

Technical Information

Proline Promass P 100

Coriolis flowmeter



Specialist for life sciences with an ultra-compact transmitter

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Dedicated to applications under sterile conditions in the life sciences industry

Device properties

- ASME BPE, 3-A, EHEDG conform & low delta-ferrite
- Electropolished measuring tube in 1.4435 (316L)
- Fast recovery from CIP/SIP
- Robust, ultra-compact transmitter housing
- Highest degree of protection: IP69K
- Local display available

Your benefits

- Highest process quality – fully compliant to industry requirements
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in-/outlet run needs
- Space-saving transmitter – full functionality on smallest footprint
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology

Table of contents






About this document	4	Degree of protection	49
Symbols	4	Shock and vibration resistance	49
Function and system design	5	Internal cleaning	49
Measuring principle	5	Electromagnetic compatibility (EMC)	50
Measuring system	7	Process	50
Equipment architecture	8	Medium temperature range	50
Reliability	8	Pressure/temperature ratings	50
Input	9	Sensor housing	53
Measured variable	9	Flow limit	54
Measuring range	9	Pressure loss	54
Operable flow range	9	Static pressure	54
Input signal	9	Thermal insulation	55
Output	10	Heating	55
Output signal	10	Vibrations	55
Signal on alarm	11	Mechanical construction	56
Ex connection data	13	Dimensions in SI units	56
Low flow cut off	14	Dimensions in US units	77
Protocol-specific data	14	Weight	84
Power supply	24	Materials	85
Terminal assignment	24	Process connections	87
Pin assignment, device plug	31	Surface roughness	87
Supply voltage	34	Operability	87
Power consumption	34	Operating concept	87
Current consumption	34	Local display	88
Device fuse	34	Remote operation	88
Power supply failure	35	Service interface	90
Electrical connection	35	Certificates and approvals	92
Potential equalization	39	CE mark	92
Terminals	39	UKCA marking	93
Cable entries	40	RCM marking	93
Cable specification	40	Ex approval	93
Performance characteristics	41	Hygienic compatibility	94
Reference operating conditions	41	Pharmaceutical compatibility	94
Maximum measurement error	41	HART certification	94
Repeatability	42	Certification PROFIBUS	94
Response time	43	Certification PROFINET	94
Influence of ambient temperature	43	EtherNet/IP certification	94
Influence of medium temperature	43	Modbus RS485 certification	94
Influence of medium pressure	44	Pressure Equipment Directive	95
Design fundamentals	44	External standards and guidelines	95
Installation	45	Ordering information	96
Installation point	45	Application packages	96
Orientation	46	Heartbeat Technology	96
Inlet and outlet runs	47	Concentration measurement	96
Special installation instructions	47	Special density	97
Installing the Safety Barrier Promass 100	48	Accessories	97
Environment	49	Device-specific accessories	97
Ambient temperature range	49	Communication-specific accessories	97
Storage temperature	49	Service-specific accessories	98
Climate class	49	System components	99

Supplementary documentation	99
Standard documentation	99
Supplementary device-dependent documentation	100
Registered trademarks	100









About this document

Symbols




Electrical symbols

Symbol	Meaning
	Direct current
	Alternating current
	Direct current and alternating current
	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Potential equalization connection (PE: protective earth) Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: <ul style="list-style-type: none"> ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system.

Symbols for certain types of information

Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
	Forbidden Procedures, processes or actions that are forbidden.
	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
	Hazardous area
	Safe area (non-hazardous area)
	Flow direction

Function and system design

Measuring principle

The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present in a system when both translational and rotational movements are superimposed.

$$F_c = 2 \cdot \Delta m (v \cdot \omega)$$

F_c = Coriolis force

Δm = moving mass

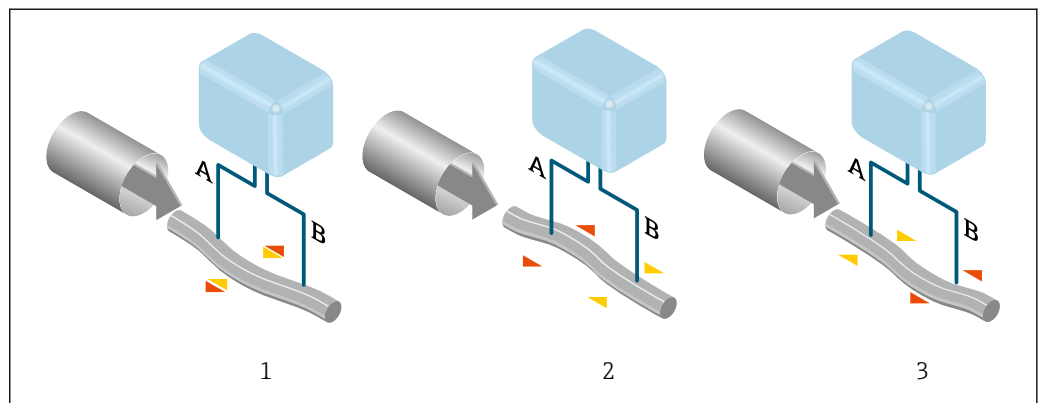
ω = rotational velocity

v = radial velocity in rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass Δm , its velocity v in the system and thus on the mass flow. Instead of a constant rotational velocity ω , the sensor uses oscillation.

In the sensor, an oscillation is produced in the measuring tube. The Coriolis forces produced at the measuring tube cause a phase shift in the tube oscillations (see illustration):

- If there is zero flow (i.e. when the fluid stands still), the oscillation measured at points A and B has the same phase (no phase difference) (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).



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The phase difference (A-B) increases with increasing mass flow. Electrodynamical sensors register the tube oscillations at the inlet and outlet. System balance is created by exciting an eccentrically arranged swinging mass to antiphase oscillation. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement

The measuring tube is continuously excited at its resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tube and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. The resonance frequency is thus a function of the medium density. The microprocessor utilizes this relationship to obtain a density signal.

Volume measurement

Together with the measured mass flow, this is used to calculate the volume flow.

Temperature measurement

The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output signal.

Gas Fraction Handler (GFH)

The Gas Fraction Handler is a Promass software function that improves measurement stability and repeatability. The function continuously checks for the presence of disturbances in single-phase flow, i.e. gas bubbles in liquids or droplets in gas. In the presence of the second phase, flow and density become increasingly unstable. The Gas Fraction Handler function improves measurement stability

with respect to the severity of the disturbances, without any effect under single-phase flow conditions.



The Gas Fraction Handler is only available in device versions with HART, Modbus RS485, PROFINET and PROFINET with Ethernet-APL.



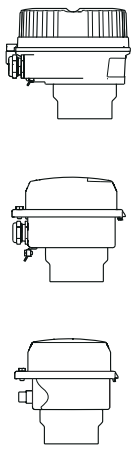
For detailed information on the Gas Fraction Handler, see the Special Documentation for "Gas Fraction Handler"

Measuring system

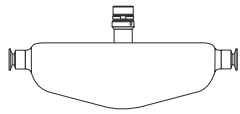
The device consists of a transmitter and a sensor. If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

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

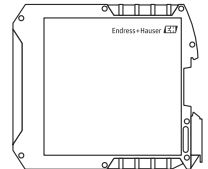
Transmitter

<p>Proline 100</p>  <p>A0016693</p> <p>A0016694</p> <p>A0016695</p>	<p>Device versions and materials:</p> <ul style="list-style-type: none"> ▪ 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) <p>Configuration:</p> <ul style="list-style-type: none"> ▪ Via operating tools (e.g. FieldCare, DeviceCare) ▪ Also for device version with local display (LCD): 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: <ul style="list-style-type: none"> ▪ Via web browser (e.g. Microsoft Internet Explorer) ▪ Via Add-on Profile Level 3 for automation system from Rockwell Automation ▪ Via Electronic Data Sheet (EDS) ▪ Also for device version with PROFINET output: <ul style="list-style-type: none"> ▪ Via web browser (e.g. Microsoft Internet Explorer) ▪ Via device master file (GSD)
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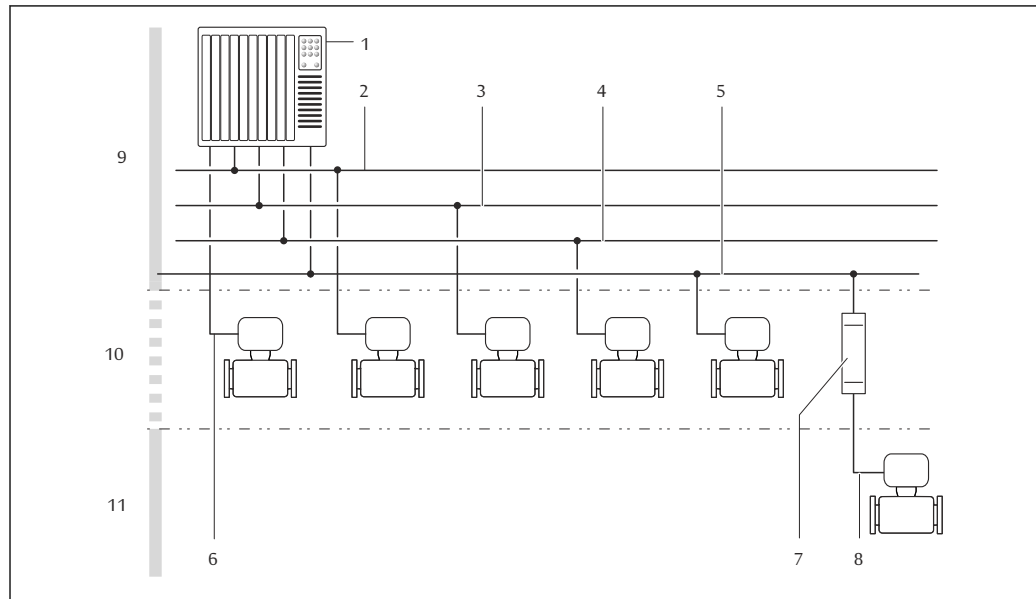
Sensor

<p>Promass P</p>  <p>A0016509</p>	<ul style="list-style-type: none"> ▪ Bent single-tube system ▪ For use in sterile applications in heavily regulated industries ▪ Nominal diameter range: DN 8 to 50 (3/8 to 2") ▪ Materials: <ul style="list-style-type: none"> ▪ Sensor: stainless steel, 1.4301 (304) ▪ Measuring tubes: stainless steel, 1.4435 BN2 (316L) ▪ Process connections: stainless steel, 1.4435 BN2 (316L); 1.4404 (F316/F316L) ▪ Surface quality: Ra ≤ 0.76 µm (30 µin) Ra ≤ 0.38 µm (15 µin) (electropolished) ▪ Delta ferrite <1%
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Safety Barrier Promass 100

 <p>A0016763</p>	<ul style="list-style-type: none"> ▪ Dual-channel safety barrier for installation in non-hazardous locations or zone 2/div. 2: <ul style="list-style-type: none"> ▪ Channel 1: DC 24 V power supply ▪ Channel 2: Modbus RS485 ▪ In addition to current, voltage and power limitation, it offers galvanic isolation of circuits for explosion protection. ▪ Easy top-hat rail mounting (DIN 35 mm) for installation in control cabinets
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Equipment architecture



A0016779

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 Safety Barrier Promass 100
- 8 Modbus RS485 intrinsically safe
- 9 Non-hazardous area
- 10 Non-hazardous area and Zone 2/Div. 2
- 11 Hazardous area and Zone 1/Div. 1

Reliability

IT security

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

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

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables



- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

DN		Measuring range full scale values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	$\frac{3}{8}$	0 to 2 000	0 to 73.50
15	$\frac{1}{2}$	0 to 6 500	0 to 238.9
25	1	0 to 18 000	0 to 661.5
40	$1\frac{1}{2}$	0 to 45 000	0 to 1 654
50	2	0 to 70 000	0 to 2 573

Recommended measuring range

 Flow limit →  54

Operable flow range

Over 1000 : 1.



Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly.

Input signal

External measured values

To increase the measurement accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring instrument:

- Operating pressure to increase measurement accuracy (Endress+Hauser recommends the use of a pressure measuring instrument for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase measurement accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow for gases

 Various pressure transmitters and temperature measuring instruments can be ordered from Endress+Hauser: see "Accessories" section →  99

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

- Mass flow
- Corrected volume flow

HART protocol

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

- HART protocol
- Burst mode

Digital communication


The measured values can be written by the automation system via:

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

Output



Output signal

HART current output

Current output	4-20 mA HART (active)
Maximum output values	<ul style="list-style-type: none"> ▪ DC 24 V (no flow) ▪ 22.5 mA
Load	0 to 700 Ω
Resolution	0.38 μ A
Damping	Configurable: 0.07 to 999 s
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature <p> The range of options increases if the measuring device has one or more application packages.</p>

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	<ul style="list-style-type: none"> ▪ DC 30 V ▪ 25 mA
Voltage drop	For 25 mA: \leq DC 2 V
Pulse output	
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow
Frequency output	
Output frequency	Configurable: 0 to 10 000 Hz
Damping	Configurable: 0 to 999 s
Pulse/pause ratio	1:1

Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature <p> The range of options increases if the measuring device has one or more application packages.</p>
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit value <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1-3 ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> ▪ Partially filled pipe detection ▪ Low flow cut off <p> The range of options increases if the measuring device has one or more application packages.</p>

PROFIBUS DP

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

Modbus RS485

Physical interface	In accordance with EIA/TIA-485-A standard
Terminating resistor	<ul style="list-style-type: none"> ▪ For device version used in non-hazardous areas or Zone 2/Div. 2: integrated and can be activated via DIP switches on the transmitter electronics module ▪ For device version used in intrinsically safe areas: integrated and can be activated via DIP switches on the Safety Barrier Promass 100

EtherNet/IP

Standards	In accordance with IEEE 802.3
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PROFINET

Standards	In accordance with IEEE 802.3
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Signal on alarm Depending on the interface, failure information is displayed as follows:

Current output 4 to 20 mA*4 to 20 mA*

Failure mode	Choose from: <ul style="list-style-type: none"> ▪ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ▪ 4 to 20 mA in accordance with US ▪ Min. value: 3.59 mA ▪ Max. value: 22.5 mA ▪ Definable value between: 3.59 to 22.5 mA ▪ Actual value ▪ Last valid value
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Pulse/frequency/switch output

Pulse output	
Fault mode	Choose from: <ul style="list-style-type: none"> ▪ Actual value ▪ No pulses
Frequency output	
Fault mode	Choose from: <ul style="list-style-type: none"> ▪ Actual value ▪ 0 Hz ▪ Definable value between: 0 to 12 500 Hz
Switch output	
Fault mode	Choose from: <ul style="list-style-type: none"> ▪ Current status ▪ Open ▪ Closed

PROFIBUS DP

Status and alarm messages	Diagnostics in accordance with PROFIBUS PA Profile 3.02
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Modbus RS485

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


Device diagnostics	Device condition can be read out in Input Assembly
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PROFINET

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



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

 Status signal as per NAMUR recommendation NE 107

Interface/protocol

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

Plain text display	With information on cause and remedial measures
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 Additional information on remote operation →  88

Web browser

Plain text display	With information on cause and remedial measures
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Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes The following information is displayed depending on the device version: <ul style="list-style-type: none"> ▪ Supply voltage active ▪ Data transmission active ▪ Device alarm/error has occurred ▪ EtherNet/IP network available ▪ EtherNet/IP connection established ▪ PROFINET network available ▪ PROFINET connection established ▪ PROFINET blinking feature
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Ex connection data


These values only apply for the following device version:
Order code for "Output", option M "Modbus RS485", for use in intrinsically safe areas

Safety Barrier Promass 100

Safety-related values


Terminal numbers			
Supply voltage		Signal transmission	
2 (L-)	1 (L+)	26 (B)	27 (A)
$U_{nom} = DC\ 24\ V$ $U_{max} = AC\ 260\ V$		$U_{nom} = DC\ 5\ V$ $U_{max} = AC\ 260\ V$	

Intrinsically safe values

Terminal numbers			
Supply voltage		Signal transmission	
20 (L-)	10 (L+)	62 (B)	72 (A)
$U_o = 16.24 \text{ V}$ $I_o = 623 \text{ mA}$ $P_o = 2.45 \text{ W}$ With IIC ¹⁾ : $L_o = 92.8 \text{ } \mu\text{H}$, $C_o = 0.433 \text{ } \mu\text{F}$, $L_o/R_o = 14.6 \text{ } \mu\text{H}/\Omega$ With IIB: $L_o = 372 \text{ } \mu\text{H}$, $C_o = 2.57 \text{ } \mu\text{F}$, $L_o/R_o = 58.3 \text{ } \mu\text{H}/\Omega$			
 For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the "Safety Instructions" (XA) document for the measuring device			

1) The gas group depends on the sensor and nominal diameter ff.

Transmitter*Intrinsically safe values*


Order code "Approval"	Terminal numbers			
	Supply voltage		Signal transmission	
	20 (L-)	10 (L+)	62 (B)	72 (A)
<ul style="list-style-type: none"> ▪ Option BM: ATEX II2G + IECEx Z1 Ex ia, II2D Ex tb ▪ Option BO: ATEX II1/2G + IECEx Z0/Z1 Ex ia, II2D ▪ Option BQ: ATEX II1/2G + IECEx Z0/Z1 Ex ia ▪ Option BU: ATEX II2G + IECEx Z1 Ex ia ▪ Option C2: CSA C/US IS Cl. I, II, III Div. 1 ▪ Option 85: ATEX II2G + IECEx Z1 Ex ia + CSA C/US IS Cl. I, II, III Div. 1 	$U_i = 16.24 \text{ V}$ $I_i = 623 \text{ mA}$ $P_i = 2.45 \text{ W}$ $L_i = 0 \text{ } \mu\text{H}$ $C_i = 6 \text{ nF}$			
 For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the "Safety Instructions" (XA) document for the measuring device				

Low flow cut off

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

Protocol-specific data**HART**

Manufacturer ID	0x11
Device type ID	0x4A
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω

<p>Dynamic variables</p>	<p>Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables.</p> <p>Measured variables for PV (primary dynamic variable)</p> <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature <p>Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable)</p> <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3 <p> The range of options increases if the measuring device has one or more application packages.</p> <p>Heartbeat Technology application package Additional measured variables are available with the Heartbeat Technology application package:</p> <ul style="list-style-type: none"> ▪ Carrier pipe temperature ▪ Oscillation amplitude 0
<p>Device variables</p>	<p>Read out the device variables: HART command 9 The device variables are permanently assigned.</p> <p>A maximum of 8 device variables can be transmitted:</p> <ul style="list-style-type: none"> ▪ 0 = mass flow ▪ 1 = volume flow ▪ 2 = corrected volume flow ▪ 3 = density ▪ 4 = reference density ▪ 5 = temperature ▪ 6 = totalizer 1 ▪ 7 = totalizer 2 ▪ 8 = totalizer 3 ▪ 13 = target mass flow ▪ 14 = carrier mass flow ▪ 15 = concentration



PROFIBUS DP

<p>Manufacturer ID</p>	<p>0x11</p>
<p>Ident number</p>	<p>0x1561</p>
<p>Profile version</p>	<p>3.02</p>
<p>Device description files (GSD, DTM, DD)</p>	<p>Information and files available at:</p> <ul style="list-style-type: none"> ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com

Output values (from measuring instrument to automation system)	Analog input 1 to 8 <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Target mass flow ▪ Carrier mass flow ▪ Density ▪ Reference density ▪ Concentration ▪ Temperature ▪ Carrier pipe temperature ▪ Electronics temperature ▪ Oscillation frequency ▪ Oscillation amplitude ▪ Frequency fluctuation ▪ Oscillation damping ▪ Tube damping fluctuation ▪ Signal asymmetry ▪ Exciter current Digital input 1 to 2 <ul style="list-style-type: none"> ▪ Partially filled pipe detection ▪ Low flow cut off Totalizer 1 to 3 <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow
Input values (from automation system to measuring instrument)	Analog output 1 to 3 (fixed assignment) <ul style="list-style-type: none"> ▪ Pressure ▪ Temperature ▪ Reference density Digital output 1 to 3 (fixed assignment) <ul style="list-style-type: none"> ▪ Digital output 1: switch positive zero return on/off ▪ Digital output 2: perform zero adjustment ▪ Digital output 3: switch switch output on/off Totalizer 1 to 3 <ul style="list-style-type: none"> ▪ Totalize ▪ Reset and hold ▪ Preset and hold ▪ Stop ▪ Operating mode configuration: <ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total
Supported functions	<ul style="list-style-type: none"> ▪ Identification & maintenance Straightforward device identification on the part of the control system and nameplate ▪ PROFIBUS upload/download Reading and writing parameters is up to ten times faster with PROFIBUS upload/download. ▪ Condensed status Straightforward and self-explanatory diagnostic information by categorizing diagnostic messages that occur
Configuration of the device address	<ul style="list-style-type: none"> ▪ DIP switches on the I/O electronics module ▪ Via operating tools (e.g. FieldCare)

Modbus RS485


Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0

Function codes	<ul style="list-style-type: none"> ▪ 03: Read holding register ▪ 04: Read input register ▪ 06: Write single registers ▪ 08: Diagnostics ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Broadcast messages	<p>Supported by the following function codes:</p> <ul style="list-style-type: none"> ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Supported baud rate	<ul style="list-style-type: none"> ▪ 1 200 BAUD ▪ 2 400 BAUD ▪ 4 800 BAUD ▪ 9 600 BAUD ▪ 19 200 BAUD ▪ 38 400 BAUD ▪ 57 600 BAUD ▪ 115 200 BAUD
Data transfer mode	<ul style="list-style-type: none"> ▪ ASCII ▪ RTU
Data access	<p>Each device parameter can be accessed via Modbus RS485.</p> <p> For Modbus register information, see "Description of device parameters" documentation →  99</p>

EtherNet/IP


Protocol	<ul style="list-style-type: none"> ▪ The CIP Networks Library Volume 1: Common Industrial Protocol ▪ The CIP Networks Library Volume 2: Ethernet/IP Adaptation of CIP
Communication type	<ul style="list-style-type: none"> ▪ 10Base-T ▪ 100Base-TX
Device profile	Generic device (product type: 0x2B)
Manufacturer ID	0x49E
Device type ID	0x104A
Baud rates	Automatic ¹⁰ / ₁₀₀ Mbit with half-duplex and full-duplex detection
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported CIP connections	Max. 3 connections
Explicit connections	Max. 6 connections
I/O connections	Max. 6 connections (scanner)
Configuration options for measuring instrument	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module for IP addressing ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Electronic Data Sheet (EDS) integrated in the measuring instrument
Configuration of the EtherNet interface	<ul style="list-style-type: none"> ▪ Speed: 10 MBit, 100 MBit, auto (factory setting) ▪ Duplex: half-duplex, full-duplex, auto (factory setting)
Configuration of the device address	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module for IP addressing (last octet) ▪ DHCP ▪ Manufacturer-specific software (FieldCare) ▪ Add-on Profile Level 3 for Rockwell Automation control systems ▪ Web browser ▪ Ethernet/IP tools, e.g. RSLinx (Rockwell Automation)
Device Level Ring (DLR)	No


Fix input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	64
	T → O configuration:	0x64	44
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	64
	T → O configuration:	0x64	44
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	44
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	44
Input Assembly	<ul style="list-style-type: none"> ▪ Current device diagnostics ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ 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	64
	T → O configuration:	0x65	88
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	64
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88

Configurable Input Assembly	<ul style="list-style-type: none"> ■ Current device diagnostics ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Totalizer 1 ■ Totalizer 2 ■ Totalizer 3 <p> The range of options increases if the measuring device has one or more application packages.</p>
Fix output	
Output Assembly	<ul style="list-style-type: none"> ■ Activation of reset totalizers 1-3 ■ Activation of pressure compensation ■ Activation of reference density compensation ■ Activation of temperature compensation ■ Reset totalizers 1-3 ■ External pressure value ■ Pressure unit ■ External reference density ■ Reference density unit ■ External temperature ■ Temperature unit
Configuration	
Configuration Assembly	<p>Only the most common configurations are listed below.</p> <ul style="list-style-type: none"> ■ Software write protection ■ Mass flow unit ■ Mass unit ■ Volume flow unit ■ Volume unit ■ Corrected volume flow unit ■ Corrected volume unit ■ Density unit ■ Reference density unit ■ Temperature unit ■ Pressure unit ■ Length ■ Totalizer 1-3: <ul style="list-style-type: none"> ■ Assignment ■ Unit ■ Mode of operation ■ Failure mode ■ Alarm delay

PROFINET

Protocol	"Application layer protocol for decentral device periphery and distributed automation", version 2.3
Conformity class	B
Communication type	100 Mbps
Device profile	Application interface identifier 0xF600 Generic device
Manufacturer ID	0x11
Device type ID	0x844A
Device description files (GSD, DTM)	Information and files available at: <ul style="list-style-type: none"> ■ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ■ https://www.profibus.com
Baud rates	Automatic 100 Mbit/s with full-duplex detection

Periods	From 8 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	<ul style="list-style-type: none"> ▪ 1 x AR (Application Relation) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation)
Configuration options for measuring instrument	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Manufacturer-specific software (FieldCare, DeviceCare) ▪ Web browser ▪ Device master file (GSD), can be read out via the integrated web server of the measuring instrument
Configuration of the device name	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol
Output values (from measuring instrument to automation system)	<p>Analog Input module (slot 1 to 14)</p> <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Target mass flow ▪ Carrier mass flow ▪ Density ▪ Reference density ▪ Concentration ▪ Temperature ▪ Carrier pipe temperature ▪ Electronics temperature ▪ Oscillation frequency ▪ Oscillation amplitude ▪ Frequency fluctuation ▪ Oscillation damping ▪ Tube damping fluctuation ▪ Signal asymmetry ▪ Exciter current <p>Discrete Input module (slot 1 to 14)</p> <ul style="list-style-type: none"> ▪ Empty pipe detection ▪ Low flow cut off <p>Diagnostics Input module (slot 1 to 14)</p> <ul style="list-style-type: none"> ▪ Last diagnostics ▪ Current diagnostics <p>Totalizer 1 to 3 (slot 15 to 17)</p> <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow <p>Heartbeat Verification module (fixed assignment) Verification status (slot 23)</p> <p> The range of options increases if the measuring device has one or more application packages.</p>

<p>Input values (from automation system to measuring instrument)</p>	<p>Analog Output module (fixed assignment)</p> <ul style="list-style-type: none"> ▪ External pressure (slot 18) ▪ External temperature (slot 19) ▪ External reference density (slot 20) <p>Discrete Output module (fixed assignment)</p> <ul style="list-style-type: none"> ▪ Activate/deactivate positive zero return (slot 21) ▪ Perform zero adjustment (slot 22) <p>Totalizer 1 to 3 (slot 15 to 17)</p> <ul style="list-style-type: none"> ▪ Totalize ▪ Reset and hold ▪ Preset and hold ▪ Stop ▪ Operating mode configuration: <ul style="list-style-type: none"> ▪ Net flow total ▪ Forward flow total ▪ Reverse flow total <p>Heartbeat Verification module (fixed assignment) Start verification (slot 23)</p> <p> The range of options increases if the measuring device has one or more application packages.</p>
<p>Supported functions</p>	<ul style="list-style-type: none"> ▪ Identification & maintenance Simple device identification via: <ul style="list-style-type: none"> ▪ Control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature via the local display for simple device identification and assignment

Administration of software options

Input/output value	Process variable	Category	Slot
Output value	Mass flow	Process variable	1...14
	Volume flow		
	Corrected volume flow		
	Density		
	Reference density		
	Temperature		
	Electronics temperature		
	Oscillation frequency		
	Frequency fluctuation		
	Oscillation damping		
	Oscillation frequency		
	Signal asymmetry		
	Exciter current		
	Empty pipe detection		
	Low flow cut off		
Output value	Target mass flow	Concentration ¹⁾	1...14
Output value	Carrier mass flow		
Output value	Concentration		
Output value	Carrier pipe temperature	Heartbeat Technology ²⁾	1...14

Input/output value	Process variable	Category	Slot
	Oscillation damping 1		
	Oscillation frequency 1		
	Oscillation amplitude 0		
	Oscillation amplitude 1		
	Frequency fluctuation 1		
	Tube damping fluctuation 1		
	Exciter current 1		
Input value	External density	Process monitoring	18
	External temperature		19
	External reference density		20
	Flow override		21
	Zero adjustment		22
	Verification status	Heartbeat Verification ²⁾	23

- 1) Only available with the "Concentration" application package.
2) Only available with the Heartbeat Technology application package.

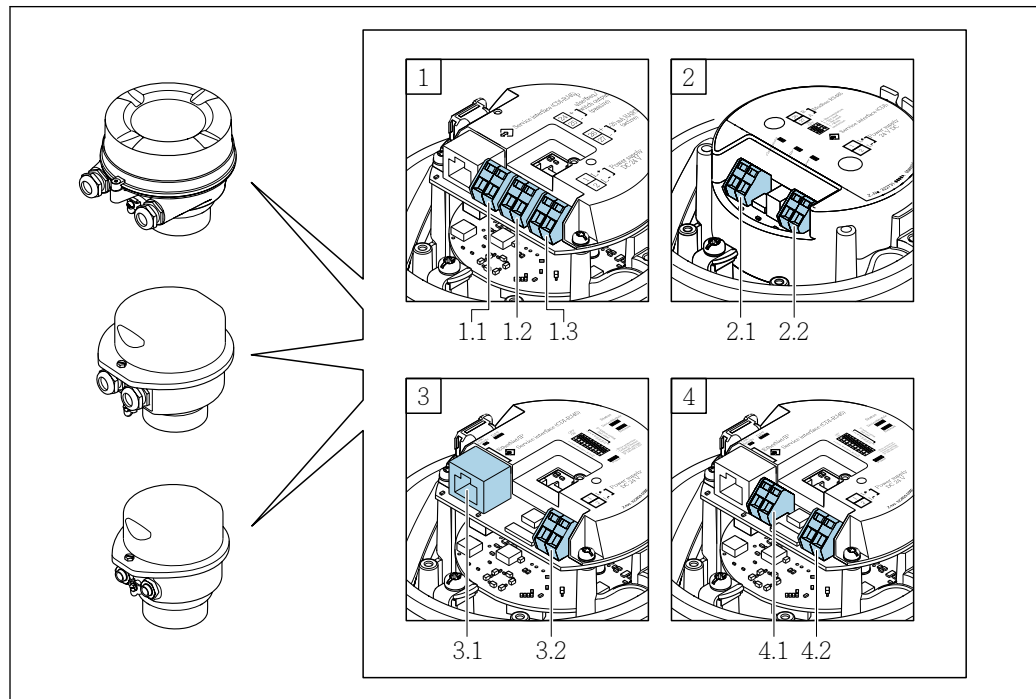
Startup configuration

<p>Startup configuration (NSU)</p>	<p>If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used.</p> <p>The following configuration is taken from the automation system:</p> <ul style="list-style-type: none"> ▪ Management <ul style="list-style-type: none"> ▪ Software revision ▪ Write protection ▪ System units <ul style="list-style-type: none"> ▪ Mass flow ▪ Mass ▪ Volume flow ▪ Volume ▪ Corrected volume flow ▪ Corrected volume ▪ Density ▪ Reference density ▪ Temperature ▪ Pressure ▪ Concentration application package <ul style="list-style-type: none"> ▪ Coefficients A0 to A4 ▪ Coefficients B1 to B3 ▪ Sensor adjustment ▪ Process parameters <ul style="list-style-type: none"> ▪ Damping (flow, density, temperature) ▪ Flow override ▪ Low flow cut off <ul style="list-style-type: none"> ▪ Assign process variable ▪ Switch-on/switch-off point ▪ Pressure shock suppression ▪ Empty pipe detection <ul style="list-style-type: none"> ▪ Assign process variable ▪ Limit values ▪ Response time ▪ Max. damping ▪ Corrected volume flow calculation <ul style="list-style-type: none"> ▪ External reference density ▪ Fixed reference density ▪ Reference temperature ▪ Linear expansion coefficient ▪ Square expansion coefficient ▪ Measuring mode <ul style="list-style-type: none"> ▪ Medium ▪ Gas type ▪ Reference sound velocity ▪ Temperature coefficient sound velocity ▪ External compensation <ul style="list-style-type: none"> ▪ Pressure compensation ▪ Pressure value ▪ External pressure ▪ Diagnostic settings ▪ Diagnostic behavior for diverse diagnostic information
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Power supply

Terminal assignment

Overview: housing version and connection versions



A0016770

- 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

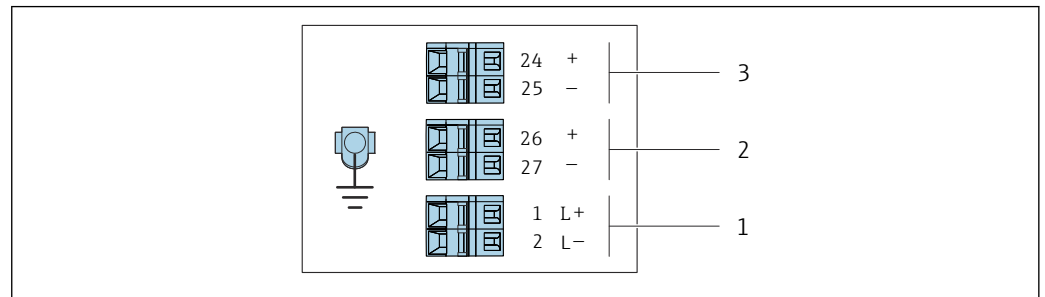
Order code for "Output", option **B**

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Outputs	Power supply	
Options A, B	Terminals	Terminals	<ul style="list-style-type: none"> Option A: coupling M20x1 Option B: thread M20x1 Option C: thread G 1/2" Option D: thread NPT 1/2"
Options A, B	Device plugs → 32	Terminals	<ul style="list-style-type: none"> Option L: plug M12x1 + thread NPT 1/2" Option N: plug M12x1 + coupling M20 Option P: plug M12x1 + thread G 1/2" Option U: plug M12x1 + thread M20
Options A, B, C	Device plugs → 32	Device plugs → 32	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 "Output"	Terminal number					
	Power supply		Output 1		Output 2	
	2 (L-)	1 (L+)	27 (-)	26 (+)	25 (-)	24 (+)
Option B	DC 24 V		4-20 mA HART (active)		Pulse/frequency/switch output (passive)	

Order code for "Output":




Option B: 4-20 mA HART with pulse/frequency/switch output

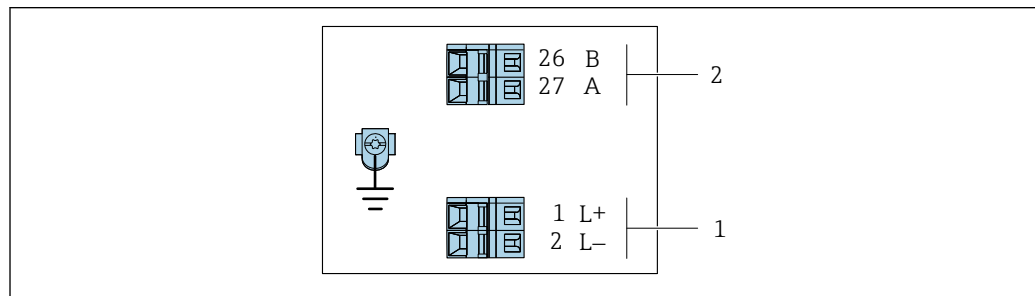
PROFIBUS DP connection version

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

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

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Terminals	Terminals	<ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G ½" ▪ Option D: thread NPT ½"
Options A, B	Device plug connectors →  32	Terminals	<ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT ½" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G ½" ▪ Option U: plug M12x1 + thread M20
Options A, B, C	Device plug connectors →  32	Device plug connectors →  32	Option Q: 2 x plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> ▪ 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 "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				

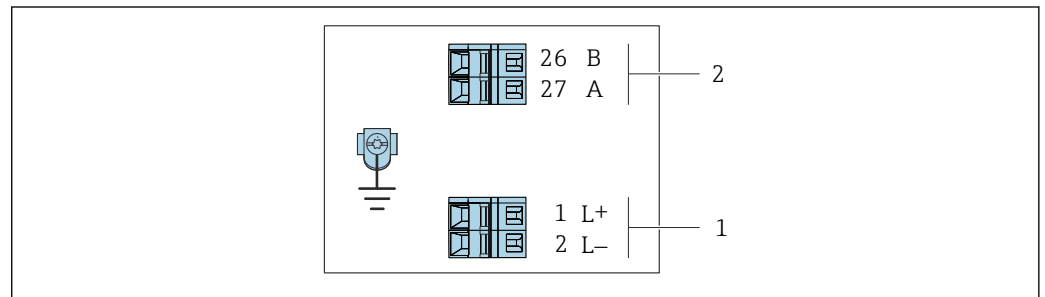
Modbus RS485 connection version

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


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

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Terminals	Terminals	<ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G ½" ▪ Option D: thread NPT ½"
Options A, B	Device plugs →  32	Terminals	<ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT ½" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G ½" ▪ Option U: plug M12x1 + thread M20
Options A, B, C	Device plugs →  32	Device plugs →  32	Option Q: 2 x plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> ▪ Option A: compact, coated aluminum ▪ Option B: compact, hygienic, stainless ▪ Option C: ultra-compact, hygienic, stainless 			




A0019528

 4 Modbus RS485 terminal assignment, connection version for use in non-hazardous areas and Zone 2/Div. 2

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


Order code "Output"	Terminal number			
	Power supply		Output	
	1 (L+)	2 (L-)	26 (B)	27 (A)
Option M	DC 24 V		Modbus RS485	
Order code for "Output": Option M : Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2				

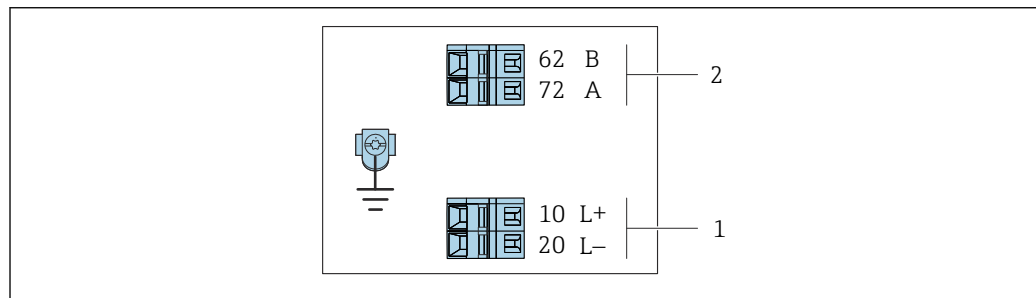
Modbus RS485 connection version

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


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

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Terminals	Terminals	<ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G ½" ▪ Option D: thread NPT ½"
A, B, C	Device plugs →  32		Option I: plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> ▪ Option A: compact, coated aluminum ▪ Option B: compact, hygienic, stainless ▪ Option C: ultra-compact, hygienic, stainless 			



A0030219

 5 Modbus RS485 terminal assignment, connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)

1 Intrinsically safe power supply




2 Modbus RS485

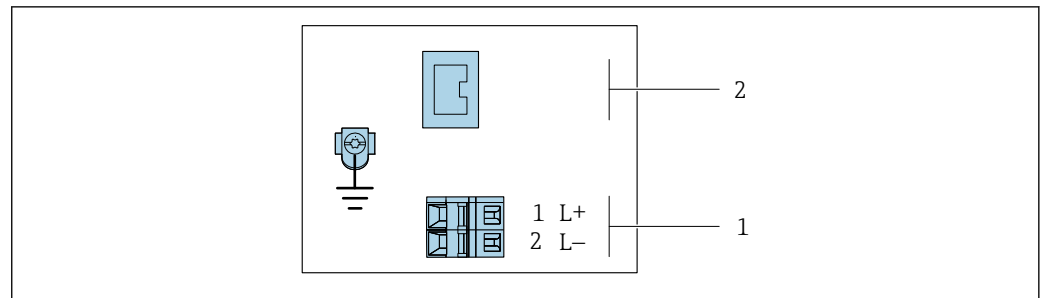
Order code "Output"	10 (L+)	20 (L-)	62 (B)	72 (A)
Option M	Intrinsically safe supply voltage		Modbus RS485 intrinsically safe	
Order code for "Output": Option M : Modbus RS485, for use in the intrinsically safe area (connection via Safety Barrier Promass 100)				

EtherNet/IP connection version

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

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Device plug connectors →  33	Terminals	<ul style="list-style-type: none"> ▪ Option L: plug M12x1 + thread NPT 1/2" ▪ Option N: plug M12x1 + coupling M20 ▪ Option P: plug M12x1 + thread G 1/2" ▪ Option U: plug M12x1 + thread M20
Options A, B, C	Device plug connectors →  33	Device plug connectors →  33	Option Q : 2 x plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> ▪ Option A: compact, coated aluminum ▪ Option B: compact, hygienic, stainless ▪ Option C ultra-compact, hygienic, stainless 			



A0017054

 6 *EtherNet/IP terminal assignment*




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

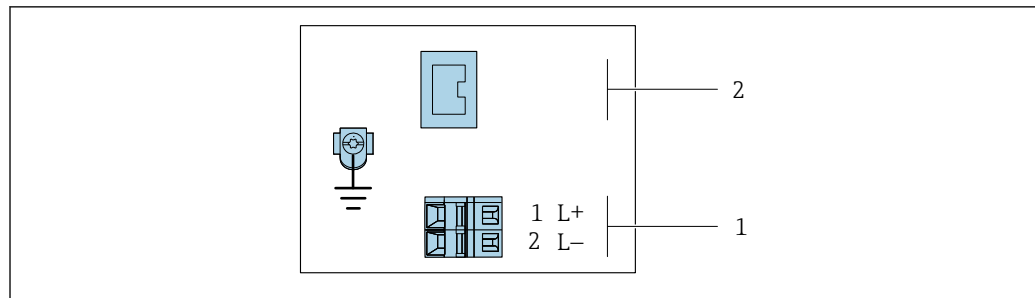
Order code "Output"	Terminal number		Output Device plug M12x1
	Power supply 2 (L-)	1 (L+)	
Option N	DC 24 V		EtherNet/IP
Order code for "Output": Option N : EtherNet/IP			

PROFINET connection version


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

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

Order code "Housing"	Connection methods available		Possible options for order code "Electrical connection"
	Output	Power supply	
Options A, B	Device plug connectors →  31	Terminals	<ul style="list-style-type: none"> ■ Option L: plug M12x1 + thread NPT ½" ■ Option N: plug M12x1 + coupling M20 ■ Option P: plug M12x1 + thread G ½" ■ Option U: plug M12x1 + thread M20
Options A, B, C	Device plug connectors →  31	Device plug connectors →  31	Option Q : 2 x plug M12x1
Order code for "Housing": <ul style="list-style-type: none"> ■ Option A: compact, coated aluminum ■ Option B: compact, hygienic, stainless ■ Option C ultra-compact, hygienic, stainless 			



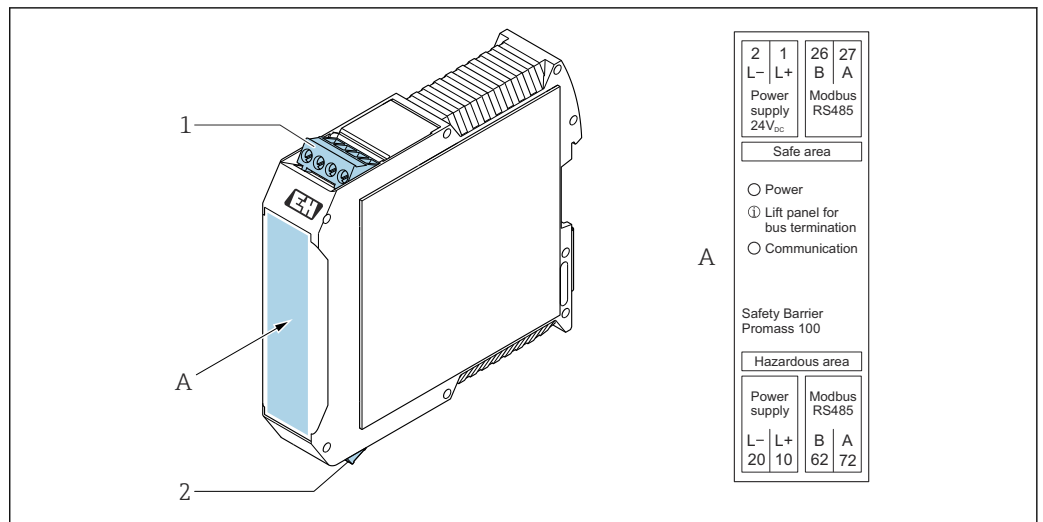
A0017054

 7 *PROFINET terminal assignment*

- 1 Power supply: DC 24 V
- 2 PROFINET

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

Safety Barrier Promass 100



8 Safety Barrier Promass 100 with terminals

- 1 Non-hazardous area, Zone 2, Class I Division 2
- 2 Intrinsically safe area

Pin assignment, device plug

- i** Order codes for the M12x1 plugs, see the "Order code for **electrical connection**" column:
 - 4-20 mA HART, pulse/frequency/switch output → 24
 - PROFIBUS DP → 26
 - Modbus RS485 → 27
 - Ethernet/IP → 29
 - PROFINET → 30

Supply voltage

Intrinsically safe for all connection versions except MODBUS RS485 (device side), male connection (plug)

- i** Device plug MODBUS RS485 intrinsically safe with supply voltage → 32

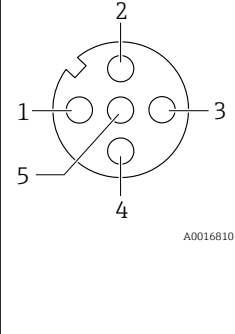
<p style="text-align: center; font-size: small;">A0029042</p>	Pin		Assignment
	1	L+	DC 24 V
	2		Not assigned
	3		Not assigned
	4	L-	DC 24 V
	5		Grounding/shielding ¹⁾
Coding		Plug/socket	
A		Plug	

1) Not assigned for order code for "Housing", option C "Ultra-compact, hygienic, stainless"

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

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

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

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

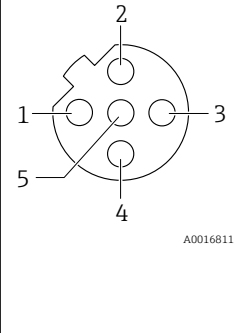
1) Not assigned for order code for "Housing", option C "Ultra-compact, hygienic, stainless"

-  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)

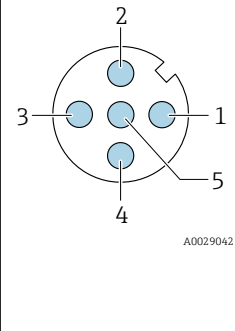
	Pin	Assignment	
	1		Not assigned
	2	A	PROFIBUS DP
	3		Not assigned
	4	B	PROFIBUS DP
	5		Grounding/shielding ¹⁾
Coding		Plug/socket	
B		Socket	

1) Not assigned for order code for "Housing", option C "Ultra-compact, hygienic, stainless"


-  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 with supply voltage (device side), MODBUS RS485 (intrinsically safe)

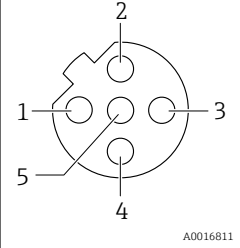
	Pin	Assignment	
	1	L+	Supply voltage, intrinsically safe
	2	A	Modbus RS485, intrinsically safe
	3	B	
	4	L-	Supply voltage, intrinsically safe
	5		Grounding/shielding ¹⁾
Coding		Plug/socket	
A		Plug	

1) Not assigned for order code for "Housing", option C "Ultra-compact, hygienic, stainless"

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

Device plug for signal transmission (device side), MODBUS RS485 (not intrinsically safe)

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

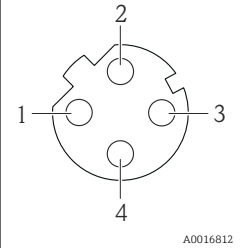
	Pin	Assignment	
	1		Not assigned
	2	A	Modbus RS485
	3		Not assigned
	4	B	Modbus RS485
	5		Grounding/shielding ¹⁾
Coding		Plug/socket	
B		Socket	


1) Not assigned for order code for "Housing", option C "Ultra-compact, hygienic, stainless"

-  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

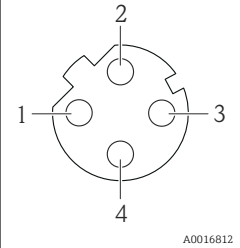
Device plug for signal transmission (device side)


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

-  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	

-  Recommended plug:
 - Binder, series 825, 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 communication type:

- HART, PROFIBUS DP, EtherNet/IP: DC 20 to 30 V
- Modbus RS485, device version:
 - For use in the non-hazardous area and Zone 2/Div. 2: DC 20 to 30 V
 - For use in the intrinsically safe area: power supply via Safety Barrier Promass 100

Promass 100 safety barrier

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, for use in non-hazardous areas and Zone 2/Div. 2	3.5 W
Option M : Modbus RS485, for use in intrinsically safe areas	2.45 W
Option N : EtherNet/IP	3.5 W
Option R : PROFINET	3.5 W

Promass 100 safety barrier

Order code for "Output"	Maximum Power consumption
Option M : Modbus RS485, for use in intrinsically safe areas	4.8 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, for use in non-hazardous areas and Zone 2/Div. 2	90 mA	10 A (< 0.8 ms)
Option M : Modbus RS485, for use in intrinsically safe areas	145 mA	16 A (< 0.4 ms)
Option N : EtherNet/IP	145 mA	18 A (< 0.125 ms)
Option R : PROFINET	145 mA	18 A (< 0.125 ms)

Promass 100 safety barrier

Order code for "Output"	Maximum Current consumption	Maximum switch-on current
Option M : Modbus RS485, for use in intrinsically safe areas	230 mA	10 A (< 0.8 ms)

Device fuse

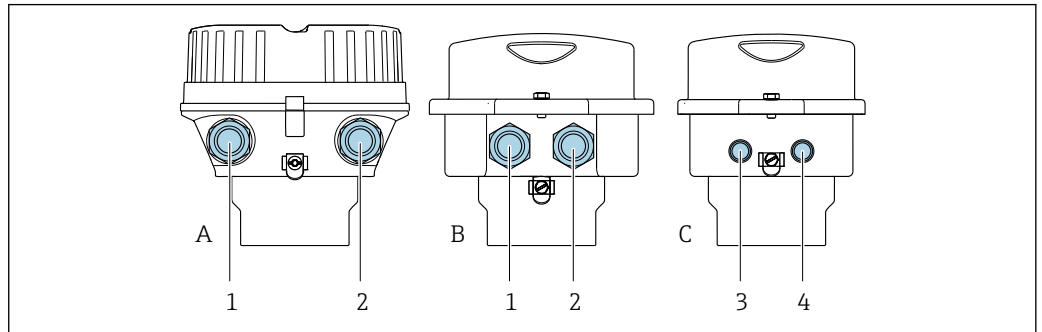
Fine-wire fuse (slow-blow) T2A

Power supply failure

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

Electrical connection

Connecting the transmitter



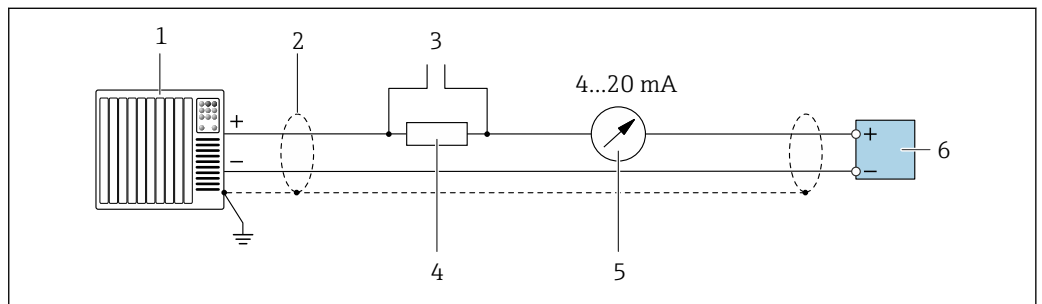
- A Housing version: compact, coated, aluminum
- B Housing version: compact, hygienic, stainless
- 1 Cable entry or device plug for signal transmission
- 2 Cable entry or device plug for supply voltage
- C Housing version: ultra-compact, hygienic, stainless, M12 device plug
- 3 Device plug for signal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

- Terminal assignment → 24
- Pin assignment, device plug → 31

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

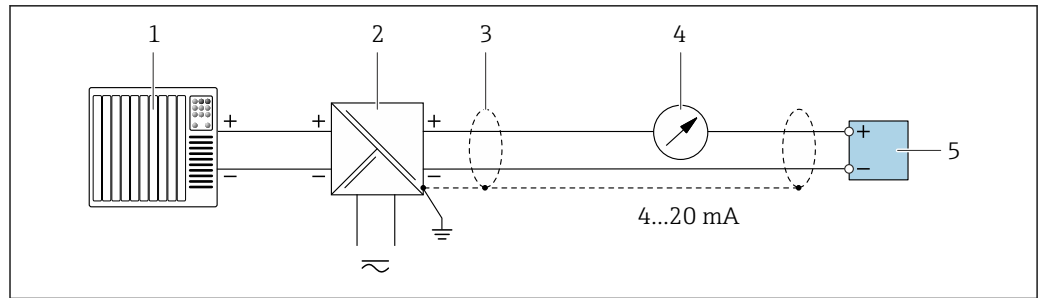
Connection examples

Current output 4 to 20 mA HART



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

- 1 Automation system with current input (e.g. PLC)
- 2 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 40
- 3 Connection for HART operating devices → 88
- 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 5 Analog display unit: observe maximum load
- 6 Transmitter

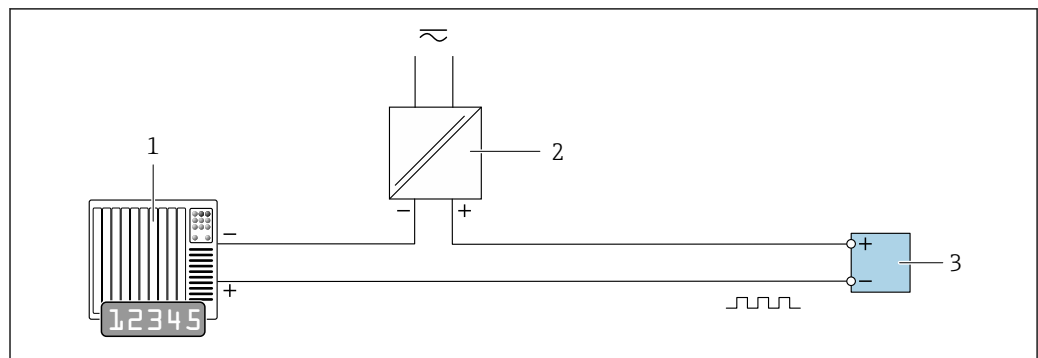


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10 Connection example for 4 to 20 mA HART current output (passive)

- 1 Automation system with current input (e.g. PLC)
- 2 Power supply
- 3 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 40
- 4 Analog display unit: observe maximum load
- 5 Transmitter

Pulse/frequency output

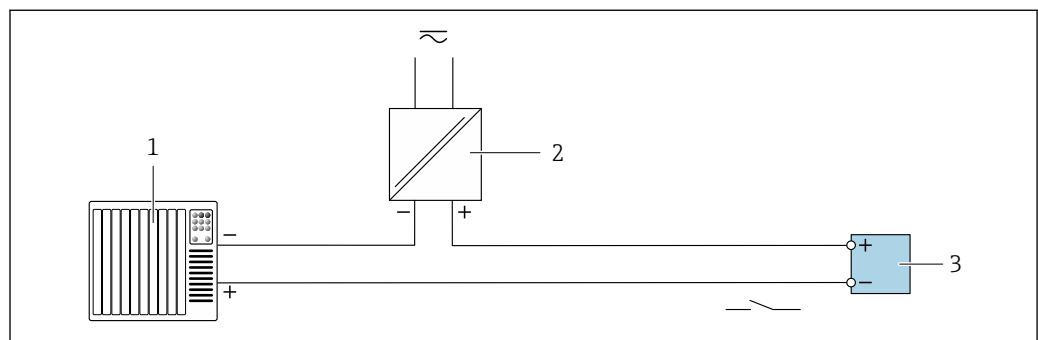


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11 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 10

Switch output

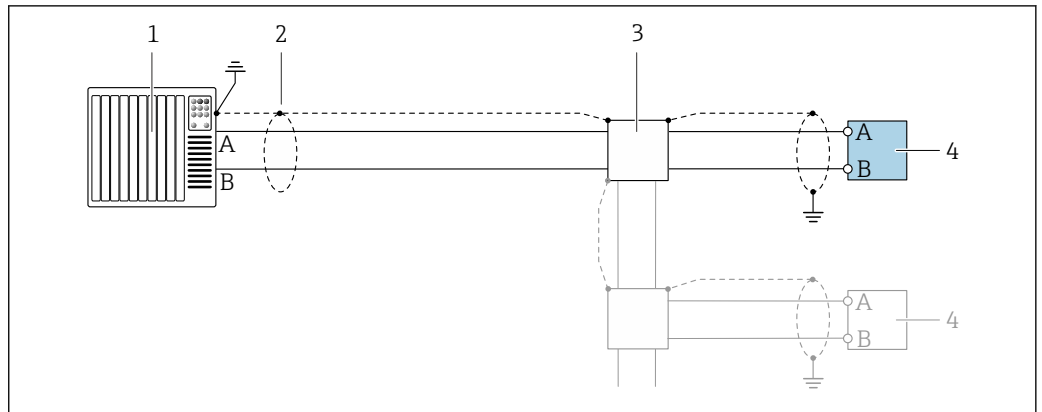


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12 Connection example for switch output (passive)

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

PROFIBUS DP



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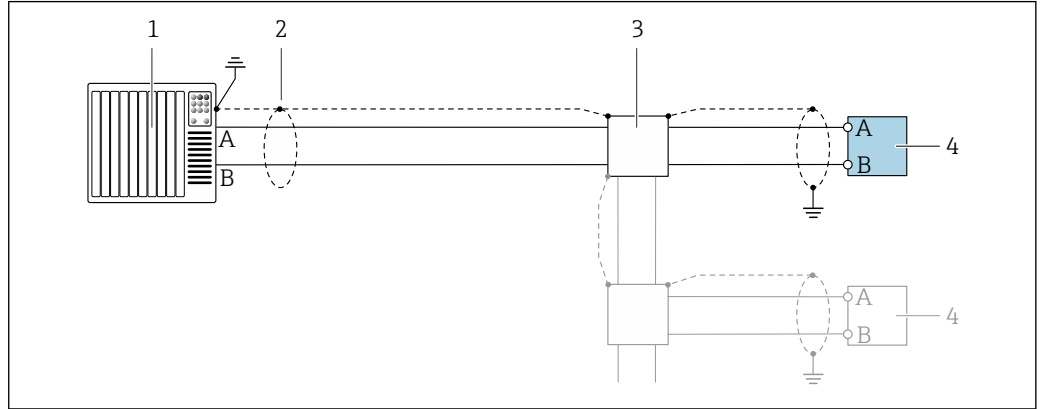
13 Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2

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

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

Modbus RS485

Modbus RS485, non-hazardous area and Zone 2/Div. 2

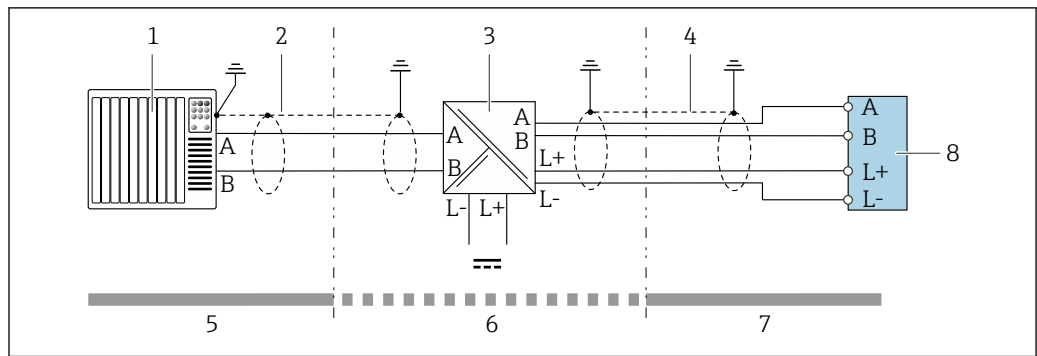


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14 Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2

- 1 Control system (e.g. PLC)
- 2 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 40
- 3 Distribution box
- 4 Transmitter

Modbus RS485 intrinsically safe

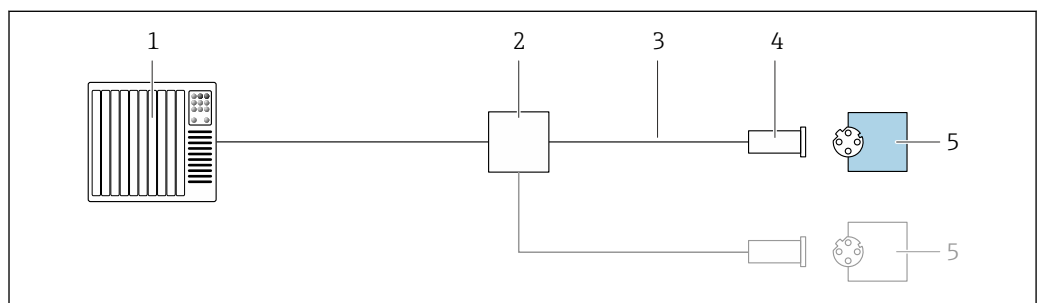


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15 Connection example for Modbus RS485 intrinsically safe

- 1 Control system (e.g. PLC)
- 2 Cable shield provided at one end. Observe cable specifications
- 3 Safety Barrier Promass 100
- 4 Observe cable specifications
- 5 Non-hazardous area
- 6 Non-hazardous area and Zone 2/Div. 2
- 7 Intrinsically safe area
- 8 Transmitter

EtherNet/IP

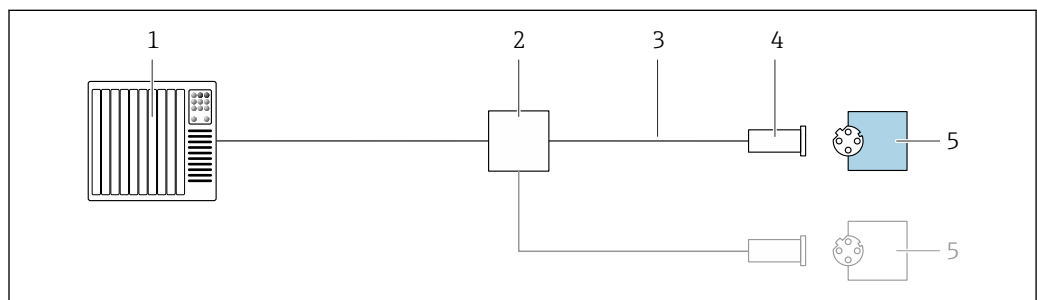


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16 Connection example for EtherNet/IP

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

PROFINET

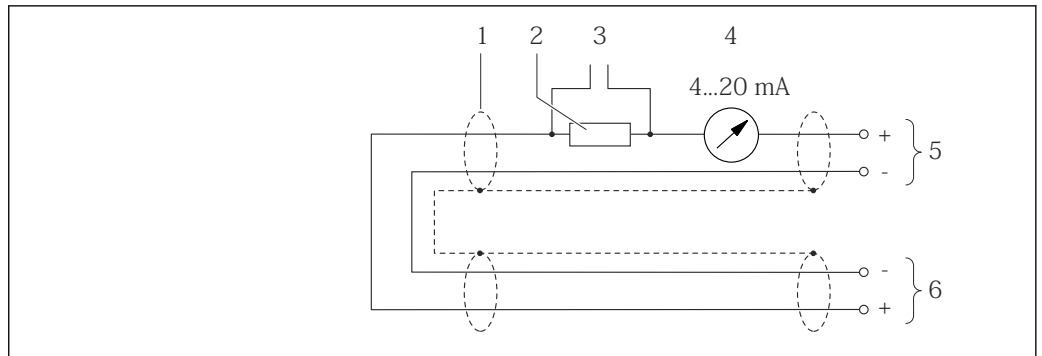


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17 Connection example for PROFINET

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

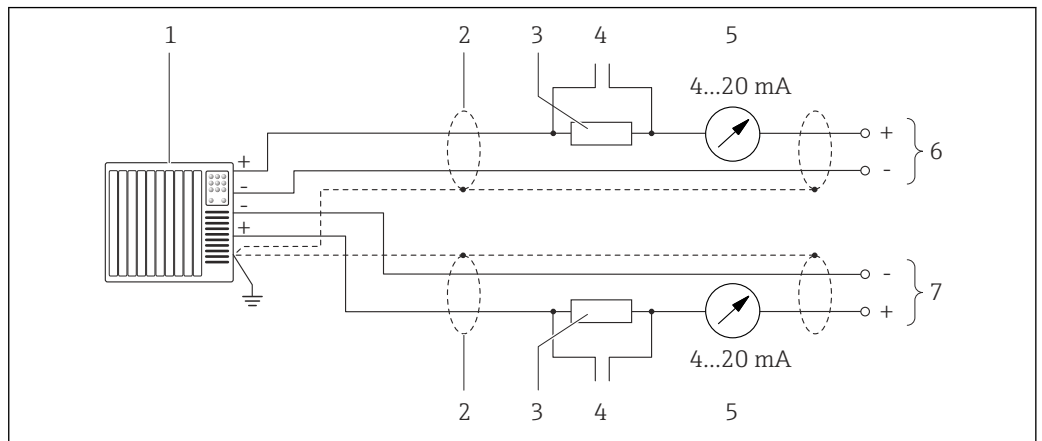
HART input



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

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



A0019830

19 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 provided at one end. Observe cable specifications
- 3 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 4 Connection for HART operating devices
- 5 Analog display unit
- 6 Transmitter
- 7 Sensor for external measured variable

Potential equalization

Requirements

For potential equalization:

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

Terminals

Transmitter

Spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)

Promass 100 safety barrier

Plug-in screw terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)

Cable entries

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


Cable specification**Permitted temperature range**

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

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

Standard installation cable is sufficient.

Signal cable

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

Current output 4 to 20 mA HART

Shielded twisted-pair cable.

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

Pulse /frequency /switch output

Standard installation cable is sufficient.

PROFIBUS DP

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

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

Modbus RS485

Shielded twisted-pair cable.

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

EtherNet/IP

Twisted-pair Ethernet CAT 5 or better.

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


PROFINET

Only PROFINET cables.

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

Connecting cable between Safety Barrier Promass 100 and measuring device

Cable type	Shielded twisted-pair cable with 2x2 wires. When grounding the cable shield, observe the grounding concept of the plant.
Maximum cable resistance	2.5 Ω, one side



 Comply with the maximum cable resistance specifications to ensure the operational reliability of the measuring device.

The maximum cable length for individual wire cross-sections is specified in the table below. Observe the maximum capacitance and inductance per unit length of the cable and connection values for hazardous areas .

Wire cross-section		Maximum cable length	
[mm ²]	[AWG]	[m]	[ft]
0.5	20	70	230
0.75	18	100	328
1.0	17	100	328
1.5	16	200	656
2.5	14	300	984

Performance characteristics



Reference operating conditions

- Error limits based on ISO 11631
 - Water
 - +15 to +45 °C (+59 to +113 °F)
 - 2 to 6 bar (29 to 87 psi)
 - Data as indicated in the calibration protocol
 - Accuracy based on accredited calibration rigs according to ISO 17025
-  To obtain measured errors, use the *Applicator* sizing tool →  98

Maximum measurement error

o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

Base accuracy

 Design fundamentals →  44

Mass flow and volume flow (liquids)

±0.10 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration ¹⁾	Wide-range Density specification ^{2) 3)}
[g/cm ³]	[g/cm ³]	[g/cm ³]
±0.0005	±0.01	±0.002

- 1) Valid over the entire temperature and density range
- 2) Valid range for special density calibration: 0 to 2 g/cm³, +10 to +80 °C (+50 to +176 °F)
- 3) order code for "Application package", option EE "Special density"

Temperature

±0.5 °C ± 0.005 · T °C (±0.9 °F ± 0.003 · (T - 32) °F)

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	3/8	0.20	0.007
15	1/2	0.65	0.024

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
25	1	1.80	0.066
40	1½	4.50	0.165
50	2	7.0	0.257

Flow values

Flow values as turndown parameters depending on nominal diameter.


SI units

DN [mm]	1:1	1:10	1:20	1:50	1:100	1:500
	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
8	2 000	200	100	40	20	4
15	6 500	650	325	130	65	13
25	18 000	1 800	900	360	180	36
40	45 000	4 500	2 250	900	450	90
50	70 000	7 000	3 500	1 400	700	140

US units

DN [inch]	1:1	1:10	1:20	1:50	1:100	1:500
	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
¾	73.50	7.350	3.675	1.470	0.735	0.147
½	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
1½	1 654	165.4	82.70	33.08	16.54	3.308
2	2 573	257.3	128.7	51.46	25.73	5.146

Accuracy of outputs

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

The outputs have the following base accuracy specifications.

Current output

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

Pulse/frequency output

o.r. = of reading

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

Repeatability

o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

Base repeatability

 Design fundamentals →  44

Mass flow and volume flow (liquids)

±0.05 % o.r.

Density (liquids)

±0.00025 g/cm³

Temperature

±0.25 °C ± 0.0025 · T °C (±0.45 °F ± 0.0015 · (T-32) °F)

Response time

The response time depends on the configuration (damping).

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.
--------------------------------	---

Influence of medium temperature

Mass flow

o.f.s. = of full scale value

If there is a difference between the temperature during zero adjustment and the process temperature, the additional measurement error of the sensors is typically ±0.0002 %o.f.s./°C (±0.0001 % o. f.s./°F).

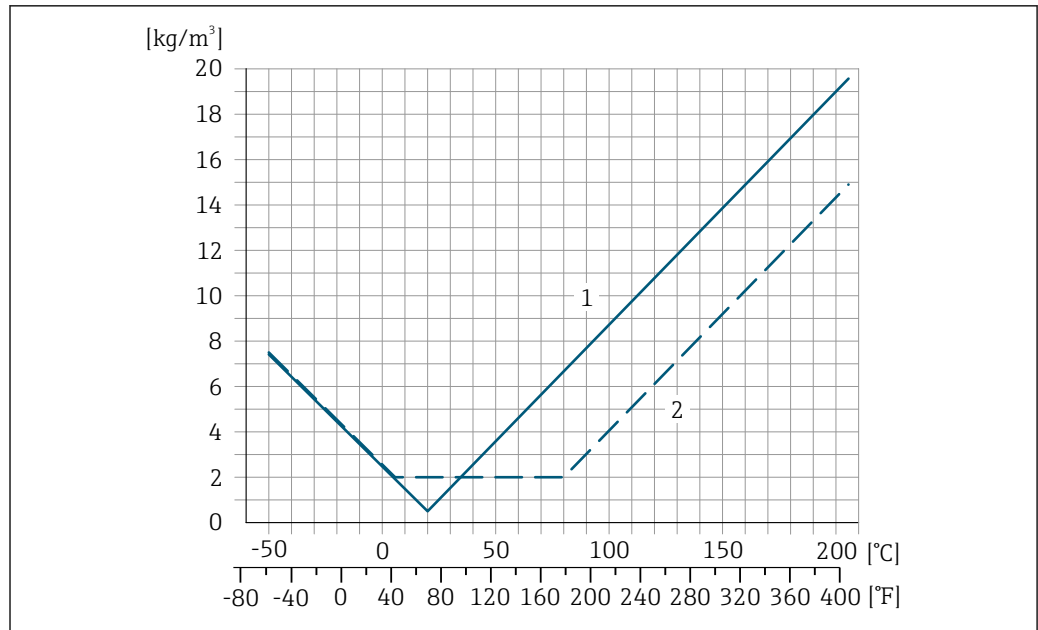
The influence is reduced when the zero adjustment is performed at process temperature.

Density

If there is a difference between the density calibration temperature and the process temperature, the measurement error of the sensors is typically ±0.0001 g/cm³/°C (±0.00005 g/cm³/°F). Field density adjustment is possible.

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range (→ 41) the measurement error is ±0.0001 g/cm³ /°C (±0.00005 g/cm³ /°F)



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- 1 Field density adjustment, for example at +20 °C (+68 °F)
- 2 Special density calibration

Temperature

$\pm 0.005 \cdot T \text{ } ^\circ\text{C}$ ($\pm 0.005 \cdot (T - 32) \text{ } ^\circ\text{F}$)

Influence of medium pressure

The following shows how the process pressure (gauge pressure) affects the accuracy of the mass flow.

o.r. = of reading

- It is possible to compensate for the effect by:
 - Reading in the current pressure measured value via the current input or a digital input.
 - Specifying a fixed value for the pressure in the device parameters.

Operating Instructions → 100.

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
8	3/8	-0.002	-0.0001
15	1/2	-0.006	-0.0004
25	1	-0.005	-0.0003
40	1 1/2	-0.007	-0.0005
50	2	-0.006	-0.0004

Design fundamentals

o.r. = of reading, o.f.s. = of full scale value

BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.

MeasValue = measured value; ZeroPoint = zero point stability

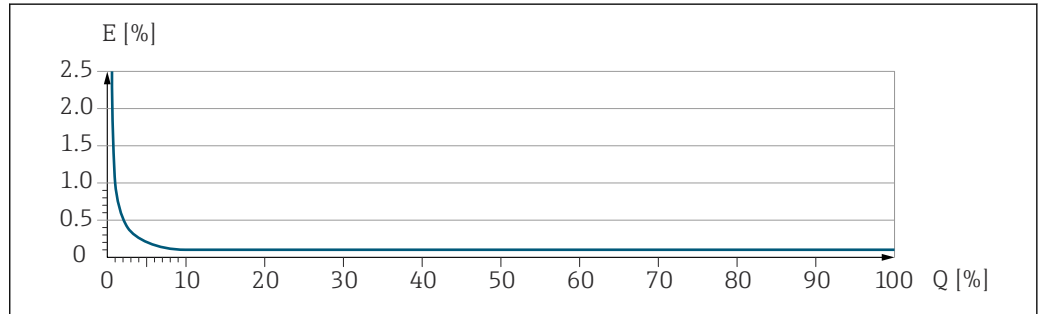
Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021332</small>	$\pm \text{BaseAccu}$ <small>A0021339</small>
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021333</small>	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021334</small>

Calculation of the maximum repeatability as a function of the flow rate

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ <small>A0021335</small>	$\pm \text{BaseRepeat}$ <small>A0021340</small>
$< \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ <small>A0021336</small>	$\pm 1/2 \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021337</small>

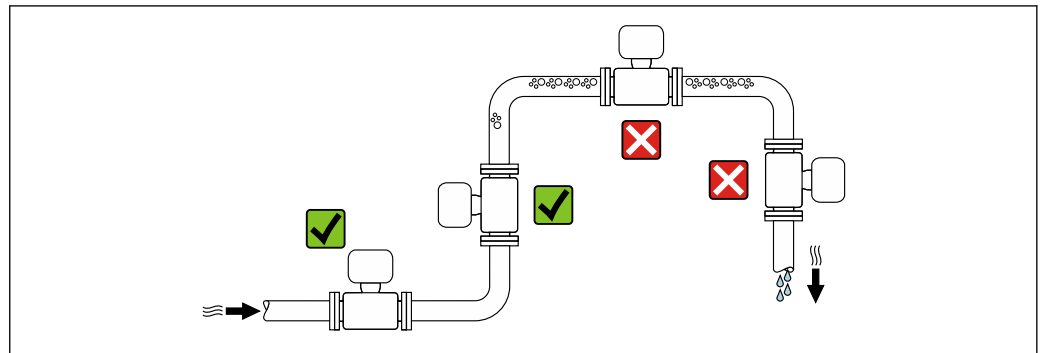
Example of maximum measurement error



E Maximum measurement error in % o.r. (example)
 Q Flow rate in % of maximum full scale value

Installation

Installation point

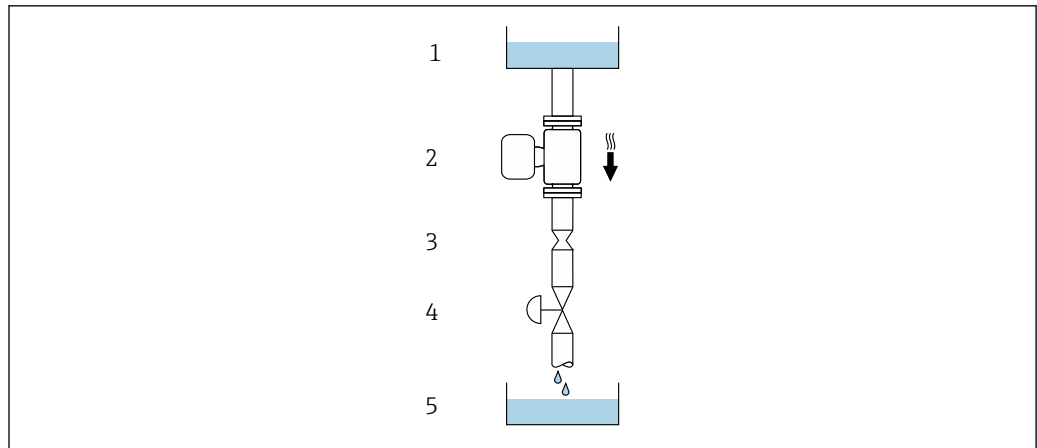


To prevent measuring errors arising from accumulation of gas bubbles in the measuring pipe, avoid the following mounting locations in the piping:

- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

However, the following installation suggestion allows for installation in an open vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.



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20 Installation in a down pipe (e.g. for batching applications)

- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Filling vessel

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
8	3/8	6	0.24
15	1/2	10	0.40
25	1	14	0.55
40	1 1/2	22	0.87
50	2	28	1.10

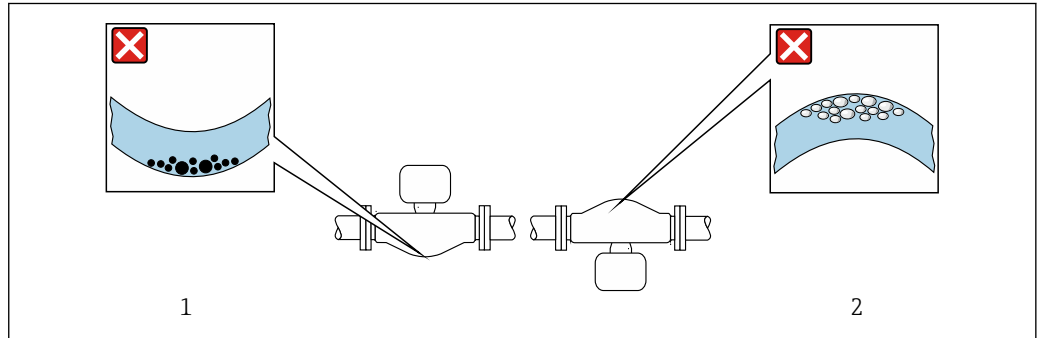
Orientation

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

Orientation		Recommendation
A	Vertical orientation	 <small>A0015591</small>
B	Horizontal orientation, transmitter at top	 <small>A0015589</small>
C	Horizontal orientation, transmitter at bottom	 <small>A0015590</small>
D	Horizontal orientation, transmitter at side	 <small>A0015592</small>

- 1) This orientation is recommended to ensure self-draining.
- 2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

If a sensor is installed horizontally with a curved measuring tube, match the position of the sensor to the fluid properties.



21 Orientation of sensor with curved measuring tube

- 1 Avoid this orientation for fluids with entrained solids: Risk of solids accumulating
- 2 Avoid this orientation for outgassing fluids: Risk of gas accumulating

Inlet and outlet runs

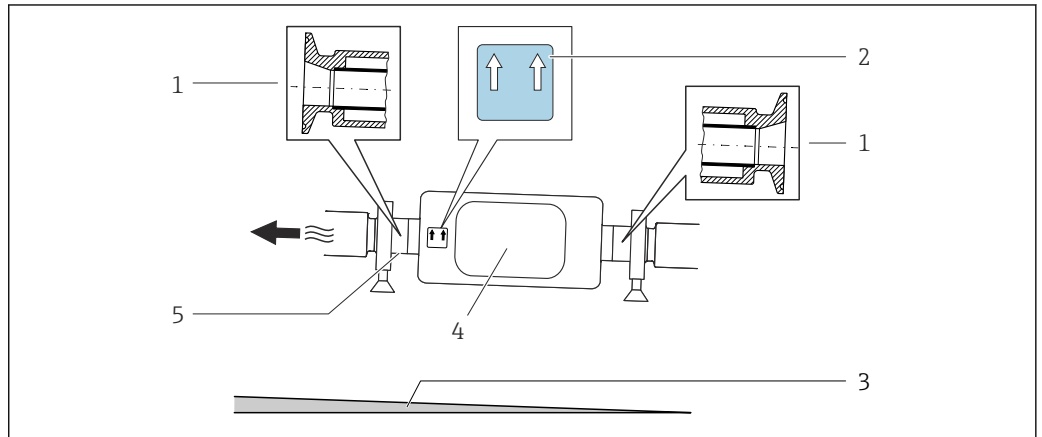
No special precautions need to be taken for fittings that create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → 54.

Special installation instructions

Drainability

When installed vertically, the measuring tube can be drained completely and protected against buildup.

When the sensor is installed in a horizontal line, eccentric clamps can be used to ensure complete drainability. When the system is pitched in a specific direction and at a specific slope, gravity can be used to achieve complete drainability. The sensor must be mounted in the correct position to ensure full drainability in the horizontal position. Markings on the sensor show the correct mounting position to optimize drainability.



- 1 Eccentric clamp connection
- 2 "This side up" label indicates which side is up
- 3 For DN 8 to 25 (3/8 to 1"): Gradient: approx. 2% or 21 mm/m (0.24 in/ft); for DN 40 to 50 (1½ to 2"): Gradient approx. 2° or 35 mm/m (0.42 in/ft)
- 4 Transmitter
- 5 Line on the underside indicates the lowest point of the eccentric process connection.

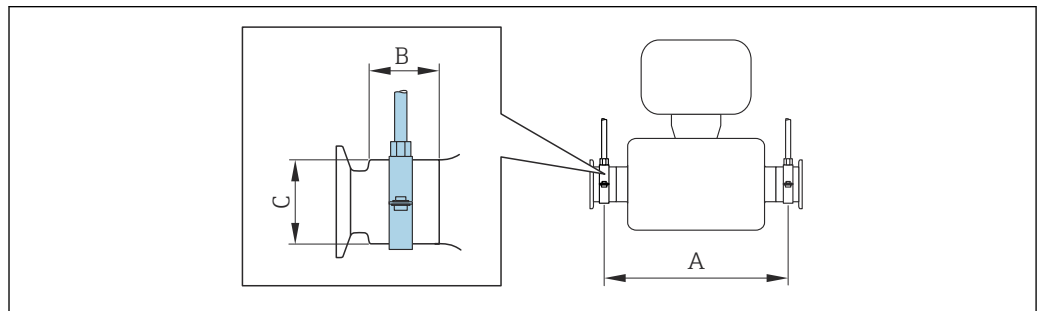
Hygienic compatibility

i When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → 94

Securing with mounting clamp in the case of hygiene connections

It is not necessary to provide additional support for the sensor for operational performance purposes. If, however, additional support is required for installation purposes, the following dimensions must be observed.

Use mounting clamp with lining between clamp and measuring instrument.



A0030298

DN		A		B		C	
[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]
8	3/8	298	11.73	33	1.3	28	1.1
15	1/2	402	15.83	33	1.3	28	1.1
25	1	542	21.34	33	1.3	38	1.5
40	1 1/2	658	25.91	36.5	1.44	56	2.2
50	2	772	30.39	44.1	1.74	75	2.95

Zero verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 41. Therefore, a zero adjustment in the field is generally not required.

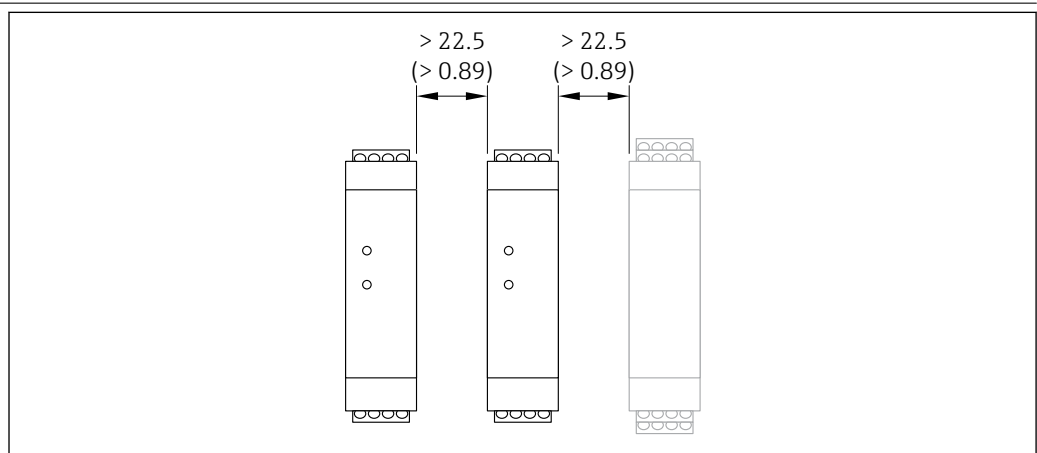
Experience shows that zero adjustment is advisable only in special cases:

- To achieve maximum measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).
- For gas applications with low pressure

For information on checking the zero point and performing a zero adjustment, see the Operating Instructions for the device.

i To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stresses during operation.

Installing the Safety Barrier Promass 100



A0016894

22 Minimum distance between additional Safety Barrier Promass 100 or other modules. Engineering unit mm (in)

Environment

Ambient temperature range	Measuring device	<ul style="list-style-type: none"> ■ -40 to +60 °C (-40 to +140 °F) ■ Order code for "Test, certificate", option JM: -50 to +60 °C (-58 to +140 °F)
	Safety barrier Promass 100	-40 to +60 °C (-40 to +140 °F)
<p>► If operating outdoors: Avoid direct sunlight, particularly in warm climatic regions.</p>		
Storage temperature	-40 to +80 °C (-40 to +176 °F), preferably at +20 °C (+68 °F) (standard version) -50 to +80 °C (-58 to +176 °F) (Order code for "Test, certificate", option JM)	
Climate class	DIN EN 60068-2-38 (test Z/AD)	
Degree of protection	Transmitter and sensor <ul style="list-style-type: none"> ■ Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4 ■ With the order code for "Sensor options", option CM: IP69 can also be ordered ■ When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2 ■ Display module: IP20, Type 1 enclosure, suitable for pollution degree 2 Safety Barrier Promass 100 IP20	
Shock and vibration resistance	Vibration sinusoidal, in accordance with IEC 60068-2-6 <ul style="list-style-type: none"> ■ 2 to 8.4 Hz, 3.5 mm peak ■ 8.4 to 2 000 Hz, 1 g peak Vibration broad-band random, according to IEC 60068-2-64 <ul style="list-style-type: none"> ■ 10 to 200 Hz, 0.003 g²/Hz ■ 200 to 2 000 Hz, 0.001 g²/Hz ■ Total: 1.54 g rms Shock half-sine, according to IEC 60068-2-27 6 ms 30 g	
	Rough handling shocks according to IEC 60068-2-31	
Internal cleaning	<ul style="list-style-type: none"> ■ CIP cleaning ■ SIP cleaning ■ Cleaning with pigs Options Oil- and grease-free version for wetted parts, without declaration Order code for "Service", option HA ¹⁾	

1) The cleaning refers to the measuring instrument only. Any accessories supplied are not cleaned.

Electromagnetic compatibility (EMC)

- Depends on the communication protocol:
 - As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
 - As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
 - 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
- i** 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.
- i** Details are provided in the Declaration of Conformity.
- i** This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

Process

Medium temperature range

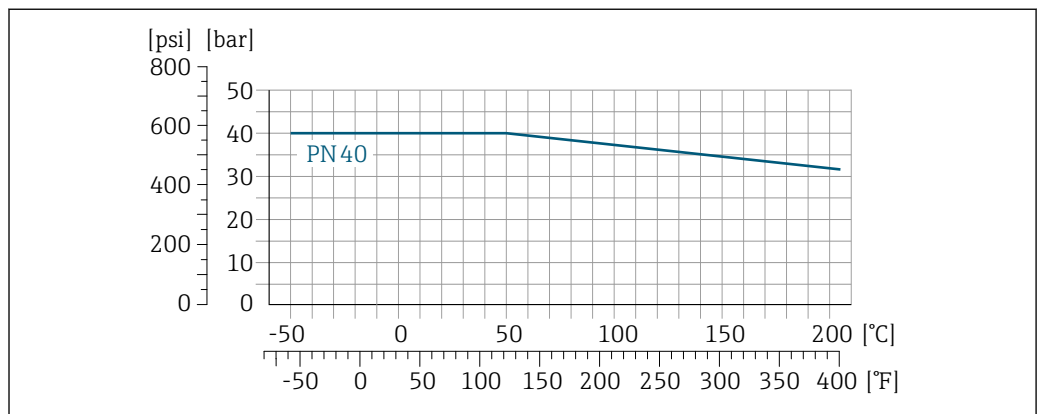
Standard version	-50 to +150 °C (-58 to +302 °F)	Order code for "Measuring tube mat., wetted surface", option BB, BC, BD
Extended temperature version	-50 to +205 °C (-58 to +401 °F)	Order code for "Measuring tube mat., wetted surface", option TD, TG

Pressure/temperature ratings

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

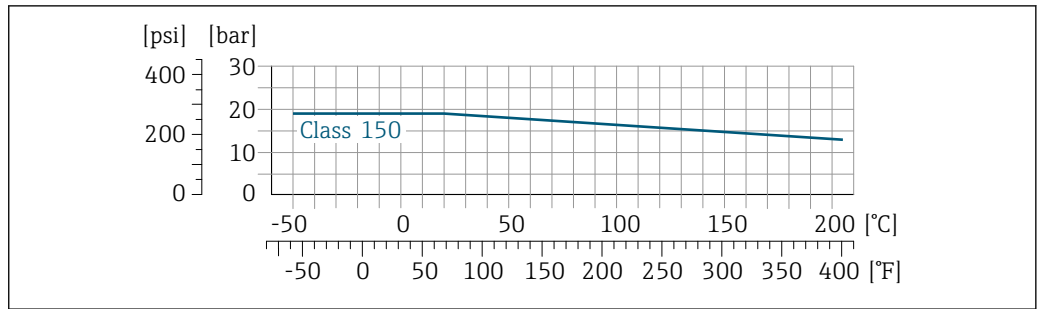
- i** Pressure-temperature ratings with the +151 to +205 °C (+304 to +401 °F) temperature range only for the extended temperature version of the measuring device.

Flange similar to EN 1092-1 (DIN 2501)



23 With flange material 1.4404 (F316/F316L).

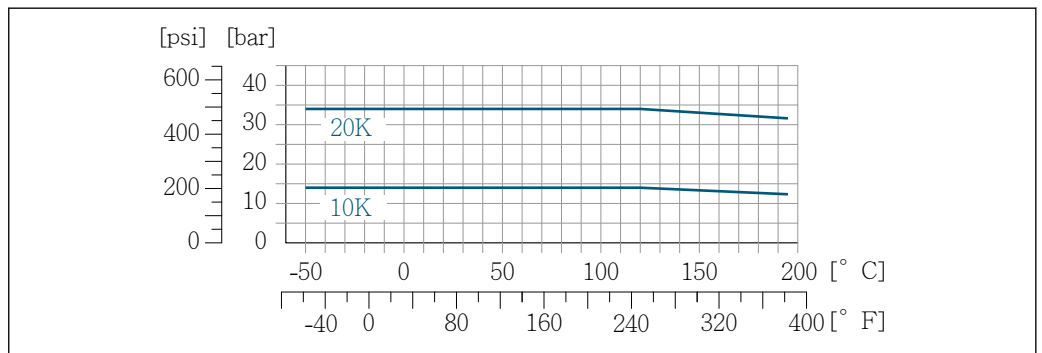
Flange similar to ASME B16.5



A0029906-EN

24 With flange material 1.4404 (F316/F316L)

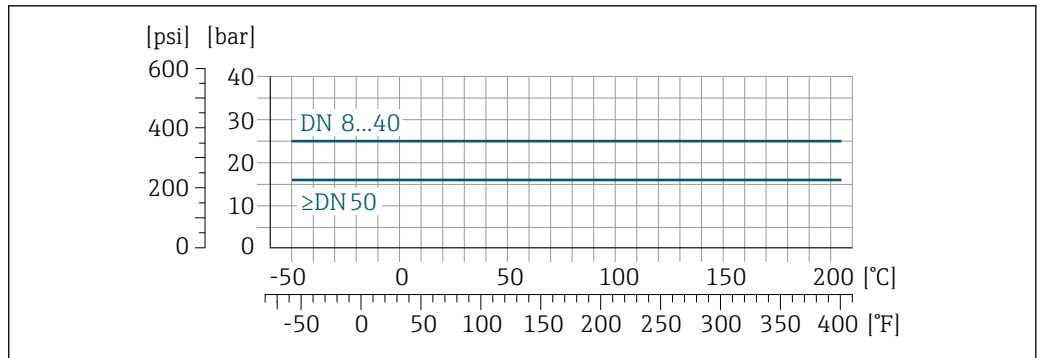
Flange JIS B2220



A0029907-EN

25 With flange material 1.4404 (F316/F316L)

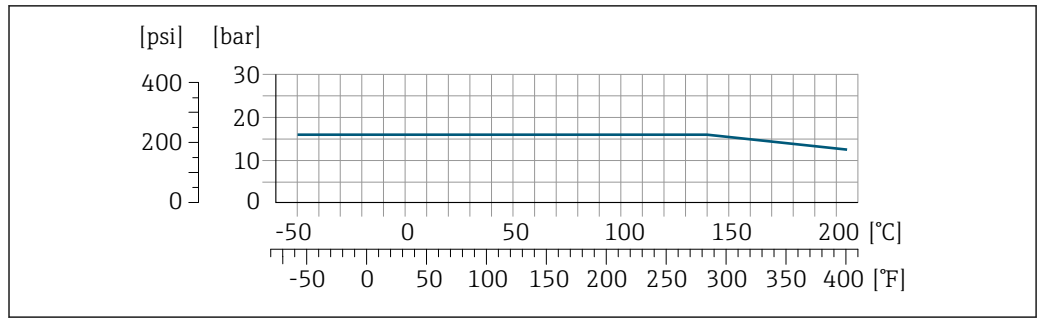
Flange DIN 11864-2 Form A



A0029908-EN

26 With flange material 1.4435 (316L)

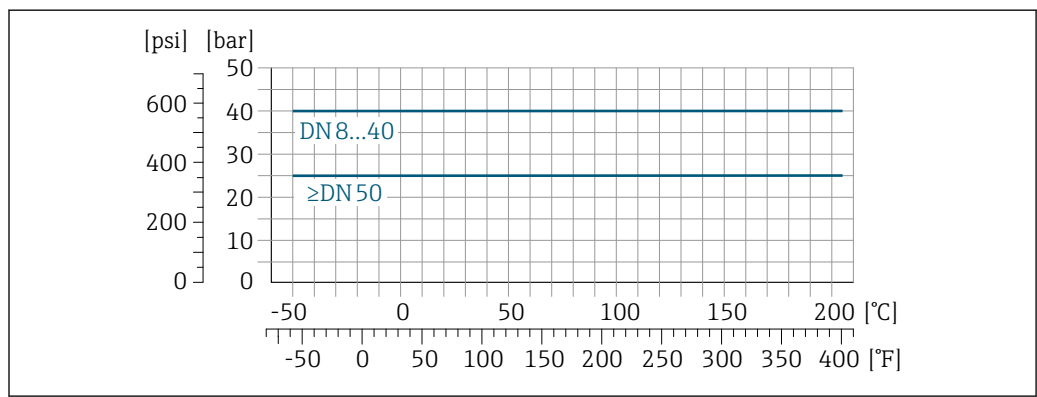
Neumo BioConnect, BBS flange



A0027782-EN

27 With flange material 1.4435 (316L)

Thread DIN 11851

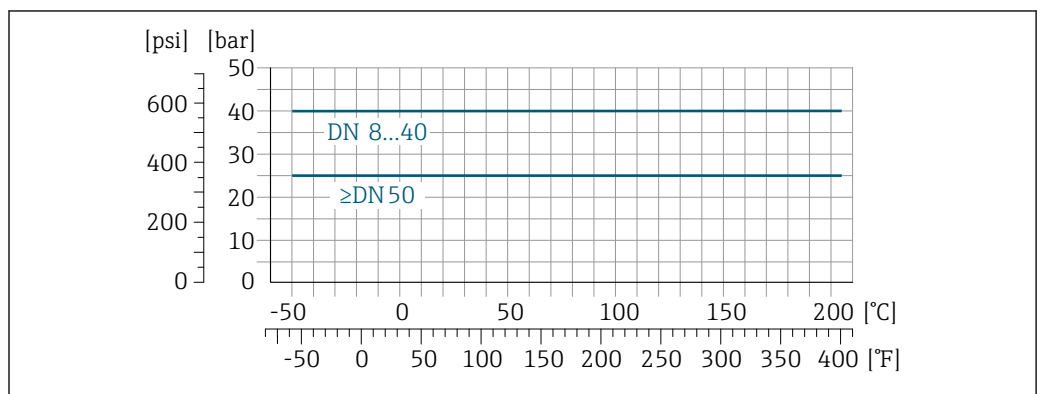


A0029909-EN

28 With flange material 1.4435 (316L)

DIN 11851 allows for applications up to +140 °C (+284 °F) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

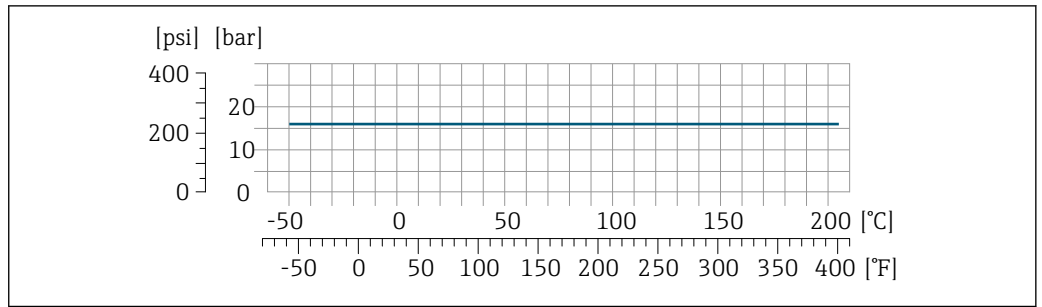
Thread DIN 11864-1 Form A



A0029910-EN

29 With connection material 1.4435 (316L)

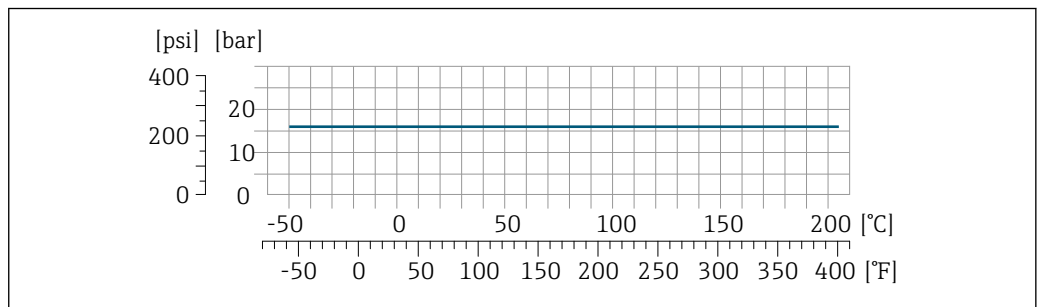
Thread ISO 2853



A0034703-EN

30 With connection material 1.4435 (316L)

Thread SMS 1145

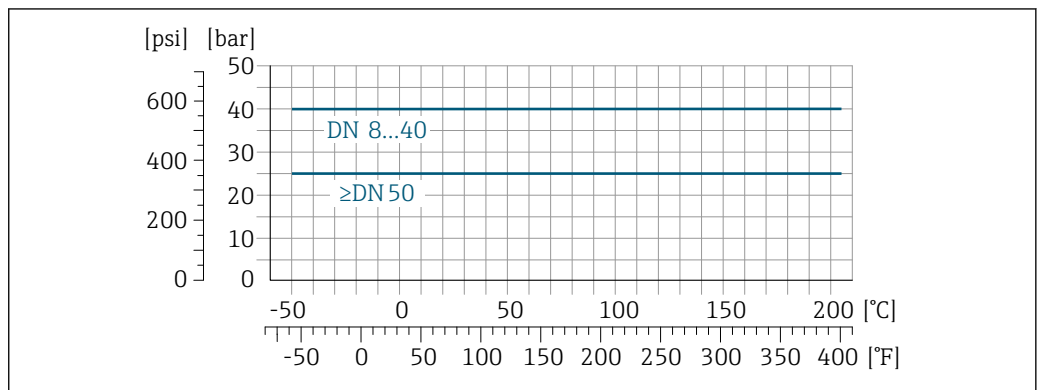


A0029889-EN

31 With connection material 1.4435 (316L)

SMS 1145 allows for applications up to 6 bar (87 psi) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

Clamp connections DIN 11864-3 Form A



A0029910-EN

32 With connection material 1.4435 (316L)

Tri-Clamp; clamp connection ISO 2852, DIN 32676, BBS, Neumo BioConnect

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

Sensor housing

The sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside.

i If a measuring tube fails (e.g. due to process characteristics like corrosive or abrasive fluids), the fluid will initially be contained by the sensor housing.

If the sensor is to be purged with gas (gas detection), it should be equipped with purge connections.

i Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge.

Maximum pressure: 5 bar (72.5 psi)

Burst pressure of the sensor housing

The following sensor housing burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (not opened/as delivered).

If a device fitted with purge connections (order code for "Sensor option", option CH "Purge connection") is connected to the purge system, the maximum pressure is determined by the purge system itself or by the device, depending on which component has the lower pressure classification.


The sensor housing burst pressure refers to a typical internal pressure which is reached prior to mechanical failure of the sensor housing and which was determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option LN "Sensor housing burst pressure, type test").

DN		Sensor housing burst pressure	
[mm]	[in]	[bar]	[psi]
8	$\frac{3}{8}$	190	2 755
15	$\frac{1}{2}$	175	2 538
25	1	165	2 392
40	$1\frac{1}{2}$	152	2 204
50	2	103	1 494


For information on the dimensions: see the "Mechanical construction" section

Flow limit


Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.

i For an overview of the full scale values for the measuring range, see the "Measuring range" section →  9

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).

i To calculate the flow limit, use the *Applicator* sizing tool →  98

Pressure loss

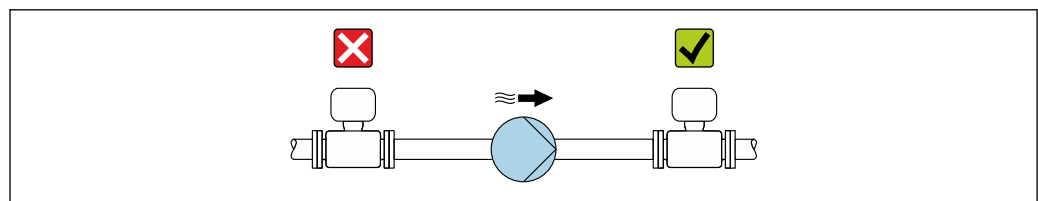
i To calculate the pressure loss, use the *Applicator* sizing tool →  98

Static pressure

It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas. This is prevented by means of a sufficiently high static pressure.

For this reason, the following mounting locations are recommended:

- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)



A0028777

Thermal insulation

In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

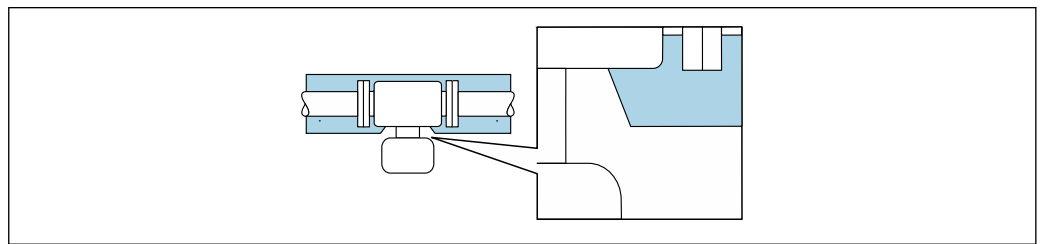
The following device versions are recommended for versions with thermal insulation:

- Version with extended neck for insulation:
Order code for "Sensor option", option CG with an extended neck length of 105 mm (4.13 in).
- Extended temperature version:
Order code for "Measuring tube material", option TD or TG with an extended neck length of 105 mm (4.13 in).

NOTICE

Electronics overheating on account of thermal insulation!

- ▶ Recommended orientation: horizontal orientation, transmitter housing pointing downwards.
- ▶ Do not insulate the transmitter housing .
- ▶ Maximum permissible temperature at the lower end of the transmitter housing: 80 °C (176 °F)
- ▶ Regarding thermal insulation with an exposed extended neck: We advise against insulating the extended neck to ensure optimal heat dissipation.



A0034391

33 Thermal insulation with exposed extended neck

Heating

Some fluids require suitable measures to avoid loss of heat at the sensor.

Heating options

- Electrical heating, e.g. with electric band heaters ²⁾
- Via pipes carrying hot water or steam
- Via heating jackets

 Heating jackets for the sensors can be ordered as accessories from Endress+Hauser →  97.


NOTICE

Danger of overheating when heating

- ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F).
- ▶ Ensure that sufficient convection takes place at the transmitter neck.
- ▶ Ensure that a sufficiently large area of the transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.
- ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.
- ▶ Consider the "830 ambient temperature too high" and "832 electronics temperature too high" process diagnostics if overheating cannot be ruled out based on a suitable system design.

Vibrations

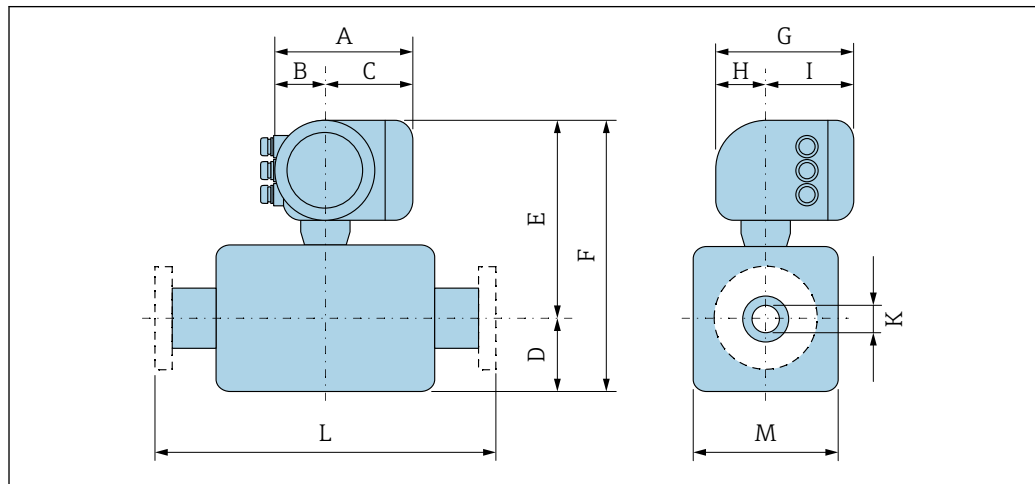
The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

2) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" →  100

Mechanical construction

Dimensions in SI units

Compact version



A0039785

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E ^{1) 2)} [mm]	F ^{1) 2)} [mm]	G [mm]	H [mm]	I [mm]	K [mm]	L [mm]	M [mm]
8	147.5	93.5	54	108	191	299	136	59	141	8.31	³⁾	92
15	147.5	93.5	54	108	191	299	136	59	141	12.0	³⁾	92
25	147.5	93.5	54	121	191	312	136	59	141	17.6	³⁾	92
40	147.5	93.5	54	173	215	388	136	59	141	26.0	³⁾	132
50	147.5	93.5	54	241	226	467	136	59	141	40.5	³⁾	167

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG and order code for "Measuring tube material", option TD, TG: values + 70 mm

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

3) Depends on the particular process connection

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

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E ^{1) 2)} [mm]	F ^{1) 2)} [mm]	G [mm]	K [mm]	L [mm]	M [mm]
8	136.8	78	58.8	108	186	294	133.5	8.31	³⁾	92
15	136.8	78	58.8	108	186	294	133.5	12.00	³⁾	92
25	136.8	78	58.8	121	186	307	133.5	17.60	³⁾	92
40	136.8	78	58.8	173	210	383	133.5	26.00	³⁾	132
50	136.8	78	58.8	241	221	462	133.5	40.50	³⁾	167

1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG and order code for "Measuring tube material", option TD, TG: values + 70 mm

2) If using a display, order code for "Display; Operation", option B: values + 14 mm

3) Depends on the particular process connection

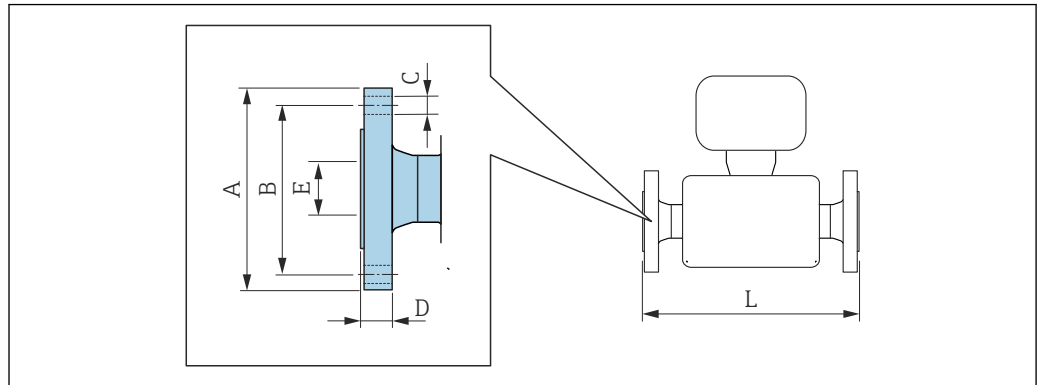
Order code for "Housing", option C "Ultra-compact, hygienic, stainless"

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E ^{1) 2)} [mm]	F ^{1) 2)} [mm]	G [mm]	K [mm]	L [mm]	M [mm]
8	123.6	67.7	55.9	108	186	294	111.4	8.31	³⁾	92
15	123.6	67.7	55.9	108	186	294	111.4	12.00	³⁾	92
25	123.6	67.7	55.9	121	186	307	111.4	17.60	³⁾	92
40	123.6	67.7	55.9	173	210	383	111.4	26.00	³⁾	132
50	123.6	67.7	55.9	241	221	462	111.4	40.50	³⁾	167

- 1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG and order code for "Measuring tube material", option TD, TG: values + 70 mm
- 2) If using a display, order code for "Display; Operation", option B: values + 14 mm
- 3) Depends on the particular process connection

Flange connections

Fixed flange EN 1092-1, ASME B16.5, JIS B2220



A0015621

i Length tolerance for dimension L in mm:
+1.5/-2.0

**Flange according to EN 1092-1 (DIN 2501): PN 40
1.4404 (F316/F316L)**

Order code for "Process connection", option D2W

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8 ¹⁾	95	65	4 × Ø14	17.0	17.3	336
15	95	65	4 × Ø14	20.0	17.3	440
25	115	85	4 × Ø14	19.0	28.5	580
40	150	110	4 × Ø18	21.0	43.1	707
50	165	125	4 × Ø18	25.0	54.5	828

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm

1) DN 8 with DN 15 flanges as standard

**Flange according to ASME B16.5: Cl 150
1.4404 (F316/F316L)**

Order code for "Process connection", option AAW

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8 ¹⁾	90	60.3	4 × Ø15.7	11.2	15.7	336
15	90	60.3	4 × Ø15.7	11.2	15.7	440
25	110	79.4	4 × Ø15.7	14.2	26.7	580
40	125	98.4	4 × Ø15.7	17.5	40.9	707
50	150	120.7	8 × Ø19.1	19.1	52.6	828

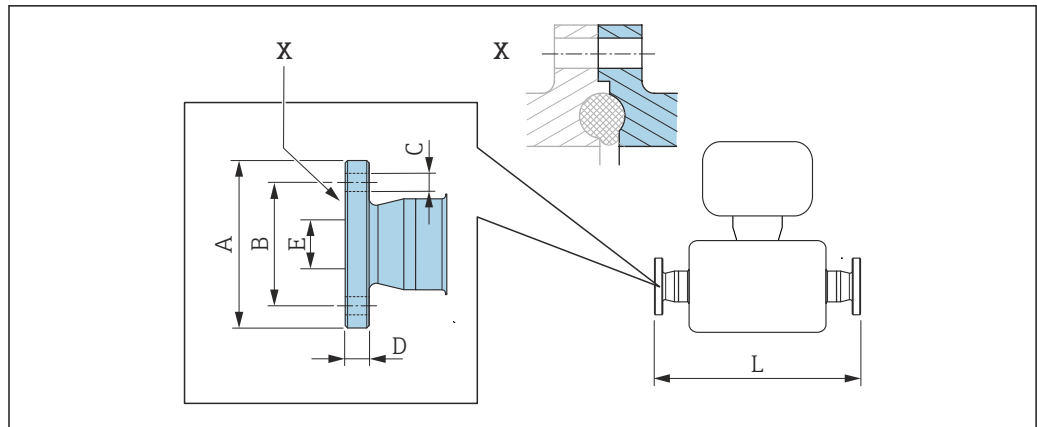
Surface roughness (flange): Ra 3.2 to 6.3 µm

1) DN 8 with DN 15 flanges as standard

Flange JIS B2220: 20K 1.4404 (F316/F316L) <i>Order code for "Process connection", option NEW</i>						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8 ¹⁾	95	70	4 × Ø15	16.0	15	336
15	95	70	4 × Ø15	16.0	15	440
25	125	90	4 × Ø19	17.5	25	580
40	140	105	4 × Ø19	20.0	40	707
50	155	120	8 × Ø19	27.5	50	828
Surface roughness (flange): Ra 3.2 to 6.3 µm						

1) DN 8 with DN 15 flanges as standard

Fixed flange DIN 11864-2



A0015627

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

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Flange DIN 11864-2 Form A, for pipe according to DIN11866 series A, flange with notch 1.4435 (316L)

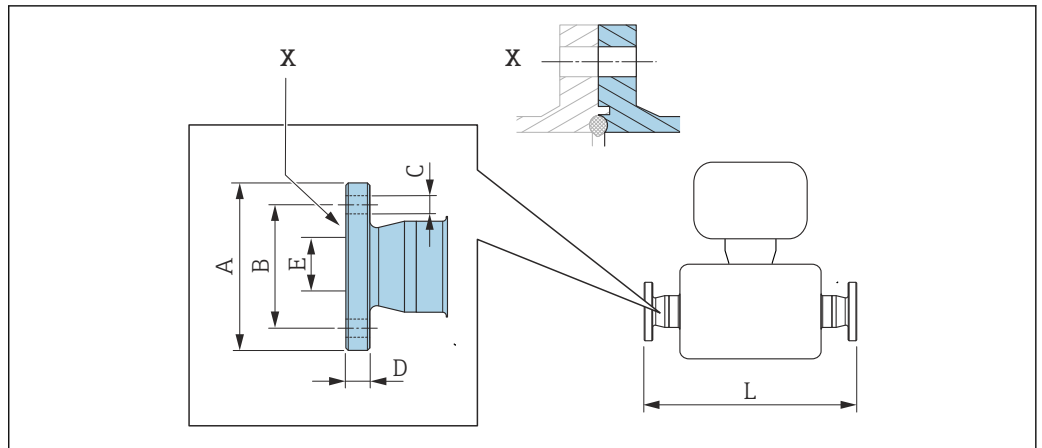
Order code for "Process connection", option KJW

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	59.0	42	4 × Ø9	10	16.00	384
15	59.0	42	4 × Ø9	10	16.00	488
25	70.0	53	4 × Ø9	10	26.00	626
40	82.0	65	4 × Ø9	10	38.00	753
50	94.0	77	4 × Ø9	10	50.00	877

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD

Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

BBS fixed flange



A0016910

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

i Length tolerance for dimension L in mm:
+1.5 / -2.0

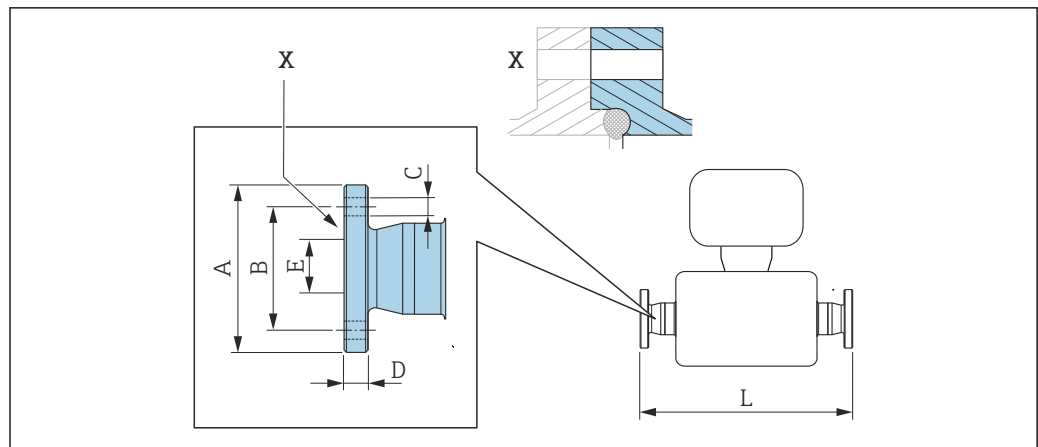
BBS flange small (sterile orbital), for pipe according to DIN 11866 series A, female 1.4435 (316L)						
Order code for "Process connection", option BSK						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	59	42	4 × Ø9	10	10.00	384
15	59	42	4 × Ø9	10	16.00	488
25	70	53	4 × Ø9	10	26.00	626
40	82	65	4 × Ø9	10	38.00	753
50	94	77	4 × Ø9	10	50.00	877

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

BBS flange small (sterile orbital), for pipe according to DIN 11866 series B, female 1.4435 (316L)						
Order code for "Process connection", option BSL						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	59	42	4 × Ø9	10	14.00	384
15	62	45	4 × Ø9	10	18.10	488
25	74	57	4 × Ø9	10	29.70	626
40	88	71	4 × Ø9	10	44.30	753
50	103	85	4 × Ø9	10	56.30	877

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Neumo BioConnect fixed flange



A0016907

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

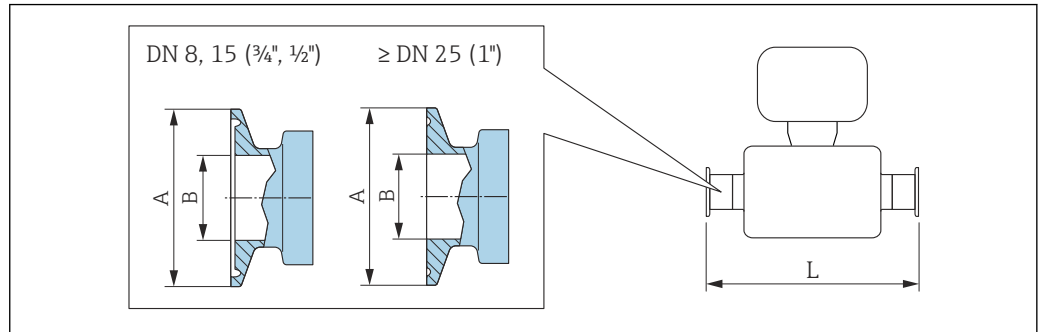
i Length tolerance for dimension L in mm:
+1.5 / -2.0

Neumo BioConnect flange (sterile orbital), for pipe according to DIN 11866 series A, flange form R 1.4435 (316L) Order code for "Process connection", option BSB						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
8	65	45	4 × Ø9	10	10.00	384
15	75	55	4 × Ø9	10	16.00	488
25	85	65	4 × Ø9	12	26.00	626
40	100	80	4 × Ø9	12	38.00	753
50	110	90	4 × Ø9	14	50.00	877

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Clamp connections

Tri-Clamp



A0023342

37 Unit mm (in)

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Tri-Clamp, for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FHW</i>				
DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
8	1/2	25.0	9.40	362
15	3/4	25.0	15.75	466
25	1 ¹⁾	50.4	22.10	606
40	1 1/2 ¹⁾	50.4	34.80	731
50	2 ¹⁾	63.9	47.50	853

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

1) The connection corresponds to the hygienic clamp dimensions according to ASME BPE.

1/2" Tri-Clamp, for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FCW</i>				
DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
15	1/2	25.0	9.40	466

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD

3/4" Tri-Clamp, for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FFW</i>				
DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
8	3/4	25.0	15.75	362

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

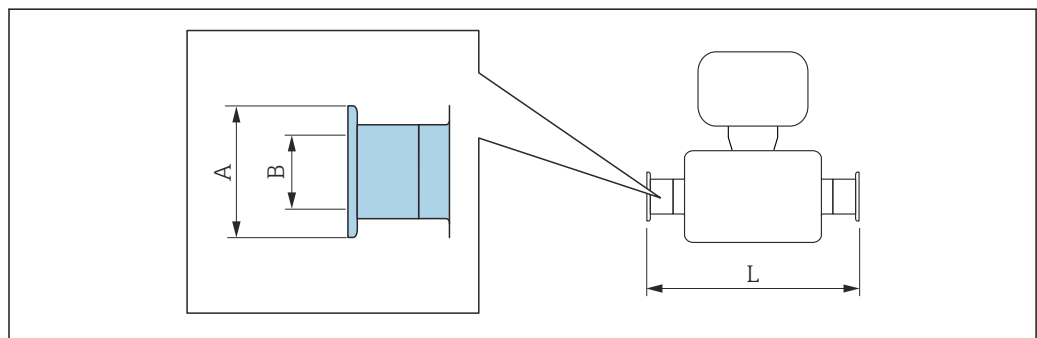
1" Tri-Clamp, for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FPW</i>				
DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
8	1 ¹⁾	50.4	22.10	362
15	1 ¹⁾	50.4	22.10	466
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG				

1) The connection corresponds to the hygienic clamp dimensions according to ASME BPE.

Tri-Clamp eccentric, for pipe according to DIN 11866 series C 1.4435 (316L)					
DN [mm]	Order code for "Process connection", option	Clamp [in]	A [mm]	B [mm]	L [mm]
8	FEB	½	25.0	9.40	362
15	FED	¾	25.0	15.75	466
25	FEF	1 ¹⁾	50.4	22.10	606
40	FEH	1½ ¹⁾	50.4	34.80	738
50	FEK	2 ¹⁾	63.9	47.50	860
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG Additional information regarding "Eccentric clamps"					

1) The connection corresponds to the hygienic clamp dimensions according to ASME BPE.

Clamp connection DIN 32676, ISO 2852



A0015625

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Clamp DIN 32676, for pipe according to DIN 11866 series A 1.4435 (316L)			
<i>Order code for "Process connection", option KPW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	34.0	16.00	362
15	34.0	16.00	466
25	50.5	26.00	606

Clamp DIN 32676, for pipe according to DIN 11866 series A			
1.4435 (316L)			
<i>Order code for "Process connection", option KPW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
40	50.5	38.00	732
50	64.0	50.00	854

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

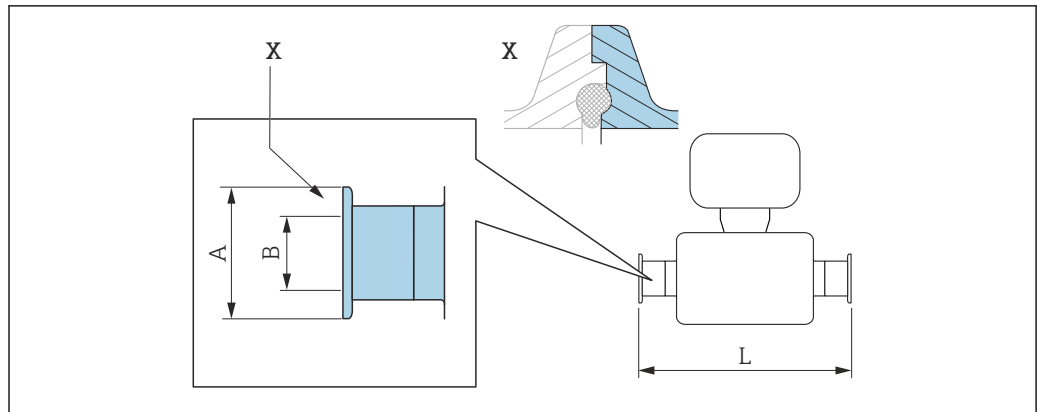
Clamp ISO 2852, for pipe according to ISO 2037			
1.4435 (316L)			
<i>Order code for "Process connection", option JSA</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	50.5	22.6	362
15	50.5	22.6	466
25	50.5	22.6	606
40	50.5	35.6	731
50	64.0	48.6	853

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Clamp ISO 2852, for pipe according to DIN11866 series B			
1.4435 (316L)			
<i>Order code for "Process connection", option JSC</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	34.0	14.00	362
15	34.0	18.10	466
25	50.5	29.70	606
40	64.0	44.30	731
50	77.5	56.30	853

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Clamp connection DIN 11864-3



A0016903

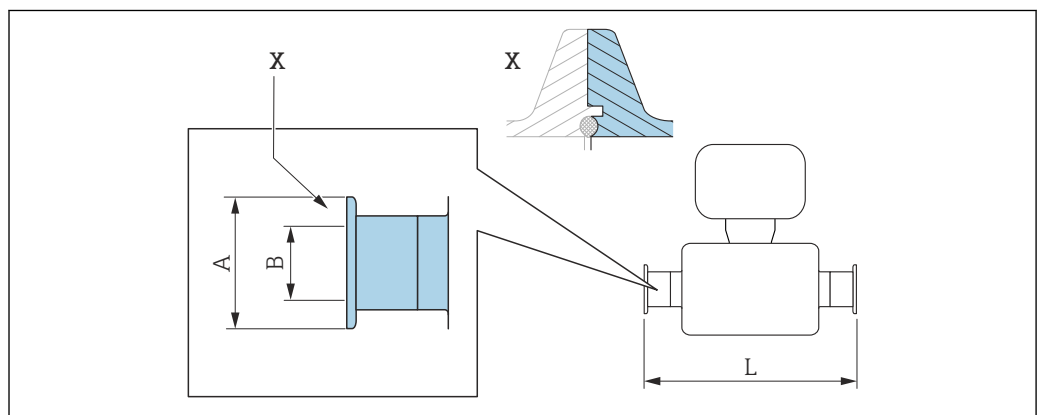
38 Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Clamp DIN 11864-3 Form A, with notch, for pipe according to DIN 11866 series A 1.4435 (316L) Order code for "Process connection", option K LW			
DN [mm]	A [mm]	B [mm]	L [mm]
8	34.0	16.05	370
15	34.0	16.05	474
25	50.5	26.05	614
40	64.0	38.05	738
50	77.5	50.05	853

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

BBS clamp connection



A0016908

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

i Length tolerance for dimension L in mm:
+1.5 / -2.0

BBS Quick Connect (sterile orbital), for pipe according to DIN 11866 series A, female 1.4435 (316L)
Order code for "Process connection", option BSE

DN [mm]	A [mm]	B [mm]	L [mm]
8	25.0	10.00	362
15	50.5	16.00	466
25	50.5	26.00	606
40	64.0	38.00	732
50	77.5	50.00	854

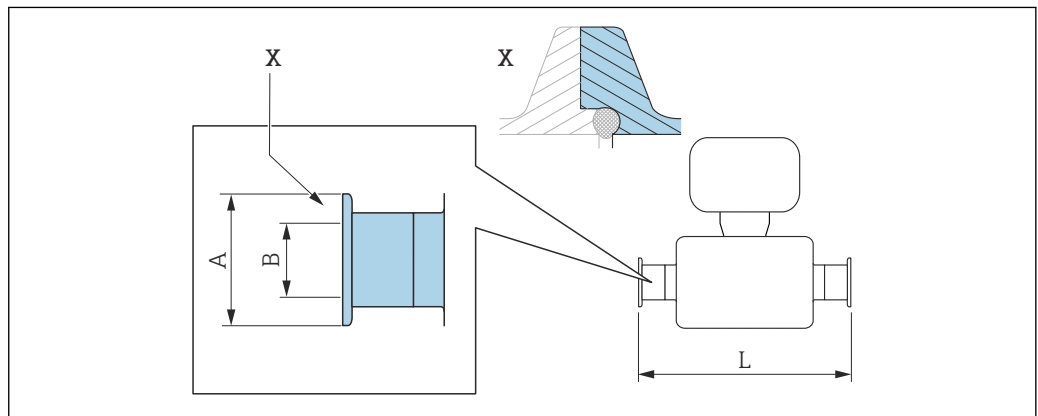
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

BBS Quick Connect (sterile orbital) for pipe according to DIN11866 series B, female 1.4435 (316L)
Order code for "Process connection", option BSJ

DN [mm]	A [mm]	B [mm]	L [mm]
8	25.0	14.00	362
15	50.5	18.10	466
25	50.5	29.70	606
40	64.0	44.30	738
50	77.5	56.30	860

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
 Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Neumo BioConnect clamp connection



A0016905

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

i Length tolerance for dimension L in mm:
 +1.5 / -2.0

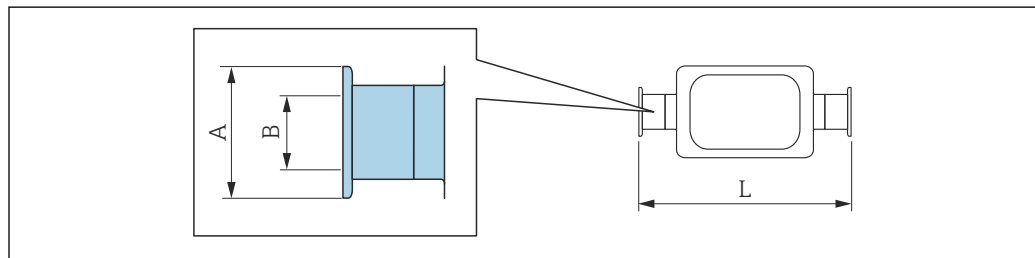
Clamp, Neumo BioConnect (sterile orbital), for pipe according to DIN 11866 series A, clamp form R 1.4435 (316L)

Order code for "Process connection", option BSA

DN [mm]	A [mm]	B [mm]	L [mm]
8	25.0	10.00	362
15	25.0	16.00	466
25	50.4	26.00	606
40	64.0	38.00	732
50	77.4	50.00	854

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD

Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Eccentric clamp connection DIN 32676, ISO 2852

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Eccentric clamp DIN 32676, for pipe according to DIN 11866 series A 1.4435 (316L)

Order code for "Process connection", option KRW

DN [mm]	A [mm]	B [mm]	L [mm]
8	34.0	10.00	362
15	34.0	16.00	466
25	50.5	26.00	606
50	64.0	50.00	860

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD

Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Eccentric clamp ISO 2852, for pipe according to DIN11866 series B 1.4435 (316L)

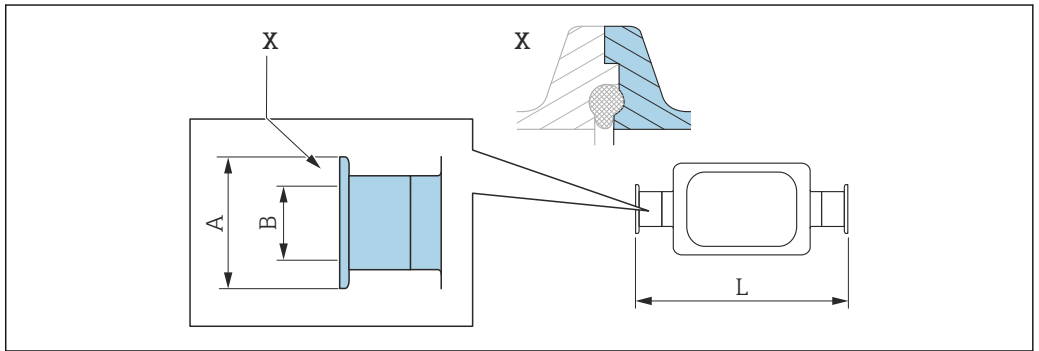
Order code for "Process connection", option JEC

DN [mm]	A [mm]	B [mm]	L [mm]
8	34.0	10.30	362
15	34.0	14.00	466
25	34.0	18.10	606
40	50.5	29.70	738

Eccentric clamp ISO 2852, for pipe according to DIN11866 series B 1.4435 (316L)			
<i>Order code for "Process connection", option JEC</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
50	64.0	44.30	853
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG Additional information regarding "Eccentric clamps"			

Eccentric clamp ISO 2852, for pipe according to DIN11866 series B, for connection to DN15 pipes 1.4435 (316L)			
<i>Order code for "Process connection", option JED</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
25	50.5	18.10	606
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG Additional information regarding "Eccentric clamps"			

Eccentric clamp connection DIN 11864-3

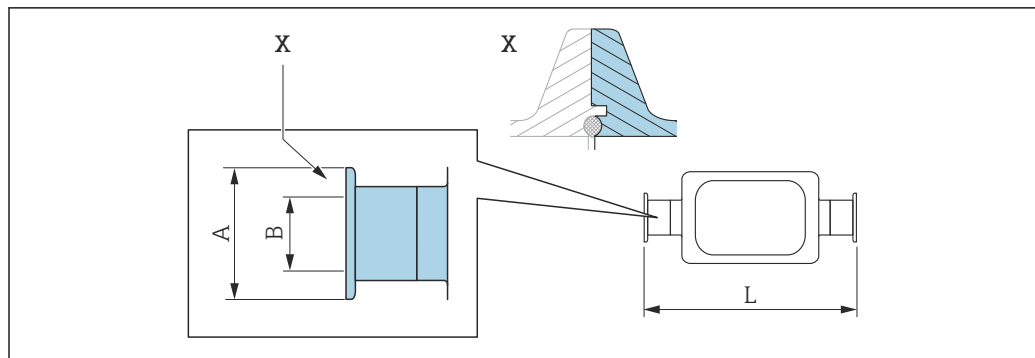


41 Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Eccentric clamp DIN 11864-3 Form A, with notch, for pipe according to DIN 11866 series A 1.4435 (316L)			
<i>Order code for "Process connection", option KNW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	34.0	10.00	370
15	34.0	16.00	474
25	50.5	26.00	624
50	77.5	50.00	869
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG Additional information regarding "Eccentric clamps"			

BBS eccentric clamp connection



A0016909

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

i Length tolerance for dimension L in mm:
+1.5 / -2.0

BBS Quick Connect (sterile orbital), eccentric, for pipe according to DIN11866 series A, female 1.4435 (316L)

Order code for "Process connection", option BEJ

DN [mm]	A [mm]	B [mm]	L [mm]
8	25.0	10.00	362
15	50.5	16.00	466
25	50.5	26.00	606
50	77.5	50.00	860

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD

Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Additional information regarding "Eccentric clamps"

BBS Quick Connect (sterile orbital), eccentric, for pipe according to DIN11866 series B, female 1.4435 (316L)

Order code for "Process connection", option BEK

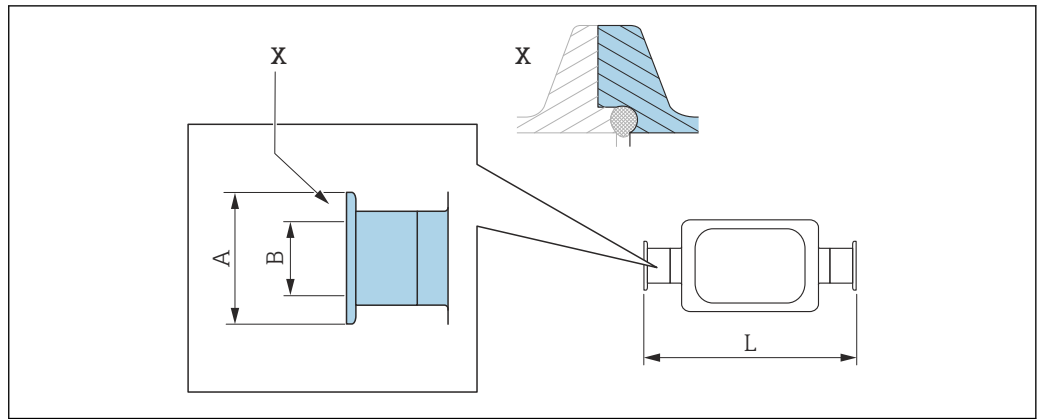
DN [mm]	A [mm]	B [mm]	L [mm]
8	25.0	10.30	362
15	50.5	14.00	466
25	50.5	18.10	606
40	50.5	29.70	738
50	64.0	44.30	860

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD

Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Additional information regarding "Eccentric clamps"

Neumo BioConnect eccentric clamp connection



A0016906

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

i Length tolerance for dimension L in mm:
+1.5 / -2.0

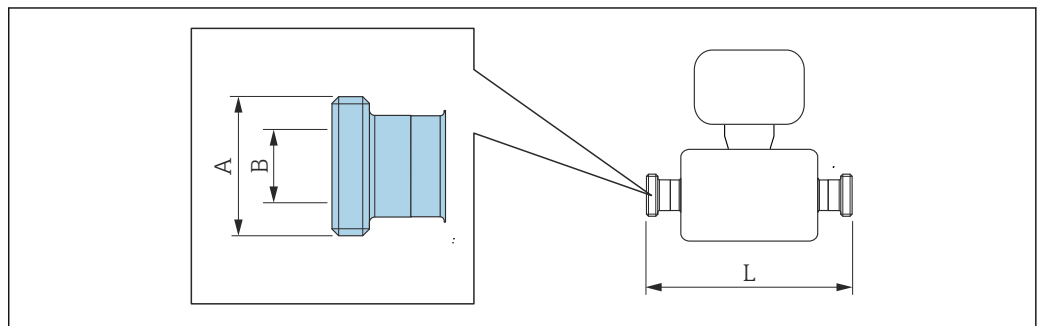
Neumo BioConnect eccentric clamp connection, for pipe according to DIN 11866 series C, clamp form R 1.4435 (316L)
Order code for "Process connection", option BEA

DN [mm]	A [mm]	B [mm]	L [mm]
8	25	10	362
15	25	16	466
25	50.4	26	610
50	77.4	50	859

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG
Additional information regarding "Eccentric clamps"

Glands

Threaded adapter DIN 11851, DIN 11864-1, SMS 1145, BBS



A0015628

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Threaded adapter DIN 11851, for pipe according to DIN 11866 series A 1.4435 (316L)			
<i>Order code for "Process connection", option KCW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 34 × 1/8	16	362
15	Rd 34 × 1/8	16	466
25	Rd 52 × 1/6	26	606
40	Rd 65 × 1/6	38	738
50	Rd 78 × 1/6	50	864

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Threaded adapter DIN 11851, Rd 28 × 1/8", for pipe according to DIN 11866 series A 1.4435 (316L)			
<i>Order code for "Process connection", option KAW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 28 × 1/8"	10.00	362
15	Rd 28 × 1/8"	10.00	466

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Threaded adapter DIN 11864-1 Form A, for pipe according to DIN 11866 series A 1.4435 (316L)			
<i>Order code for "Process connection", option KGW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 34 × 1/8"	16	362
15	Rd 34 × 1/8"	16	466
25	Rd 52 × 1/6"	26	620
40	Rd 65 × 1/6"	38	738
50	Rd 78 × 1/6"	50	864

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Threaded adapter SMS 1145 1.4435 (316L)			
<i>Order code for "Process connection", option SAW</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
8	Rd 40 × 1/6"	22.50	362
15	Rd 40 × 1/6"	22.50	466
25	Rd 40 × 1/6"	22.50	606
40	Rd 60 × 1/6"	35.50	742
50	Rd 70 × 1/6"	48.50	864

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

**BBS threaded adapter (sterile orbital), for pipe according to DIN 11866 series A
1.4435 (316L)**
Order code for "Process connection", option BSC

DN [mm]	A [mm]	B [mm]	L [mm]
8	M22 × 1.5	10.00	362
15	M30 × 2	16.00	466
25	M42 × 2	26.00	606
40	M52 × 2	38.00	732
50	M68 × 2	50.00	854

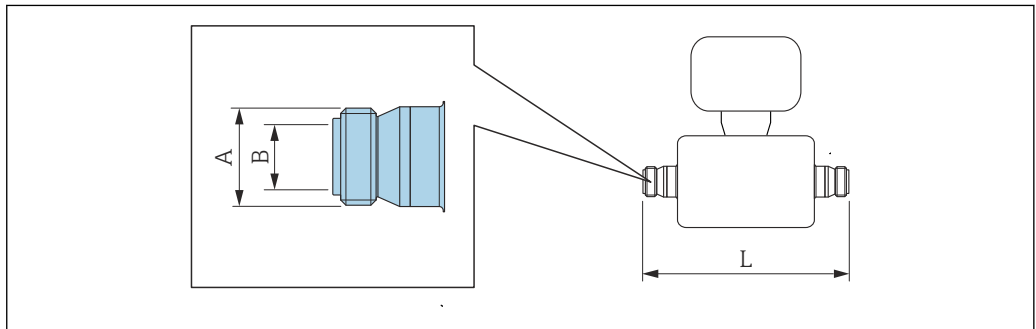
Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

**BBS threaded adapter (sterile orbital), for pipe according to DIN 11866 series B
1.4435 (316L)**
Order code for "Process connection", option BSD

DN [mm]	A [mm]	B [mm]	L [mm]
8	M26 × 1.5	14.00	362
15	M30 × 2	18.10	466
25	M42 × 2	29.70	606
40	M56 × 2	44.30	738
50	M68 × 2	56.30	860

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Threaded adapter ISO 2853



A0015623

 Length tolerance for dimension L in mm:
+1.5 / -2.0

**Threaded adapter ISO 2853, for pipe according to ISO 2037
1.4435 (316L)**
Order code for "Process connection", option JSD

DN [mm]	A [mm]	B [mm]	L [mm]
8	37.13	22.60	370
15	37.13	22.60	474
25	37.13	22.60	614

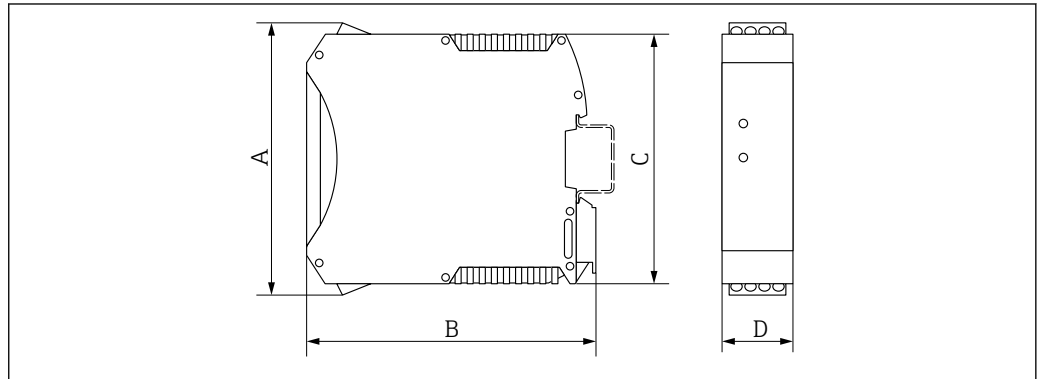
Threaded adapter ISO 2853, for pipe according to ISO 2037 1.4435 (316L)			
<i>Order code for "Process connection", option JSD</i>			
DN [mm]	A [mm]	B [mm]	L [mm]
40	50.65	35.60	742
50	64.10	48.60	864

Ra ≤ 0.76 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 0.38 µm electropolished: order code for "Measuring tube material", option BC, TG

Safety Barrier Promass 100

Top-hat rail EN 60715:

- TH 35 x 7.5
- TH 35 x 15

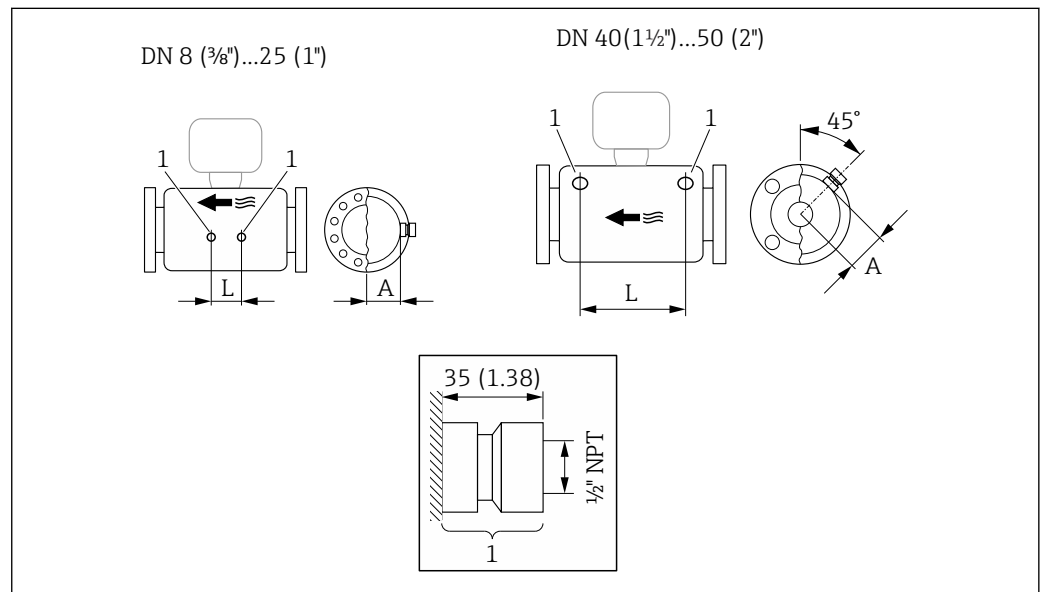


A0016777

A	B	C	D
[mm]	[mm]	[mm]	[mm]
108	114.5	99	22.5

Accessories

Rinse connections



A0029971

44

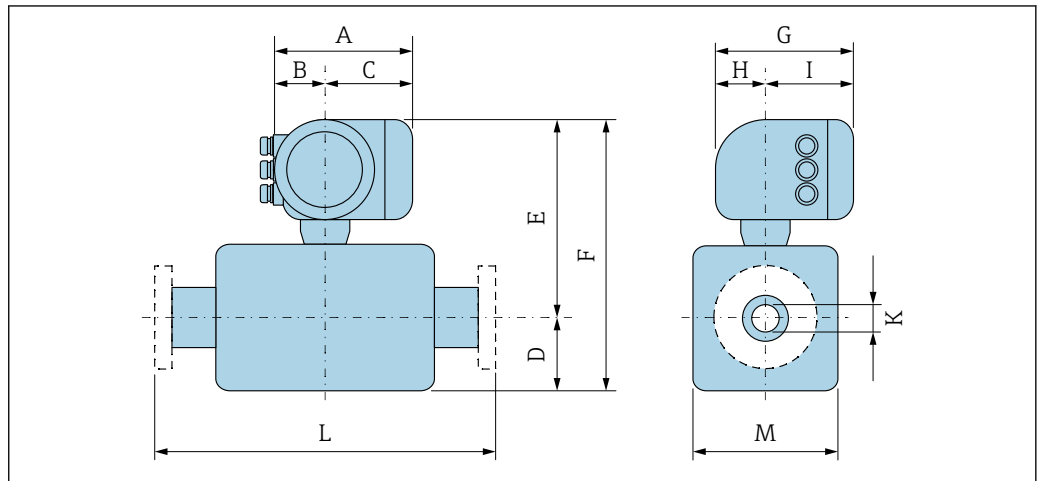
1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"

DN	A	L
[mm]	[mm]	[mm]
8	47	110
15	47	204
25	47	348

DN	A	L
[mm]	[mm]	[mm]
40	68.15	418
50	81.65	473

Dimensions in US units

Compact version



A0033783

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

DN [in]	A [in]	B [in]	C [in]	D [in]	E ^{1) 2)} [in]	F ^{1) 2)} [in]	G [in]	H [in]	I [in]	K [in]	L [in]	M [in]
3/8	5.81	3.68	2.13	4.25	7.52	11.8	5.35	2.32	5.55	0.33	³⁾	3.62
1/2	5.81	3.68	2.13	4.25	7.52	11.8	5.35	2.32	5.55	0.47	³⁾	3.62
1	5.81	3.68	2.13	4.76	7.52	12.3	5.35	2.32	5.55	0.69	³⁾	3.62
1 1/2	5.81	3.68	2.13	6.81	8.46	15.3	5.35	2.32	5.55	1.02	³⁾	5.20
2	5.81	3.68	2.13	9.49	8.90	18.4	5.35	2.32	5.55	1.59	³⁾	6.57

- 1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG and order code for "Measuring tube material", option TD, TG: values + 2.76 in
- 2) If using a display, order code for "Display; Operation", option B: values + 1.1 in
- 3) Depends on the particular process connection

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

DN [in]	A [in]	B [in]	C [in]	D [in]	E ^{1) 2)} [in]	F ^{1) 2)} [in]	G [in]	K [in]	L [in]	M [in]
3/8	5.39	3.07	2.31	4.25	7.32	11.6	5.26	0.33	³⁾	3.62
1/2	5.39	3.07	2.31	4.25	7.32	11.6	5.26	0.47	³⁾	3.62
1	5.39	3.07	2.31	4.76	7.32	12.1	5.26	0.69	³⁾	3.62
1 1/2	5.39	3.07	2.31	6.81	8.27	15.1	5.26	1.02	³⁾	5.20
2	5.39	3.07	2.31	9.49	8.70	18.2	5.26	1.59	³⁾	6.57

- 1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG and order code for "Measuring tube material", option TD, TG: values + 2.76 in
- 2) If using a display, order code for "Display; Operation", option B: values + 0.55 in
- 3) Depends on the particular process connection

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

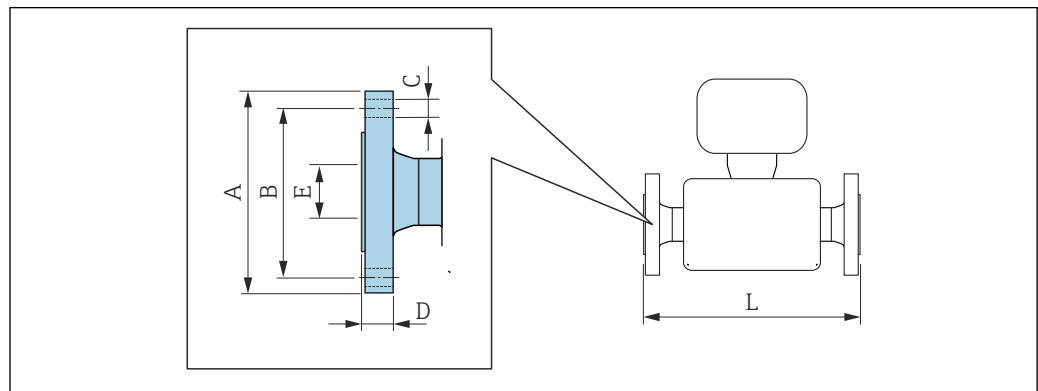
DN [in]	A [in]	B [in]	C [in]	D [in]	E ^{1) 2)} [in]	F ^{1) 2)} [in]	G [in]	K [in]	L [in]	M [in]
3/8	4.87	2.67	2.20	4.25	7.32	11.57	4.39	0.33	³⁾	3.62
1/2	4.87	2.67	2.20	4.25	7.32	11.6	4.39	0.47	³⁾	3.62
1	4.87	2.67	2.20	4.76	7.32	12.1	4.39	0.69	³⁾	3.62

DN [in]	A [in]	B [in]	C [in]	D [in]	E ^{1) 2)} [in]	F ^{1) 2)} [in]	G [in]	K [in]	L [in]	M [in]
1½	4.87	2.67	2.20	6.81	8.27	15.1	4.39	1.02	³⁾	5.20
2	4.87	2.67	2.20	9.49	8.70	18.2	4.39	1.59	³⁾	6.57

- 1) If using an extension neck for the extended temperature range, order code for "Sensor option", option CG and order code for "Measuring tube material", option TD, TG: values + 2.76 in
- 2) If using a display, order code for "Display; Operation", option B: values + 0.55 in
- 3) Depends on the particular process connection

Flange connections

Fixed flange ASME B16.5



A0015621

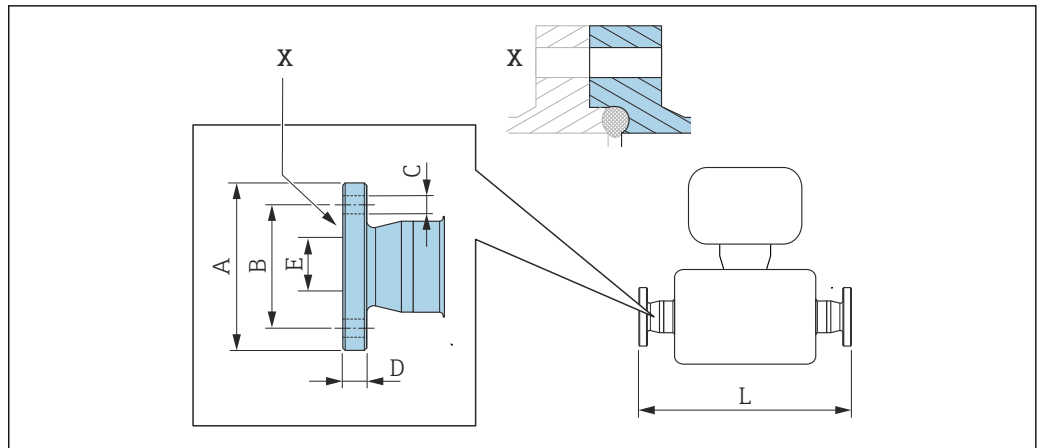
i Length tolerance for dimension L in inches:
+0.06/-0.08

Flange according to ASME B16.5: Cl 150						
1.4404 (F316/F316L)						
<i>Order code for "Process connection", option AAW</i>						
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
¾ ¹⁾	3.54	2.37	4 × Ø0.62	0.44	0.62	13.23
½	3.54	2.37	4 × Ø0.62	0.44	0.62	17.32
1	4.33	3.13	4 × Ø0.62	0.56	1.05	22.83
1½	4.92	3.87	4 × Ø0.62	0.69	1.61	27.83
2	5.91	4.75	4 × Ø0.75	0.75	2.07	32.6

Surface roughness (flange): Ra 3.2 to 6.3 µm

- 1) DN ¾" with DN ½" flanges as standard

Neumo BioConnect fixed flange



A0016907

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

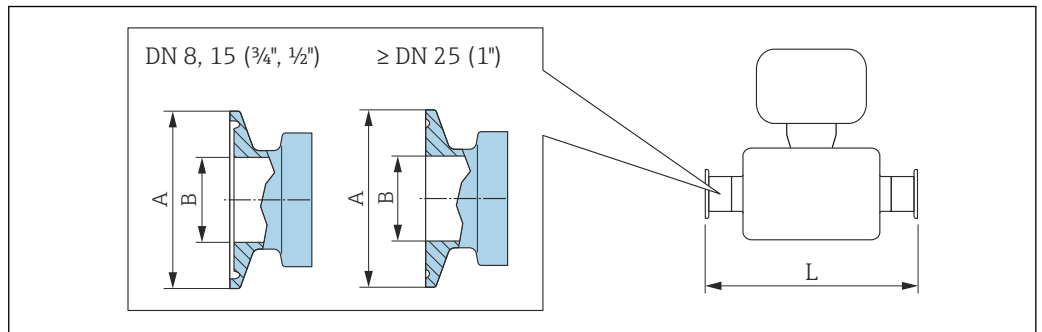
i Length tolerance for dimension L in inch:
+0.06 / -0.08

Neumo BioConnect flange (sterile orbital), for pipe according to DIN 11866 series A, flange form R 1.4435 (316L) Order code for "Process connection", option BSB						
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3/8	2.56	1.77	4 × Ø0.35	0.39	0.39	15.12
1/2	2.95	2.17	4 × Ø0.35	0.39	0.63	19.21
1	3.35	2.56	4 × Ø0.35	0.47	1.02	24.65
1 1/2	3.94	3.15	4 × Ø0.35	0.47	1.5	29.65
2	4.33	3.54	4 × Ø0.35	0.55	1.97	34.53

Ra ≤ 30 µm: order code for "Measuring tube material", option BB, TD
Ra ≤ 15 µm electropolished: order code for "Measuring tube material", option BC, TG

Clamp connections

Tri-Clamp



A0023342

46 Unit mm (in)

i Length tolerance for dimension L in inch:
+0.06 / -0.08

Tri-Clamp; for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FHW</i>				
DN [in]	Clamp [in]	A [in]	B [in]	L [in]
3/8	1/2	0.98	0.37	14.25
1/2	3/4	0.98	0.62	18.35
1	1	1.98	0.87	23.86
1 1/2	1 1/2	1.98	1.37	28.78
2	2	2.52	1.87	33.58

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG

1/2" Tri-Clamp; for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FCW</i>				
DN [in]	Clamp [in]	A [in]	B [in]	L [in]
1/2	1/2	0.98	0.37	18.35

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD

3/4" Tri-Clamp; for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FFW</i>				
DN [in]	Clamp [in]	A [in]	B [in]	L [in]
3/8	3/4	0.98	0.62	14.25

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG

1" Tri-Clamp; for pipe according to DIN 11866 series C 1.4435 (316L)				
<i>Order code for "Process connection", option FPW</i>				
DN [in]	Clamp [in]	A [in]	B [in]	L [in]
3/8	1	1.98	0.87	14.25
1/2	1	1.98	0.87	18.35

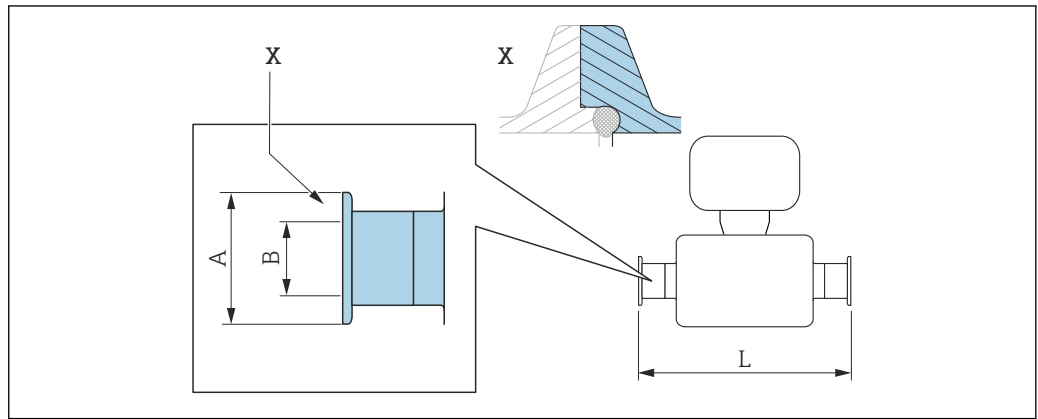
Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG

Tri-Clamp eccentric; for pipe according to DIN 11866 series C 1.4435 (316L)					
DN [in]	Order code for "Process connection", option	Clamp [in]	A [in]	B [in]	L [in]
3/8	FEB	1/2	0.98	0.37	14.25
1/2	FED	3/4	0.98	0.62	18.35
1	FEF	1	1.98	0.87	23.86
1 1/2	FEH	1 1/2	1.98	1.37	29.06

Tri-Clamp eccentric; for pipe according to DIN 11866 series C 1.4435 (316L)					
DN [in]	Order code for "Process connection", option	Clamp [in]	A [in]	B [in]	L [in]
2	FEK	2	2.52	1.87	33.86

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
 Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG
 Additional information regarding "Eccentric clamps"

Neumo BioConnect clamp connection



A0016905

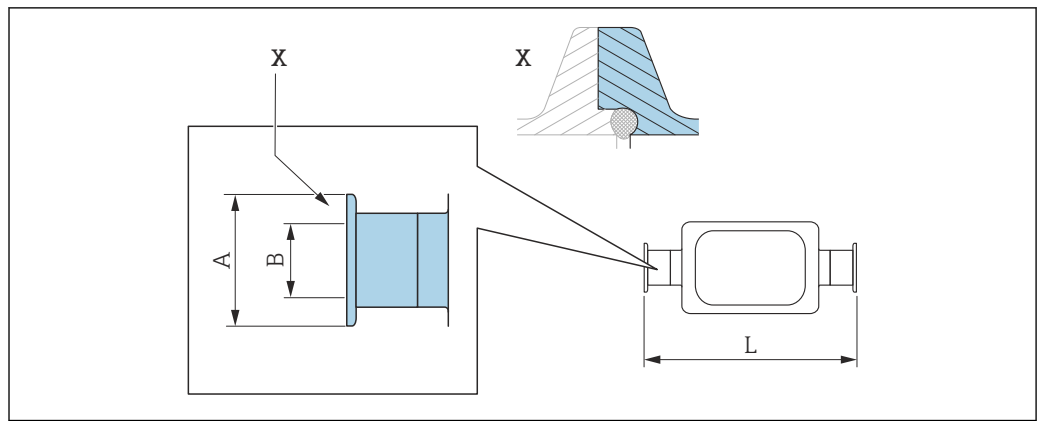
47 Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.

i Length tolerance for dimension L in inch:
 +0.06 / -0.08

Clamp; Neumo BioConnect (sterile orbital), for pipe according to DIN 11866 series A, clamp form R 1.4435 (316L)			
Order code for "Process connection", option BSA			
DN [in]	A [in]	B [in]	L [in]
3/8	0.98	0.39	14.25
1/2	0.98	0.63	18.35
1	1.98	1.02	23.86
1 1/2	2.52	1.5	28.82
2	3.05	1.97	33.62

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
 Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG

Neumo BioConnect eccentric clamp connection



A0016906

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

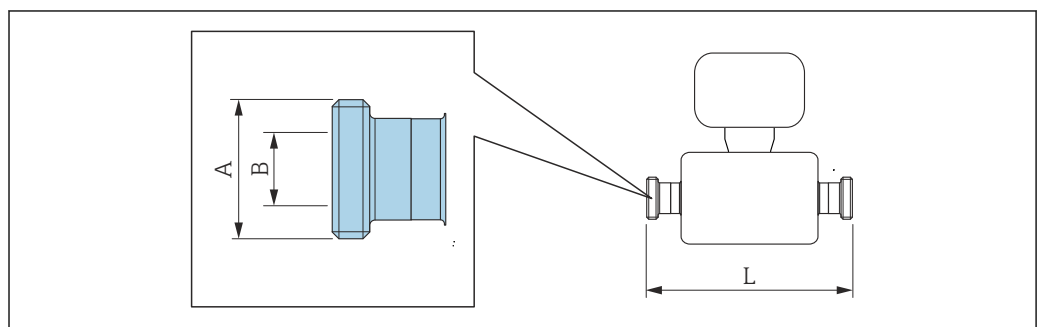
i Length tolerance for dimension L in inch:
+0.06 / -0.08

Neumo BioConnect eccentric clamp connection, for pipe according to DIN 11866 series C, clamp form R 1.4435 (316L) Order code for "Process connection", option BEA			
DN [in]	A [in]	B [in]	L [in]
3/8	0.98	0.39	14.25
1/2	0.98	0.63	18.35
1	1.98	1.02	24.02
2	3.05	1.97	43.39

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
 Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG
 Additional information regarding "Eccentric clamps"

Glands

Threaded adapter SMS 1145



A0015628

i Length tolerance for dimension L in inch:
+0.06 / -0.08

Threaded adapter SMS 1145
1.4435 (316L)
Order code for "Process connection", option SAW

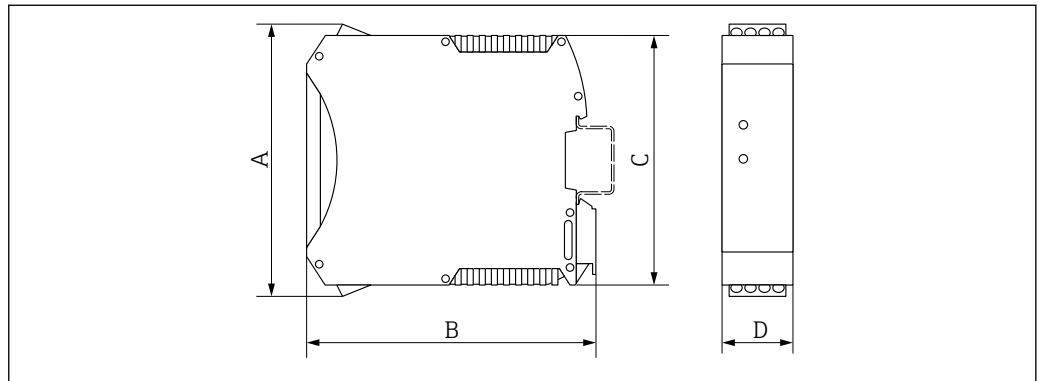
DN [in]	A [in]	B [in]	L [in]
3/8	Rd 40 × 1/6	0.89	14.25
1/2	Rd 40 × 1/6	0.89	18.35
1	Rd 40 × 1/6	0.89	23.86
1 1/2	Rd 60 × 1/6	1.4	29.21
2	Rd 70 × 1/6	1.91	34.02

Ra ≤ 30 µin: order code for "Measuring tube material", option BB, TD
 Ra ≤ 15 µin electropolished: order code for "Measuring tube material", option BC, TG

Safety Barrier Promass 100

Top-hat rail EN 60715:

- TH 35 x 7.5
- TH 35 x 15

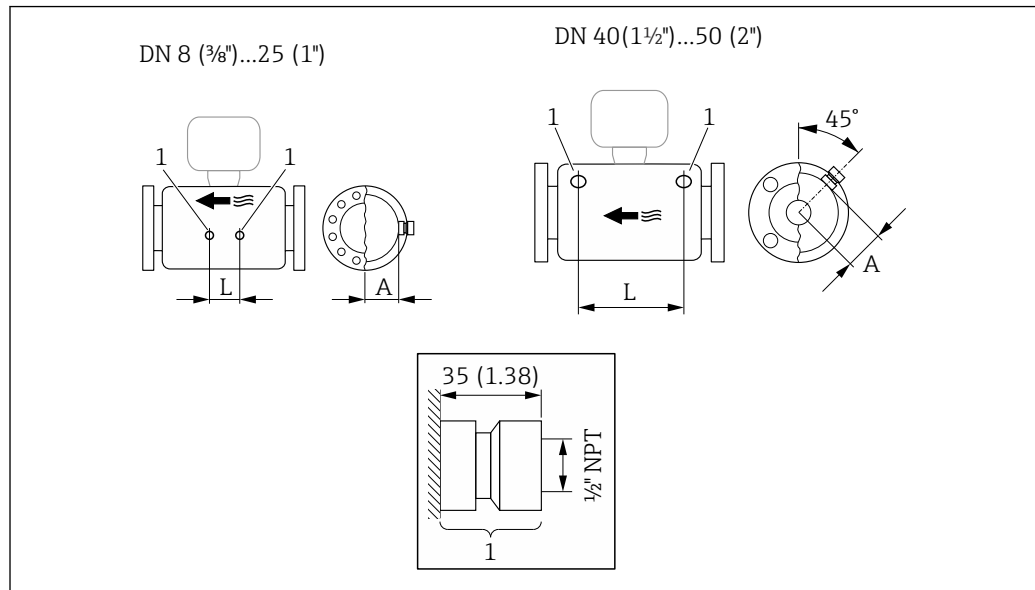


A0016777

A	B	C	D
[in]	[in]	[in]	[in]
4.25	4.51	3.9	0.89

Accessories

Rinse connections



A0029971

49

1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"

DN	A	L
[in]	[in]	[in]
3/8	1.85	4.33
1/2	1.85	8.03
1	1.85	13.7
1 1/2	2.683	16.46
2	3.215	18.62

Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges. Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Weight in SI units

DN [mm]	Weight [kg]
8	12
15	14
25	20
40	36
50	59

Weight in US units

DN [in]	Weight [lbs]
3/8	26
1/2	31
1	44
1 1/2	79
2	130

Safety Barrier Promass 100

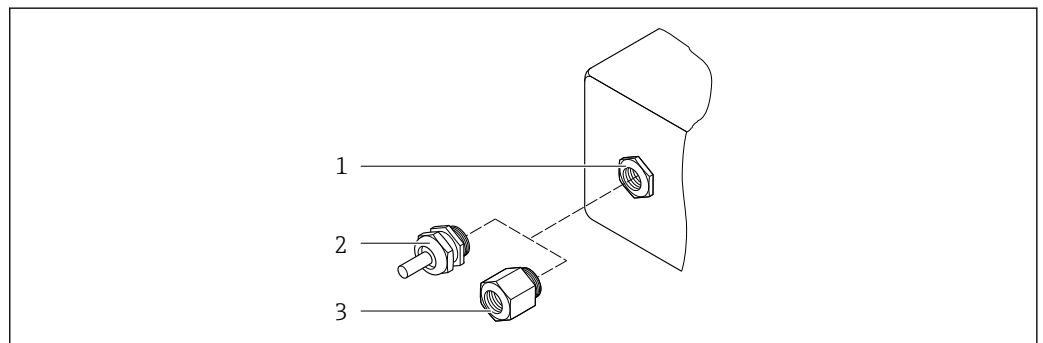
49 g (1.73 ounce)

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 (→ 88):
 - For order code for "Housing", option **A**: glass
 - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands



50 Possible cable entries/cable glands

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

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

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

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Nickel-plated brass
Adapter for cable entry with internal thread G 1/2"	
Adapter for cable entry with internal thread NPT 1/2"	

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	<ul style="list-style-type: none"> ▪ Socket: Stainless steel, 1.4404 (316L) ▪ Contact housing: Polyamide ▪ Contacts: Gold-plated brass

Sensor housing



- Acid and alkali-resistant outer surface
- Stainless steel 1.4301 (304)

Measuring tubes

Stainless steel, 1.4435 BN2 (316L)

Process connections

- Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / according to JIS B2220: Stainless steel, 1.4404 (F316/F316L)
- All other process connections: Stainless steel, 1.4435 BN2 (316L)

 Available process connections →  87

Seals

Welded process connections without internal seals

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

Safety Barrier Promass 100

Housing: Polyamide

Process connections

- Fixed flange connections:
 - EN 1092-1 (DIN 2501) flange
 - EN 1092-1 (DIN 2512N) flange
 - ASME B16.5 flange
 - JIS B2220 flange
 - DIN 11864-2 Form A flange, DIN 11866 series A, flange with notch
 - BBS flange small (sterile orbital), DIN 11866 series A, female
 - BBS flange small (sterile orbital), DIN 11866 series B, female
- Clamp connections:
 - Tri-Clamp (OD tubes), DIN 11866 series C
 - DIN 11864-3 Form A clamp, DIN 11866 series A, with notch
 - DIN 32676 clamp, DIN 11866 series A
 - ISO 2852 clamp, ISO 2037
 - ISO 2852 clamp, DIN 11866 series B
 - BBS Quick-Connect (sterile orbital), DIN 11866 series A, female
 - BBS Quick-Connect (sterile orbital), DIN 11866 series B, female
 - Neumo BioConnect clamp, DIN 11866 series A, clamp form R
- Eccentric clamp connections:
 - Eccen. Tri-Clamp, DIN 11866 series C
 - DIN 11864-3 Form A clamp, DIN 11866 series A, with notch
 - DIN 32676 clamp, DIN 11866 series A
 - ISO 2852 clamp, DIN 11866 series B
 - BBS Quick-Connect (sterile orbital), DIN 11866 series A, female
 - BBS Quick-Connect (sterile orbital), DIN 11866 series B, female
 - Neumo BioConnect clamp, DIN 11866 series A, clamp form R
- Thread:
 - DIN 11851 thread, DIN 11866 series A
 - SMS 1145 thread
 - ISO 2853 thread, ISO 2037
 - DIN 11864-1 Form A thread, DIN 11866 series A
 - BBS thread (sterile orbital), DIN 11866 series A
 - BBS thread (sterile orbital), DIN 11866 series B

 Process connection materials

Surface roughness

All data refer to parts in contact with the medium.

The following surface roughness categories can be ordered:

Category	Method	Option(s) order code "Measuring tube mat., wetted surface"
Ra ≤ 0.76 µm (30 µin) ¹⁾	Mechanically polished	BB, TD
Ra ≤ 0.38 µm (15 µin) ¹⁾	Mechanical and electropolished	BC, TG

1) Ra according to ISO 21920

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning

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

Reliable operation

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

Efficient diagnostics increase measurement availability

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

Local display

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

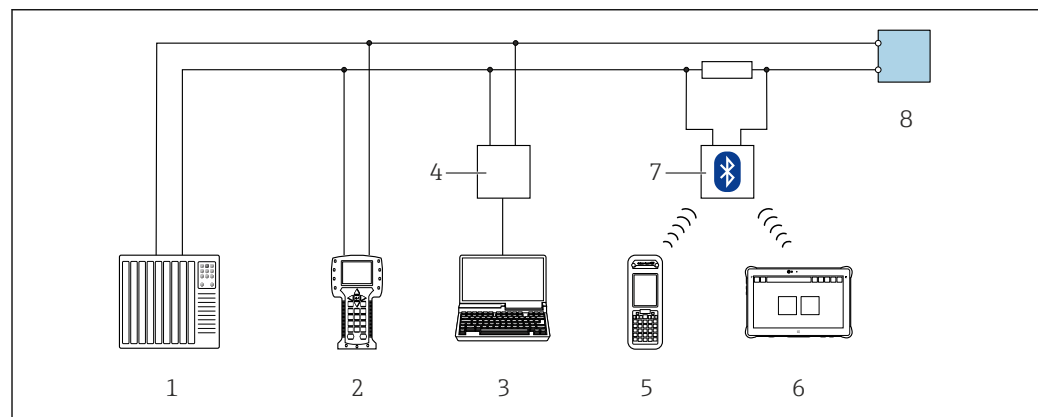
The local display is only available with the following device order code:
Order code for "Display; operation", option **B**: 4-line; illuminated, via communication


Display element

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

Remote operation**Via HART protocol**

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

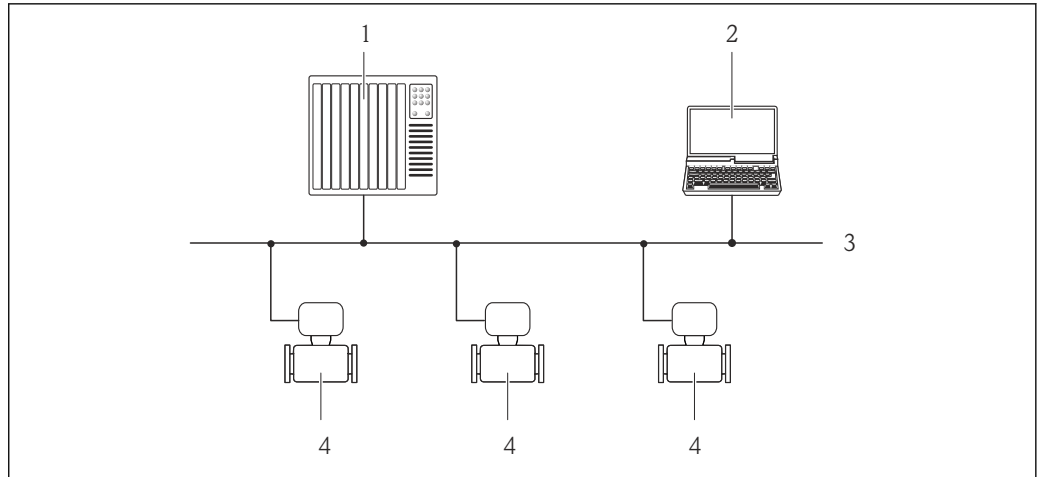


 51 Options for remote operation via HART protocol

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

Via PROFIBUS DP network

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



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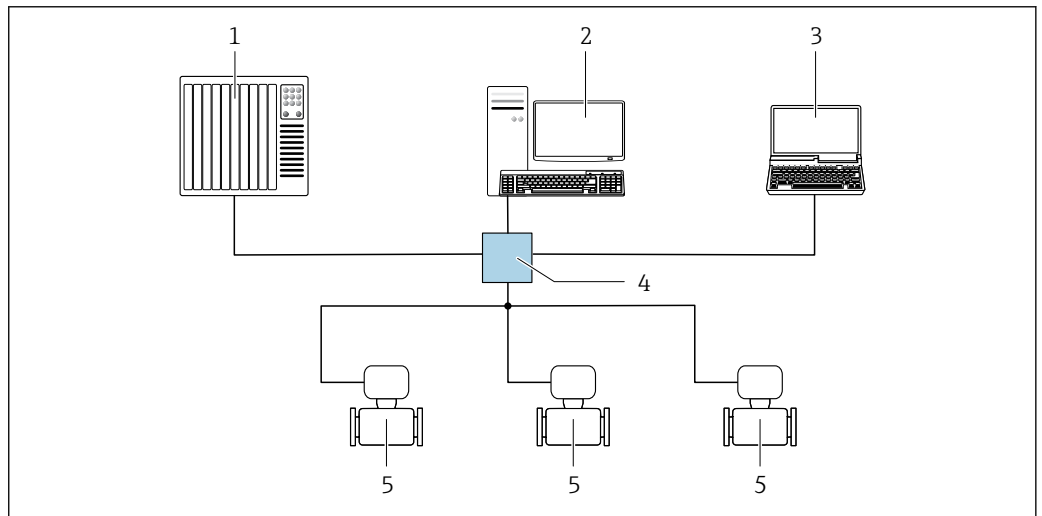
52 Options for remote operation via PROFIBUS DP network

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

Via EtherNet/IP network

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

Star topology



A0032078

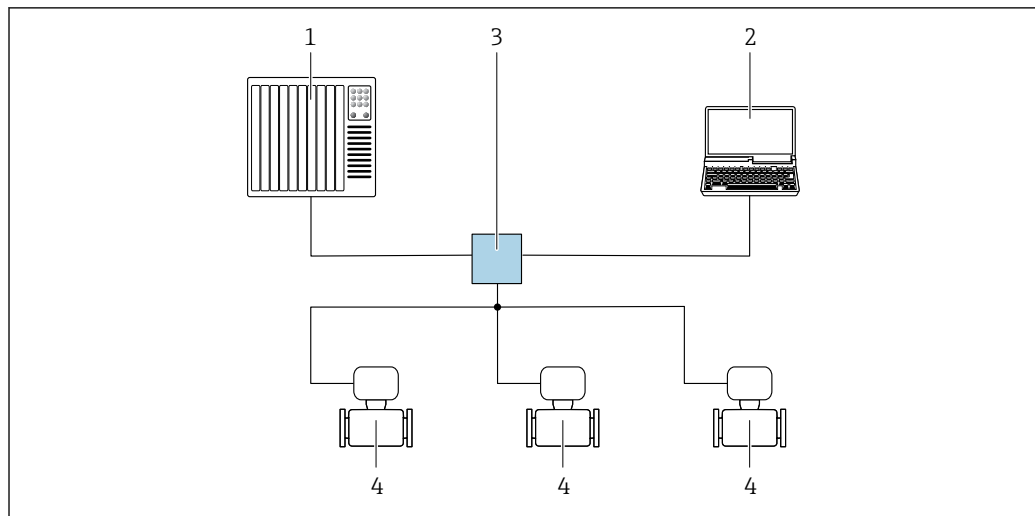
53 Options for remote operation via EtherNet/IP network: star topology

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

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



A0026545

54 Options for remote operation via PROFINET network: star topology

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

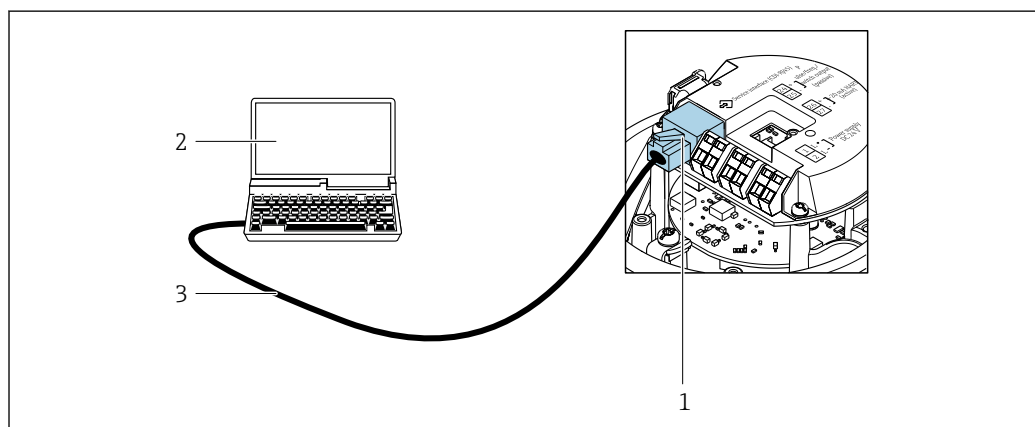
Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:

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

HART

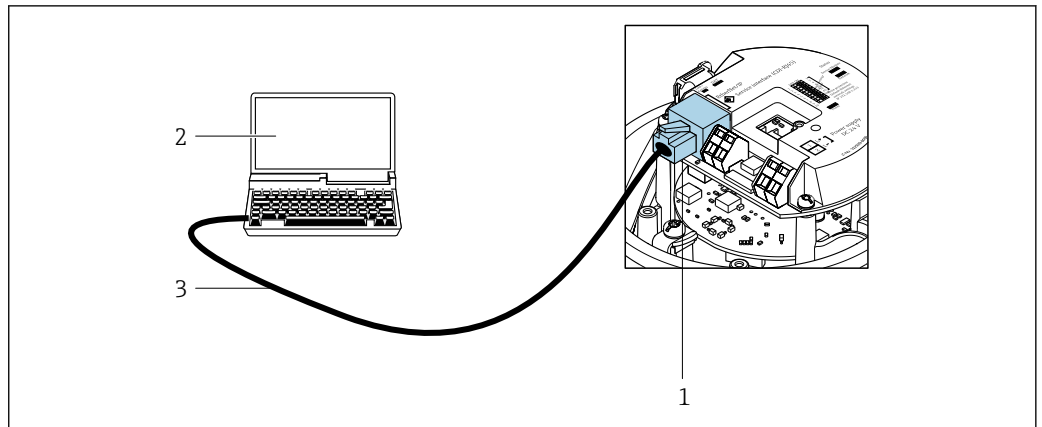


A0016926

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

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

PROFIBUS DP

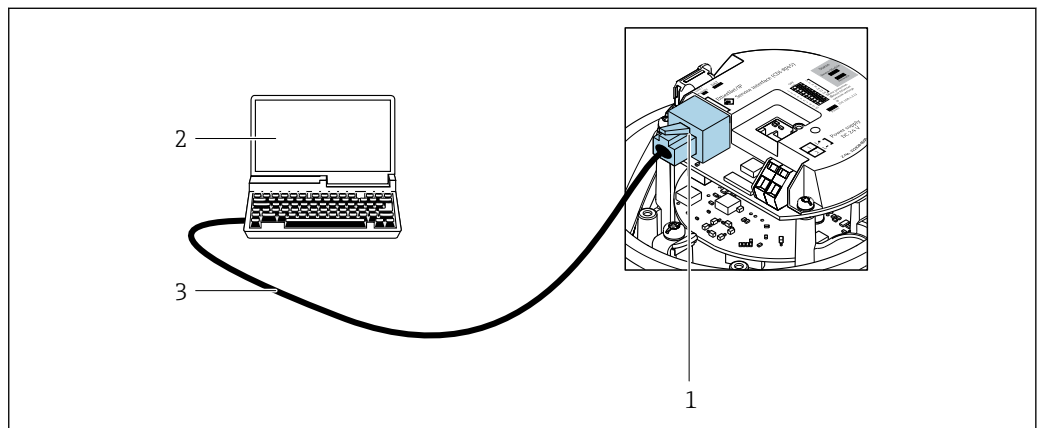


A0021270

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

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

EtherNet/IP

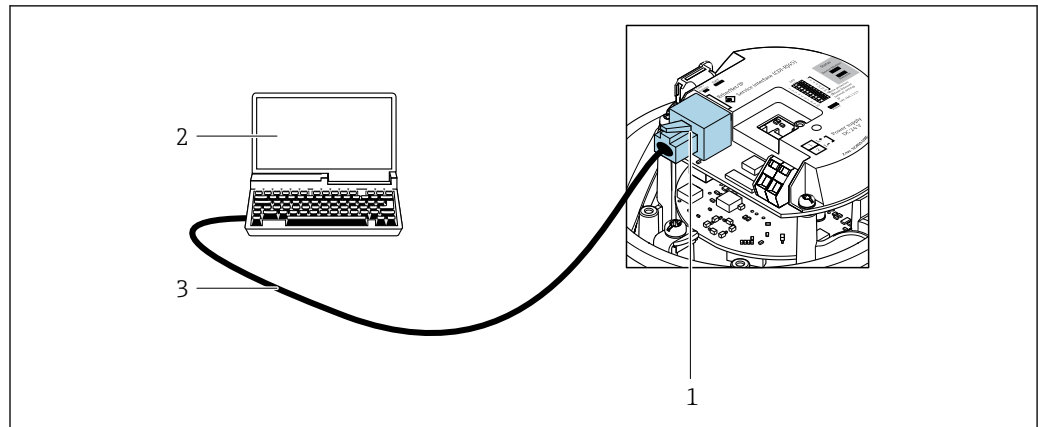


A0016940

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

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

PROFINET



A0016940

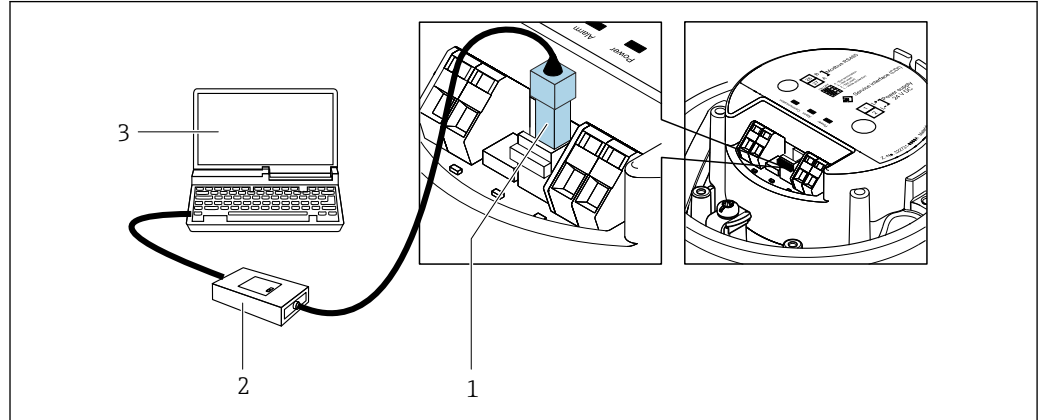
58 Connection for order code for "Output", option R: PROFINET

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

Via service interface (CDI)

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

Modbus RS485



A0030216

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

Certificates and approvals

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

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

CE mark

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

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

UKCA marking

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


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

RCM marking

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

Ex approval

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

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

ATEX/IECEX

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

Ex ia

Category (ATEX)	Type of protection
II2G	Ex ia IIC T6...T1 Gb or Ex ia IIB T6...T1 Gb
II1/2G, II2D	Ex ia IIC T6...T1 Ga/Gb or Ex ia IIB T6...T1 Ga/Gb Ex tb IIIC Txx °C Db
II2G, II2D	Ex ia IIC T6...T1 Gb or Ex ia IIB T6...T1 Gb Ex tb IIIC Txx °C Db

Ex nA

Category (ATEX)	Type of protection
II3G	Ex nA IIC T6...T1 Gc or Ex nA IIC T5-T1 Gc

cCSA_{US}


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

IS (Ex i)

- Class I Division 1 Groups ABCD
- Class II Division 1 Groups EFG and Class III

NI (Ex nA)

Class I Division 2 Groups ABCD

Hygienic compatibility	<ul style="list-style-type: none"> ■ 3-A approval <ul style="list-style-type: none"> ■ Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval. ■ The 3-A approval refers to the measuring instrument. ■ When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument. A remote display module must be installed in accordance with the 3-A Standard. ■ Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard. Each accessory can be cleaned. Disassembly may be necessary under certain circumstances. ■ EHEDG-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). To meet the requirements for EHEDG certification, the device must be installed in a position that ensures drainability.
	 Observe the special installation instructions
Pharmaceutical compatibility	<ul style="list-style-type: none"> ■ FDA 21 CFR 177 ■ USP <87> ■ USP <88> Class VI 121 °C ■ TSE/BSE Certificate of Suitability
HART certification	<p>HART interface</p> <p>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified according to HART 7 ■ The device can also be operated with certified devices of other manufacturers (interoperability)
Certification PROFIBUS	<p>PROFIBUS interface</p> <p>The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified according to PA Profile 3.02 ■ The device can also be operated with certified devices of other manufacturers (interoperability)
Certification PROFINET	<p>PROFINET interface</p> <p>The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified according to: <ul style="list-style-type: none"> ■ Test specification for PROFINET devices ■ PROFINET Security Level 1– Netload Class 2 0 Mbps ■ The device can also be operated with certified devices of other manufacturers (interoperability) ■ The device supports PROFINET S2 system redundancy.
EtherNet/IP certification	<p>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:</p> <ul style="list-style-type: none"> ■ 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)
Modbus RS485 certification	<p>The measuring device meets all the requirements of the MODBUS RS485 conformity test and has the "MODBUS RS485 Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out.</p>

Pressure Equipment Directive

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

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

External standards and guidelines

- EN 60529
Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- EN 61326-1/-2-3
EMC requirements for electrical equipment for measurement, control and laboratory use
- 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 80
The application of the pressure equipment directive to process control devices
- 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
- NAMUR NE 132
Coriolis mass meter
- ETSI EN 300 328
Guidelines for 2.4 GHz radio components.
- EN 301489
Electromagnetic compatibility and radio spectrum matters (ERM).

Ordering information

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

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



Product Configurator - the tool for individual product configuration

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

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.



Detailed information on the application packages:
Special Documentation → 100

Heartbeat Technology

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

Heartbeat Verification

Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".

- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.
- Extension of calibration intervals according to operator's risk assessment.

Heartbeat Monitoring

Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:

- Draw conclusions - using these data and other information - about the impact process influences (e.g. 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 .



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

Concentration measurement

Order code for "Application package", option ED "Concentration"

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:

- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.).
- Common or user-defined units ("Brix", "Plato", "% mass", "% volume, mol/l etc.) for standard applications.
- Concentration calculation from user-defined tables.

The measured values are output via the digital and analog outputs of the device.



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

Special density

Order code for "Application package", option EE "Special density"

Many applications use density as a key measured value for monitoring quality or controlling processes. The measuring instrument measures the density of the fluid as standard and makes this value available to the control system.

The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.



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

Accessories






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




Device-specific accessories

For the sensor



Accessories	Description
Heating jacket	<p>Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.</p> <p> If using oil as a heating medium, please consult with Endress+Hauser.</p> <ul style="list-style-type: none"> ▪ If ordered together with the measuring device: <ul style="list-style-type: none"> Order code for "Accessory enclosed" <ul style="list-style-type: none"> ▪ Option RB "Heating jacket, G 1/2" female thread" ▪ Option RC "Heating jacket, G 3/4" female thread" ▪ Option RD "Heating jacket, NPT 1/2" female thread" ▪ Option RE "Heating jacket, NPT 3/4" female thread" ▪ If ordered subsequently: <ul style="list-style-type: none"> Use the order code with the product root DK8003. <p> Special Documentation SD02160D</p>

Communication-specific accessories




Accessories	Description
Commubox FXA195 HART	<p>For intrinsically safe HART communication with FieldCare via the USB port.</p> <p> Technical Information TI00404F</p>
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> Technical Information TI00405C</p>
HART loop converter HMX50	<p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.</p> <p> <ul style="list-style-type: none"> ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F </p>
Wireless HART adapter SWA70	<p>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.</p> <p> Operating Instructions BA00061S</p>
Fieldgate FXA42	<p>Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments</p> <p> <ul style="list-style-type: none"> ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42 </p>

Field Xpert SMT50	<p>The Field Xpert SMT50 tablet PC for device configuration enables mobile plant asset management in the non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.</p> <p>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage the field instruments throughout their entire life cycle.</p>  <ul style="list-style-type: none"> ▪ Technical Information TI01555S ▪ Operating Instructions BA02053S ▪ Product page: www.endress.com/smt50
Field Xpert SMT70	<p>The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.</p> <p>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage the field instruments throughout their entire life cycle.</p>  <ul style="list-style-type: none"> ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt70
Field Xpert SMT77	<p>The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.</p>  <ul style="list-style-type: none"> ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77


Service-specific accessories

Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring instruments:</p> <ul style="list-style-type: none"> ▪ Choice of measuring instruments for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy. ▪ Graphic display of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. <p>Applicator is available: Via the Internet: https://portal.endress.com/webapp/applicator</p>
Netilion	<p>IloT ecosystem: Unlock knowledge</p> <p>With the Netilion IloT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration.</p> <p>Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IloT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.</p> <p>www.netilion.endress.com</p>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.</p>  <p>Operating Instructions BA00027S and BA00059S</p>
DeviceCare	<p>Tool to connect and configure Endress+Hauser field devices.</p>  <p>Innovation brochure IN01047S</p>


System components

Accessories	Description
Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick. <ul style="list-style-type: none">  Technical Information TI00133R  Operating Instructions BA00247R
iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature. <ul style="list-style-type: none">  "Fields of Activity" document FA00006T

Supplementary documentation

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

Standard documentation

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

Brief Operating instructions

Brief Operating Instructions for the sensor

Measuring instrument	Documentation code
Proline Promass P	KA01286D

Brief operating instructions for transmitter

Measuring instrument	Documentation code		E t h e r n e t / I E E P T
	H A R T P R O F I B U S D P	Modbus RS485	
Proline Promass 100	KKA01333D	KA01335D	KK AA 00 11 33 33 26 DD

Operating Instructions

Measuring device	Documentation code				
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promass P 100	BA01192D	BA01253D	BA01059D	BA01067D	BA01431D

Description of device parameters

Measuring device	Documentation code				
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promass 100	GP01033D	GP01034D	GP01035D	GP01036D	GP01037D

Supplementary device-dependent documentation

Safety Instructions

Content	Documentation code
ATEX/IECEX Ex i	XA00159D
ATEX/IECEX Ex nA	XA01029D
cCSAus IS	XA00160D
INMETRO Ex i	XA01219D
INMETRO Ex nA	XA01220D
NEPSI Ex i	XA01249D
NEPSI Ex nA	XA01262D

Special Documentation

Content	Documentation code
Information on the Pressure Equipment Directive	SD00142D
Modbus RS485 Register Information	SD00154D
Concentration measurement	SD01152D
Concentration measurement	SD01503D
Heartbeat Technology	SD01153D
Heartbeat Technology	SD01493D
Web server	SD01820D
Web server	SD01821D
Web server	SD01822D
Web server	SD01823D

Installation instructions

Contents	Note
Installation instructions for spare part sets and accessories	Documentation code: specified for each individual accessory → 97.

Registered trademarks

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Registered trademark of the FieldComm Group, Austin, Texas USA

PROFIBUS®

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EtherNet/IP™

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TRI-CLAMP®

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