

Technical Information

Proline Promass 80P, 83P

Coriolis Mass Flow Measuring System

The single-tube system with a "fit-and-forget" design:
hygienic – drainable – complying with the requirements, codes and standards ASME BPE, ISPE, FDA, EHEDG, 3-A



Application

The Coriolis measuring principle operates independently of physical fluid properties, such as viscosity and density.

- Extremely accurate measurement of liquids and gases found in Life Sciences Industries processes such as: Water purification, WFI, Fermentation processes, Media preparation, batch verification, batch fermenter, Sterilization process, cleaning agents and solvents. Fast recovery from CIP/SIP.
- Process up to +200 °C (+392 °F) and 63 bar (914 psi)
- Mass flow measurement up to 70 t/h (2570 lb/min)

Certification for highly regulated industries:

- ASME BPE Certificate of Compliance to relevant scope, 3A, EHEDG
- Inspection certificates: EN 10204, MTR for material, roughness, and delta ferrite.

Approvals for:

- ATEX, FM, CSA, TIIS, IECEx, NEPSI
- HART, PROFIBUS PA/DP, FOUNDATION Fieldbus, MODBUS
- Pressure Equipment Directive, SIL-2

Your benefits

The Promass measuring devices are suitable for use in PAT applications for the continuous monitoring of critical quality process variables such as mass flow, volume flow, density and temperature.

The uniform **Proline transmitter concept** includes software options for batching and concentration measurement for extended range of application.

The **Promass sensors**, tried and tested in over 100 000 applications, offer:

- Material selected according to ASME BPE and BN2 guidelines, EN 1.4435/ASTM 316L, low delta ferrite
- Wetted surfaces: $Ra_{max} = 0.76 \mu\text{m}$ (30 μin) or $Ra_{max} = 0.38 \mu\text{m}$ (15 μin) electropolished
- Accredited flow calibration according to ISO/SCS/IEC 17025/A2LA, traceable density calibration
- Fully welded sensor design, no seals or gaskets
- Electropolished exterior: "Hygienic design" for higher corrosion resistance and easier cleanability
- Complete drainability, even in horizontal lines

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Function and system design

Measuring principle

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

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

F_C = Coriolis force

Δm = moving mass

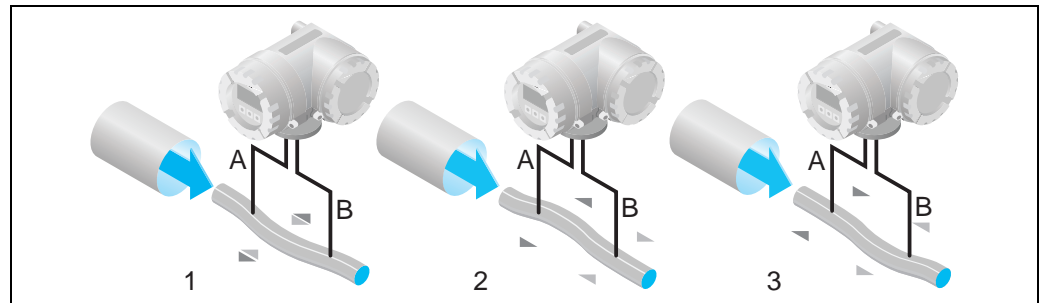
ω = rotational velocity

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 angular velocity ω , the Promass sensor uses oscillation.

This causes the tube through which the fluid is flowing to oscillate. The Coriolis forces produced at the measuring tubes 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, and thus there is no phase difference (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).



The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet.

The system balance required for proper measurement is created by exciting an eccentrically arranged swinging mass to antiphase oscillation. This patented TMB™ system (Torsion Mode Balanced System) guarantees perfect measurements, even in changing process and environmental conditions.

Therefore, the device is just as easy to install as the familiar two-tube systems! Consequently, no special measures for attachment are required in front of or behind the sensor.

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 the measuring tube and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency is thus a function of fluid density. The microprocessor utilizes this relationship to obtain a density signal.

Temperature measurement

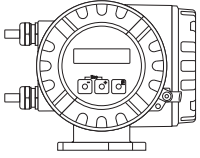
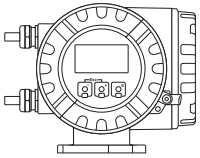
The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output.

Measuring system

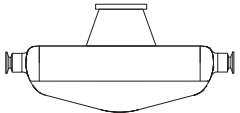
The measuring system consists of a transmitter and a sensor. Two versions are available:

- Compact version: transmitter and sensor form a mechanical unit.
- Remote version: transmitter and sensor are mounted physically separate from one another.

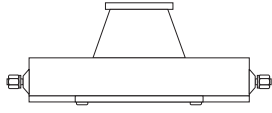
Transmitter

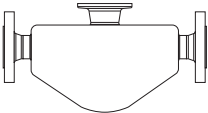
<p>Promass 80</p>  <p style="text-align: right; font-size: small;">a0003671</p>	<ul style="list-style-type: none"> ■ Two-line liquid-crystal display ■ Operation with push buttons
<p>Promass 83</p>  <p style="text-align: right; font-size: small;">a0003672</p>	<ul style="list-style-type: none"> ■ Four-line liquid-crystal display ■ Operation with "Touch control" ■ Application-specific Quick Setup ■ Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. fluid concentrations)

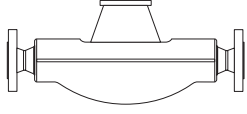
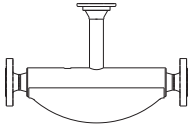
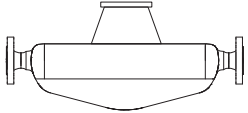
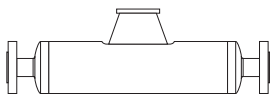
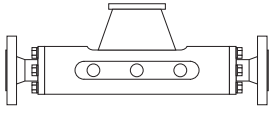
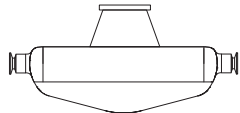
Sensor

<p>P</p>  <p style="text-align: right; font-size: small;">a0006828</p>	<ul style="list-style-type: none"> ■ Single bent tube, minimal shear stress on fluid. Hygienic design with documents for Life Science Industries applications, low pressure loss, for fluid temperatures up to +200 °C (+392 °F). ■ Nominal diameters DN 8 to 50 (3/8" to 2") ■ Material: Stainless steel EN 1.4435/ASTM 316L 	<p>Documentation No. TI078D</p>
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Other sensors can be found in the separate documentation

<p>A</p>  <p style="text-align: right; font-size: small;">a0003679</p>	<ul style="list-style-type: none"> ■ Single-tube system for highly accurate measurement of very small flows ■ Nominal diameters DN 1 to 4 (1/24" to 1/8") ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 (process connection) 	<p>Documentation No. TI054D</p>
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<p>E</p>  <p style="text-align: right; font-size: small;">a0002271</p>	<ul style="list-style-type: none"> ■ General purpose sensor, ideal replacement for volumetric flowmeters. ■ Nominal diameters DN 8 to 80 (3/8" to 3") ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L 	<p>Documentation No. TI061D</p>
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<p>F</p>  <p>a0003673</p>	<ul style="list-style-type: none"> ■ Universal sensor for fluid temperatures up to +200 °C (+392 °F). ■ Nominal diameters DN 8 to 250 (3/8" to 10"). ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 	<p>Documentation No. TI101D</p>
<p>F (High-temperature)</p>  <p>a0003675</p>	<ul style="list-style-type: none"> ■ Universal high-temperature sensor for fluid temperatures up to +350 °C (+662 °F). ■ Nominal diameters DN 25, 50, 80 (1", 2", 3") ■ Material: Alloy C-22, DIN 2.4602, EN 1.4404/ASTM 316L 	
<p>H</p>  <p>a0003677</p>	<ul style="list-style-type: none"> ■ Single bent tube. Low pressure loss and chemically resistant material ■ Nominal diameters DN 8 to 50 (3/8" to 2") ■ Material: Zirconium 702/R 60702, Tantalum 2.5W 	<p>Documentation No. TI074D</p>
<p>I</p>  <p>a0003678</p>	<ul style="list-style-type: none"> ■ Straight single-tube instrument. Minimal shear stress on fluid, hygienic design, low pressure loss ■ Nominal diameters DN 8 to 80 (3/8" to 3") ■ Material: Titanium, Ti Grade 2, Ti Grade 9 	<p>Documentation No. TI075D</p>
<p>M</p>  <p>a0003676</p>	<ul style="list-style-type: none"> ■ Robust sensor for extreme process pressures, high requirements for the secondary containment and fluid temperatures up to +150 °C (+302 °F) ■ Nominal diameters DN 8 to 80 (3/8" to 3") ■ Material: Titanium, Ti Grade 2, Ti Grade 9 	<p>Documentation No. TI102D</p>
<p>S</p>  <p>a0006828</p>	<ul style="list-style-type: none"> ■ Single bent tube. Hygienic design, low pressure loss, for fluid temperatures up to 150 °C (+302 °F) ■ Nominal diameters DN 8 to 50 (3/8" to 2") ■ Material: Stainless steel, EN 1.4539/ASTM 904L, EN 1.4435/ASTM 316L 	<p>Documentation No. TI076D</p>

Input

Measured variable

- Mass flow (proportional to the phase difference between two sensors mounted on the measuring tube to register a phase shift in the oscillation)
- Fluid density (proportional to resonance frequency of the measuring tube)
- Fluid temperature (measured with temperature sensors)

Measuring range

Measuring ranges for liquids

DN		Range for full scale values (liquids) $\dot{m}_{\min(F)} \dots \dot{m}_{\max(F)}$	
[mm]	[inch]	[kg/h]	[lb/min]
8	3/8"	0 to 2000	0 to 73.5
15	1/2"	0 to 6500	0 to 238
25	1"	0 to 18000	0 to 660
40	1 1/2"	0 to 45000	0 to 1650
50	2"	0 to 70000	0 to 2570

Measuring ranges for gases

The full scale values depend on the density of the gas. Use the formula below to calculate the full scale values:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_{(G)} \cdot x \text{ [kg/m}^3\text{]}$$

$$\dot{m}_{\max(G)} = \text{max. full scale value for gas [kg/h]}$$

$$\dot{m}_{\max(F)} = \text{max. full scale value for liquid [kg/h]}$$

$$\rho_{(G)} = \text{Gas density in [kg/m}^3\text{] at operating conditions}$$

DN		x
[mm]	[inch]	
8	3/8"	60
15	1/2"	80
25	1"	90
40	1 1/2"	90
50	2"	90

Here, $\dot{m}_{\max(G)}$ can never be greater than $\dot{m}_{\max(F)}$

Calculation example for gas:

- Sensor type: Promass P, DN 50
- Gas: air with a density of 60.3 kg/m³ (at 20 °C and 50 bar)
- Measuring range (liquid): 70000 kg/h
- x = 90 (for Promass P, DN 50)

Max. possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_{(G)} \cdot x \text{ [kg/m}^3\text{]} = 70000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 : 90 \text{ kg/m}^3 = 46900 \text{ kg/h}$$

Recommended full scale values

See information in the "Limiting flow" section → 22 ff.

Operable flow range

Greater than 1000 : 1. Flow rates above the preset full scale value do not overload the amplifier, i.e. the totalizer values are registered correctly.

Input signal**Status input (auxiliary input)**

$U = 3$ to 30 V DC, $R_i = 5$ k Ω , galvanically isolated.

Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment start, batching start/stop (optional), totalizer reset for batching (optional).

Status input (auxiliary input) with PROFIBUS DP

$U = 3$ to 30 V DC, $R_i = 3$ k Ω , galvanically isolated.

Switch level: ± 3 to ± 30 V DC, independent of polarity.

Configurable for: positive zero return, error message reset, zero point adjustment start, batching start/stop (optional), totalizer reset for batching (optional).

Status input (auxiliary input) with MODBUS RS485

$U = 3$ to 30 V DC, $R_i = 3$ k Ω , galvanically isolated.

Switch level: ± 3 to ± 30 V DC, independent of polarity.

Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment start.

Current input (only Promass 83)

Active/passive selectable, galvanically isolated, resolution: 2 μ A

- Active: 4 to 20 mA, $R_L < 700$ Ω , $U_{out} = 24$ V DC, short-circuit proof
- Passive: $0/4$ to 20 mA, $R_i = 150$ Ω , $U_{max} = 30$ V DC

Output

Output signal**Promass 80***Current output*

Active/passive selectable, galvanically isolated, time constant selectable (0.05 to 100 s), full scale value selectable, temperature coefficient: typically 0.005% o.f.s./ $^{\circ}$ C, resolution: 0.5 μ A

- Active: $0/4$ to 20 mA, $R_L < 700$ Ω (for HART: $R_L \geq 250$ Ω)
- Passive: 4 to 20 mA; supply voltage U_S 18 to 30 V DC; $R_i \geq 150$ Ω

Pulse/ frequency output

Passive, open collector, 30 V DC, 250 mA, galvanically isolated.

- Frequency output: full scale frequency 2 to 1000 Hz ($f_{max} = 1250$ Hz), on/off ratio $1:1$, pulse width max. 2 s
- Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.5 to 2000 ms)

PROFIBUS PA interface

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Profile Version 3.0
- Current consumption: 11 mA
- Permitted supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic) = 0 mA
- Data transmission rate: 31.25 kBit/s
- Signal encoding: Manchester II
- Function blocks: $4 \times$ Analog Input, $2 \times$ Totalizer
- Output data: Mass flow, Volume flow, Density, Temperature, Totalizer
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be configured via miniature switches or via the local display (optional)

Promass 83*Current output*

Active/passive selectable, galvanically isolated, time constant selectable (0.05 to 100 s), full scale value selectable, temperature coefficient: typically 0.005% o.f.s./°C, resolution: 0.5 μ A

- Active: 0/4 to 20 mA, $R_L < 700 \Omega$ (for HART: $R_L \geq 250 \Omega$)
- Passive: 4 to 20 mA; supply voltage U_S : 18 to 30 V DC; $R_i \geq 150 \Omega$

Pulse/frequency output:

active/passive selectable, galvanically isolated

- Active: 24 V DC, 25 mA (max. 250 mA during 20 ms), $R_L > 100 \Omega$
- Passive: open collector, 30 V DC, 250 mA
- Frequency output: full scale frequency 2 to 10000 Hz ($f_{\max} = 12500$ Hz), on/off ratio 1:1, pulse width max. 2 s
- Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.05 to 2000 ms)

PROFIBUS DP interface

- PROFIBUS DP in accordance with EN 50170 Volume 2
- Profile Version 3.0
- Data transmission rate: 9.6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Signal encoding: NRZ Code
- Function blocks: 6 \times Analog Input, 3 \times Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be configured via miniature switches or via the local display (optional)
- Available output combination \rightarrow 11

PROFIBUS PA interface

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Data transmission rate: 31.25 kBit/s
- Current consumption: 11 mA
- Permitted supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Signal encoding: Manchester II
- Function blocks: 6 \times Analog Input, 3 \times Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be configured via miniature switches or via the local display (optional)
- Available output combination \rightarrow 11

MODBUS interface

- MODBUS device type: slave
- Address range: 1 to 247
- Supported function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Physical interface: RS485 in accordance with EIA/TIA-485 standard
- Supported baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Transmission mode: RTU or ASCII
- Response times:
 - Direct data access = typically 25 to 50 ms
 - Auto-scan buffer (data range) = typically 3 to 5 ms
- Possible output combinations \rightarrow 11

FOUNDATION Fieldbus interface

- FOUNDATION Fieldbus H1, IEC 61158-2, galvanically isolated
- Data transmission rate: 31.25 kBit/s
- Current consumption: 12 mA
- Permitted supply voltage: 9 to 32 V
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Bus connection with integrated reverse polarity protection
- Signal encoding: Manchester II
- ITK Version 5.01
- Function blocks:
 - 8 × Analog Input (Execution time: each 18 ms)
 - 1 × Digital Output (18 ms)
 - 1 × PID (25 ms)
 - 1 × Arithmetic (20 ms)
 - 1 × Input Selector (20 ms)
 - 1 × Signal Characterizer (20 ms)
 - 1 × Integrator (18 ms)
- Number of VCRs: 38
- Number of link objects in VFD: 40
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Reset totalizer
- Link Master (LM) function is supported

Signal on alarm

Current output

Failsafe mode selectable (e.g. in accordance with NAMUR Recommendation NE 43)

Pulse/frequency output

Failsafe mode selectable

Status output (Promass 80)

Nonconductive in the event of a fault or if the power supply fails

Relay output (Promass 83)

Dead in the event of a fault or if the power supply fails

Load

see "Output signal"

Low flow cut off

Switch points for low flow cut off are selectable.

Galvanic isolation

All circuits for inputs, outputs, and power supply are galvanically isolated from each other.

Switching output

Status output (Promass 80)

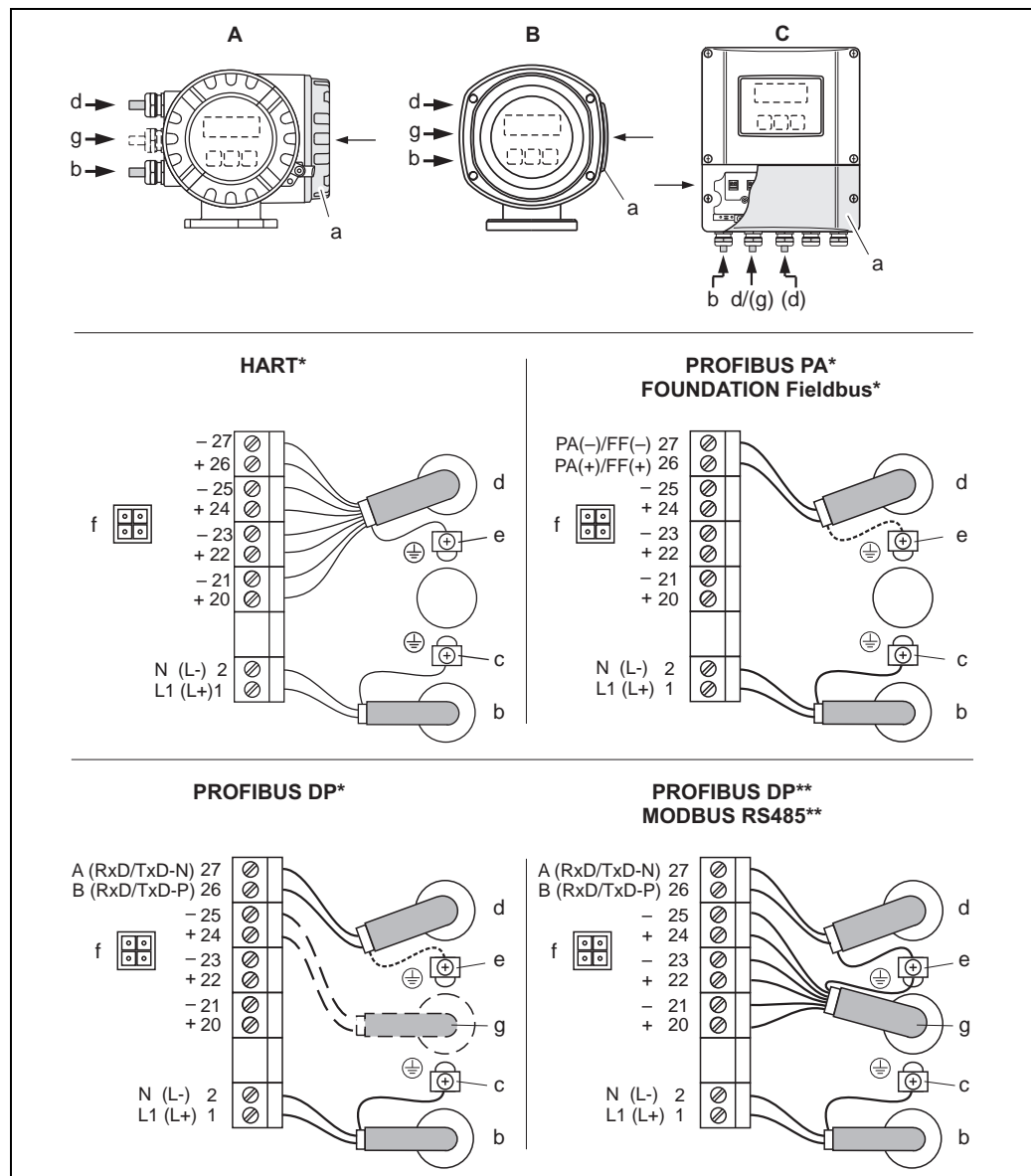
- Open collector
- max. 30 V DC / 250 mA
- galvanically isolated
- Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values

Relay output (Promass 83)

- max. 30 V / 0.5 A AC; 60 V / 0.1 A DC
- galvanically isolated
- Normally closed (NC or break) or normally open (NO or make) contacts available (factory setting: relay 1 = NO, relay 2 = NC)

Power supply

Electrical connection, measuring unit



Connecting the transmitter, cable cross-section: max. 2.5 mm²

- A View A (field housing)
 B View B (Stainless Steel field housing)
 C View C (wall-mount housing)

*) fixed communication board

**) flexible communication board

a Connection compartment cover

b Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC

Terminal No. 1: L1 for AC, L+ for DC

Terminal No. 2: N for AC, L- for DC

c Ground terminal for protective ground

d Signal cable: see Terminal assignment → 11

Fieldbus cable:

Terminal No. 26: DP (B) / PA (+) / FF (+) / MODBUS RS485 (B) / (PA, FF: with reverse polarity protection)

Terminal No. 27: DP (A) / PA (-) / FF (-) / MODBUS RS485 (A) / (PA, FF: with reverse polarity protection)

e Ground terminal for signal cable shield / fieldbus cable / RS485 line

f Service adapter for connecting service interface FXA 193 (Fieldcheck, FieldCare)

g Signal cable: see Terminal assignment → 11

Cable for external termination (only for PROFIBUS DP with permanent assignment communication board):

Terminal No. 24: +5 V

Terminal No. 25: DGND

**Electrical connection,
terminal assignment**

Promass 80

Order version	Terminal No. (inputs/outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
80***_*****A	-	-	Frequency output	Current output, HART
80***_*****D	Status input	Status output	Frequency output	Current output, HART
80***_*****H	-	-	-	PROFIBUS PA
80***_*****S	-	-	Frequency output Ex i, passive	Current output Ex i active, HART
80***_*****T	-	-	Frequency output Ex i, passive	Current output Ex i passive, HART
80***_*****8	Status input	Frequency output	Current output 2	Current output 1, HART

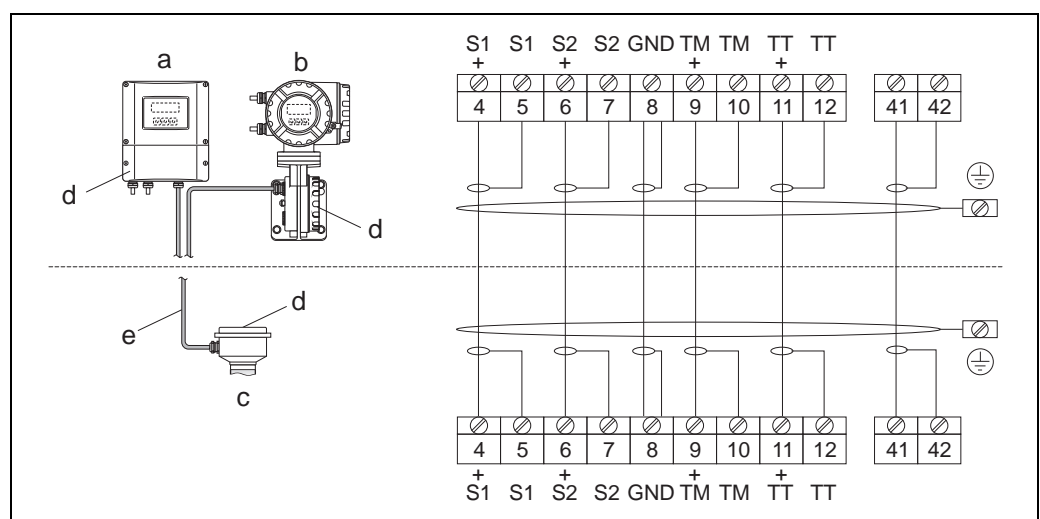
Promass 83

The inputs and outputs on the communication board can be either permanently assigned (fixed) or variable (flexible), depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

Order version	Terminal No. (inputs/ outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
<i>Fixed communication boards (permanent assignment)</i>				
83***_*****A	-	-	Frequency output	Current output HART
83***_*****B	Relay output	Relay output	Frequency output	Current output HART
83***_*****F	-	-	-	PROFIBUS PA, Ex i
83***_*****G	-	-	-	FOUNDATION Fieldbus Ex i
83***_*****H	-	-	-	PROFIBUS PA
83***_*****J	-	-	+5V (ext. termination)	PROFIBUS DP
83***_*****K	-	-	-	FOUNDATION Fieldbus
83***_*****Q	-	-	Status input	MODBUS RS485
83***_*****R	-	-	Current output 2 Ex i, active	Current output 1 Ex i active, HART
83***_*****S	-	-	Frequency output Ex i, passive	Current output Ex i active, HART
83***_*****T	-	-	Frequency output Ex i, passive	Current output Ex i passive, HART
83***_*****U	-	-	Current output 2 Ex i, passive	Current output 1 Ex i passive, HART
<i>Flexible communication boards</i>				
83***_*****C	Relay output 2	Relay output 1	Frequency output	Current output, HART
83***_*****D	Status input	Relay output	Frequency output	Current output, HART
83***_*****E	Status input	Relay output	Current output 2	Current output 1, HART
83***_*****L	Status input	Relay output 2	Relay output 1	Current output, HART
83***_*****M	Status input	Freq. output 2	Frequency output 1	Current output, HART
83***_*****N	Current output	Frequency output	Status input	MODBUS RS485
83***_*****P	Current output	Frequency output	Status input	PROFIBUS DP
83***_*****V	Relay output 2	Relay output 1	Status input	PROFIBUS DP

Order version	Terminal No. (inputs/ outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
83***_*****W	Relay output	Current output 3	Current output 2	Current output 1, HART
83***_*****0	Status input	Current output 3	Current output 2	Current output 1, HART
83***_*****2	Relay output	Current output 2	Frequency output	Current output 1, HART
83***_*****3	Current input	Relay output	Current output 2	Current output 1, HART
83***_*****4	Current input	Relay output	Frequency output	Current output, HART
83***_*****5	Status input	Current input	Frequency output	Current output, HART
83***_*****6	Status input	Current input	Current output 2	Current output 1, HART
83***_*****7	Relay output 2	Relay output 1	Status input	MODBUS RS485

Electrical connection, remote version



Connecting the remote version

- a Wall-mount housing transmitter: non-hazardous area and ATEX II3G / zone 2 → see separate "Ex documentation"
- b Wall-mount housing transmitter: ATEX II2G / Zone 1 / FM/CSA → see separate "Ex documentation"
- c Connection housing sensor
- d Cover for connection compartment or connection housing
- e Connecting cable

Terminal No.: 4/5 = gray; 6/7 = green; 8 = yellow; 9/10 = pink; 11/12 = white; 41/42 = brown

Supply voltage

85 to 260 V AC, 45 to 65 Hz
 20 to 55 V AC, 45 to 65 Hz
 16 to 62 V DC

Cable entries

Power-supply and signal cables (inputs/outputs)

- Cable entry M20 × 1.5 (8 to 12 mm) (0.31" to 0.47")
- Thread for cable entries, ½" NPT, G ½"

Connecting cable for remote version

- Cable entry M20 × 1.5 (8 to 12 mm) (0.31" to 0.47")
- Thread for cable entries, ½" NPT, G ½"

Cable specification, remote version

- $6 \times 0.38 \text{ mm}^2$ (PVC cable with common shield and individually shielded cores)
- Conductor resistance: $\leq 50 \text{ } \Omega/\text{km}$ ($\leq 0.015 \text{ } \Omega/\text{ft}$)
- Capacitance: core/shield: $\leq 420 \text{ pF/m}$ ($\leq 128 \text{ pF/ft}$)
- Cable length: max. 20 m (65 ft)
- Permanent operating temperature: max. $+105 \text{ } ^\circ\text{C}$ ($+221 \text{ } ^\circ\text{F}$)

Operation in zones of severe electrical interference:

The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of IEC/EN 61326, and NAMUR recommendation NE 21/43.

Power consumption

AC: $< 15 \text{ VA}$ (including sensor)

DC: $< 15 \text{ W}$ (including sensor)

Switch-on current

- Max. 13.5 A ($< 50 \text{ ms}$) at 24 V DC
 - Max. 3 A ($< 5 \text{ ms}$) at 260 V AC
-

Power supply failure

Promass 80

Lasting min. 1 power cycle:

- EEPROM saves measuring system data if the power supply fails
- HistoROM/S-DAT: exchangeable data storage chip with sensor specific data (nominal diameter, serial number, calibration factor, zero point etc.)

Promass 83

Lasting min. 1 power cycle:

- EEPROM and T-DAT save the measuring system data if the power supply fails.
 - HistoROM/S-DAT: exchangeable data storage chip with sensor specific data (nominal diameter, serial number, calibration factor, zero point etc.)
-

Potential equalization


No special measures for potential equalization are required. For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.

Performance characteristics

Reference operating conditions

- Error limits following ISO/DIS 11631
- Water with +15 to +45 °C (+59 to +113 °F); 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol ± 5 °C (± 9 °F) and ± 2 bar (± 29 psi)
- Accuracy based on accredited calibration rigs according to ISO 17025

Maximum measured error

The following values refer to the pulse/ frequency output. Measured error at the current output is typically ± 5 μ A. Design fundamentals →  16.

o.r. = of reading

Mass and volume flow (liquids)

Promass 83P:

- $\pm 0.10\%$ o.r.

Promass 80P:

- $\pm 0.15\%$ o.r.

Mass flow (gases)

Promass 83P, 80P: $\pm 0.50\%$ o.r.

Density (liquid)

Reference conditions

- ± 0.0005 g/cm³

Field density calibration⁽¹⁾

- ± 0.0005 g/cm³


Standard density calibration⁽²⁾

- ± 0.01 g/cm³

Special density calibration⁽³⁾

- ± 0.002 g/cm³

⁽¹⁾ After on-site field density calibration under customer process reference conditions.

⁽²⁾ Performed on all sensors, valid over medium temperature and density range →  22

⁽³⁾ Optional, valid range: +5 to +80 °C (+41 to +176 °F); 0 – 2.0g/cm³

Temperature

± 0.5 °C $\pm 0.005 \cdot T$ °C

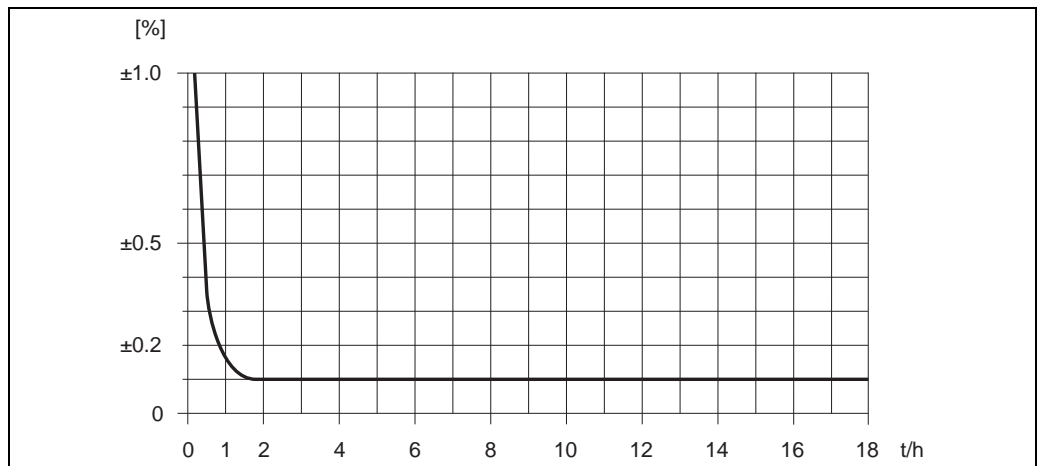
(± 1 °F $\pm 0.003 \cdot (T - 32)$ °F)

T = medium temperature

Zero point stability

DN		Zero point stability	
[mm]	[inch]	[kg/h] or [l/h]	[lb/min]
8	3/8"	0.20	0.007
15	1/2"	0.65	0.024
25	1"	1.80	0.066
40	1 1/2"	4.50	0.165
50	2"	7.00	0.257

Example for Max. measured error



Max. measured error in % o.r. (example: Promass 83P / DN 25)

Flow values (example)

Design fundamentals → 16

Turn down	Flow		Max. measured error [% o.r.]
	[kg/h] or [l/h]	[lb/min]	
250 : 1	72	2.646	1.875
100 : 1	180	6.615	0.750
25 : 1	720	26.46	0.188
10 : 1	1800	66.15	0.100
2 : 1	9000	330.75	0.100

o.r. = of reading

Repeatability

Design fundamentals → 16.

o.r. = of reading

Mass flow and volume flow (liquids)

Promass 80P, 83P: ±0.05% o.r.

Mass flow (gases)

Promass 80P, 83P: ±0.25% o.r.

Density (liquids)

±0.00025 g/cc

1 g/cc = 1 kg/l

Temperature

±0.25 °C ± 0.0025 · T °C

(±1 °F ± 0.003 · (T-32) °F)

T = Medium temperature

Influence of fluid temperature

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the Promass sensor is ±0.0002% of the full scale value / °C (±0.0001% of the full scale value / °F).

Influence of fluid pressure

The table below shows the effect on accuracy of mass flow due to a difference between calibration pressure and process pressure.

DN		Promass P
[mm]	[inch]	[% o.r./bar]
8	3/8"	-0.002
15	1/2"	-0.006
25	1"	-0.005
40	1 1/2"	-0.005
50	2"	-0.005

o.r. = of reading

Design fundamentals

Dependent on the flow:

- Flow \geq Zero point stability \div (base accuracy \div 100)
 - Max. measured error: \pm base accuracy in % o.r.
 - Repeatability: \pm 1/2 \cdot base accuracy in % o.r.
- Flow $<$ Zero point stability \div (base accuracy \div 100)
 - Max. measured error: \pm (zero point stability \div measured value) \cdot 100% o.r.
 - Repeatability: \pm 1/2 \cdot (zero point stability \div measured value) \cdot 100% o.r.

o.r. = of reading

Base accuracy for	Promass 83P	Promass 80P
Mass flow liquids	0.10	0.15
Volume flow liquids	0.10	0.15
Mass flow gases	0.50	0.50

Operating conditions: Installation**Installation instructions**

Note the following points:

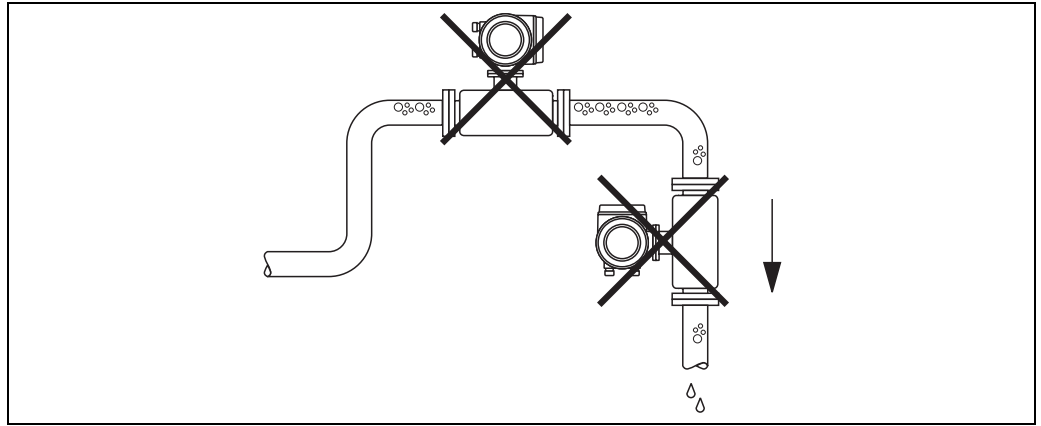
- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument, for example the secondary containment.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations.
- No special precautions need to be taken for fittings which create turbulence (valves, elbows, T-pieces etc.), as long as no cavitation occurs.
- For mechanical reasons and to protect the pipe, support is recommended for heavy sensors.

Mounting location

Entrained air or gas bubbles in the measuring tube can result in an increase in measuring errors.

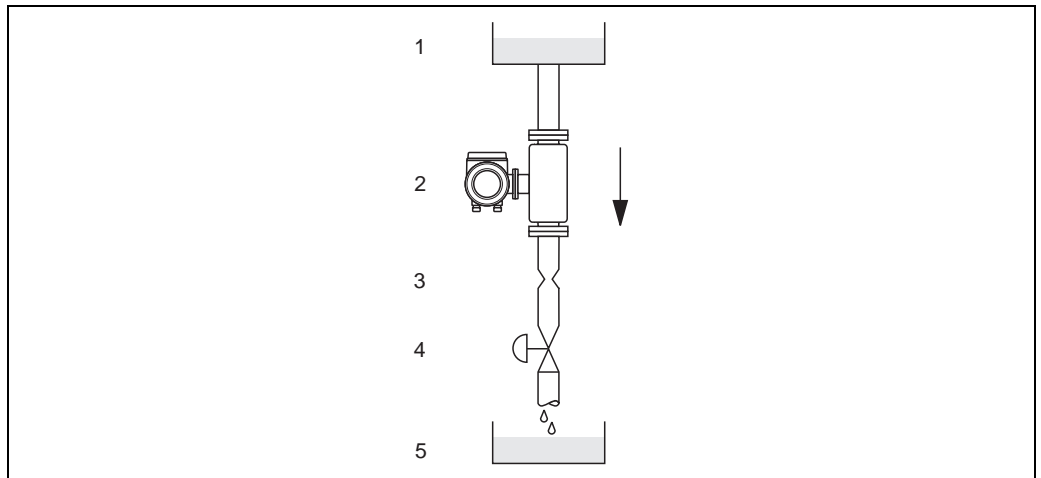
Therefore, avoid the following mounting locations in the pipe installation:

- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream of a free pipe outlet in a vertical pipeline.



Mounting location

Notwithstanding the above, the installation proposal below permits 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.



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

- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction (see Table following page)
- 4 Valve
- 5 Batching tank

DN		Ø Orifice plate, pipe restriction	
[mm]	[inch]	[mm]	[inch]
8	3/8"	6	0.24
15	1/2"	10	0.39
25	1"	14	0.55
40	1 1/2"	22	0.87
50	2"	28	1.10

Orientation

Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction of fluid flow through the pipe).

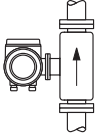

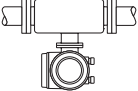

Vertical (Fig. V)

Recommended orientation with upward direction of flow. When fluid is not flowing, entrained solids will sink down and gases will rise away from the measuring tube. Thus the measuring tubes can be completely drained and protected against solids buildup.

Horizontal (Fig. H1 to H3)

The transmitter can be installed in any orientation in a horizontal pipe run.

Please note the special installation instructions →  19.

Orientation:	Vertikal	Horizontal, Transmitter head up	Horizontal, Transmitter head down	Horizontal, Transmitter head to the side
	 <small>a0004572</small> Fig. V	 <small>a0004576</small> Fig. H1	 <small>a0004580</small> Fig. H2	 <small>a0007558</small> Fig. H3
Standard, Compact version	✓✓	✓✓	✓✓	✓✓
Standard, Remote version	✓✓	✓✓	✓✓	✓✓

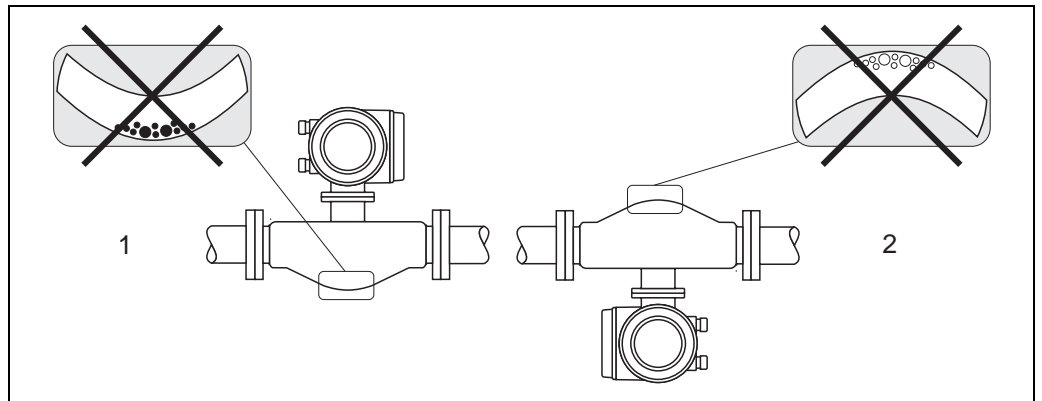
✓✓ = Recommended orientation; ✓ = Orientation recommended in certain situations; ✗ = Impermissible orientation

In order to ensure that the permissible ambient temperature range for the transmitter is not exceeded, we recommend the following orientations:

- For fluids with very high temperatures, we recommend the horizontal orientation with the transmitter head pointing downwards (Fig. H2) or the vertical orientation (Fig. V).
- For fluids with very low temperatures, we recommend the horizontal orientation with the transmitter head pointing upwards (Fig. H1) or the vertical orientation (Fig. V).

Special installation instructions

When using a bent measuring tube and horizontal installation, the position of the sensor has to be matched to the fluid properties!

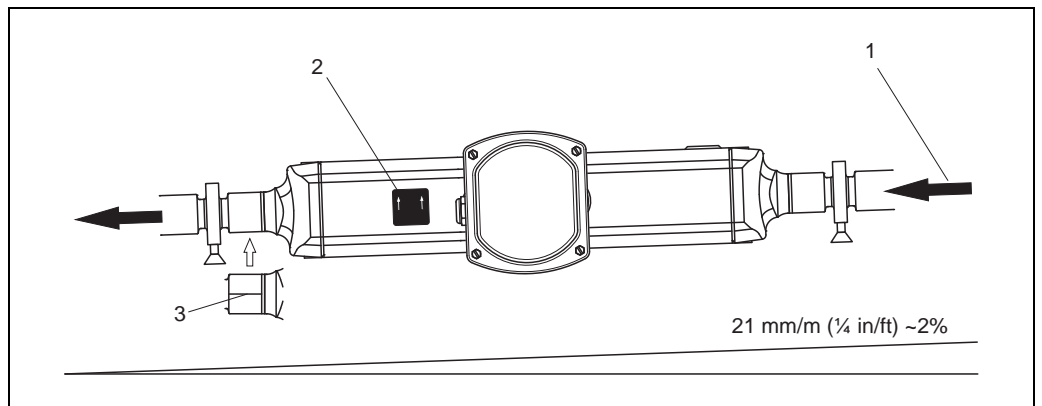


Horizontal installation for sensors with a bent measuring tube

- 1 Not suitable for fluids with entrained solids. Risk of solids accumulating.
- 2 Not suitable for outgassing fluids. Risk of air accumulating.

Eccentric clamps

Eccentric Clamps can be used to ensure complete drainability when the sensor is installed in a horizontal line. When lines are pitched in a specific direction and at a specific slope, gravity can be used to achieve complete drainability. The sensor must be installed in the correct position with the tube bend facing to the side, to ensure full drainability in the horizontal position. Markings on the sensor show the correct mounting position to optimize drainability.

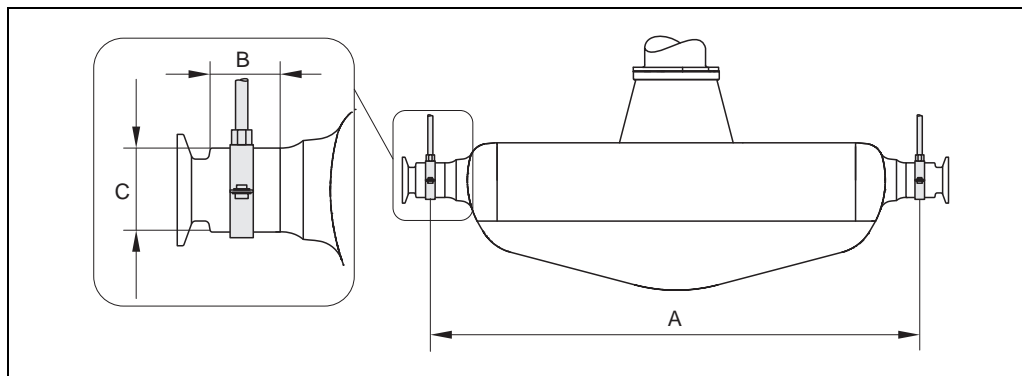


When lines are pitched in a specific direction and at a specific slope: as per hygienic guidelines (21 mm/m (1/4 inch/ft) or approximately 2%). Gravity can be used to achieve complete drainability.

- 1 The arrow indicates the direction of flow (direction of fluid flow through the pipe).
- 2 The label shows the installation orientation for horizontal drainability.
- 3 The underside of the process connection is indicated by a scribed line. This line indicates the lowest point of the eccentric process connection.

Hygienic connections (mounting clamp with lining between clamp and instrument)

It is not necessary to support the sensor under any circumstances for operational performance. If the requirement exists to support the sensor the following recommendation should be followed.



Mounting with mounting clamp

DN		A		B		C	
[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
8	3/8"	298	11.73	33.0	1.30	28	1.10
15	1/2"	402	15.83	33.0	1.30	28	1.10
25	1"	542	21.34	33.0	1.30	38	1.50
40	1 1/2"	750	29.53	36.5	1.44	56	2.20
50	2"	1019	40.12	44.1	1.74	75	2.95

Heating

Some fluids require suitable measures to avoid heat transfer at the sensor. Heating can be electric, e.g. with heated elements, or by means of hot water or steam pipes made of copper or heating jackets.

- Risk of electronics overheating! Make sure that the maximum permissible ambient temperature for the transmitter is not exceeded. Consequently, make sure that the adapter between the sensor and transmitter and the connection housing of the remote version always remain free of insulating material. Note that a certain orientation might be required, depending on the fluid temperature → 18.
- If using an electric trace heating system whose heating is regulated via phase angle control or pulse packages, influence on the measured values cannot be ruled out due to magnetic fields (i.e. for values that are greater than the values approved by the EN standard (sine 30 A/m)). In such cases, the sensor must be magnetically shielded.

The secondary containment can be shielded with tin plates or electric sheets without preferential direction (e.g. V330-35A) with the following properties:

- Relative magnetic permeability $\mu_r \geq 300$
- Plate thickness $d \geq 0.35 \text{ mm} (\geq 0.014")$

- Information on permitted temperature ranges → 22

Special heating jackets, which can be ordered separately from Endress+Hauser as an accessory, are available for the sensors.

Zero point adjustment

All measuring devices are calibrated to state-of-the-art technology. The zero point determined in this way is imprinted on the nameplate of the device. Calibration takes place under reference conditions → 14.


Therefore, a zero point adjustment is generally **not** required!

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

- When the highest measuring accuracy is required and the flow rates are very low.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high viscosity fluids).

Inlet and outlet runs	There are no installation requirements regarding inlet and outlet runs.
Length of connecting cable	Max. 20 meters (66 ft), remote version
System pressure	<p>It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.</p> <p>In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapor pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.</p> <p>Therefore, the following locations should be preferred for installation:</p> <ul style="list-style-type: none"> ■ Downstream from pumps (no danger of vacuum) ■ At the lowest point in a vertical pipe

Operating conditions: Environment

Ambient temperature range	<p>Sensor, transmitter:</p> <ul style="list-style-type: none"> ■ Standard: -20 to $+60$ °C (-4 to $+140$ °F) ■ Optional: -40 to $+60$ °C (-40 to $+140$ °F) <p> Note!</p> <ul style="list-style-type: none"> ■ Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions. ■ At ambient temperatures below -20 °C (-4 °F) the readability of the display may be impaired.
Storage temperature	-40 to $+80$ °C (-40 to $+176$ °F), preferably $+20$ °C ($+68$ °F)
Degree of protection	Standard: IP 67 (NEMA 4X) for transmitter and sensor
Shock resistance	According to IEC 68-2-31
Vibration resistance	Acceleration up to 1 g, 10 to 150 Hz, following IEC 68-2-6
Electromagnetic compatibility (EMC)	As per IEC/EN 61326 and NAMUR recommendation NE 21

Operating conditions: Process

Fluid temperature range

Sensor

–50 to +200 °C (–58 to +392 °F)

Medium density

0 to 5000 kg/m³ (0 to +312 lb/cf)

Fluid pressure range (nominal pressure)

Flanges

- according to DIN PN 40 to 63
- according to ASME B16.5 Cl 150, Cl 300
- JIS 20K, 40K

Secondary containment

- DN 8 to 25 (3/8" to 1"): 25 bar (362 psi)
- DN 40 (1 1/2"): 16 bar (232 psi)
- DN 50 (2"): 10 bar : (145 psi)



Warning!

In case a danger of measuring tube failure exists due to process characteristics, e.g. with corrosive process fluids, we recommend the use of sensors whose secondary containment is equipped with special pressure monitoring connections (ordering option). With the help of these connections, fluid collected in the secondary containment in the event of tube failure can be bled off. This is especially important in high pressure gas applications. These connections can also be used for gas purging (gas detection). Dimensions → 25

Limiting flow

See information in the "Measuring range" section → 6

Select nominal diameter by optimizing between required flow range and permissible pressure loss. See the "Measuring range" section for a list of maximum possible full scale values.

- The minimum recommended full scale value is approx. 1/20 of the max. full scale value.
- In most applications, 20 to 50% of the maximum full scale value can be considered ideal
- Select a lower full scale value for abrasive substances such as fluids with entrained solids (flow velocity <1 m/s (<3 ft/s)).
- For gas measurement the following rules apply:
 - Flow velocity in the measuring tubes should not be more than half the sonic velocity (0.5 Mach).
 - The maximum mass flow depends on the density of the gas: formula → 6

Pressure loss

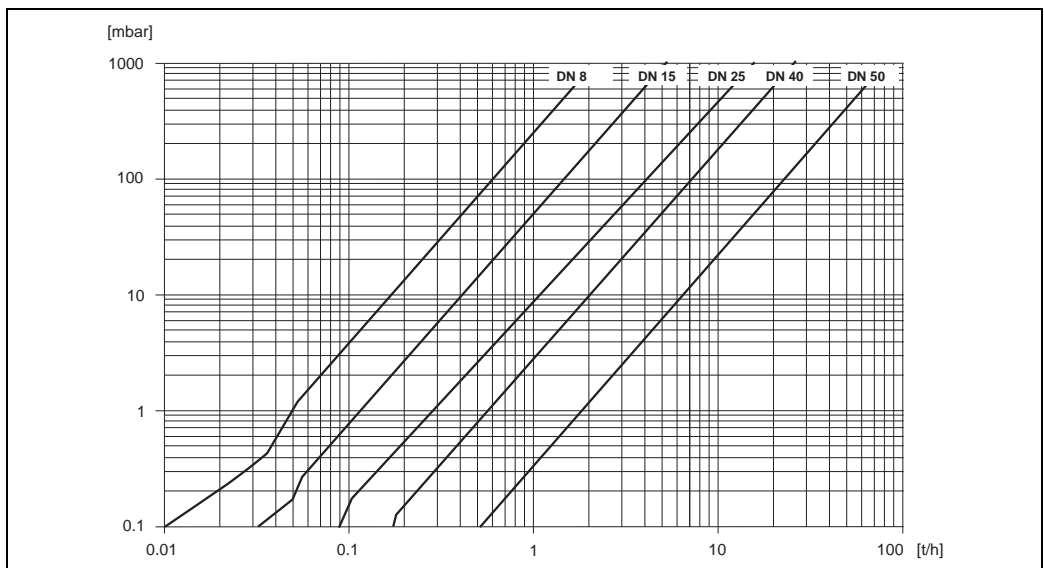
Pressure loss depends on the fluid properties and on the flow rate. The following formulae can be used to approximately calculate the pressure loss:

Reynolds number	$Re = \frac{4 \cdot \dot{m}}{\pi \cdot d \cdot \nu \cdot \rho}$	a0003381
Re ≥ 2300 *	$\Delta p = K \cdot \nu^{0.25} \cdot \dot{m}^{1.75} \cdot \rho^{-0.75} + \frac{K3 \cdot \dot{m}^2}{\rho}$	a0004631
Re < 2300	$\Delta p = K1 \cdot \nu \cdot \dot{m} + \frac{K3 \cdot \dot{m}^2}{\rho}$	a0004633
<p> Δp = pressure loss [mbar] ρ = fluid density [kg/m³] ν = kinematic viscosity [m²/s] d = inside diameter of measuring tubes [m] \dot{m} = mass flow [kg/s] K to K3 = constants (depending on nominal diameter) </p> <p>* To compute the pressure loss for gases, always use the formula for Re ≥ 2300.</p>		

Pressure loss coefficients

DN		d[m]	K	K1	K3
[mm]	[inch]				
8	3/8"	8.31 · 10 ⁻³	8.78 · 10 ⁶	3.53 · 10 ⁷	1.30 · 10 ⁶
15	1/2"	12.00 · 10 ⁻³	1.81 · 10 ⁶	9.99 · 10 ⁶	1.87 · 10 ⁵
25	1"	17.60 · 10 ⁻³	3.67 · 10 ⁵	2.76 · 10 ⁶	4.99 · 10 ⁴
40	1 1/2"	26.00 · 10 ⁻³	8.00 · 10 ⁴	7.96 · 10 ⁵	1.09 · 10 ⁴
50	2"	40.50 · 10 ⁻³	1.41 · 10 ⁴	1.85 · 10 ⁵	1.20 · 10 ³

Pressure loss data includes interface between measuring tube and piping



Pressure loss diagram for water

Pressure loss (US units)

Pressure loss is dependent on fluid properties nominal diameter. Consult Endress+Hauser for Applicator PC software to determine pressure loss in US units. All important instrument data is contained in the Applicator software programm in order to optimize the design of measuring system. The software is used for following calculations:

- Nominal diameter of the sensor with fluid characteristics such as viscosity, density, etc.
- Pressure loss downstream of the measuring point.
- Converting mass flow to volume flow etc.
- Simultaneous display of various meter size.
- Determining measuring ranges.

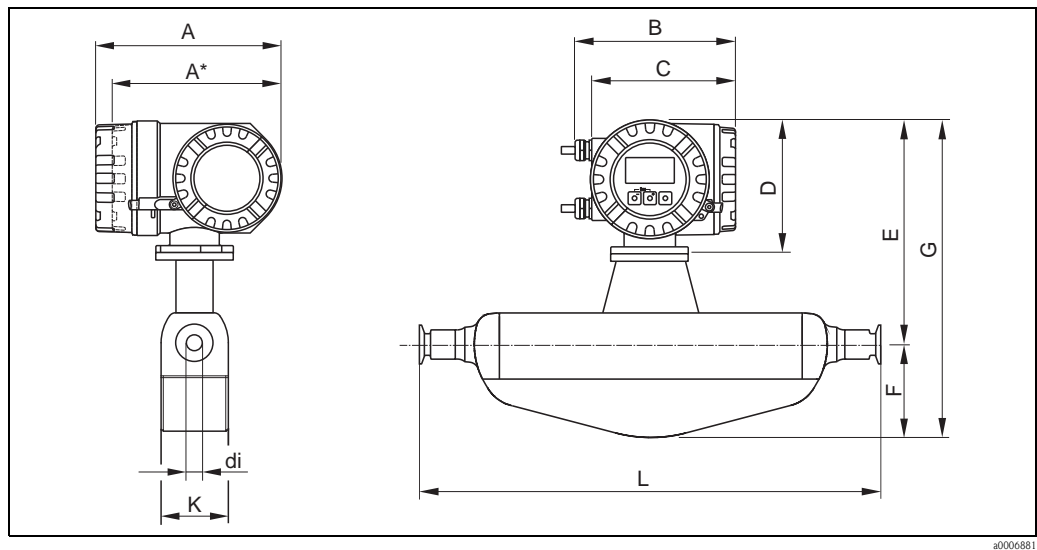
The Applicator runs on any IBM compatible PC with windows.

Mechanical construction

Design, dimensions

Dimensions:	
Field housing compact version, powder-coated die-cast aluminum	→ 26
Transmitter compact version, stainless steel	→ 26
Transmitter connection housing remote version (II2G/Zone 1)	→ 28
Transmitter remote version, wall-mount housing (non hazardous area and II3G/zone 2)	→ 29
Transmitter remote version, connection housing	→ 30
Process connections in SI units	
Flange connections EN (DIN), ASME B16.5, JIS	→ 31
Tri-Clamp (BS4825, ASME BPE, DIN 11866 line C)	→ 33
Tri-Clamp, eccentric (BS4825, ASME BPE, DIN 11866 line C)	→ 34
DIN 11851 (threaded hygienic connection), DIN 11866 line A	→ 35
DIN 11864-1 Form A (aseptic threaded connection), DIN 11866 line A	→ 36
DIN 11864-2 Form A (aseptic flange with notch), DIN 11866 line A	→ 37
DIN 11864-3 Form A (aseptic clamp with notch), DIN 11866 line A	→ 38
DIN 11864-3 Form A (aseptic clamp with notch, eccentric), DIN 11866 line A	→ 38
DIN 32676 (clamp), DIN 11866 line A	→ 39
DIN 32676 (clamp, eccentric), DIN 11866 line A	→ 39
ISO 2852 (clamp), ISO 2037	→ 40
ISO 2852 (clamp connection), DIN 11866 line B	→ 40
ISO 2852 (clamp, eccentric), DIN 11866 line B	→ 41
ISO 2852 (clamp, eccentric), DIN 11866 line B, for connection at DN15 pipes (option)	→ 41
ISO 2853 (threaded hygienic connection), ISO 2037	→ 42
Neumo BioConnect (clamp with notch), DIN 11866 line A	→ 42
Neumo BioConnect (clamp with notch, eccentric), DIN 11866 line A	→ 43
Neumo BioConnect (flange with notch), DIN 11866 line A	→ 44
BBS (clamp with notch), DIN 11866 line A	→ 45
BBS (clamp with notch, eccentric), DIN 11866 line A	→ 45
BBS (clamp with notch), DIN 11866 line B	→ 46
BBS (clamp with notch, eccentric), DIN 11866 line B	→ 46
BBS (flange with notch), DIN 11866 line A	→ 47
BBS (flange with notch), DIN 11866 line B	→ 47
BBS (aseptic threaded connection), DIN 11866 line A	→ 48
BBS (aseptic threaded connection), DIN 11866 line B	→ 48
SMS 1145 (threaded hygienic connection), ISO 2037	→ 49
Process connections in US units	
Flange connections ASME B16.5	→ 50
Tri-Clamp (BS4825, ASME BPE, DIN 11866 line C)	→ 51
Tri-Clamp, eccentric (BS4825, ASME BPE, DIN 11866 line C)	→ 52
Neumo BioConnect (clamp with notch), DIN 11866 line A	→ 53
Neumo BioConnect (clamp with notch, eccentric), DIN 11866 line A	→ 53
Neumo BioConnect (flange with notch), DIN 11866 line A	→ 54
SMS 1145 (threaded hygienic connection), ISO 2037	→ 55
Purge connections / secondary containment monitoring	→ 55

Field housing compact version, powder-coated die-cast aluminum



a0006881

Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	K	L	di
8	227	207	187	168	160	280	108	388	92	¹⁾	¹⁾
15	227	207	187	168	160	280	108	388	92	¹⁾	¹⁾
25	227	207	187	168	160	280	121	401	92	¹⁾	¹⁾
40	227	207	187	168	160	304	173	477	132	¹⁾	¹⁾
50	227	207	187	168	160	315	241	556	167	¹⁾	¹⁾

* Blind version (without local display)

¹⁾ dependent on respective process connection

All dimensions in [mm]

Dimensions in US units

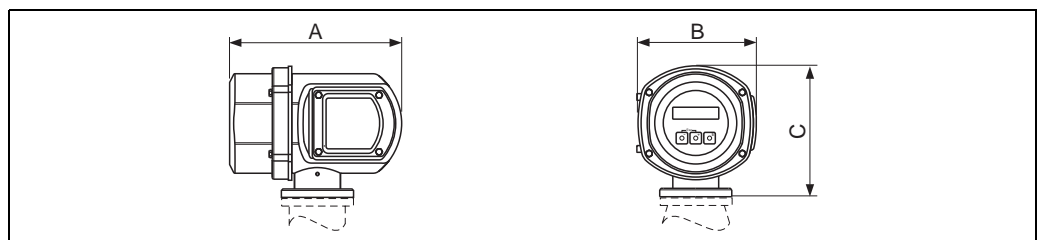
DN	A	A*	B	C	D	E	F	G	K	L	di
3/8"	8.93	8.15	7.36	6.61	6.30	11.02	4.25	15.28	3.62	¹⁾	¹⁾
1/2"	8.93	8.15	7.36	6.61	6.30	11.02	4.25	15.28	3.92	¹⁾	¹⁾
1"	8.93	8.15	7.36	6.61	6.30	11.02	4.76	15.79	3.62	¹⁾	¹⁾
1 1/2"	8.93	8.15	7.36	6.61	6.30	11.97	6.81	18.78	5.20	¹⁾	¹⁾
2"	8.93	8.15	7.36	6.61	6.30	12.40	9.49	21.89	6.57	¹⁾	¹⁾

* Blind version (without local display)

¹⁾ dependent on respective process connection

All dimensions in [inch]

Transmitter compact version, stainless steel

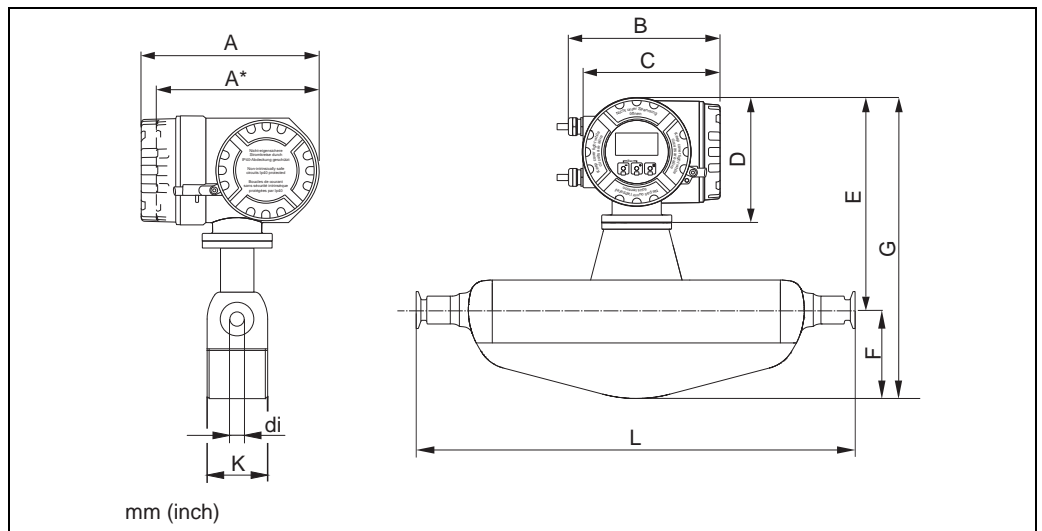


a0002245

Dimensions in SI and US units

A		B		C	
[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
225	8.86	153	6.02	168	6.61

Field housing compact version (II2G/Zone 1)



a0014392

Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	K	L	di
8	240	217	206	186	178	298	108	406	92	¹⁾	¹⁾
15	240	217	206	186	178	298	108	406	92	¹⁾	¹⁾
25	240	217	206	186	178	298	121	419	92	¹⁾	¹⁾
40	240	217	206	186	178	322	173	495	132	¹⁾	¹⁾
50	240	217	206	186	178	333	241	574	167	¹⁾	¹⁾

* Blind version (without local display)

¹⁾ dependent on respective process connection

All dimensions in [mm]

Dimensions in US units

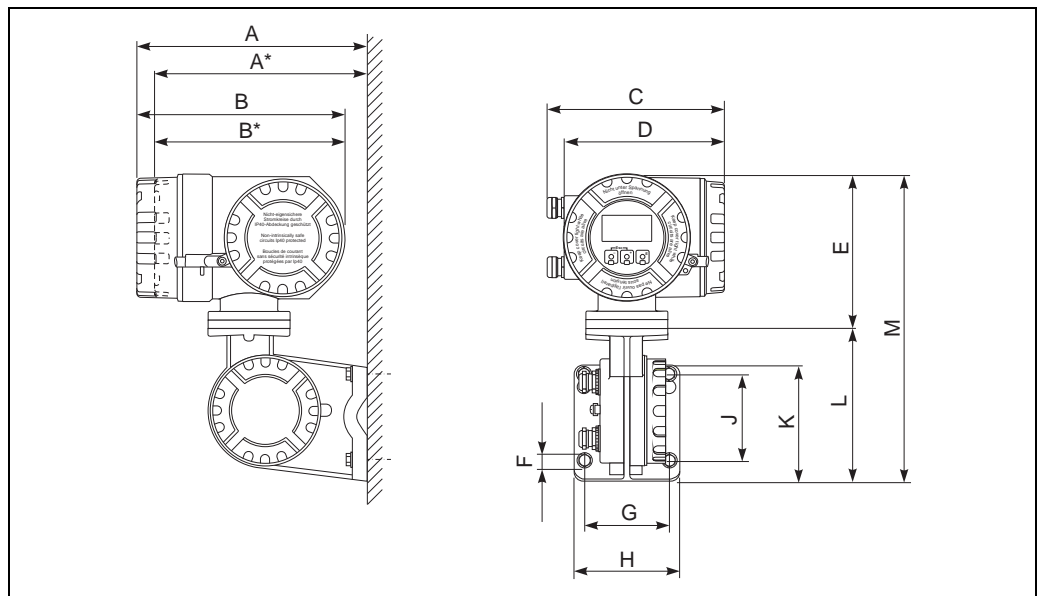
DN	A	A*	B	C	D	E	F	G	K	L	di
3/8"	9.45	8.54	8.11	7.32	7.00	11.73	4.25	16.0	3.62	¹⁾	¹⁾
1/2"	9.45	8.54	8.11	7.32	7.00	11.73	4.25	16.0	3.92	¹⁾	¹⁾
1"	9.45	8.54	8.11	7.32	7.00	11.73	4.76	16.5	3.62	¹⁾	¹⁾
1 1/2"	9.45	8.54	8.11	7.32	7.00	12.68	6.81	19.5	5.20	¹⁾	¹⁾
2"	9.45	8.54	8.11	7.32	7.00	13.11	9.49	22.6	6.57	¹⁾	¹⁾

* Blind version (without local display)

¹⁾ dependent on respective process connection

All dimensions in [inch]

Transmitter connection housing remote version (II2G/Zone 1)



a0002128

Dimensions in SI units

A	A*	B	B*	C	D	E	F Ø	G	H	J	K	L	M
265	242	240	217	206	186	178	8,6 (M8)	100	130	100	144	170	348

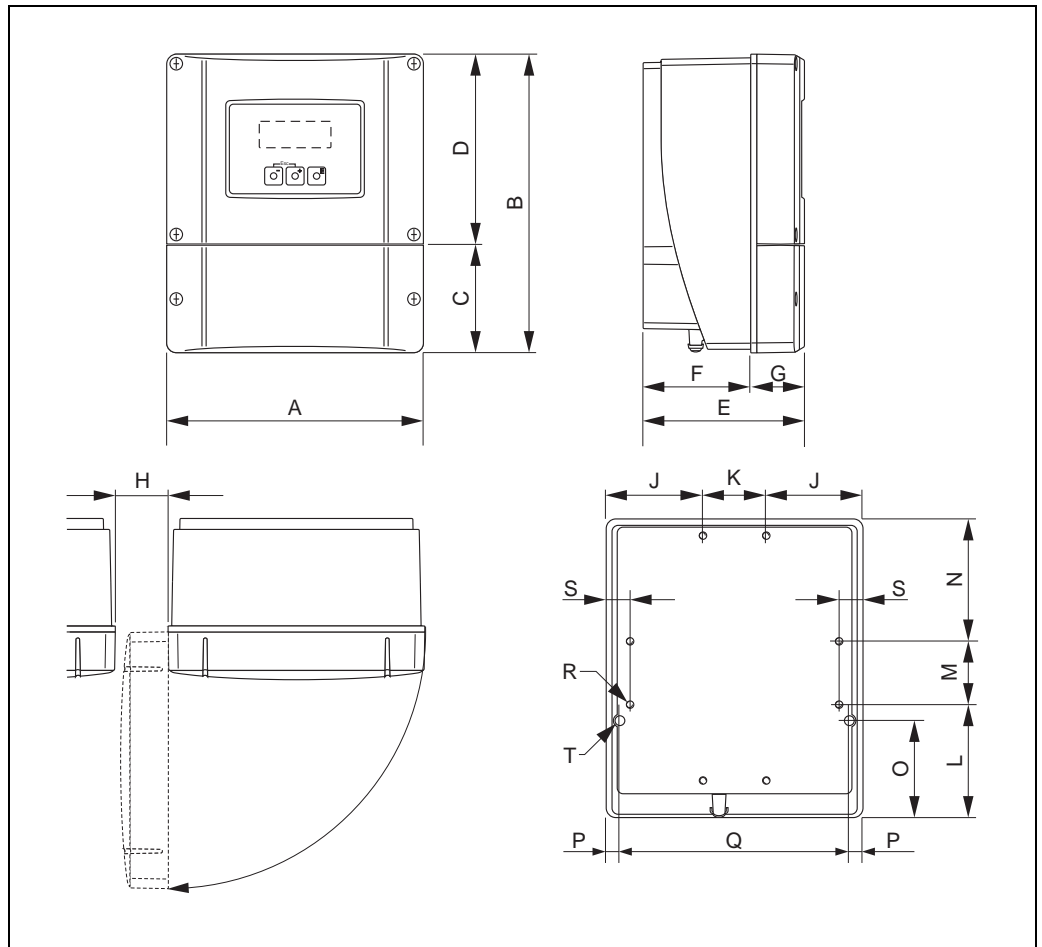
* Blind version (without local display)
All dimensions in [mm]

Dimensions in US units

A	A*	B	B*	C	D	E	F Ø	G	H	J	K	L	M
10.4	9.53	9.45	8.54	8.11	7.32	7.01	0,34 (M8)	3.94	5.12	3.94	5.67	6.69	13.7

* Blind version (without local display)
All dimensions in [inch]

Transmitter remote version, wall-mount housing (non hazardous area and II3G/zone 2)



a0001150

Dimensions in SI units

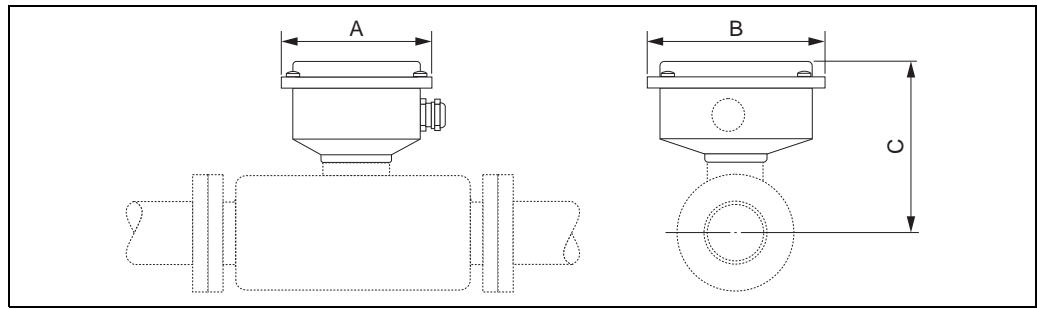
A	B	C	D	E	F	G	H	J
215	250	90.5	159.5	135	90	45	>50	81
K	L	M	N	O	P	Q	R	S
53	95	53	102	81.5	11.5	192	8 × M5	20

All dimensions in [mm]

Dimensions in US units

A	B	C	D	E	F	G	H	J
8.46	9.84	3.56	6.27	5.31	3.54	1.77	>1.97	3.18
K	L	M	N	O	P	Q	R	S
2.08	3.74	2.08	4.01	3.20	0.45	7.55	8 × M5	0.79

All dimensions in [inch]

Transmitter remote version, connection housing*Dimensions in SI units*

DN	A	B	C
8	118.5	137.5	127
15	118.5	137.5	127
25	118.5	137.5	127
40	118.5	137.5	151
50	118.5	137.5	162

All dimensions in [mm]

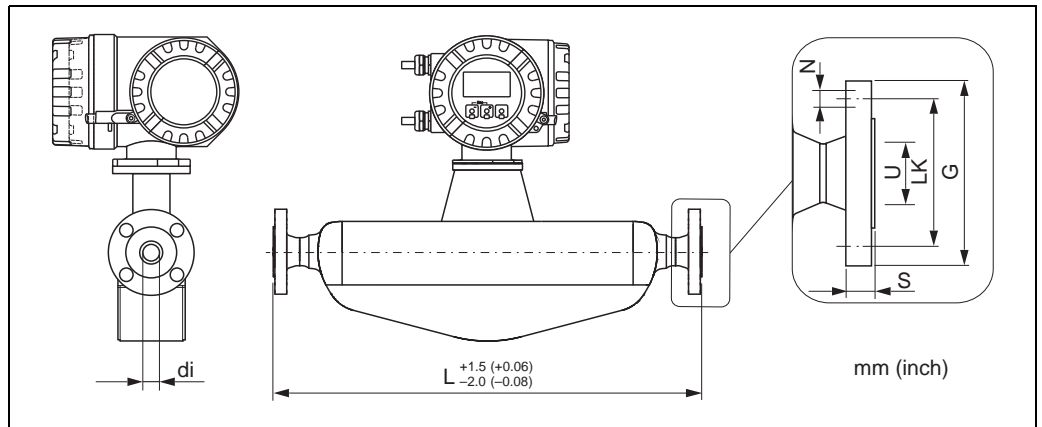
Dimensions in US units

DN	A	B	C
3/8"	4.67	5.41	5.00
1/2"	4.67	5.41	5.00
1"	4.67	5.41	5.00
1 1/2"	4.67	5.41	5.94
2"	4.67	5.41	6.38

All dimensions in [inch]

Process connections in SI units

Flange connections EN (DIN), ASME B16.5, JIS



a0006883-ae

Flange connections EN (DIN)

Flange according to EN 1092-1 (DIN 2501) / PN 40: 1.4404/316L/316 (option code D2Z)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm							
DN	G	L	N	S	LK	U	di
8 ¹⁾	95.0	336	4 × Ø14	17.0	65.0	17.30	8.31
15	95.0	440	4 × Ø14	20.0	65.0	17.30	12.00
25	115.0	580	4 × Ø14	19.0	85.0	28.50	17.60
40	150.0	794	4 × Ø18	21.0	110.0	43.10	26.00
50	165.0	1071	4 × Ø18	25.0	125.0	54.50	40.50

¹⁾ DN 8 with DN 15 flange as standard
All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501) / PN 63: 1.4404/316L/316 (option code D3Z)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 0.8 to 3.2 µm							
DN	G	L	N	S	LK	U	di
50	180.0	1083	4 × Ø22	29.0	135.0	54.50	40.50

All dimensions in [mm]

Flange connections ASME B16.5

Flange according to ASME B16.5 / Cl 150: 1.4404/316L/316 (option code AAZ)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8 ¹⁾	88.9	336	4 × Ø15.7	17.1	60.5	15.70	8.31
15	88.9	440	4 × Ø15.7	17.1	60.5	15.70	12.00
25	108.0	580	4 × Ø15.7	17.6	79.2	26.70	17.60
40	127.0	794	4 × Ø15.7	18.6	98.6	40.90	26.00
50	152.4	1071	4 × Ø19.1	25.1	120.7	52.60	40.50

¹⁾ DN 8 with DN 15 flange as standard
All dimensions in [mm]

Flange according to ASME B16.5 / Cl 300: 1.4404/316L/316 (option code ABZ)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8 ¹⁾	95.2	336	4 × Ø15.7	16.6	66.5	15.70	8.31
15	95.2	440	4 × Ø15.7	16.6	66.5	15.70	12.00
25	123.9	580	4 × Ø19.1	18.1	88.9	26.70	17.60
40	155.4	794	4 × Ø22.3	24.6	114.3	40.90	26.00
50	165.1	1071	8 × Ø19.1	27.6	127.0	52.60	40.50

¹⁾ DN 8 with DN 15 flange as standard
All dimensions in [mm]

Flange connections JIS

Flange JIS B2220 / 20K: 1.4404/316L/316 (option code NDZ)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8 ¹⁾	95	336	4 × Ø15	16.0	70.0	15.00	8.31
15	95	440	4 × Ø15	16.0	70.0	15.00	12.00
25	125	580	4 × Ø19	17.5	90.0	25.00	17.60
40	140	794	4 × Ø19	20.0	105.0	40.00	26.00
50	155	1071	8 × Ø19	27.5	120.0	50.00	40.50

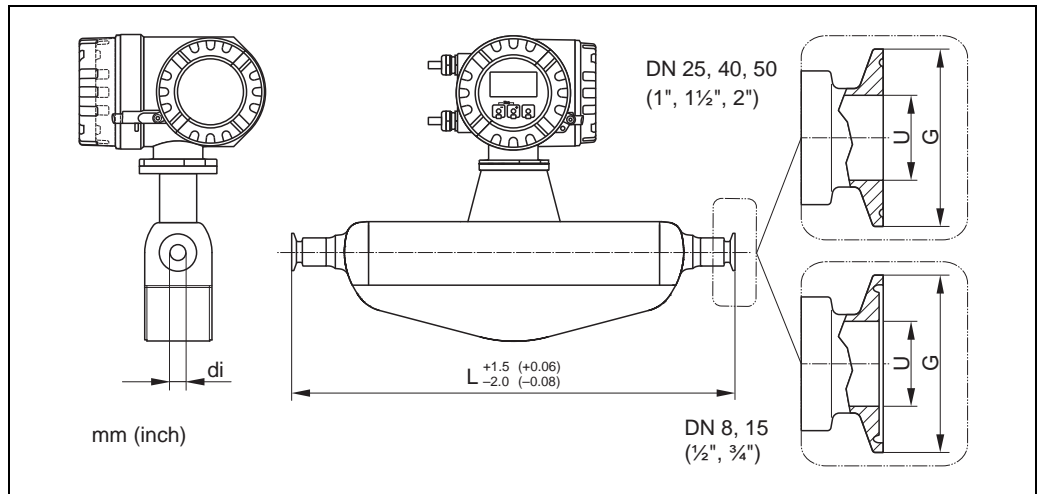
¹⁾ DN 8 with DN 15 flange as standard
All dimensions in [mm]

Flange JIS B2220 / 40K: 1.4404/316L/316 (option code NGZ)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8 ¹⁾	115	336	4 × Ø19	21.0	80.0	15.00	8.31
15	115	440	4 × Ø19	21.0	80.0	15.00	12.00
25	130	589	4 × Ø19	22.0	95.0	25.00	17.60
40	160	804	4 × Ø23	26.0	120.0	38.00	26.00
50	165	1071	8 × Ø19	26.0	130.0	50.00	40.50

¹⁾ DN 8 with DN 15 flange as standard
All dimensions in [mm]

Tri-Clamp (BS4825, ASME BPE, DIN 11866 line C)

All Tri-Clamp (BS4825-3, 1", 1½", 2") connections correspond to the relevant ASME BPE hygienic clamp dimensions.



Tri-Clamp: 1.4435/316L ($R_{a_{max}}$ 0.76 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FTM)					
DN	Clamp	G	L	U	d_i
8	½"	25.0	362	9.40	8.31
15	¾"	25.0	466	15.75	12.00
25	1"	50.4	606	22.10	17.60
40	1½"	50.4	818	34.80	26.00
50	2"	63.9	1096	47.50	40.50

All dimensions in [mm]

1" Tri-Clamp: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FAB)					
DN	Clamp	G	L	U	d_i
8	1"	50.4	362	22.10	8.31
15	1"	50.4	466	22.10	12.00

All dimensions in [mm]

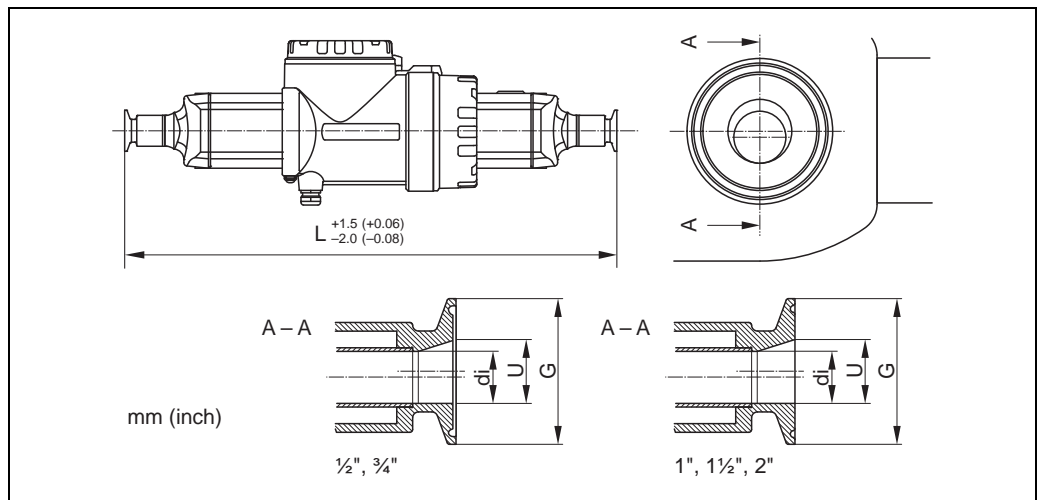
¾" Tri-Clamp: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FPE)					
DN	Clamp	G	L	U	d_i
8	¾"	25.0	362	15.75	8.31

All dimensions in [mm]

½" Tri-Clamp: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FUG)					
DN	Clamp	G	L	U	d_i
15	½"	25.0	466	9.40	12.00

All dimensions in [mm]

Tri-Clamp, eccentric (BS4825, ASME BPE, DIN 11866 line C)



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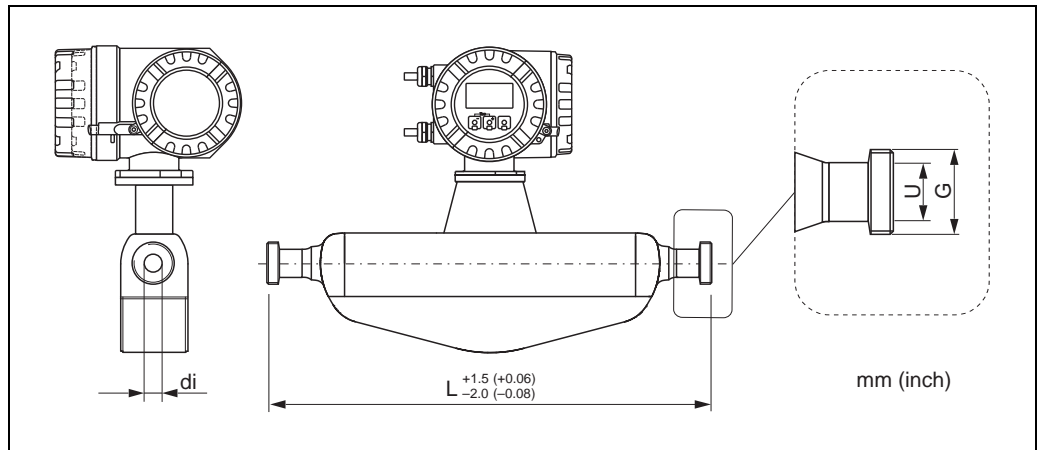
Tri-Clamps, eccentric: 1.4435/316L (Ra _{max} 0.75 µm or Ra _{max} 0.38 µm electropolished)						
DN	Option code	Clamp	G	L	U	di
8	ETA	½"	25.0	362	9.40	8.31
15	ETB	¾"	25.0	466	15.75	12.00
25	ETC	1"	50.4	606	22.10	17.60
40	ETD	1½"	50.4	825	34.80	26.00
50	ETE	2"	63.9	1103	47.50	40.50

All dimensions in [mm]



Note!
Further information refer to "Eccentric clamps" → 19.

DIN 11851 (threaded hygienic connection), DIN 11866 line A



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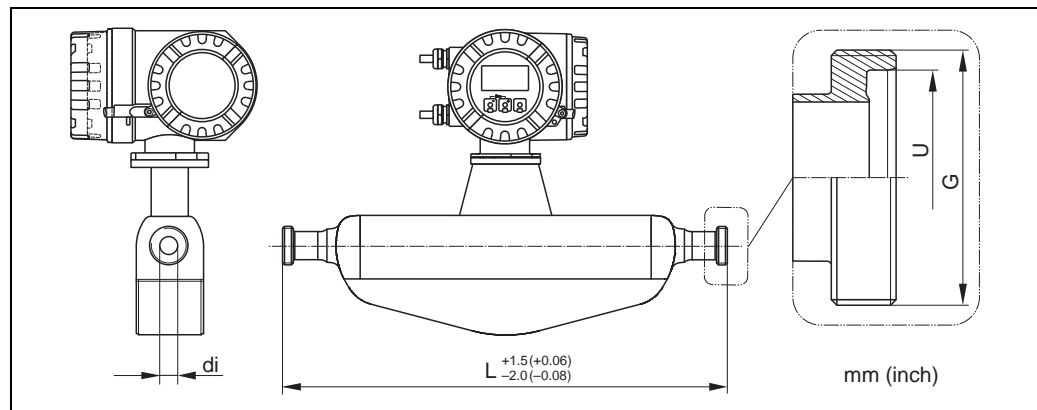
Threaded hygienic connection DIN 11851: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FMD)				
DN	G	L	U	di
8	Rd 34 × 1/8"	362	16.00	8.31
15	Rd 34 × 1/8"	466	16.00	12.00
25	Rd 52 × 1/6"	606	26.00	17.60
40	Rd 65 × 1/6"	825	38.00	26.00
50	Rd 78 × 1/6"	1107	50.00	40.50

All dimensions in [mm]

Rd 28 × 1/8" - Threaded hygienic connection DIN 11851: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FGD)				
DN	G	L	U	di
8	Rd 28 × 1/8"	362	10.00	8.31
15	Rd 28 × 1/8"	466	10.00	12.00

All dimensions in [mm]

DIN 11864-1 Form A (aseptic threaded connection), DIN 11866 line A



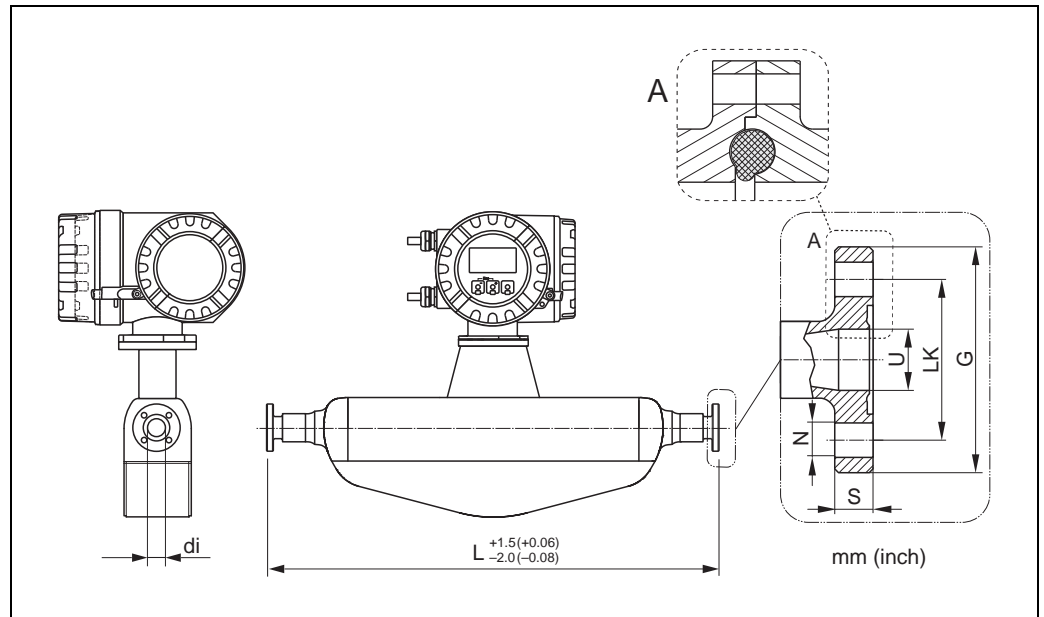
Threaded hygienic connection DIN 11864-1 Form A:

1.4435/316L (Ra_{max} 0.75 μm or Ra_{max} 0.38 μm electropolished) (option code FLH)

DN	G	L	U	di
8	Rd 34 × 1/8"	362	16.00	8.31
15	Rd 34 × 1/8"	466	16.00	12.00
25	Rd 52 × 1/6"	620	26.00	17.60
40	Rd 65 × 1/6"	825	38.00	26.00
50	Rd 78 × 1/6"	1107	50.00	40.50

All dimensions in [mm]

DIN 11864-2 Form A (aseptic flange with notch), DIN 11866 line A

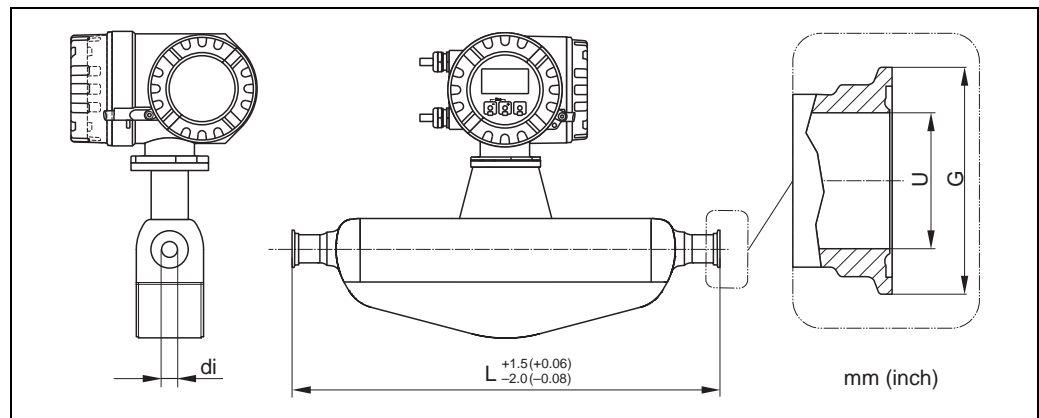


Detail A: The flange has the smaller groove for the O-ring on the sensor side. When mounting the sensor the corresponding flange must have accordingly a larger groove.

DIN 11864-2 Form A (flat flange with notch): 1.4435/316L (Ra _{max} 0.75 µm or Ra _{max} 0.38 µm electropolished) (option code FKG)							
DN	G	L	N	S	LK	U	di
8	59.0	384	4 × Ø9	10	42	16.00	8.31
15	59.0	488	4 × Ø9	10	42	16.00	12.00
25	70.0	626	4 × Ø9	10	53	26.00	17.60
40	82.0	840	4 × Ø9	10	65	38.00	26.00
50	94.0	1120	4 × Ø9	10	77	50.00	40.50

All dimensions in [mm]

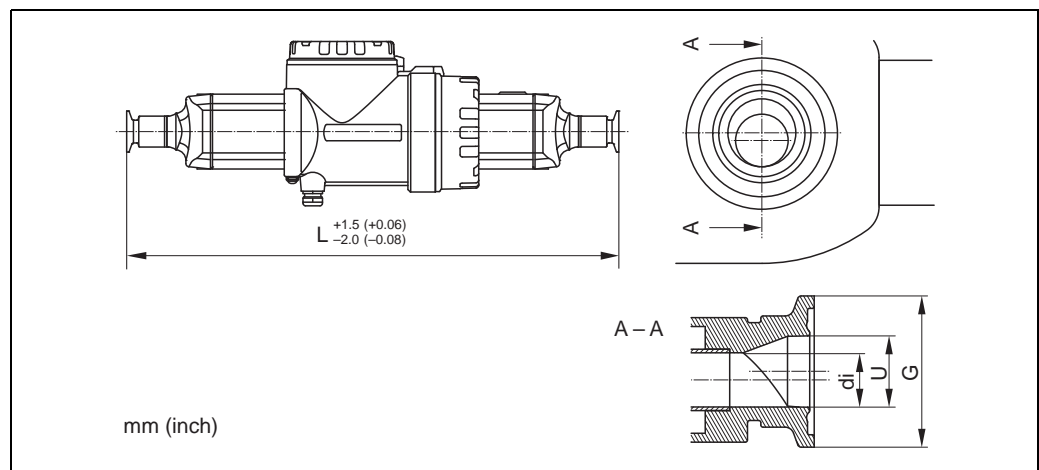
DIN 11864-3 Form A (aseptic clamp with notch), DIN 11866 line A



Clamp DIN 11864-3 Form A: 1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code FWA)				
DN	G	L	U	di
8	34.0	370	16.05	8.31
15	34.0	474	16.05	12.00
25	50.5	614	26.05	17.60
40	64.0	825	38.05	26.00
50	77.5	1096	50.05	40.50

All dimensions in [mm]

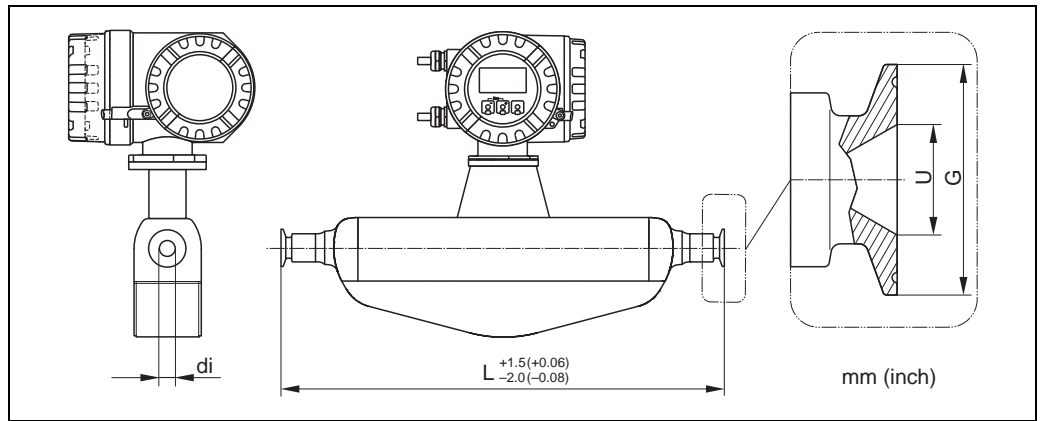
DIN 11864-3 Form A (aseptic clamp with notch, eccentric), DIN 11866 line A



DIN 11864-3 Form A: 1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code FWB)				
DN	G	L	U	di
8	34.0	370	10.00	8.31
15	34.0	474	16.00	12.00
25	50.5	624	26.00	17.60
50	77.5	1112	50.00	40.50

All dimensions in [mm]

DIN 32676 (clamp), DIN 11866 line A

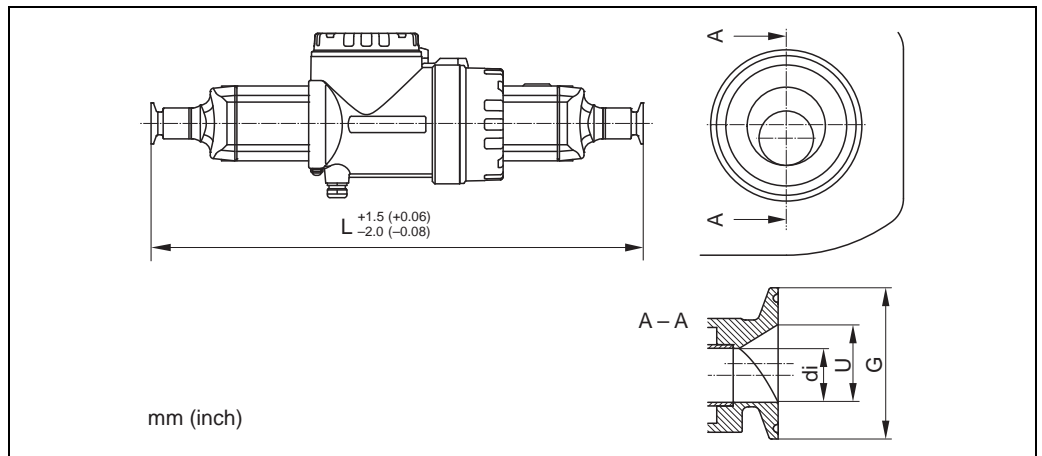


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Clamp DIN 32676: 1.4435/316L (Ra_{max} 0.75 μm or Ra_{max} 0.38 μm electropolished) (option code FDW)				
DN	G	L	U	di
8	34.0	362	16.00	8.31
15	34.0	466	16.00	12.00
25	50.5	606	26.00	17.60
40	50.5	819	38.00	26.00
50	64.0	1097	50.00	40.50

All dimensions in [mm]

DIN 32676 (clamp, eccentric), DIN 11866 line A

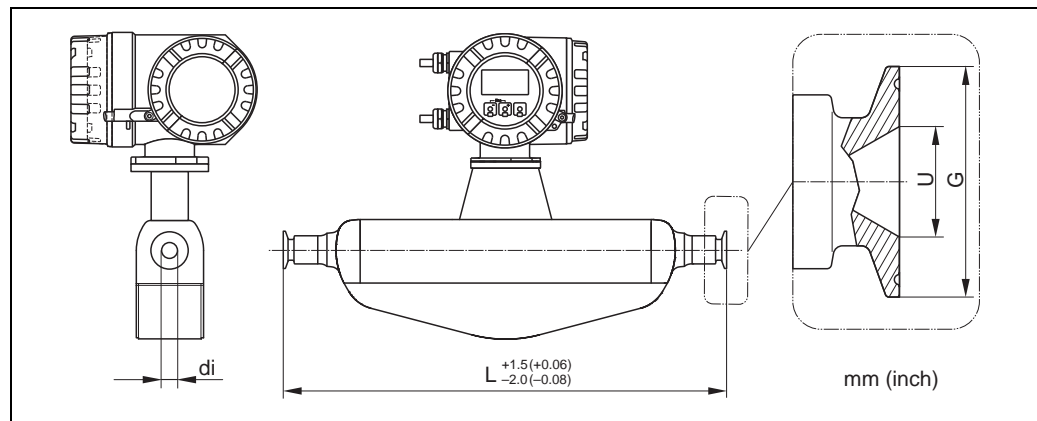


A0011069-ae

Eccentric clamp DIN 32676: 1.4435/316L (Ra_{max} 0.75 μm or Ra_{max} 0.38 μm electropolished) (option code FDZ)				
DN	G	L	U	di
8	34.0	362	10.00	8.31
15	34.0	466	16.00	12.00
25	50.5	606	26.00	17.60
50	64.0	1103	50.00	40.50

All dimensions in [mm]

ISO 2852 (clamp), ISO 2037



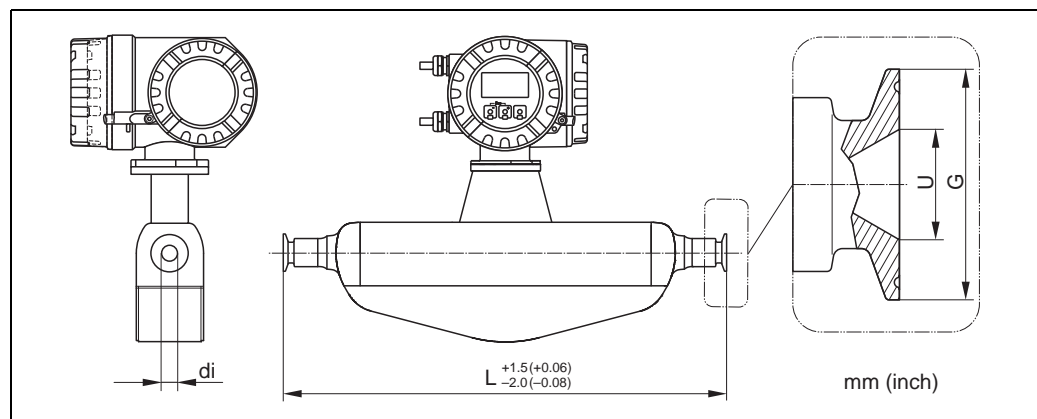
A0011058-ae

Clamp ISO 2852, ISO 2037: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FEA)

DN	G	L	U	di
8	50.5	362	22.60	8.31
15	50.5	466	22.60	12.00
25	50.5	606	22.60	17.60
40	50.5	818	35.60	26.00
50	64.0	1096	48.60	40.50

All dimensions in [mm]

ISO 2852 (clamp connection), DIN11866 line B



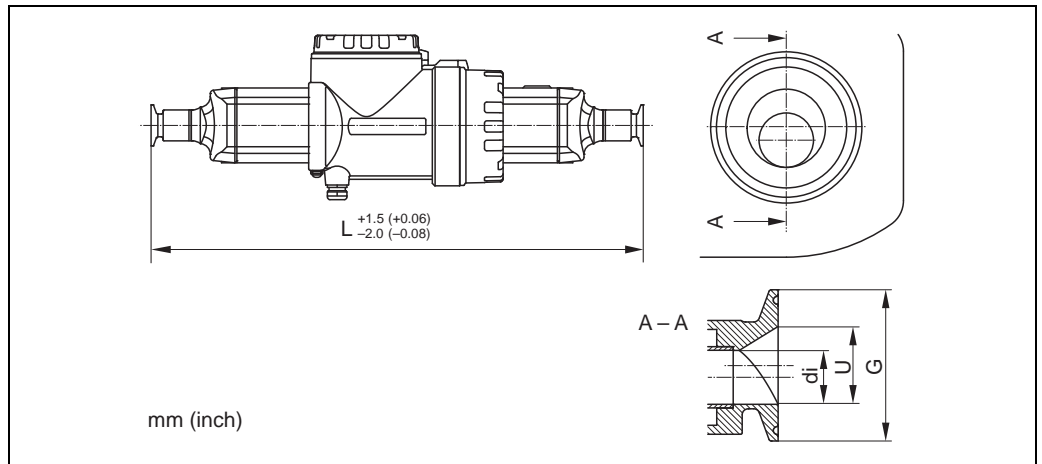
A0011058-ae

Clamp ISO 2852, DIN11866 line B: 1.4435/316L ($R_{a_{max}}$ 0.75 μm or $R_{a_{max}}$ 0.38 μm electropolished) (option code FEB)

DN	G	L	U	di
8	34.0	362	14.00	8.31
15	34.0	466	18.10	12.00
25	50.5	606	29.70	17.60
40	64.0	818	44.30	26.00
50	77.5	1096	56.30	40.50

All dimensions in [mm]

ISO 2852 (clamp, eccentric), DIN11866 line B



A0011009-ae

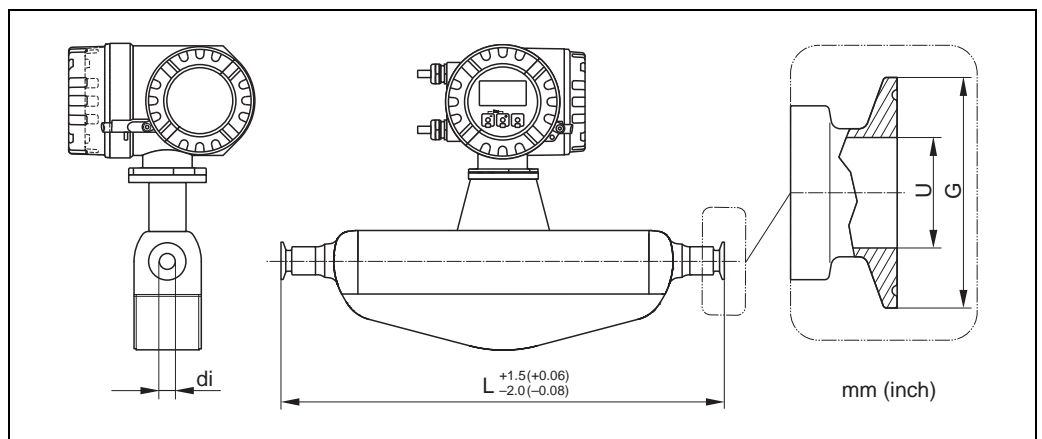
Eccentric clamp ISO 2852, DIN11866 line B:

1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code FEC)

DN	G	L	U	di
8	34.0	362	10.30	8.31
15	34.0	466	14.00	12.00
25	34.0	606	18.10	17.60
40	50.5	825	29.70	26.00
50	64.0	1096	44.30	40.50

All dimensions in [mm]

ISO 2852 (clamp, eccentric), DIN11866 line B, for connection at DN15 pipes (option)



A0011127-ae

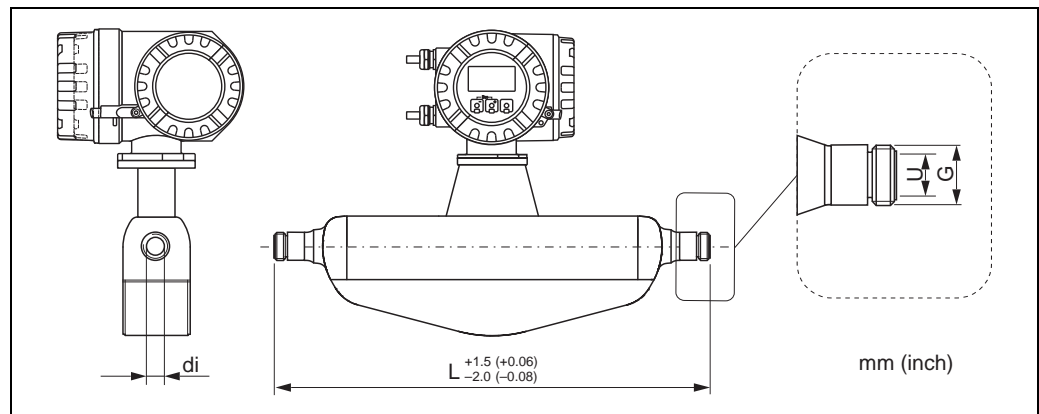
Eccentric clamp ISO 2852, DIN11866 line B, for connection at DN15 pipes:

1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code FED)

DN	G	L	U	di
25	50.5	606	18.10	17.60

All dimensions in [mm]

ISO 2853 (threaded hygienic connection), ISO 2037



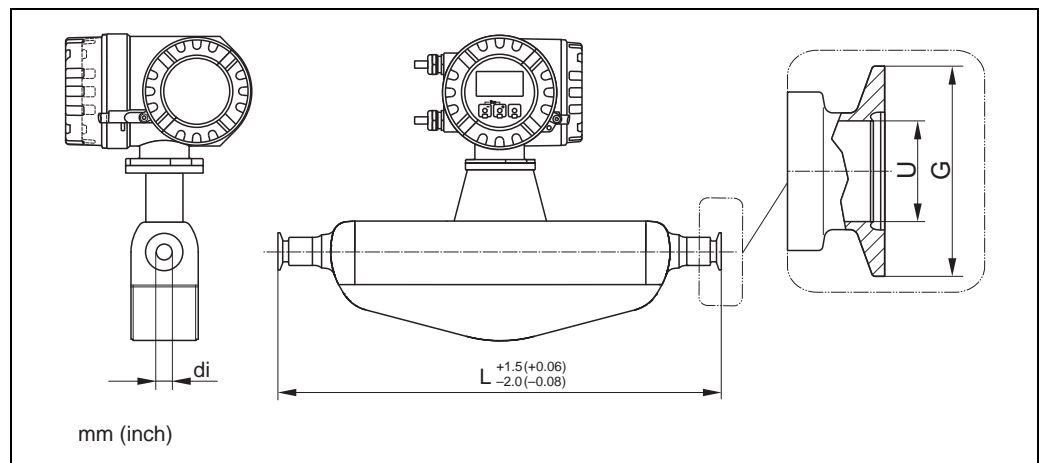
a000689-ae

Threaded hygienic connection ISO 2853: 1.4435/316L (Ra_{max} 0.75 µm or Ra_{max} 0.38 µm electropolished) (option code FJG)

DN	G	L	U	di
8	37.13	370	22.60	8.31
15	37.13	474	22.60	12.00
25	37.13	614	22.60	17.60
40	50.65	829	35.60	26.00
50	64.10	1107	48.60	40.50

All dimensions in [mm]

Neumo BioConnect (clamp with notch), DIN 11866 line A



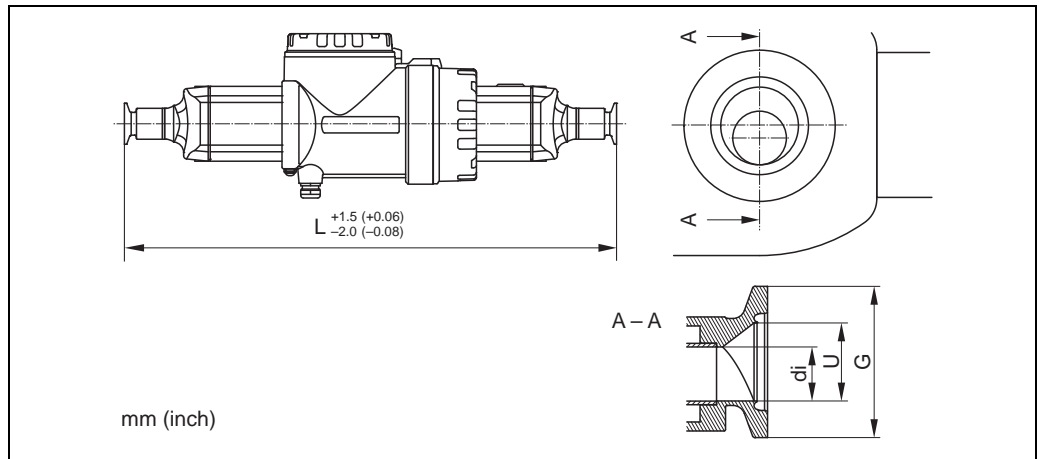
a0011233-ae

Clamp Neumo BioConnect: 1.4435/316L (Ra_{max} 0.75 µm or Ra_{max} 0.38 µm electropolished) (option code BCD)

DN	G	L	U	di
8	25.0	362	10.00	8.31
15	25.0	466	16.00	12.00
25	50.4	606	26.00	17.60
40	64.0	819	38.00	26.00
50	77.4	1097	50.00	40.50

All dimensions in [mm]

Neumo BioConnect (clamp with notch, eccentric), DIN 11866 line A

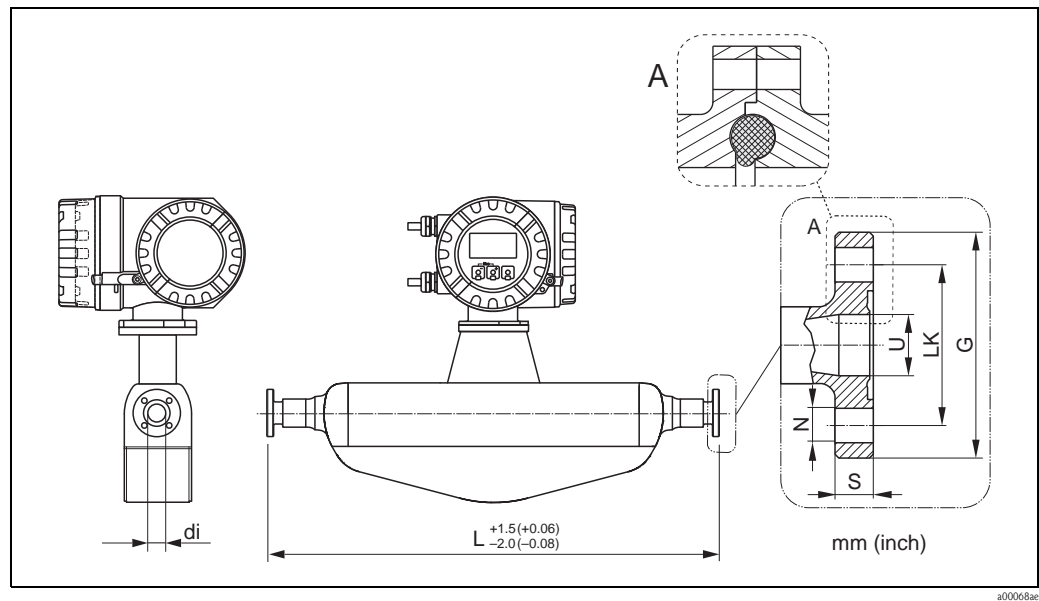


a0011071-ae

Eccentric clamp Neumo BioConnect: 1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code BED)				
DN	G	L	U	di
8	25	362	10.00	8.31
15	25	466	16.00	12.00
25	25	610	26.00	17.60
50	25	1102	50.00	40.50

All dimensions in [mm]

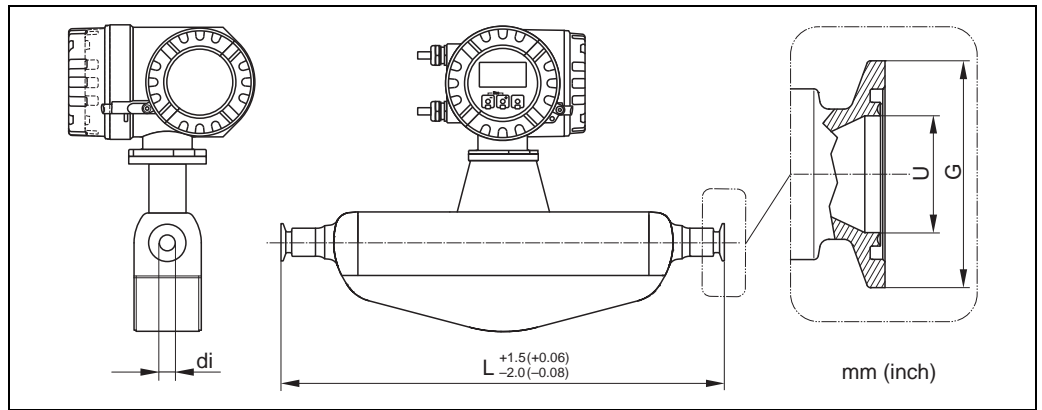
Neumo BioConnect (flange with notch), DIN 11866 line A



Flange Neumo BioConnect: 1.4435/316L (Ra_{max} 0.75 μm or Ra_{max} 0.38 μm electropolished) (option code BFD)							
DN	G	L	N	S	LK	U	di
8	65	384	4 × Ø9	10	45	10.00	8.31
15	75	488	4 × Ø9	10	55	16.00	12.00
25	85	626	4 × Ø9	12	65	26.00	17.60
40	100	840	4 × Ø9	12	80	38.00	26.00
50	110	1120	4 × Ø9	14	90	50.00	40.50

All dimensions in [mm]

BBS (clamp with notch), DIN 11866 line A

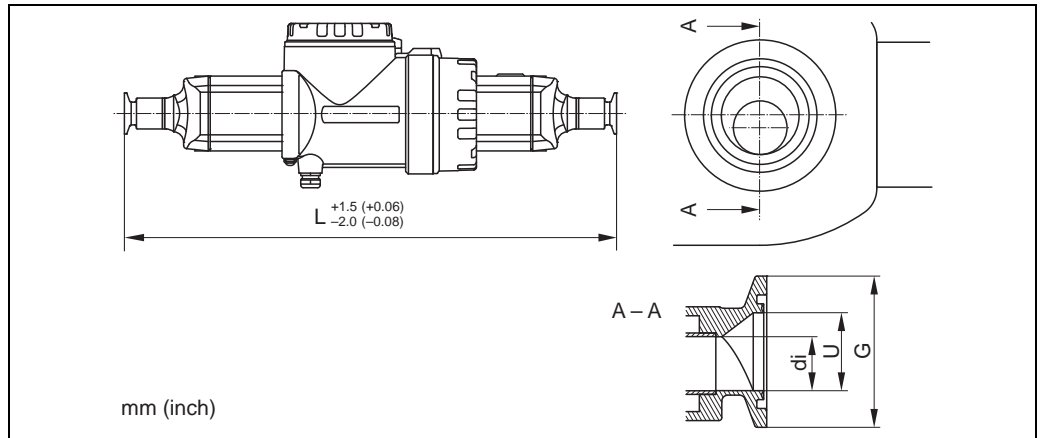


Clamp BBS, DIN11866 line A: 1.4435/316L (Ra_{max} 0.75 µm or Ra_{max} 0.38 µm electropolished) (option code BBD)

DN	G	L	U	di
8	25.0	362	10.00	8.31
15	50.5	466	16.00	12.00
25	50.5	606	26.00	17.60
40	64.0	819	38.00	26.00
50	77.5	1097	50.00	40.50

All dimensions in [mm]

BBS (clamp with notch, eccentric), DIN 11866 line A

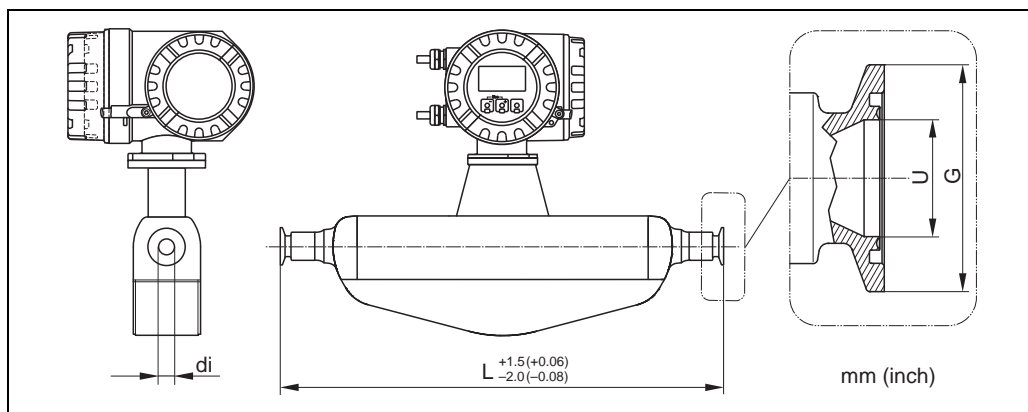


Eccentric clamp BBS, DIN11866 line A: 1.4435/316L (Ra_{max} 0.75 µm or Ra_{max} 0.38 µm electropolished) (option code BBE)

DN	G	L	U	di
8	25.0	362	10.00	8.31
15	50.5	466	16.00	12.00
25	50.5	606	26.00	17.60
50	77.5	1103	50.00	40.50

All dimensions in [mm]

BBS (clamp with notch), DIN 11866 line B

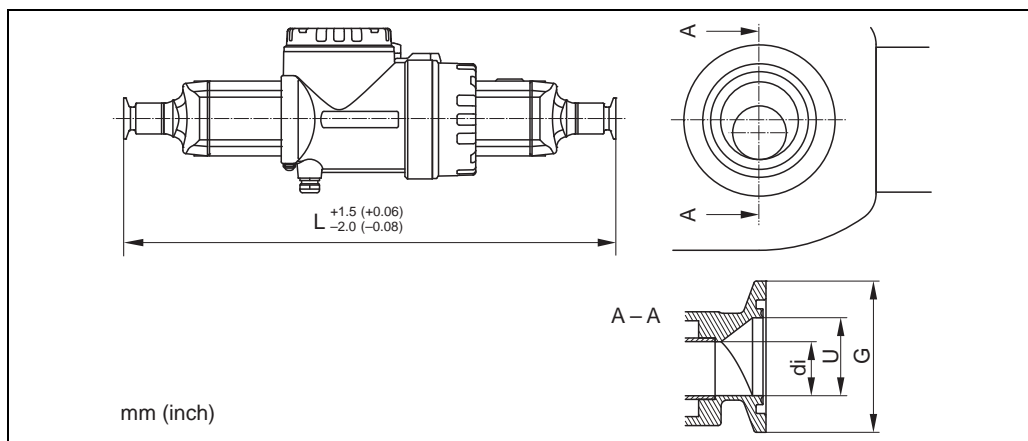


Clamp BBS, DIN11866 line B: 1.4435/316L (Ra_{max} 0.75 µm or Ra_{max} 0.38 µm electropolished) (option code BBF)

DN	G	L	U	di
8	51.0	362	14.00	8.31
15	50.5	466	18.10	12.00
25	50.5	606	29.70	17.60
40	64.0	825	44.30	26.00
50	77.5	1103	56.30	40.50

All dimensions in [mm]

BBS (clamp with notch, eccentric), DIN 11866 line B

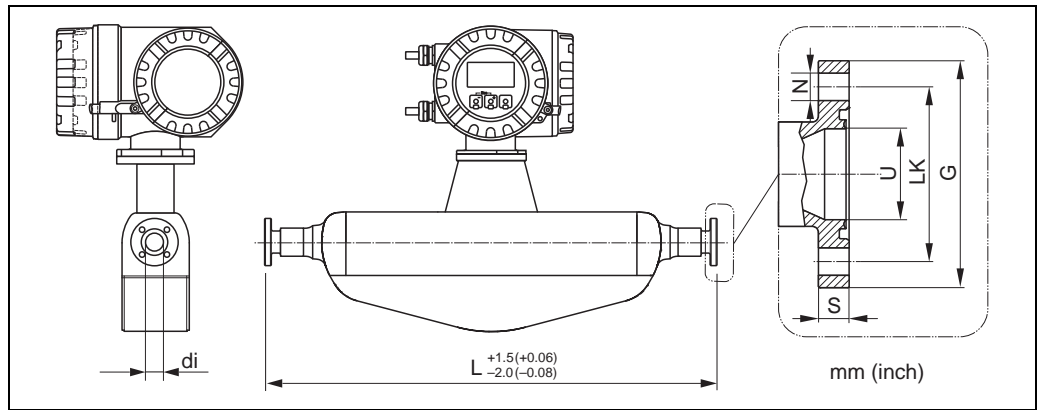


Eccentric clamp BBS, DIN11866 line B: 1.4435/316L (Ra_{max} 0.75 µm or Ra_{max} 0.38 µm electropolished) (option code BBG)

DN	G	L	U	di
8	25.0	362	10.30	8.31
15	50.5	466	14.00	12.00
25	50.5	606	18.10	17.60
40	50.5	825	29.70	26.00
50	64.0	1103	44.30	40.50

All dimensions in [mm]

BBS (flange with notch), DIN 11866 line A



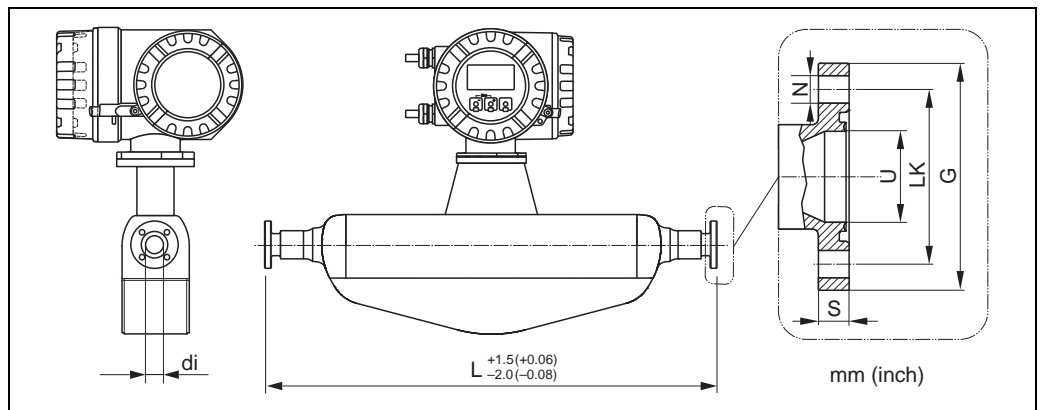
a0011074-ae

Flange BBS, DIN 11866 line A: 1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code BBH)

DN	G	L	N	S	LK	U	di
8	59	384	4 × Ø 9	10	42	10.00	8.31
15	59	488	4 × Ø 9	10	42	16.00	12.00
25	70	626	4 × Ø 9	10	53	26.00	17.60
40	82	840	4 × Ø 9	10	65	38.00	26.00
50	94	1120	4 × Ø 9	10	77	50.00	40.50

All dimensions in [mm]

BBS (flange with notch), DIN 11866 line B



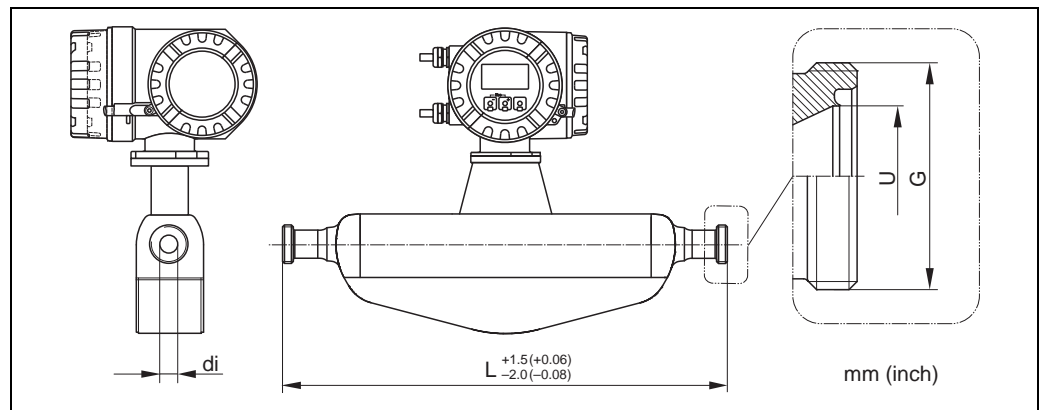
a0011074-ae

Flange BBS, DIN 11866 line B: 1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code BBK)

DN	G	L	N	S	LK	U	di
8	59	384	4 × Ø 9	10	42	14.00	8.31
15	62	488	4 × Ø 9	10	45	18.10	12.00
25	74	626	4 × Ø 9	10	57	29.70	17.60
40	88	840	4 × Ø 9	10	71	44.30	26.00
50	103	1120	4 × Ø 9	10	85	56.30	40.50

All dimensions in [mm]

BBS (aseptic threaded connection), DIN 11866 line A



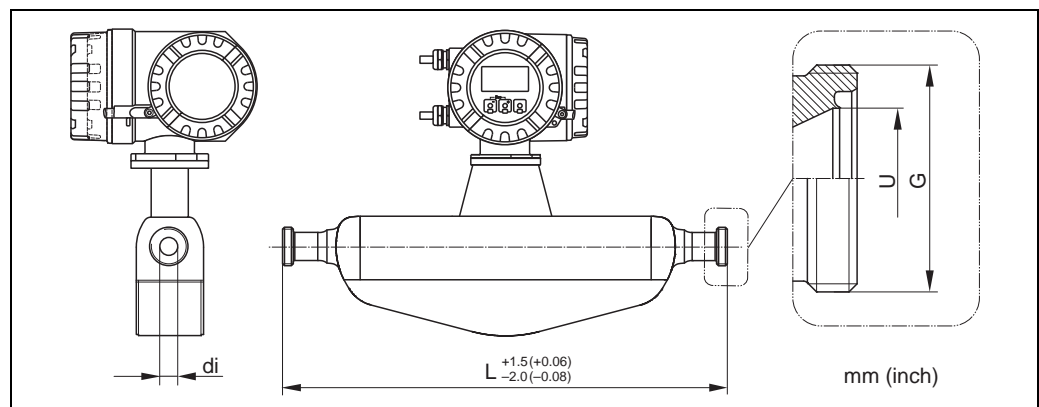
a0011075-ae

Aseptic threaded connection BBS, DIN 11866 line A:
1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code BBA)

DN	G	L	U	di
8	M26×1.5	362	10.00	8.31
15	M30×2	466	16.00	12.00
25	M42×2	606	26.00	17.60
40	M56×2	819	38.00	26.00
50	M68×2	1097	50.00	40.50

All dimensions in [mm]

BBS (aseptic threaded connection), DIN 11866 line B



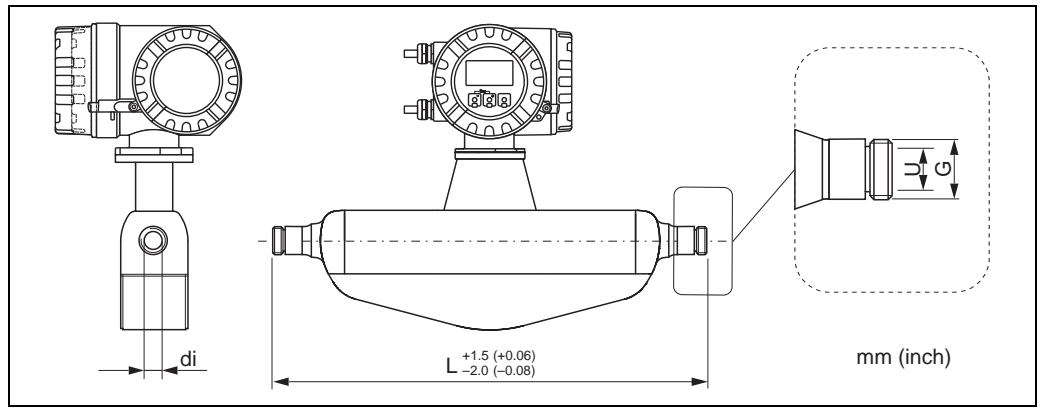
a0011075-ae

Aseptic threaded connection BBS, DIN 11866 line B:
1.4435/316L (Ra_{max} 0.75 μ m or Ra_{max} 0.38 μ m electropolished) (option code BBC)

DN	G	L	U	di
8	M22×1.5	362	14.00	8.31
15	M30×2	466	18.10	12.00
25	M42×2	606	29.70	17.60
40	M52×2	825	44.30	26.00
50	M68×2	1103	56.30	40.50

All dimensions in [mm]

SMS 1145 (threaded hygienic connection), ISO 2037



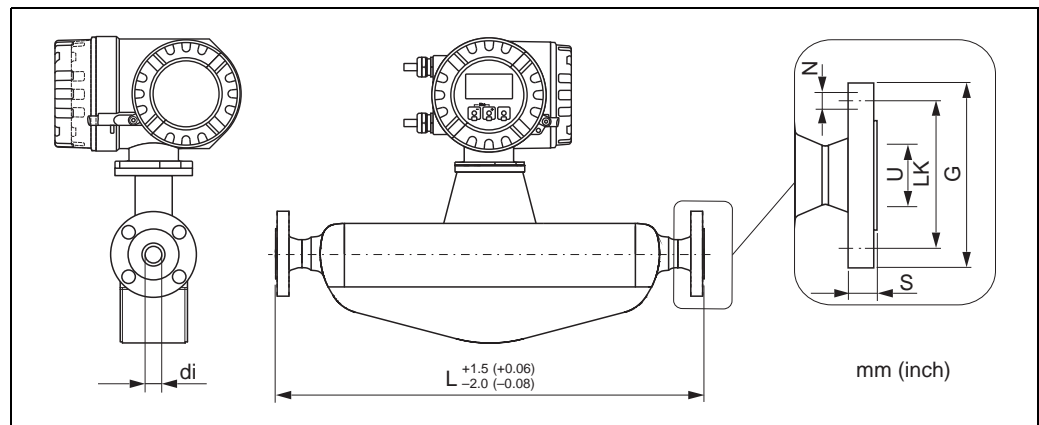
Threaded hygienic connection SMS 1145: 1.4435/316L (Ra_{max} 0.75 μm or Ra_{max} 0.38 μm electropolished) (option code FSD)

DN	G	L	U	di
8	Rd 40 × 1/6"	362	22.50	8.31
15	Rd 40 × 1/6"	466	22.50	12.00
25	Rd 40 × 1/6"	606	22.50	17.60
40	Rd 60 × 1/6"	829	35.50	26.00
50	Rd 70 × 1/6"	1107	48.50	40.50

All dimensions in [mm]

Process connections in US units

Flange connections ASME B16.5



a0006883-ae

Flange according to ASME B16.5 / Cl 150: 1.4404/316L/316 (option code AAZ)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
3/8" ¹⁾	3.50	13.23	4 × Ø0.62	0.67	2.38	0.62	0.33
1/2"	3.50	17.32	4 × Ø0.62	0.67	2.38	0.62	0.47
1"	4.25	22.83	4 × Ø0.62	0.69	3.12	1.05	0.69
1 1/2"	5.00	32.26	4 × Ø0.62	0.73	3.88	1.61	1.02
2"	6.00	42.17	4 × Ø0.75	0.99	4.75	2.07	1.59

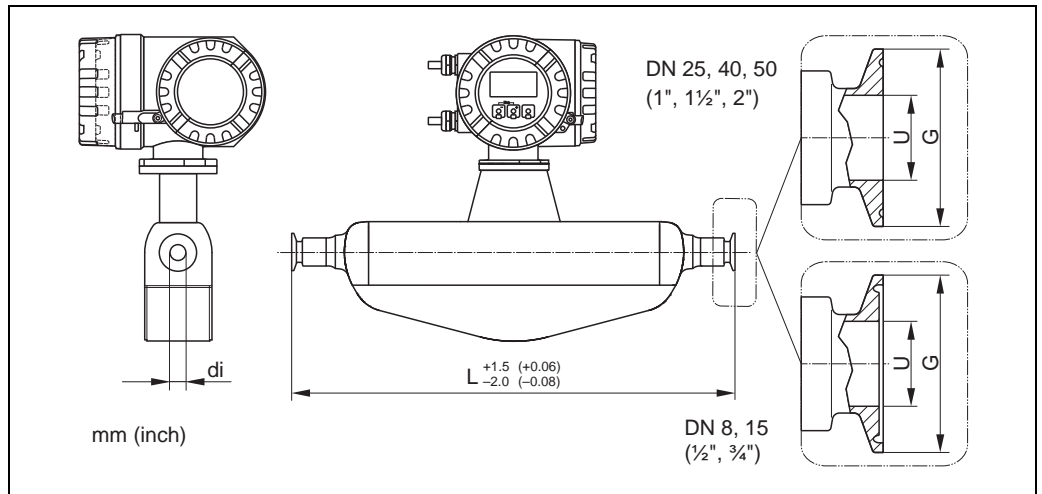
¹⁾ DN 3/8" with DN 1/2" flange as standard
All dimensions in [inch]

Flange according to ASME B16.5 / Cl 300: 1.4404/316L/316 (option code ABZ)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
3/8" ¹⁾	3.75	13.23	4 × Ø0.62	0.65	2.62	0.62	0.33
1/2"	3.75	17.32	4 × Ø0.62	0.65	2.62	0.62	0.47
1"	4.88	22.83	4 × Ø0.75	0.71	3.50	1.05	0.69
1 1/2"	6.12	32.26	4 × Ø0.88	0.97	4.50	1.61	1.02
2"	6.50	42.17	8 × Ø0.75	1.09	5.00	2.07	1.59

¹⁾ DN 3/8" with DN 1/2" flange as standard
All dimensions in [inch]

Tri-Clamp (BS4825, ASME BPE, DIN 11866 line C)

All Tri-Clamp (BS4825-3, 1", 1½", 2") connections correspond to the relevant ASME BPE hygienic clamp dimensions.



Tri-Clamp: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code FTM)					
DN	Clamp	G	L	U	di
3/8"	½"	0.98	14.25	0.37	0.33
½"	¾"	0.98	18.35	0.62	0.47
1"	1"	1.98	23.86	0.87	0.69
1 ½"	1½"	1.98	32.20	1.37	1.02
2"	2"	2.52	43.15	1.87	1.59

All dimensions in [inch]

1" Tri-Clamp: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code FAB)					
DN	Clamp	G	L	U	di
3/8"	1"	1.98	14.25	0.87	0.33
½"	1"	1.98	18.35	0.87	0.47

All dimensions in [inch]

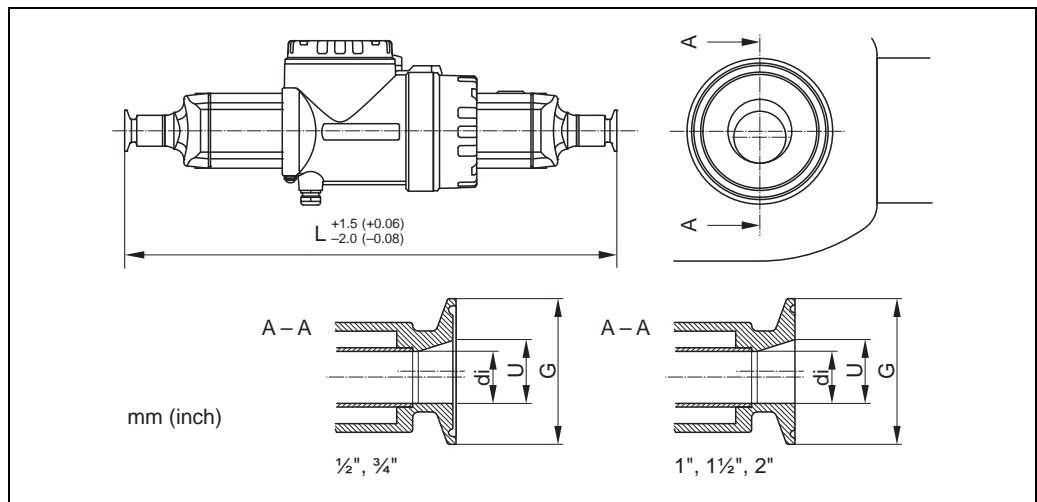
¾" Tri-Clamp: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code FPE)					
DN	Clamp	G	L	U	di
3/8"	¾"	0.98	14.25	0.62	0.33

All dimensions in [inch]

½" Tri-Clamp: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code FUG)					
DN	Clamp	G	L	U	di
½"	½"	0.98	18.35	0.37	0.47

All dimensions in [inch]

Tri-Clamp, eccentric (BS4825, ASME BPE, DIN 11866 line C)



a0007385-ae

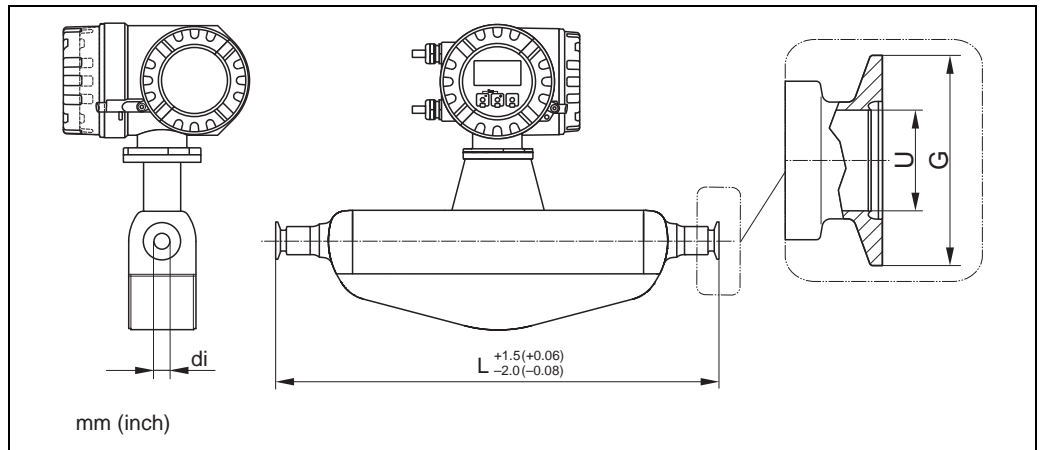
Tri-Clamps, eccentric: 1.4435/316L (Ra _{max} 30 µm or Ra _{max} 15 µm electropolished)						
DN	Option Code	Clamp	G	L	U	di
3/8"	ETA	1/2"	0.98	14.25	0.37	0.33
1/2"	ETB	3/4"	0.98	18.35	0.62	0.47
1"	ETC	1"	1.98	23.86	0.87	0.69
1 1/2"	ETD	1 1/2"	1.98	32.18	1.37	1.02
2"	ETE	2"	2.52	43.43	1.87	1.59

All dimensions in [inch]



Note!
Further information refer to "Eccentric clamps" → 19.

Neumo BioConnect (clamp with notch), DIN 11866 line A

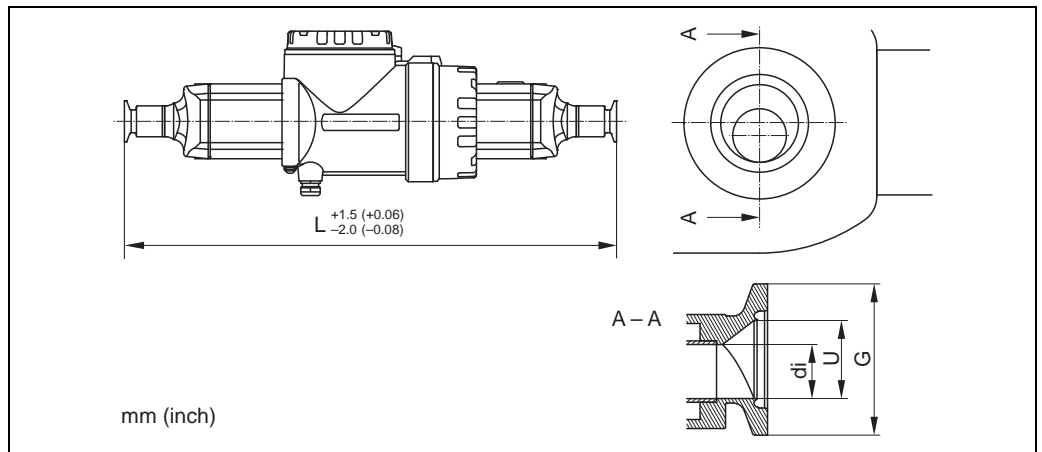


a0011233-ae

Clamp Neumo BioConnect: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code BCD)				
DN	G	L	U	di
3/8"	0.98	14.25	0.89	0.33
1/2"	0.98	18.35	0.89	0.47
1"	1.98	23.86	0.89	0.69
1 1/2"	2.51	32.24	1.40	1.02
2"	3.04	43.18	1.91	1.59

All dimensions in [inch]

Neumo BioConnect (clamp with notch, eccentric), DIN 11866 line A

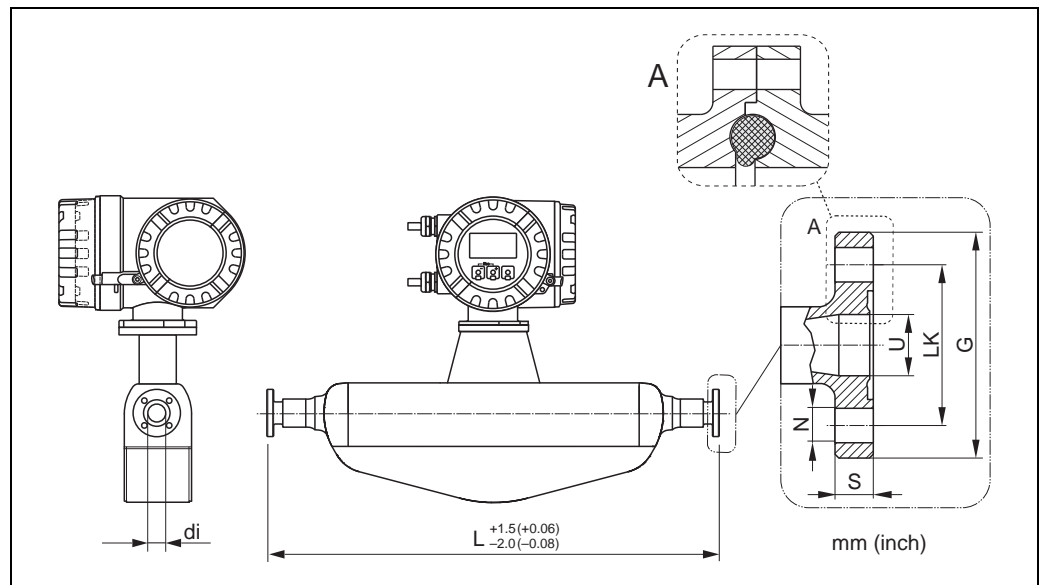


a0011071-ae

Eccentric clamp Neumo BioConnect: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code BED)				
DN	G	L	U	di
1/2"	0.98	14.25	0.39	0.33
3/4"	0.98	18.35	0.63	0.47
1"	0.98	24.02	1.02	0.69
2"	0.98	43.39	1.97	1.59

All dimensions in [inch]

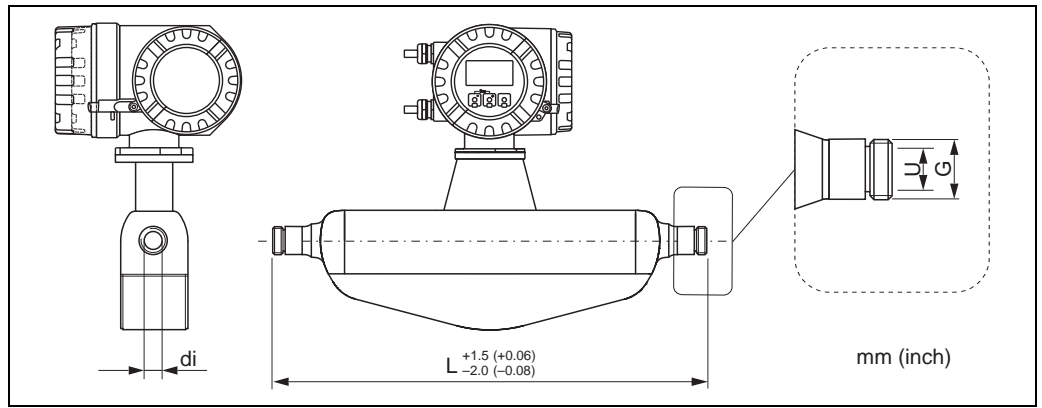
Neumo BioConnect (flange with notch), DIN 11866 line A



Flange Neumo BioConnect: 1.4435/316L (Ra_{max} 30 μ m or Ra_{max} 15 μ m electropolished) (option code BFD)							
DN	G	L	N	S	LK	U	di
½"	2.56	15.12	4 × Ø 0.35	0.39	1.77	0.39	0.33
¾"	2.95	19.21	4 × Ø 0.35	0.39	2.17	0.63	0.47
1"	3.35	24.65	4 × Ø 0.35	0.47	2.56	1.02	0.69
1½"	3.94	33.07	4 × Ø 0.35	0.47	3.15	1.50	1.02
2"	4.33	44.09	4 × Ø 0.35	0.55	3.54	1.97	1.59

All dimensions in [inch]

SMS 1145 (threaded hygienic connection), ISO 2037



Threaded hygienic connection SMS 1145: 1.4435/316L (Ra_{max} 30 µm or Ra_{max} 15 µm electropolished) (option code FSD)

DN	G	L	U	di
3/8"	Rd 40 × 1/6"	14.25	0.89	0.33
1/2"	Rd 40 × 1/6"	18.35	0.89	0.47
1"	Rd 40 × 1/6"	23.86	0.89	0.69
1 1/2"	Rd 60 × 1/6"	32.64	1.40	1.02
2"	Rd 70 × 1/6"	43.58	1.91	1.59

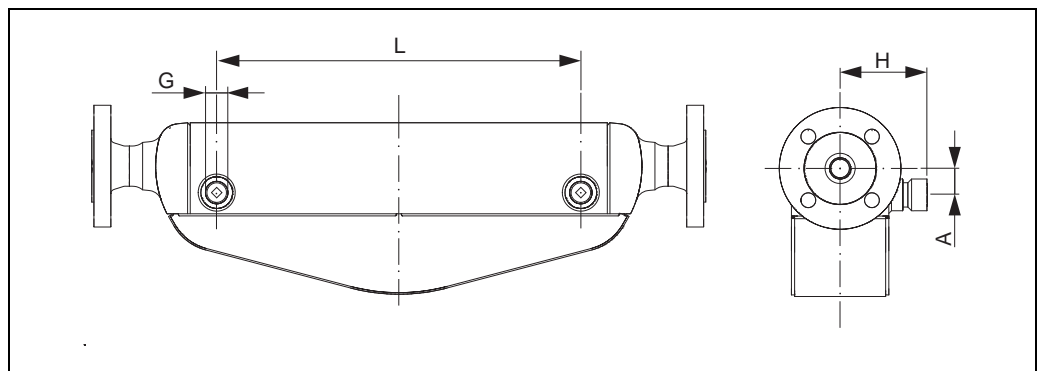
All dimensions in [inch]

Purge connections / secondary containment monitoring



Caution!

The secondary containment is filled with dry nitrogen (N₂). Do not open the purge connections unless the containment can be filled immediately with a dry inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar (72.5 psi).



DN		G	A		H		L		
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]	[inch]	[mm]	[inch]
8	3/8"	1/2"-NPT	25	0.98	82	3.23	3.57	110	4.34
15	1/2"	1/2"-NPT	25	0.98	82	3.23	3.57	204	8.04
25	1"	1/2"-NPT	25	0.98	82	3.23	3.57	348	13.54
40	1 1/2"	1/2"-NPT	45	1.77	102	4.02	4.07	526	20.70
50	2"	1/2"-NPT	58	2.28	119.5	4.70	4.64	763	30.04

Weight

- Compact version: see table below
- Remote version
 - Sensor: see table below
 - Wall-mount housing: 5 kg (11 lb)

Weight in SI units

DN [mm]	8	15	25	40	50
Compact version	13	15	21	43	80
Remote version	11	13	19	41	78

All values (weight) refer to devices with EN/DIN PN 40 flanges.
Weight information in [kg]

Weight in US units

DN [inch]	3/8"	1/2"	1"	1 1/2"	2"
Compact version	29	33	46	95	176
Remote version	24	29	42	90	172

All values (weight) refer to devices with EN/DIN PN 40 flanges.
Weight information in [lb]

Materials**Transmitter housing**

Compact version

- Powder coated die-cast aluminum
- Stainless steel housing: stainless steel 1.4301/ASTM 304
- Window material: glass or polycarbonate

Remote version

- Remote field housing: powder-coated die-cast aluminum
- Wall-mount housing: powder coated die-cast aluminum
- Window material: glass

Sensor housing / containment

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301/304

Connection housing, sensor (remote version)

Stainless steel 1.4301/304

Process connections

- Stainless steel 1.4435/316L
 - DIN 11864-2 Form A
 - Neumo BioConnect
 - Threaded hygienic connection
 - Clamp connections
- Stainless steel Stahl 1.4404/316/316L
 - Flanges according to EN 1092-1 (DIN 2501)
 - Flanges according to ASME B16.5
 - Flanges JIS B2220

Measuring tubes

- Stainless Steel 1.4435/316L
- Wetted parts surface finish (measuring tube and process connection)
- Finish quality:
 - $Ra_{max} = 0.76 \mu\text{m}$ (30 μin) (mechanically polished)
 - $Ra_{max} = 0.38 \mu\text{m}$ (15 μin) (electropolished)
- Delta ferrite <1%

Material load curves

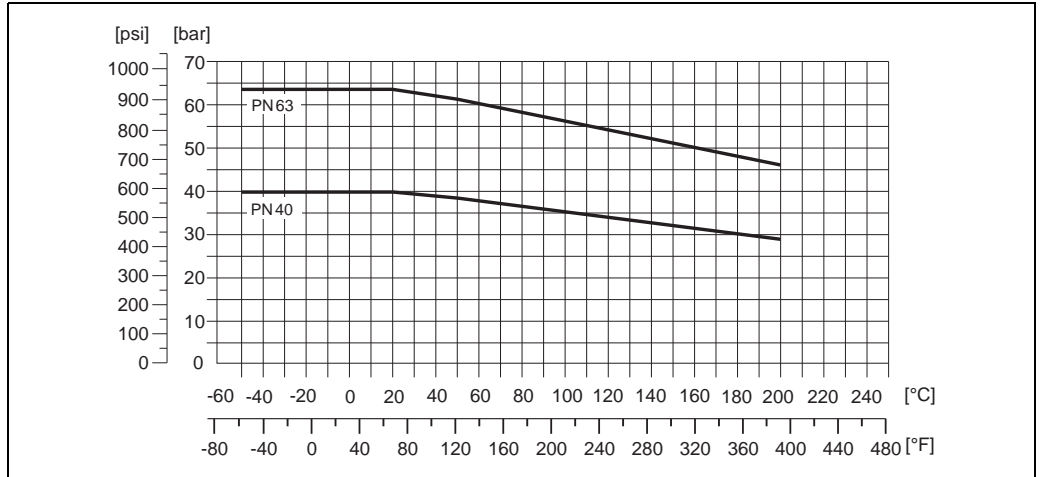


Warning!

The following material load curves refer to the entire sensor and not just the process connection.

Flange according to connection to EN 1092-1 (DIN 2501)

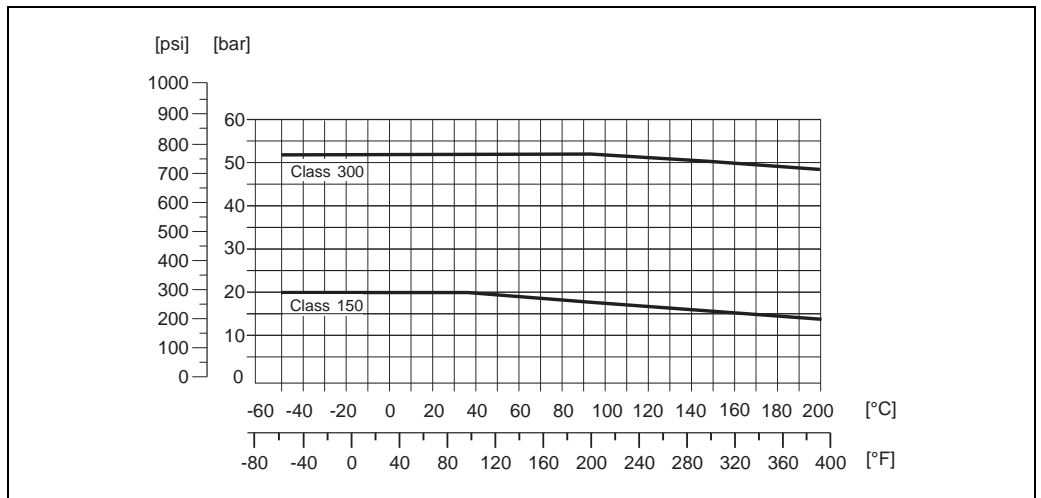
Flange material: 1.4404



a0007009-ae

Flange connection according to ASME B16.5

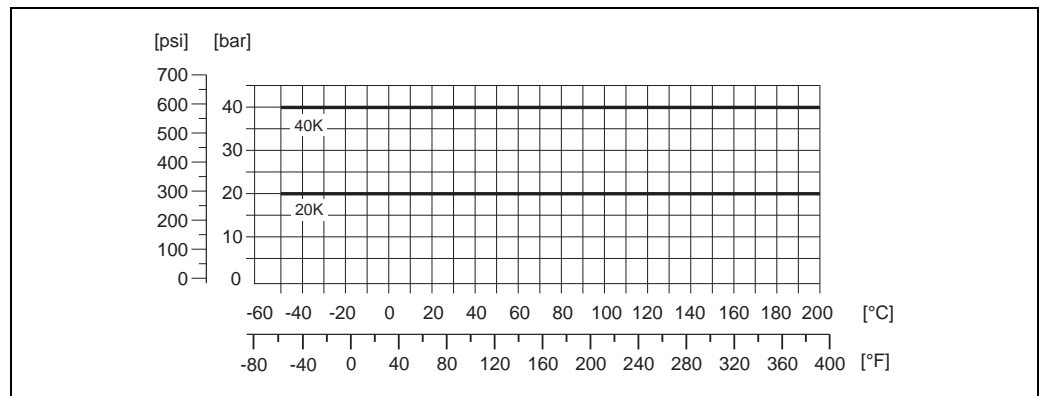
Flange material: 316/316L



a0009164-ae

Flange connection to JIS B2220

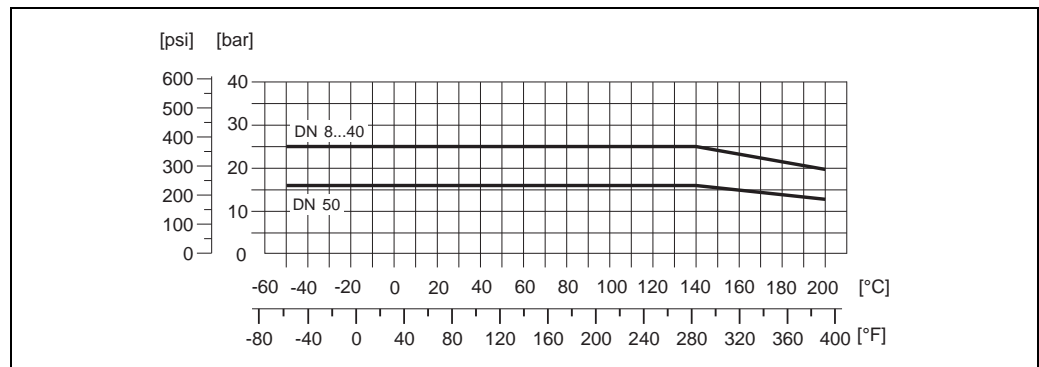
Flange material: 1.4404/316/316L



a0009165-ae

DIN 11864-2 Form A (flange with notch)

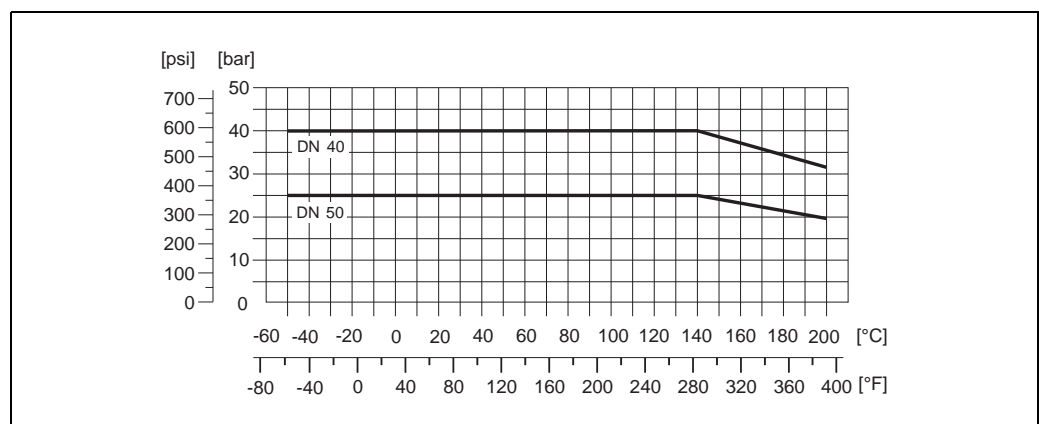
Flange material: 1.4435/316L



a0009227-ae

**DIN 11864-1 Form A (aseptic threaded connection),
DIN 11864-3 Form A (aseptic clamp with notch)**

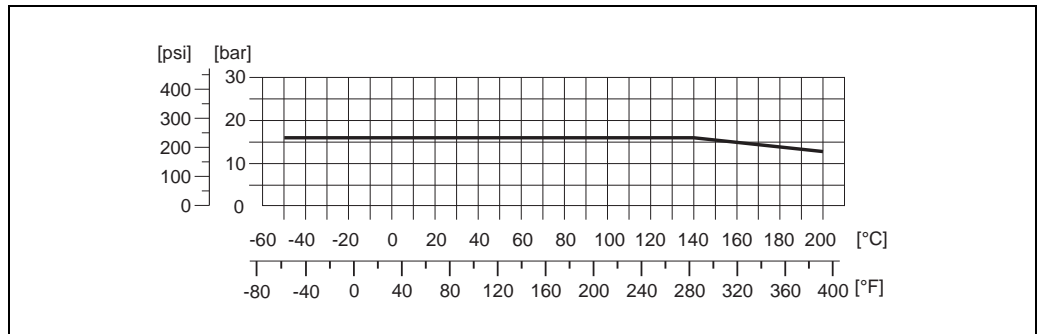
Connection material: 1.4435/316L



A0012817

Neumo BioConnect (flange with notch), BBS (flange with notch), BBS (aseptic threaded connection)

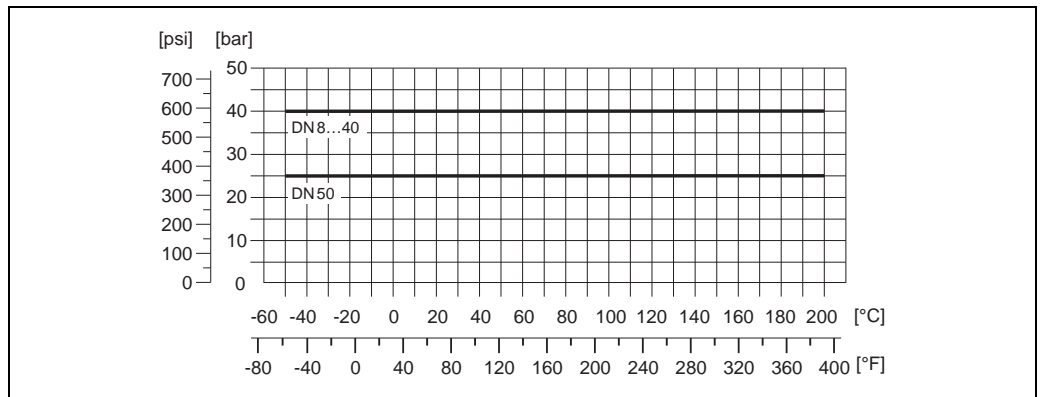
Flange material: 1.4435/316L



A0009305-ae

Process connection to DIN 11851

Connection material: 1.4404/316L

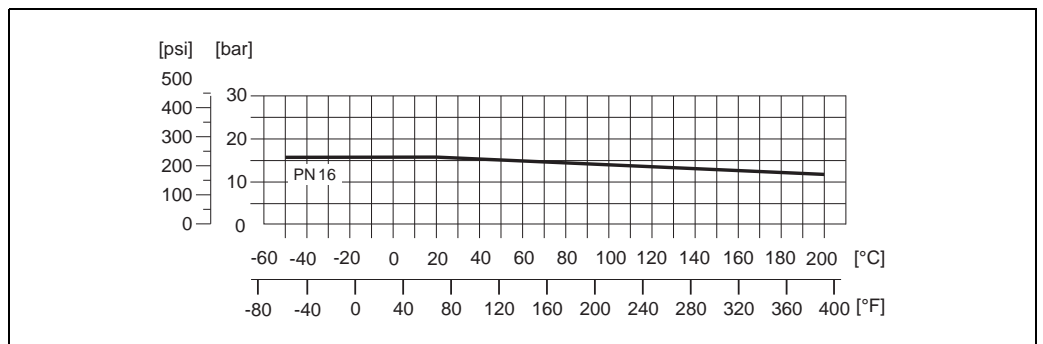


A0007012

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.

Process connection to SMS 1145

Connection material: 1.4404/316L

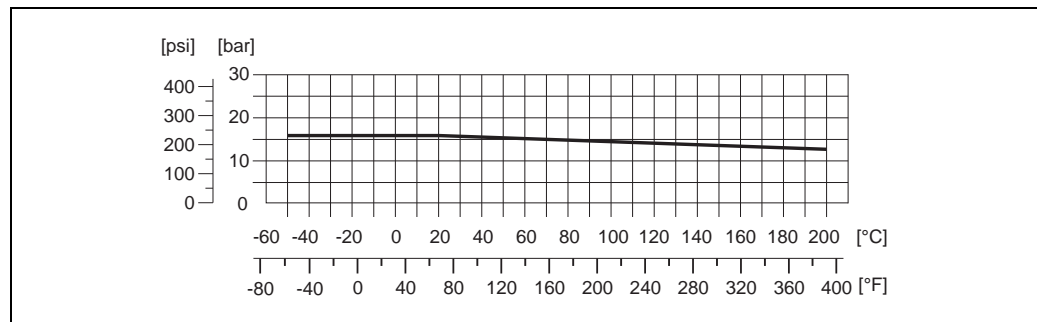


A0013056

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.

ISO 2853 (threaded hygienic connection)

Connection material: 1.4435/316L



a0004600

Tri-Clamp, ISO 2852 (clamp), DIN 32676 (clamp connection), BBS (clamp with notch), Neumo BioConnect (clamp with notch)

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

Process connections

- DIN 11864-2 Form A
- Neumo BioConnect
- Threaded hygienic connection:
 - DIN 11864-1, Form A
 - DIN 11851
 - SMS 1145
 - ISO 2853
 - BBS
- Clamp
 - Tri-Clamp
 - DIN 11864-3, Form A
 - DIN 32676
 - ISO 2852
 - Neumo BioConnect
 - BBS
- Eccentric clamp (to be used to ensure complete drainability)
 - Tri-Clamp
 - DIN 11864-3, Form A
 - DIN 32676
 - ISO 2852
 - Neumo BioConnect
 - BBS
- Flanges
 - according to EN 1092-1 (DIN 2501)
 - according to ASME B16.5
 - JIS B2220

Human interface

Display elements

- Liquid-crystal display: backlit, two lines (Promass 80) or four lines (Promass 83) with 16 characters per line
- Selectable display of different measured values and status variables
- At ambient temperatures below -20 °C (-4 °F) the readability of the display may be impaired.

Operating elements

Promass 80:

- Local operation with three keys ([-]/[+]/[E])
- Quick Setup menus for straightforward commissioning

Promass 83:

- Local operation with three optical keys ([-]/[+]/[E])
- Application-specific Quick Setup menus for straightforward commissioning

Language groups

Language groups available for operation in different countries:

- Western Europe and America (WEA):
English, German, Spanish, Italian, French, Dutch and Portuguese
- Eastern Europe/Scandinavia (EES):
English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
- South and Eastern Asia (SEA):
English, Japanese, Indonesian

Only Promass 83

- China (CN):
English, Chinese

The language group is changed using the "FieldCare" operating program.

Remote operation

Promass 80

Remote operation via HART, PROFIBUS PA

Promass 83

Remote operation via HART, PROFIBUS PA/DP, FOUNDATION fieldbus, MODBUS RS485

Certificates and approvals

CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick symbol	The measuring system complies with the EMC requirements of the "Australian Communications and Media Authority (ACMA)"
Ex approval	Information about currently available Ex versions (ATEX, FM, CSA, IECEx, NEPSI etc.) can be supplied by your Endress+Hauser Sales Center on request. All information relevant to explosion protection is available in separate Ex documents that you can order as necessary.
Hygienic compatibility	<ul style="list-style-type: none"> ■ 3A approval ■ EHEDG tested (except from BBS) ■ ASME BPE Certificate of Compliance to relevant scope <p>The scope is based on the ASME BPE 2005 Standard and is subject to revisions based on changes made in the Standard. The measuring device fulfills the requirements of Parts; GR, SD, DT, MJ, and SF that are deemed relevant to a Coriolis Mass Flow measuring system.</p>
IQ/OQ documentation package	<p>The package consist of a set of two main documents which apply to Promass 83P:</p> <ul style="list-style-type: none"> ■ IQ (Installation Qualification) ■ OQ (Operational Qualification) <p>The installation and operational qualification will provide documented verification of the proper installation and operation of a Promass 83P. The installation and operation will be evaluated based on adherence to Endress+Hauser and process design specifications, conformance to the client's stated requirements, and compliance with current Good Manufacturing Practices.</p>
Flow calibration	<ul style="list-style-type: none"> ■ Factory calibration, standard 2-point or 5 point: Verification of the measuring accuracy with adjustment of the meter on a production flow rig. Accuracy and linearity are both recorded, the meter is supplied with a calibration certificate. ■ SCS/A2LA/CNAS calibration, standard 5-point: Traceable calibration with adjustment of the meter on an accredited flow rig. Measuring uncertainty of the calibration rig has been officially verified and based on international standards. Accreditation of calibration facility is according to ISO/IEC 17025 (Reinach, Cernay, Greenwood, Aurangabad and Suzhou). The calibration certificate bears the stamp of the calibration laboratory and are signed by the certified operator and countersigned by the head of the facility.
TSE compliance	<p>Endress+Hauser declare, that no material with animal origin or ingredients of animal origin are being used during the entire production of Promass sensors produced in our Reinach/ Switzerland, Cernay/ France, Greenwood/ USA or Aurangabad/ India production facilities.</p> <p>In addition we do not use any material of animal origin during the polishing processes. Endress+Hauser therefore can confirm to TSE compliance.</p>
Additional test and Inspections	<p>The following tests and inspection are offered as standard:</p> <ul style="list-style-type: none"> ■ MTR (Material Test Reports) or EN 10204 3.1 material Inspection certificate ■ Pressure test for the measuring tube and a type test for the secondary containment ■ Cleaned from Oil and Grease ■ Roughness measurement ■ Delta Ferrite measurement <p>The above mentioned tests and inspections are available on a CoC (Certificate of compliance) or an EN 10204 3.1 certificate. Additional inspections and tests are available upon request please contact your local Endress+Hauser sales organization for further information.</p>
FOUNDATION Fieldbus certification	<p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the Fieldbus Foundation. The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ■ Certified to FOUNDATION Fieldbus Specification ■ The device meets all the specifications of the FOUNDATION Fieldbus H1. ■ Interoperability Test Kit (ITK), revision status 5.01 (device certification number: on request) ■ The device can also be operated with certified devices of other manufacturers ■ Physical Layer Conformance Test of the Fieldbus Foundation

PROFIBUS DP/PA certification	<p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organization). The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none">■ Certified in accordance with PROFIBUS Profile Version 3.0 (device certification number: available on request)■ The device can also be operated with certified devices of other manufacturers (interoperability)
MODBUS certification	<p>The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan.</p>
Other standards and guidelines	<ul style="list-style-type: none">■ EN 60529 Degrees of protection by housing (IP code)■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.■ IEC/EN 61326 "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements)■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.■ NAMUR NE 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
Pressure Equipment Directive	<p>The measuring devices can be ordered with or without PED (Pressure Equipment Directive). If a device with PED 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.</p> <ul style="list-style-type: none">■ With the identification PED/G1/III on the sensor nameplate, Endress+Hauser confirms conformity with the "Basic safety requirements" of Appendix I of the Pressure Equipment Directive 97/23/EC.■ Devices with this identification (with PED) are suitable for the following types of fluid:<ul style="list-style-type: none">- Fluids of Group 1 and 2 with a steam pressure of greater or less than 0.5 bar (7.3 psi)- Unstable gases■ Devices without this identification (without PED) are designed and manufactured according to good engineering practice. They correspond to the requirements of Art. 3, Section 3 of the Pressure Equipment Directive 97/23/EC. Their application is illustrated in Diagrams 6 to 9 in Appendix II of the Pressure Equipment Directive 97/23/EC.

Functional safety

SIL -2:
 accordance IEC 61508/IEC 61511-1 (FDIS)
 "4–20 mA HART" output according to the following order code:

Promass 80

Promass80***_*****A
 Promass80***_*****D
 Promass80***_*****S
 Promass80***_*****T
 Promass80***_*****8

Promass 83

Promass83***_*****A	Promass83***_*****M	Promass83***_*****Ø
Promass83***_*****B	Promass83***_*****R	Promass83***_*****2
Promass83***_*****C	Promass83***_*****S	Promass83***_*****3
Promass83***_*****D	Promass83***_*****T	Promass83***_*****4
Promass83***_*****E	Promass83***_*****U	Promass83***_*****5
Promass83***_*****L	Promass83***_*****W	Promass83***_*****6

Ordering information

The Endress+Hauser service organization can provide detailed ordering information and information on the order codes on request.

Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor.

Accessories	Description
Applicator	<p>Software for selecting and configuring Endress+Hauser flowmeters:</p> <ul style="list-style-type: none"> Calculating all necessary data to determine the optimal flowmeter: e.g. nominal diameter, pressure drop, performance characteristics or process connections Graphic display of calculation results <p>Management, documentation and retrievability of all project-related data and parameters of the entire operating life of a project. Applicator is available:</p> <ul style="list-style-type: none"> Via the Internet: https://wapps.endress.com/applicator On CD-ROM for installation on local computer
W@M	<p>Life cycle management for your facility W@M supports you with a wide variety of software applications across the entire process, including everything from planning and procurement to installation and commissioning to operation of the measuring devices. For each measuring device, all relevant information are available throughout the entire life cycle, such as device status, spare parts and device-specific documentation. The application is prefilled with the data of your Endress+Hauser devices; Endress+Hauser also maintains and updates the database. W@M is available:</p> <ul style="list-style-type: none"> Via the Internet: www.endress.com/lifecyclemanagement On CD-ROM for installation on local computer

Documentation

- Flow measuring technology (FA005D)
- Technical Information
 - Promass 80A, 83A (T054D)
 - Promass 80E, 83E (TI061D)
 - Promass 80F, 83F (TI101D)
 - Promass 80H, 83H (TI074D)
 - Promass 80I, 83I (TI075D)
 - Promass 80M, 83M (TI102D)
 - Promass 80S, 83S (TI076D)
- Operating Instructions/Description of Device Functions
 - Promass 80 (BA057D/BA058D)
 - Promass 80 PROFIBUS PA (BA072D/BA073D)
 - Promass 83 HART (BA059D/BA060D)
 - Promass 83 FOUNDATION Fieldbus (BA065D/BA066D)
 - Promass 83 PROFIBUS DP/PA (BA063D/BA064D)
 - Promass 83 MODBUS (BA107D/BA108D)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, IECEx NEPSI
- Functional safety manual Promass 80, 83 (SD077D)

Registered trademarks

KALREZ® and VITON®

Registered trademarks of E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

SWAGELOK®

Registered trademark of Swagelok & Co., Solon, USA

HART®

Registered trademark of HART Communication Foundation, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™ Fieldbus

Registered trademark of the Fieldbus FOUNDATION, Austin, USA

MODBUS®

Registered trademark of the MODBUS Organization

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, Fieldcheck®, FieldCare®, Applicator®

Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

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