $R_a \le 0.8\ \mu m$, optional $\le 0.38\ \mu m$
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Coupling ISO 2853, threaded adapter
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: $R_a \le 0.8\ \mu m$, optional $\le 0.38\ \mu m$
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

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

DN [mm]	Suitable for pipe ODT [mm]	DN SMS 1145 [mm]	A [mm/in]	B [mm]	L [mm]
25	1	25	Rd40 × ⅙	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: $R_a \le 0.8\ \mu m$, optional $\le 0.38\ \mu m$
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Threaded adapter with O-ring seal
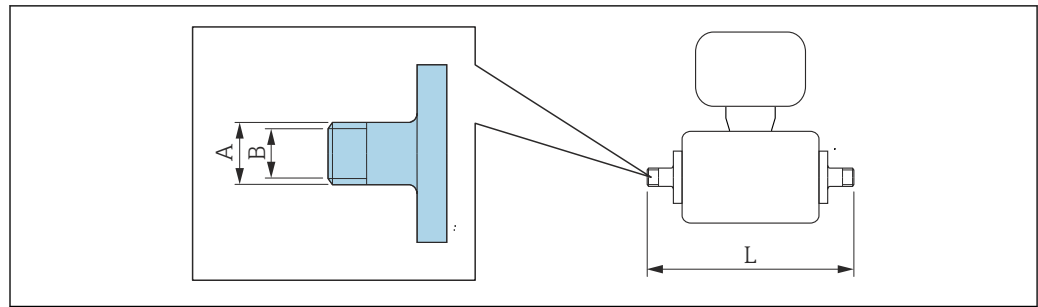
A0027509

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

DN [mm]	A [mm/in]	B [mm]	L [mm]
2 to 8	R 10.1 × 3/8	10	166
15	R 13.2 × ½	16	166
25	R 16.5 × 1	25	170
Surface roughness: $R_a \leq 1.6$ µm			

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

DN [mm]	A [mm/in]	B [mm]	L [mm]
2 to 8	Rp 13 × 3/8	9	176
15	Rp 14 × ½	16	176
25	Rp 17 × 1	27.2	188
Surface roughness: $R_a \leq 1.6$ µm			

Hose adapter

Hose adapter with O-ring seal
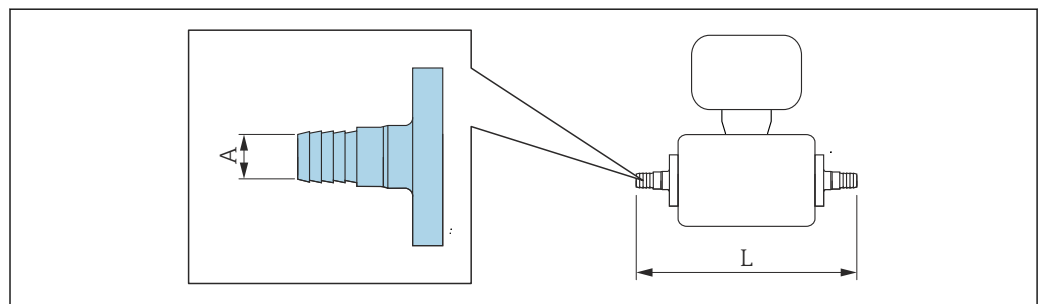
A0027511

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: $R_a \le 1.6$ µm			

Adhesive sleeves

Adhesive sleeves with O-ring seal
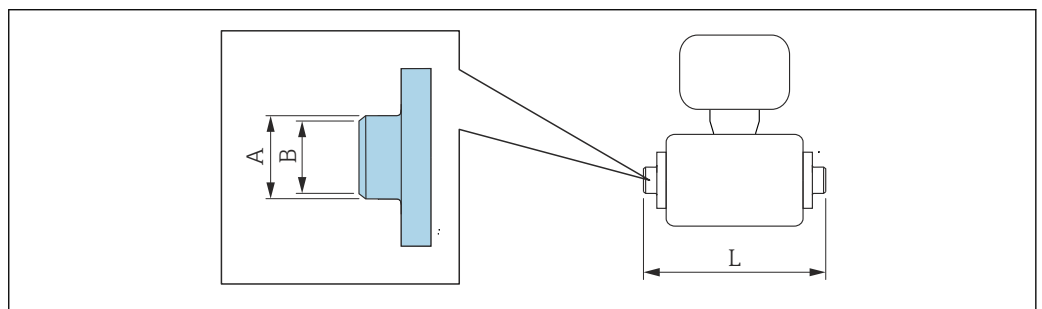
A0027510

Adhesive sleeve PVC *Order code for "Process connection", options* **O1V, O2V**				
DN [mm]	Suitable for pipe [mm] / [in]	A [mm]	B [mm]	L [mm]
2 to 8	20 × 2 (DIN 8062)	27	20.2	163
15	½	27.3	21.5	163
25	20 × 2 (DIN 8062)	27	20.2	142
Surface roughness: $R_a \le 1.6$ µm The required grounding rings can be ordered as accessories (order code: DK5HR-****).				

Mountings sets

Wall mounting kit
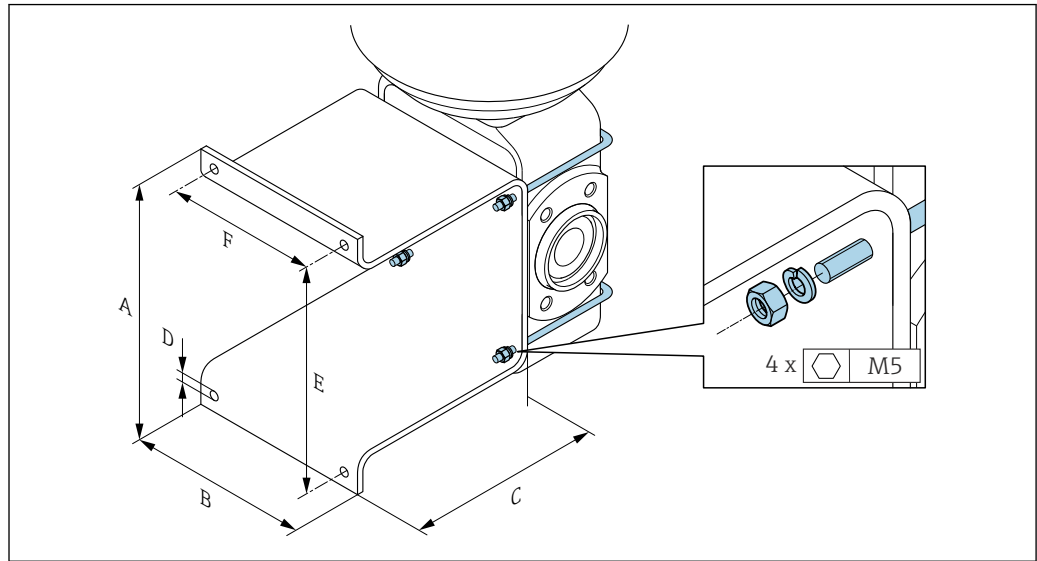
A0005537

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

Accessories

Spacer
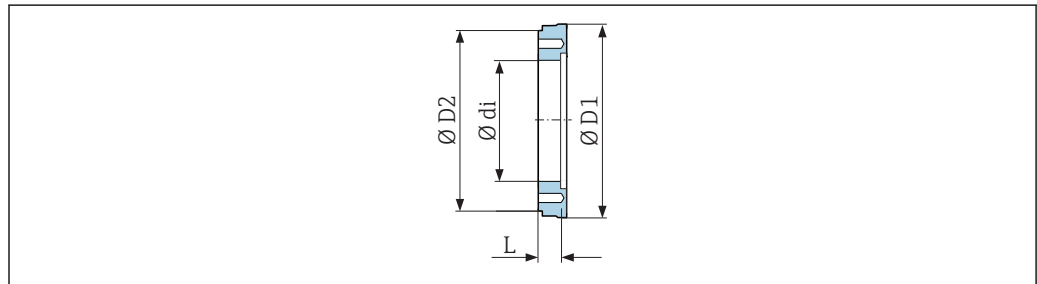
A0017294

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

Clamp connections with aseptic molded seal available for order
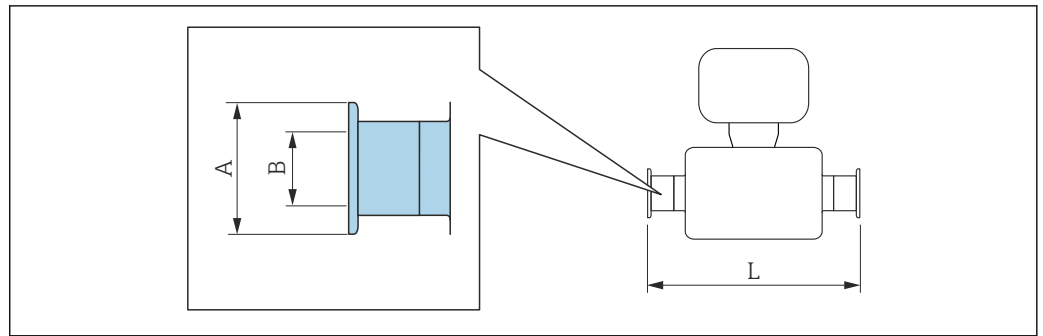
A0015625

| Tri-Clamp 1.4404 (316L) Order code: DKH**-HF**				
DN [mm]	Suitable for pipe in accordance with ASME BPE (reduction) [mm]	A [mm]	B [mm]	L [mm]
15	Pipe ODT 1	50.4	22.1	143
Surface roughness: $R_a \leq 0.8$ µm, optional ≤ 0.38 µm Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.				

Threaded glands with O-ring seal available for order
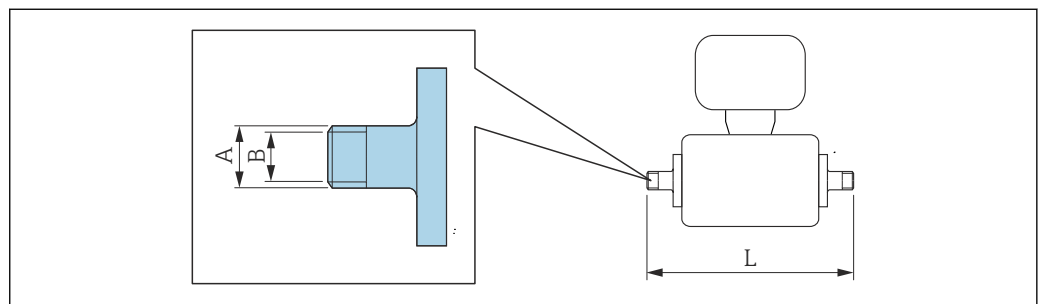
A0027509

External thread 1.4404 (316L) Order code: DKH**-GD**				
DN [mm]	Suitable for NPT internal thread [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: $R_a \leq 1.6$ µm				

Internal thread 1.4404 (316L) Order code: DKH**-GC**				
DN [mm]	Suitable for NPT external thread [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

Internal thread 1.4404 (316L) Order code: DKH**-GC**				
DN [mm]	Suitable for NPT external thread [in]	A [mm/in]	B [mm]	L [mm]
25	NPT 1	R 17 × 1	27.2	188
Surface roughness: $R_a \leq 1.6\ \mu m$				

Grounding rings
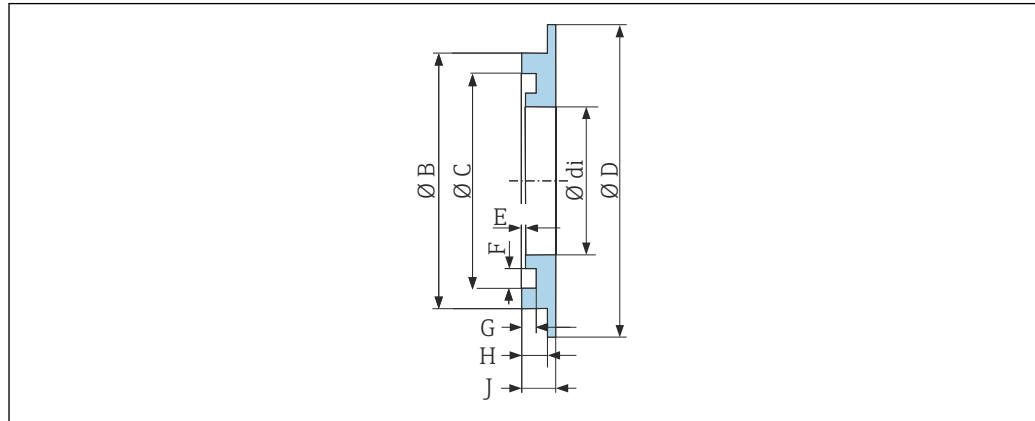
A0017673

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**

Order code for "Housing", option A "Compact, coated aluminum"
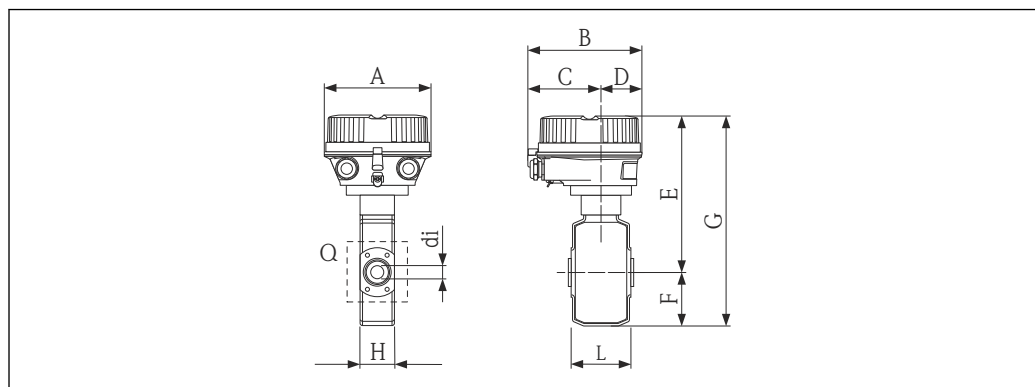
A0019463

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	5.81	3.68	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.09
5/32	5.35	5.81	3.68	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.18
5/16	5.35	5.81	3.68	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.35
½	5.35	5.81	3.68	2.13	6.75	1.88	8.63	1.69	3.39	4 × M6	0.63
1	5.35	5.81	3.68	2.13	6.90	2.04	8.94	2.07	3.39	4 × M6	1.02

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.
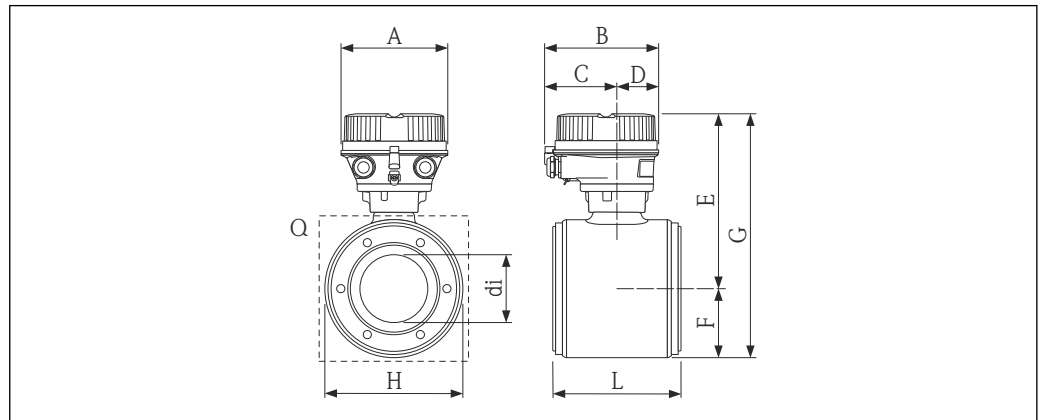
A0019468

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	5.81	3.68	2.13	7.06	2.10	9.16	4.21	5.51	4 × M8	1.37
2	5.35	5.81	3.68	2.13	7.31	2.35	9.67	4.72	5.51	4 × M8	1.87
3	5.35	5.81	3.68	2.13	7.87	2.91	10.80	5.83	5.51	6 × M8	2.87
4	5.35	5.81	3.68	2.13	8.38	3.42	11.80	6.85	5.51	6 × M8	3.83
5	5.35	5.81	3.68	2.13	9.01	4.05	13.10	8.11	7.87	6 × M10	4.72
6	5.35	5.81	3.68	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.

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

A0019464

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	5.26	5.39	3.07	2.31	6.51	1.88	8.39	1.69	3.39	4 × M6	0.09
5/32	5.26	5.39	3.07	2.31	6.51	1.88	8.39	1.69	3.39	4 × M6	0.18
5/16	5.26	5.39	3.07	2.31	6.51	1.88	8.39	1.69	3.39	4 × M6	0.35
½	5.26	5.39	3.07	2.31	6.51	1.88	8.39	1.69	3.39	4 × M6	0.63
1	5.26	5.39	3.07	2.31	6.66	2.04	8.70	2.07	3.39	4 × M6	1.02

1) If using a display, order code for "Display; Operation", option B: values + 1.1 in
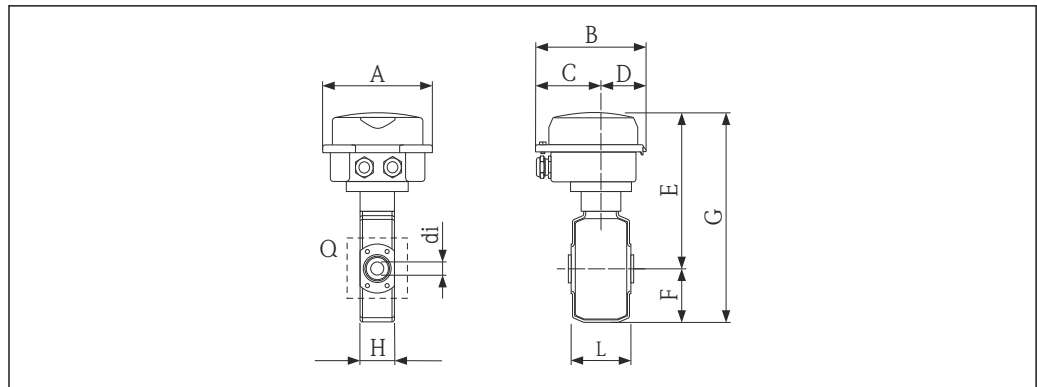2) Total length (L) depends on the process connections.
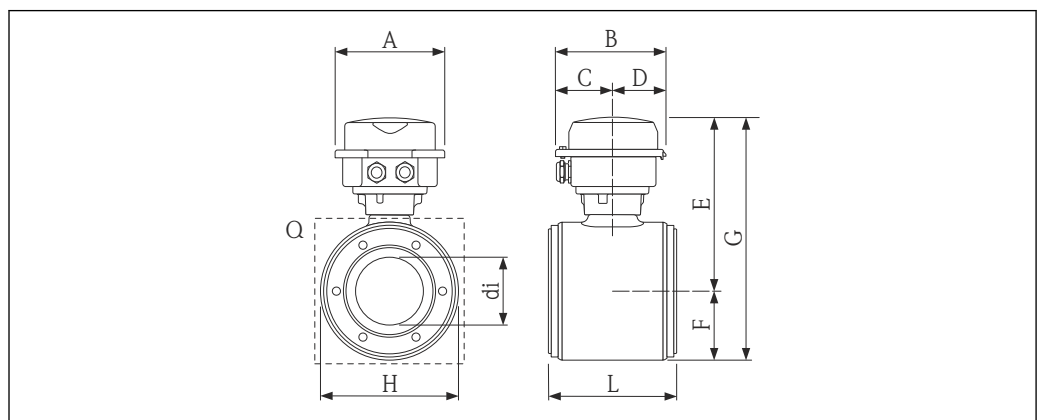
A0019470

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	5.26	5.39	3.07	2.31	6.82	2.10	8.92	4.21	5.51	4 × M8	1.37
2	5.26	5.39	3.07	2.31	7.08	2.35	9.43	4.72	5.51	4 × M8	1.87
3	5.26	5.39	3.07	2.31	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 [in] [1]	F [in]	G [in]	H [in]	L [in] [2]	Q [mm]	di [in]
4	5.26	5.39	3.07	2.31	8.14	3.42	11.60	6.85	5.51	6 × M8	3.83
5	5.26	5.39	3.07	2.31	8.77	4.05	12.80	8.11	7.87	6 × M10	4.72
6	5.26	5.39	3.07	2.31	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.

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

A0019466

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in] [1]	F [in]	G [in]	H [in]	L [in] [2]	Q [mm]	di [in]
1/12	4.39	4.87	2.67	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.09
5/32	4.39	4.87	2.67	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.18
5/16	4.39	4.87	2.67	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.35
½	4.39	4.87	2.67	2.20	6.51	1.88	8.39	1.69	3.39	4 × M6	0.63
1	4.39	4.87	2.67	2.20	6.66	2.04	8.70	2.07	3.39	4 × M6	1.02

1) If using a display, order code for "Display; Operation", option B: values + 1.1 in
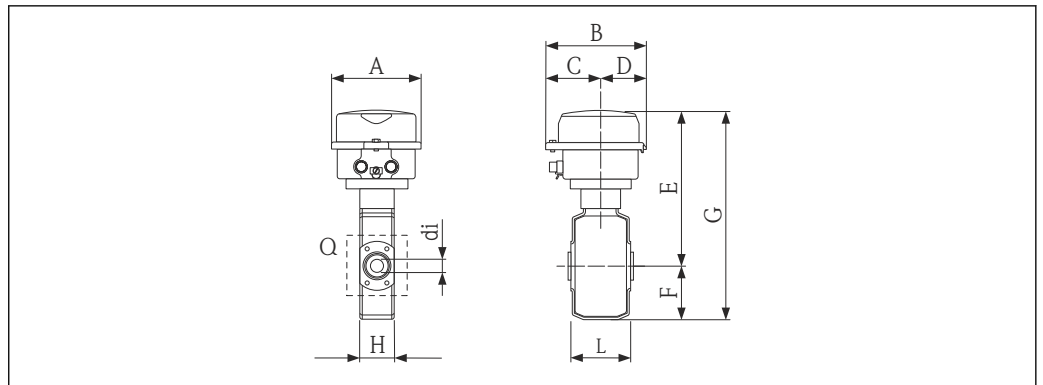2) Total length (L) depends on the process connections.
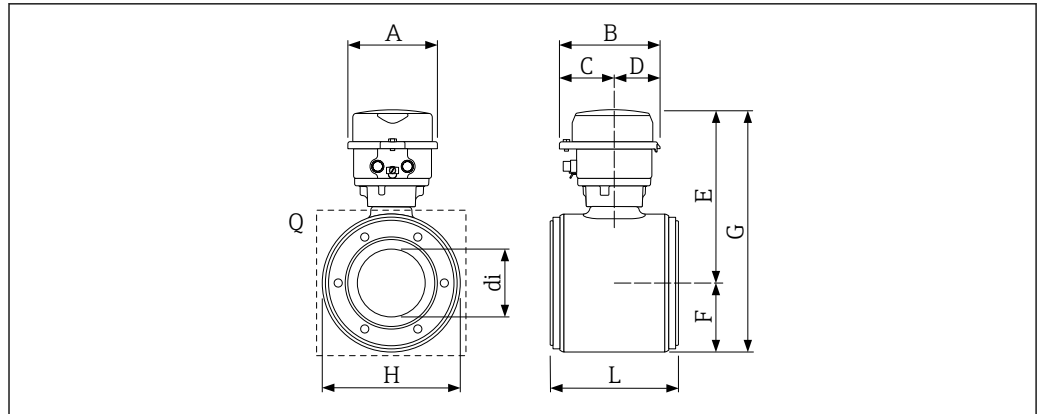
A0019471

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	4.39	4.87	2.67	2.20	6.82	2.10	8.92	4.21	5.51	4 × M8	1.37
2	4.39	4.87	2.67	2.20	7.08	2.35	9.43	4.72	5.51	4 × M8	1.87
3	4.39	4.87	2.67	2.20	7.63	2.91	10.50	5.83	5.51	6 × M8	2.87
4	4.39	4.87	2.67	2.20	8.14	3.42	11.60	6.85	5.51	6 × M8	3.83
5	4.39	4.87	2.67	2.20	8.77	4.05	12.80	8.11	7.87	6 × M10	4.72
6	4.39	4.87	2.67	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
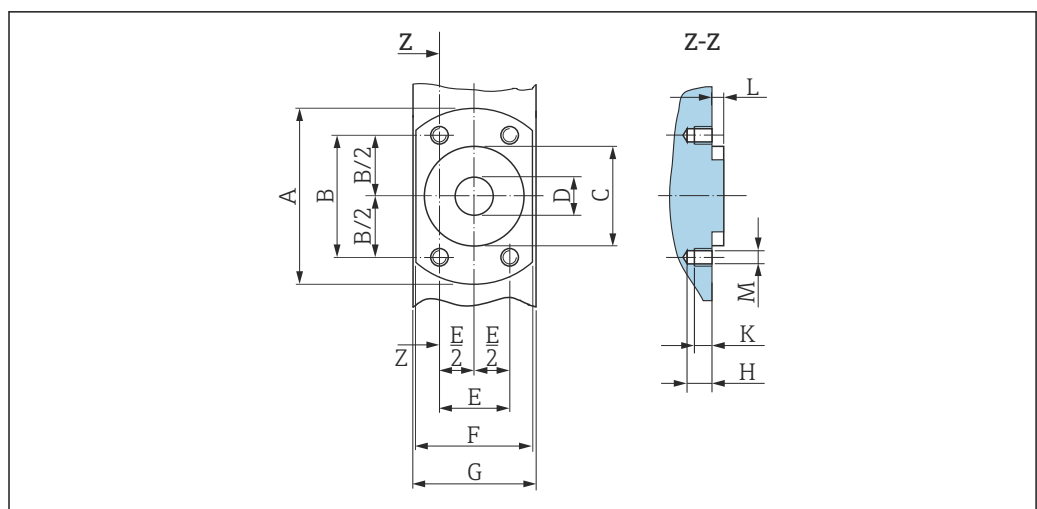2) Total length (L) depends on the process connections.

Sensor flange connection

A0017657

🖾 *37   Front view without process connections*

DN	A	B	C	D	E	F	G	H	K	L	M
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[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
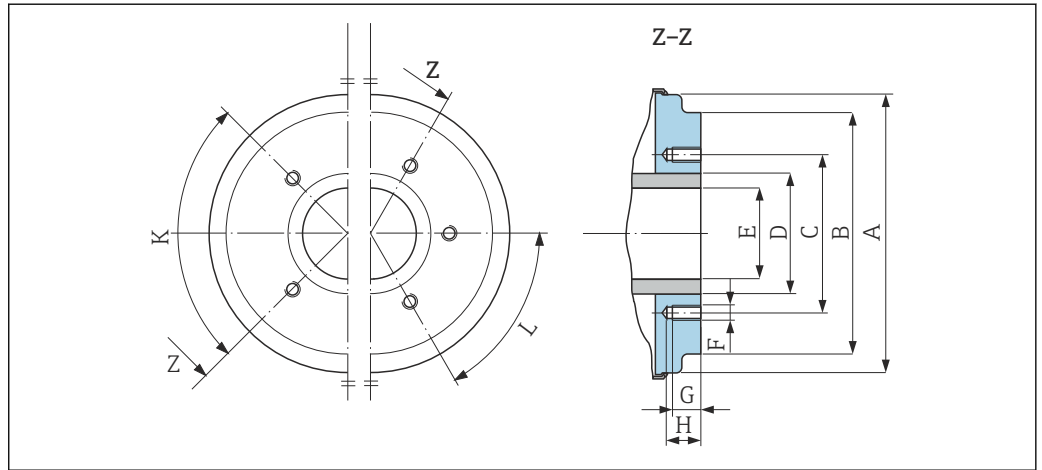
🖼 *38   Front view without process connections*

DN	A	B	C	D	E	F	G	H	K	L
									90° ±0.5°	60° ±0.5°
[in]	[in]	[in]	[in]	[in]	[in]	[mm]	[in]	[in]	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

Flanges

Flanges with O-ring seal
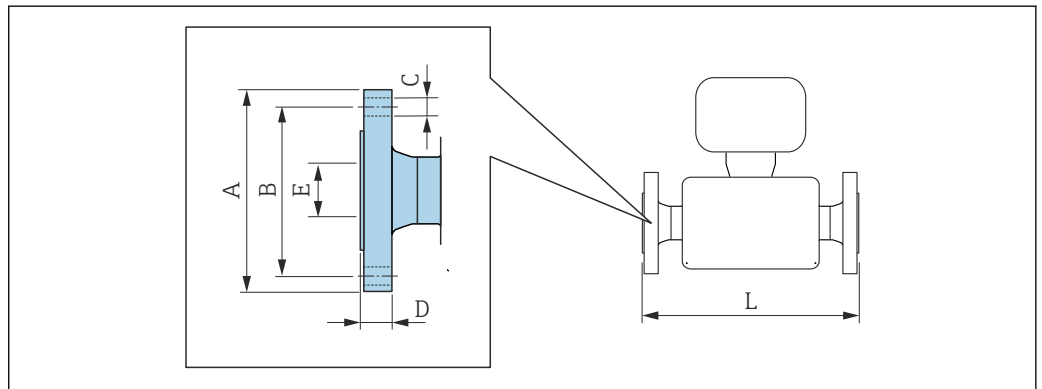
Flange according to ASME B16.5: Class 150
1.4404 (316L)
Order code for "Process connection", option A1S

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 × Ø 0.62	0.44	0.62	8.59
1/2	3.50	2.38	4 × Ø 0.62	0.44	0.63	8.59
1	4.25	3.12	4 × Ø 0.62	0.56	1.05	9.05

Surface roughness: $R_a \leq 63$ µin

1) DN 1/12 to 3/8 with DN 1/2" flanges as standard
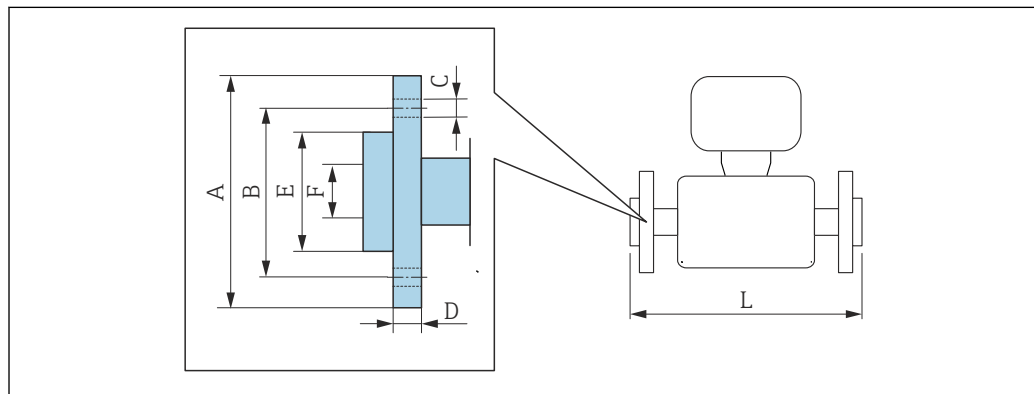
A0022221

Lap joint flange according 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
1/2	3.74	2.36	4 × Ø 0.62	0.59	1.38	0.63	7.87

Surface roughness: $R_a \leq 63$ µin
The required grounding rings can be ordered as accessories (order code: DK5HR-****).

1) DN 1/12 to 3/8 with DN 1/2" flanges as standard

Lap joint flange according 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
1/2	3.74	2.36	4 × Ø 0.62	0.59	1.38	0.63	7.87

Surface roughness: $R_a \leq 63$ µin
Grounding rings are not necessary.

1) DN 1/12 to 3/8 with DN 1/2" flanges as standard

Welding nipple

Welding nipple with aseptic molded seal

A0027510

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

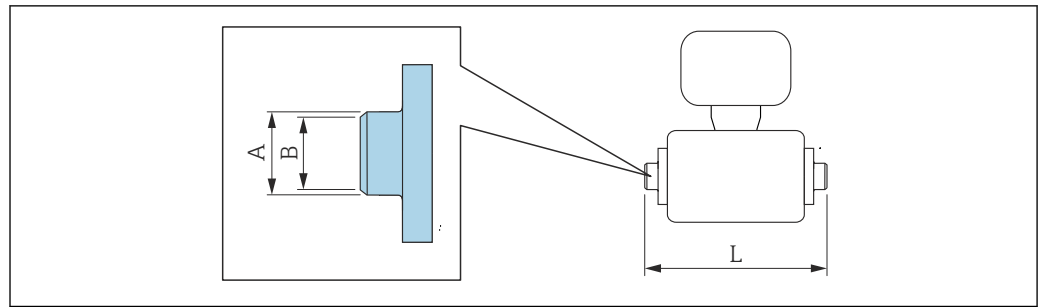| DN [in]	Suitable for pipe ISO 2037 [in]	A [in]	B [in]	L [in]
¹⁄₁₂ to ³⁄₈	0.50 × 0.06	0.47	0.39	4.65
½	0.75 × 0.06	0.71	0.63	4.65
1	1.00 × 0.06	0.98	0.89	4.65
1 ½	1.50 × 0.05	1.50	1.40	8.66
2	2.00 × 0.05	2.01	1.91	8.66
3	3.00 × 0.06	3.00	2.87	8.66
4	2.50 × 0.08	4.00	3.84	8.66
5	4.00 × 0.08	5.50	5.34	15.00
6	6.63 × 0.10	6.63	6.42	15.00

Surface roughness: R_a ≤ 31.5 µin, optional ≤ 15 µin
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Welding nipple according to ASME BPE
1.4404 (316L)
Order code for "Process connection", option **AAS**

DN [in]	Suitable for pipe 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	5.90	11.80

Surface roughness: R_a ≤ 31.5 µin, optional ≤ 15 µin
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Welding nipple with O-ring seal

A0027510

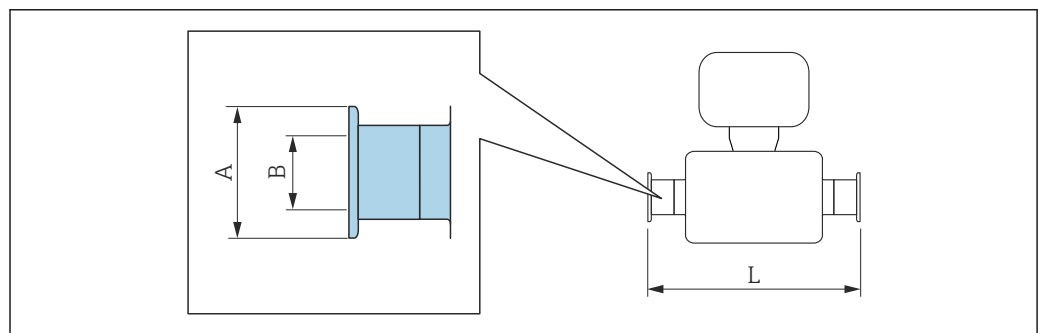| Welding nipple according to ODT/SMS 1.4404 (316L) *Order code for "Process connection", option* **A2S**				
DN [in]	Suitable for pipe ODT/SMS [in]	A [in]	B [in]	L [in]
¹⁄₁₂ to ³⁄₈	0.53 × 0.09	0.53	0.35	4.99
½	0.84 × 0.10	0.84	0.63	4.99
Surface roughness: $R_a \leq 63$ µin				

Clamp connections

Clamp connections with aseptic molded seal

A0015625

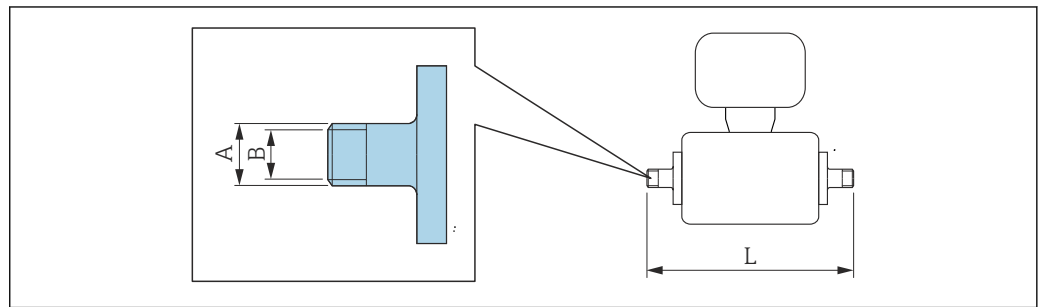| Tri-Clamp 1.4404 (316L) *Order code for "Process connection", option* **FAS**				
DN [in]	Suitable for pipe as per ASME BPE [in]	A [in]	B [in]	L [in]
¹⁄₁₂ to ³⁄₈	½	1	0.37	5.63
½	¾	25	0.62	5.63
1	1	2	0.87	5.63
1 ½	1.50 × 0.06	1.98	1.37	8.66
2	2.00 × 0.06	2.52	1.87	8.66
3	3.00 × 0.06	3.58	2.87	8.66
4	4.00 × 0.08	4.68	3.83	8.66
6	6.00 × 0.11	6.57	5.90	11.80
Surface roughness: $R_a \leq 31.5$ µin, optional ≤ 15 µin Please note the internal diameters of the measuring tube 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: R_a ≤ 31.5 µin, optional ≤ 15 µin
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Cable glands

Threaded adapter with aseptic molded seal

A0027509

Coupling SC DIN 11851, threaded adapter
1.4404 (316L)
Order code for "Process connection", option **DCS**

DN [in]	Suitable for pipe EN 10357 (DIN 11850) [in]	A [in]	B [in]	L [in]
½	Pipe ODT ¾	Rd0.05 × 0.13	0.63	6.85
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 × 1/4	3.19	11.00
4	4.09 × 0.08	Rd 5.12× 1/4	3.94	11.40
5	5.08 × 0.08	Rd 6.30 × 1/4	4.92	15.00
6	6.06 × 0.08	Rd 6.30 × 1/4	5.91	15.40

Surface roughness: R_a ≤ 31.5 µin, optional ≤ 15 µin
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Coupling ISO 2853, threaded adapter
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: R_a ≤ 31.5 µin, optional ≤ 15 µin
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

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

DN [in]	Suitable for pipe ODT [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 × 1/6	1.37	10.10
2	2.00 × 0.06	2.00	Rd 2.76 × 1/6	1.87	10.10
3	3.00 × 0.06	3.00	Rd 3.86 × 1/6	2.86	10.90
4	4.00 × 0.08	4.00	Rd 5.20 × 1/6	3.83	11.30

Surface roughness: R_a ≤ 31.5 µin, optional ≤ 15 µin
Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.

Threaded adapter with O-ring seal
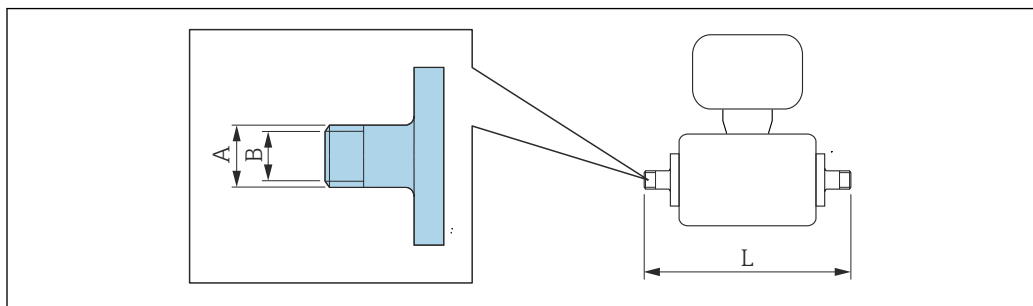
A0027509

**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	Rd 0.40 × 3/8	0.39	6.53
½	R ½	Rd 0.52 × ½	0.63	6.53
1	R 1	Rd 0.66 × 1	0.98	6.69

Surface roughness: R_a ≤ 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	Rd 0.51 × 3/8	0.35	6.93
½	Rp ½	Rd 0.55 × ½	0.63	6.93
1	Rp 1	Rd 0.67 × 1	1.07	7.41
Surface roughness: R_a ≤ 63 µin				

Adhesive sleeves

Adhesive sleeves with O-ring seal
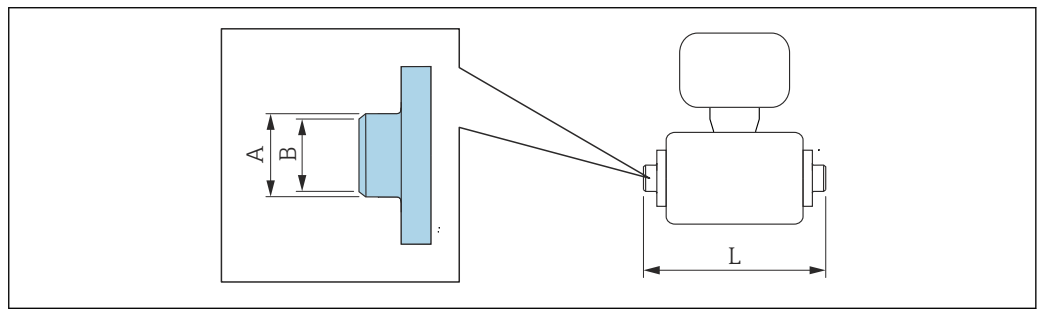
A0027510

Adhesive sleeve				
PVC				
Order code for "Process connection", options **O1V, O2V**				
DN [in]	Suitable for pipe [in]	A [in]	B [in]	L [in]
¹⁄₁₂ to ³⁄₈	½	1.07	0.85	6.43
Surface roughness: R_a ≤ 63 µin				
The required grounding rings can be ordered as accessories (order code: DK5HR-****).				

Mountings sets

Wall mounting kit
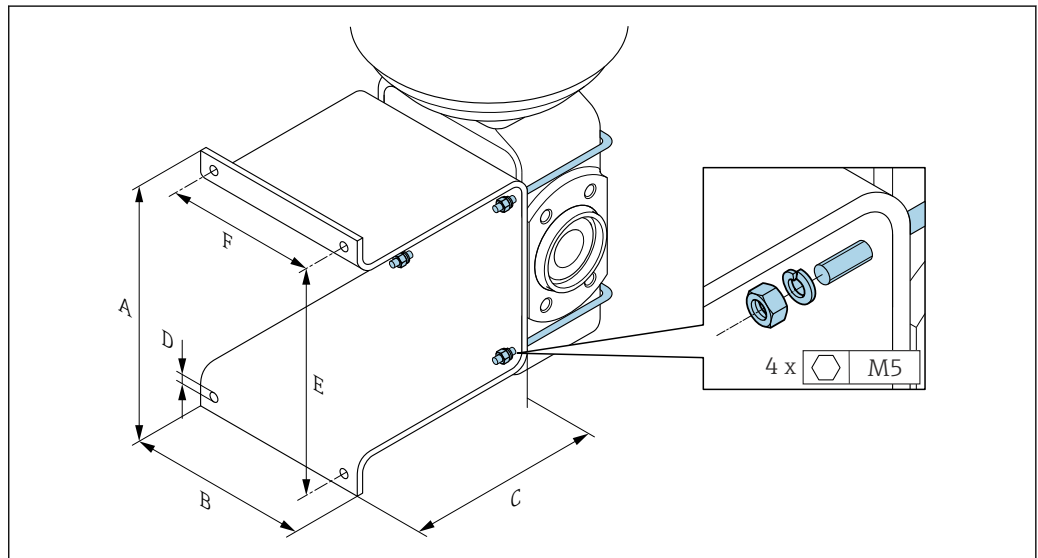
A0005537

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

Accessories

Spacer
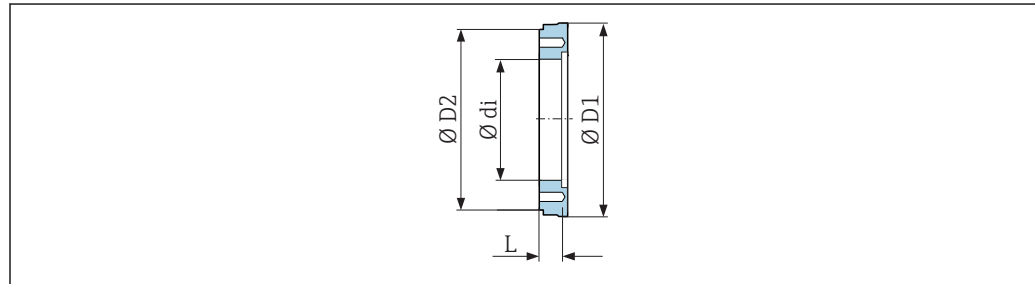
A0017294

Order code: DK5HB-****				
DN	di	D1	D2	L
[in]	[in]	[in]	[in]	[in]
3	2.87	5.54	5.55	1.30
4	3.83	6.56	6.38	1.30

Clamp connections with aseptic molded seal available for order
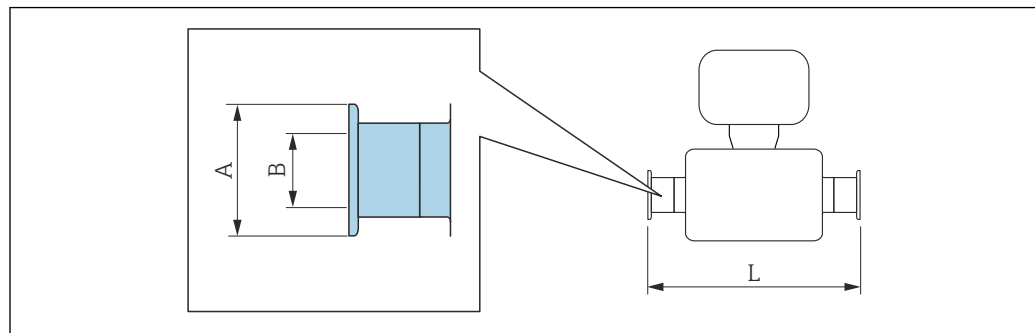

A0015625

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

| Tri-Clamp 1.4404 (316L) Order code: DKH**-HF**					
DN [in]	Suitable for pipe in accordance with ASME BPE (reduction) [in]	A [in]	B [in]	L [in]	
½	Pipe ODT 1	2	0.87	5.63	
Surface roughness: $R_a \leq 31.5$ µin, optional ≤ 15 µin Please note the internal diameters of the measuring tube and process connection (B) when cleaning with pigs.					

Threaded glands with O-ring seal available for order
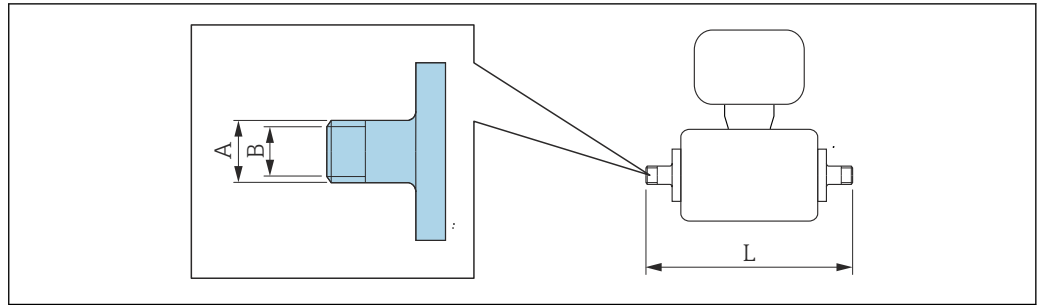
A0027509

External thread 1.4404 (316L) Order code: DKH**-GD**				
DN [in]	Suitable for NPT internal thread [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: $R_a \leq 63$ µin				

Internal thread 1.4404 (316L) Order code: DKH**-GC**				
DN [in]	Suitable for NPT external thread [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: $R_a \leq 63$ µin				
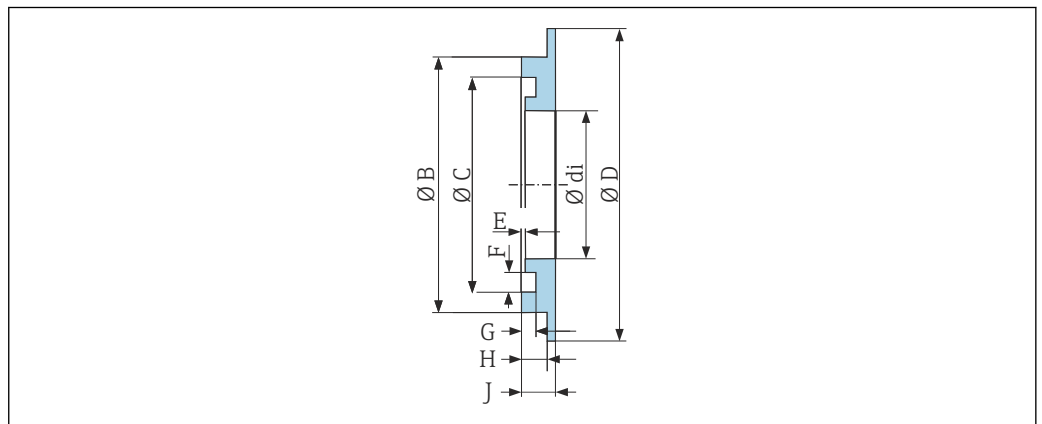
Grounding rings

A0017673

For lap joint flange made of PVDF and PVC adhesive sleeve 1.4435 (316L), Alloy C22, tantalum Order code: DK5HR-****									
DN	di	B	C	D	E	F	G	H	J
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[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 for standard pressure ratings. Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Different values due to different transmitter versions:

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
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	0.89
25	–	PN 16/40	26.0	1.02
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

| Nominal diameter		Pressure rating [1]	Process connection internal diameter	
		EN (DIN)	PFA	
[mm]	[in]	[bar]	[mm]	[in]
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

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 (→ 🖺 83):
  – For order code for "Housing", option **A**: glass
  – For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands
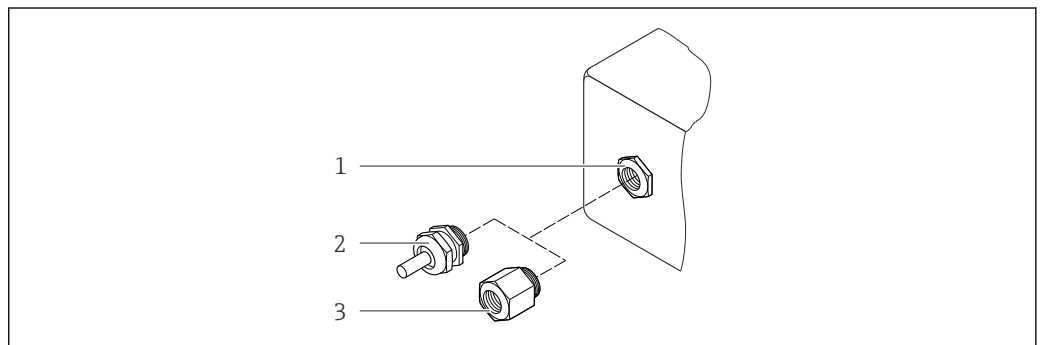
🖾 40   Possible cable entries/cable glands

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

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

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

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

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 177.1550, 3A)

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, Kalrez
• Aseptic molded seal, DN 2 to 150 (1/12 to 6"): EPDM [1], FKM, silicone [1]

Accessories

Grounding rings

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

Wall mounting kit

Stainless steel 1.4301 (304)

Spacer

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)
• External thread
• Internal thread
• Hose connection
• PVC adhesive sleeve

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1) USP Class VI, FDA 21 CFR 177.2600, 3A

With aseptic molded 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 → 🖹 82

Surface roughness	Stainless steel electrodes, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); platinum; tantalum: ≤ 0.3 to 0.5 µm (11.8 to 19.7 µin) (All data relate to parts in contact with fluid)

Liner with PFA:
≤ 0.4 µm (15.7 µin)
(All data relate to parts in contact with fluid)

Stainless steel process connections:
- With O-ring seal: ≤ 1.6 µm (63 µin)
- With aseptic seal: ≤ 0.8 µm (31.5 µin)
  Optional: ≤ 0.38 µm (15 µin)
  (All data relate to parts in contact with fluid)

Operability

Operating concept	**Operator-oriented menu structure for user-specific tasks**

- Commissioning
- Operation
- Diagnostics
- Expert level

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

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

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

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

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

Display element

- 4-line liquid crystal display with 16 characters per line.
- White background lighting; switches to red in event of device errors.
- Format for displaying measured variables and status variables can be individually configured.
- Permitted ambient temperature for the display: −20 to +60 ℃ (−4 to +140 ℉). 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.
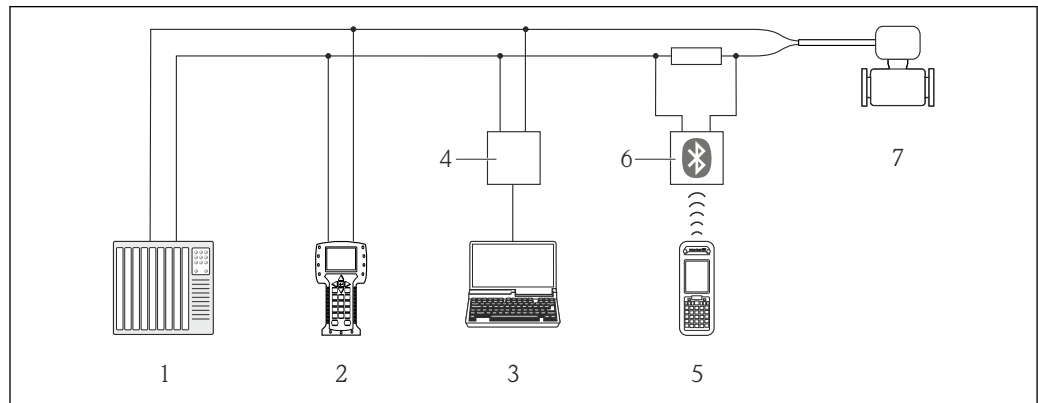
🖼 *41   Options for remote operation via HART protocol*

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   VIATOR Bluetooth modem with connecting cable
7   Transmitter

Via PROFIBUS DP network

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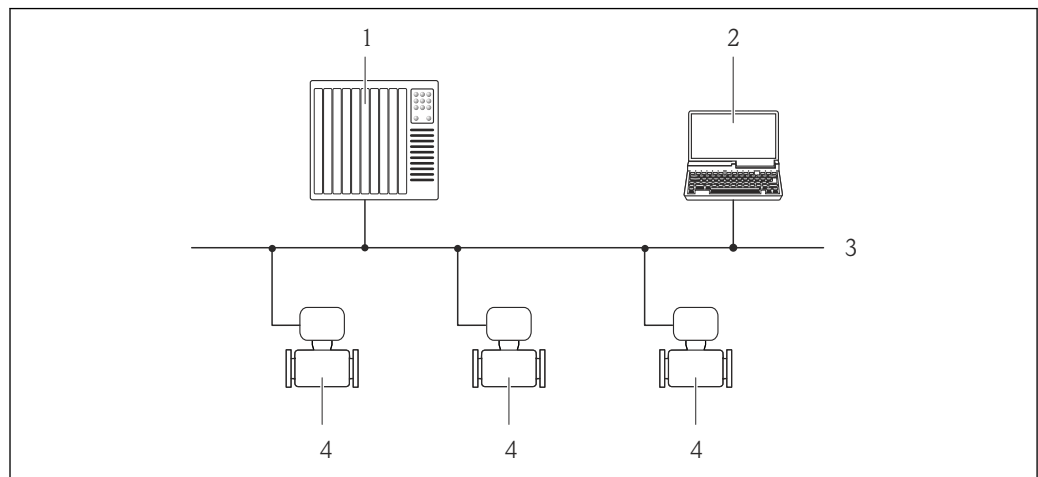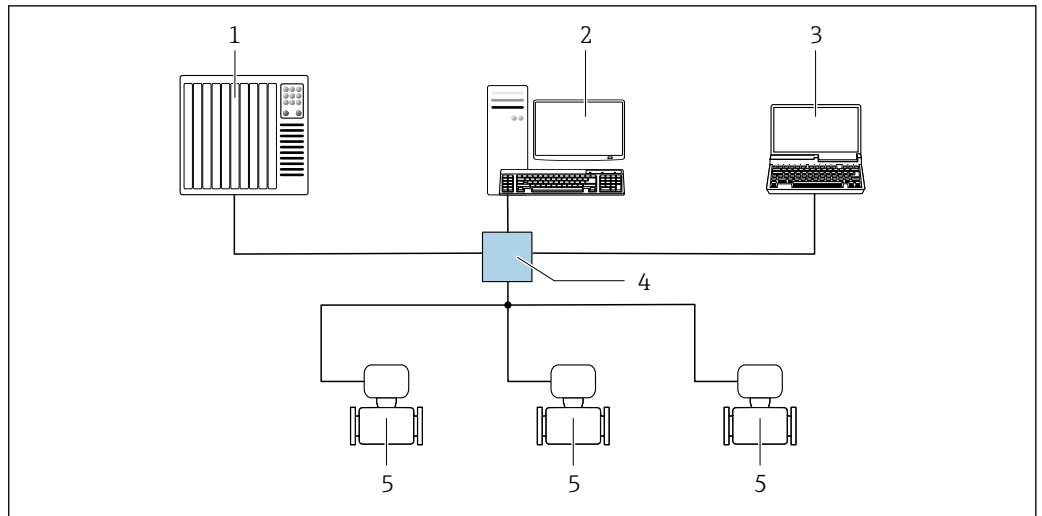

🖼 *42   Options for remote operation via PROFIBUS DP network*

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.
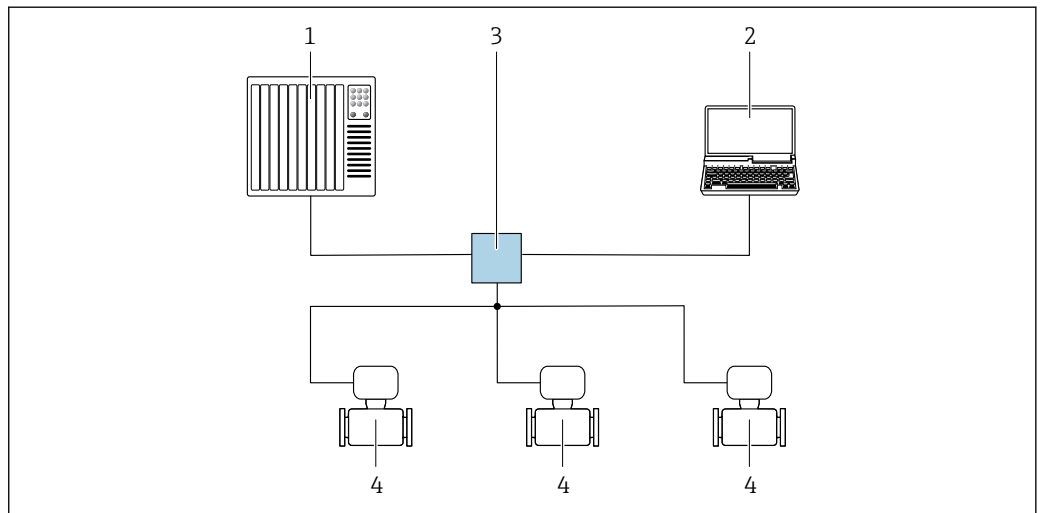
Star topology

🖼 *43 Options for remote operation via EtherNet/IP network: star topology*

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

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology

🖼 *44 Options for remote operation via PROFINET network: star topology*

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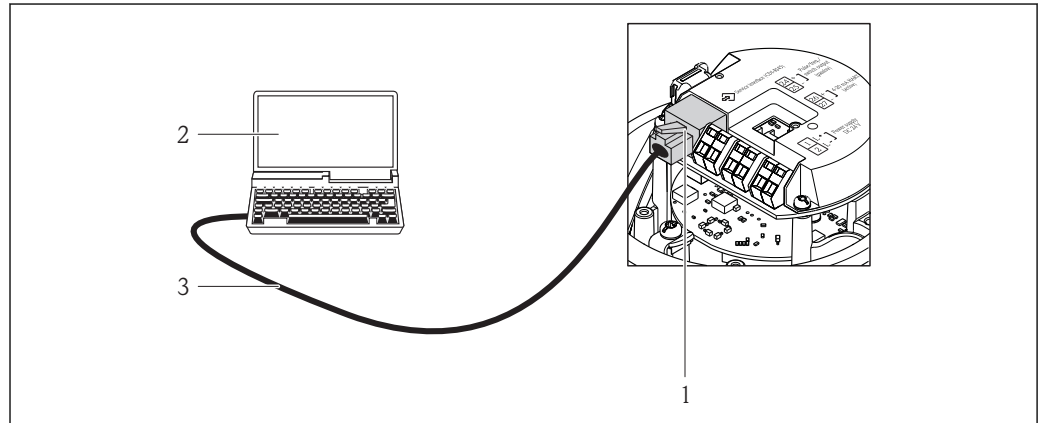*4 Measuring device*

Service interface	**Via service interface (CDI-RJ45)**

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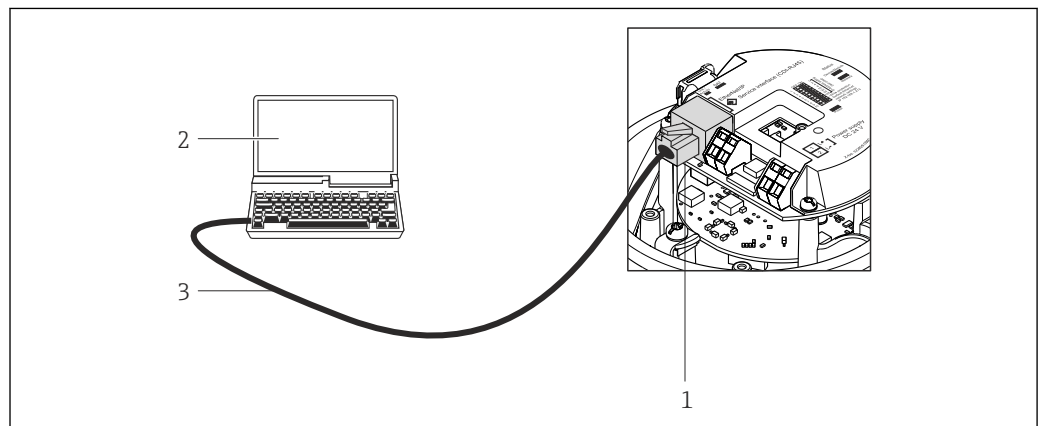- Order code for "Output", option **R**: PROFINET

HART

A0016926

⊠ *45   Connection for the order code for "Output", option B: 4-20 mA HART, pulse/frequency/switch output*

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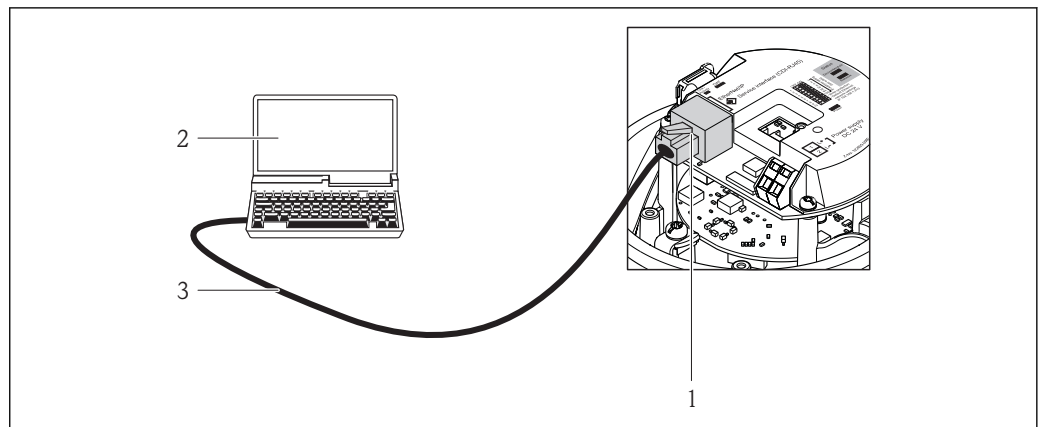
PROFIBUS DP

A0021270

⊠ *46   Connection for order code for "Output", option L: PROFIBUS DP*

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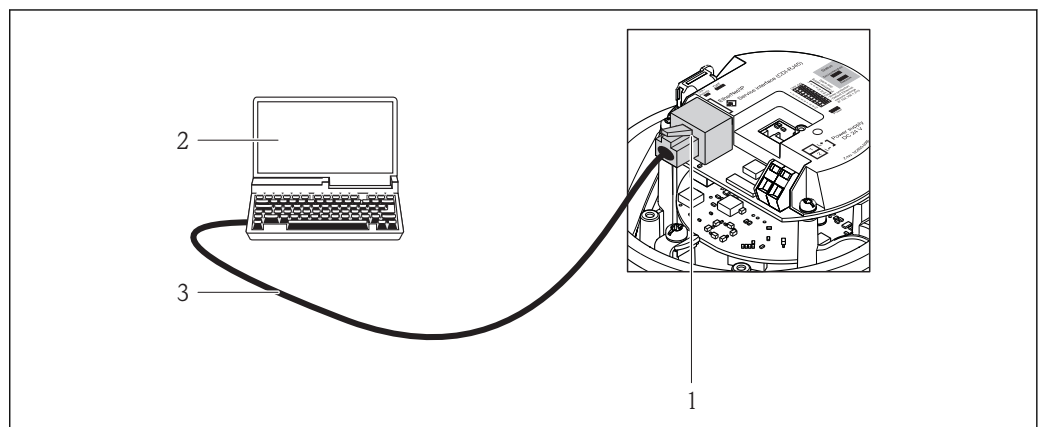
EtherNet/IP

A0016940

🖼 47   *Connection for order code for "Output", option N: EtherNet/IP*

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

PROFINET

A0016940

🖼 48   *Connection for order code for "Output", option R: PROFINET*

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

Via service interface (CDI)

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

Modbus RS485
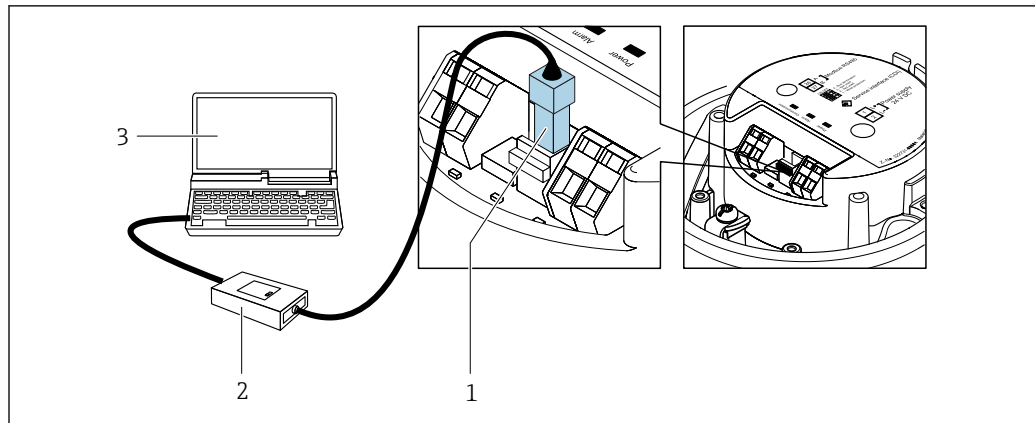
A0030216

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

Certificates and approvals

CE mark	The measuring system is in conformity with the statutory requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.
	Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick symbol	The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".
Ex approval	The measuring device is certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.

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

ATEX, IECEx

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

Ex nA

Category	Type of protection
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 approval Only devices with the order code for "Additional approval", option **LP** "3A" have 3-A approval. • EHEDG-tested Only devices with the order code for "Additional approval", option **LT** "EHEDG" have been tested and meet the requirements of the EHEDG. To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy Cleanable Pipe Couplings and Process Connections" (www.ehedg.org). • Seals FDA-compliant (apart from Kalrez seals)
HART certification	**HART interface** The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications: • Certified according to HART 7 • The device can also be operated with certified devices of other manufacturers (interoperability)
Certification PROFIBUS	**PROFIBUS interface** The measuring device is certified and registered by the PNO (PROFIBUS User Organization Organization). The measuring system meets all the requirements of the following specifications: • Certified in accordance with PROFIBUS PA Profile 3.02 • The device can also be operated with certified devices of other manufacturers (interoperability)
EtherNet/IP certification	The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications: • Certified in accordance with the ODVA Conformance Test • EtherNet/IP Performance Test • EtherNet/IP PlugFest compliance • The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFINET	**PROFINET interface**
	
	The measuring device is certified and registered by the PNO (PROFIBUS User Organization Organization). The measuring system meets all the requirements of the following specifications:
	• Certified according to:
	  – Test specification for PROFINET devices
	  – PROFINET Security Level 1 – Netload Class
	• The device can also be operated with certified devices of other manufacturers (interoperability)

Pressure Equipment Directive	The devices can be ordered with or without a PED approval. If a device with a PED approval is required, this must be explicitly stated in the order. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary. • With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the "Essential Safety Requirements" specified in Appendix I of the Pressure Equipment Directive 2014/68/EC. • Devices bearing this marking (PED) are suitable for the following types of medium: Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi) • Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art. 4, Par. 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EC.
Other standards and guidelines	• EN 60529 Degrees of protection provided by enclosures (IP code) • EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements • IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).

- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnosis of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications

Ordering information

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

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

Application packages

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

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

Cleaning

Package	Description
Electrode cleaning circuit (ECC)	The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe_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 highly conductive matter and thin layers (typical of magnetite).

Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	**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 (such as corrosion, abrasion, buildup etc.) have on the measuring performance over time. • Schedule servicing in time. • Monitor the process or product quality, e.g. gas pockets. **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.

Accessories

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

Device-specific accessories

For the transmitter

Accessories	Description

For the sensor

Accessories	Description
Adapter set	Adapter connections for installing Promag H instead of a Promag 30/33 A or Promag 30/33 H (DN 25) device. 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 nipple as process connection: welding jig for installation in pipe.
Grounding rings	Are used to ground the fluid in lined measuring tubes to ensure proper measurement. For details, see Installation Instructions EA00070D
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 interface. For details, see "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. For details, see the "Technical Information" document TI405C/07
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. For details, see "Technical Information" TI00429F and 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. For details, see Operating Instructions BA00061S
Fieldgate FXA320	Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser. For details, see "Technical Information" TI00025S and Operating Instructions BA00053S
Fieldgate FXA520	Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser. For details, see "Technical Information" TI00025S and Operating Instructions BA00051S
Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area**. For details, see Operating Instructions BA01202S
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the **non-Ex area** and the **Ex area**. For details, see Operating Instructions BA01202S

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections. • Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters throughout the entire life cycle of a project. Applicator is available: • Via the Internet: https://wapps.endress.com/applicator • On CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: • Via the Internet: www.endress.com/lifecyclemanagement • On CD-ROM for local PC installation.

FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details, see Operating Instructions BA00027S and BA00059S
DeviceCare	Tool for connecting and configuring Endress+Hauser field devices. For details, see Innovation brochure IN01047S
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see "Technical Information" TI00405C

System components

Accessories	Description
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all 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. For details, see "Technical Information" TI00133R and Operating Instructions BA00247R

Supplementary documentation

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

Standard documentation

Brief Operating Instructions

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

Operating Instructions

Measuring device	Documentation code				
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promag 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	Documentation code
Installation Instructions for spare part sets	Specified for each individual accessory

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