Technical Information
Proline Promass 80I, 83I
Coriolis flowmeter

Combines in-line viscosity and flow measurement with extended transmitter functionality

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Measuring liquids and gases in applications requiring low pressure loss and gentle fluid treatment

Device properties
- Straight, easy cleanable single-tube system
- TMB® technology
- Measuring tube made of Titanium
- Device in compact or remote version

Promass 83
- 4-line backlit display with touch control
- HART, PROFIBUS PA/DP, Modbus RS485, FF, EtherNet/IP

Your benefits

- Energy-saving – full bore design enables minimal pressure loss
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in/outlet run needs

Promass 83
- Quality – software for filling & dosing, density & concentration, advanced diagnostics
- Flexible data transfer options – numerous communication types
- Automatic recovery of data for servicing

Endress+Hauser
People for Process Automation

Table of contents

Function and system design

Measuring principle

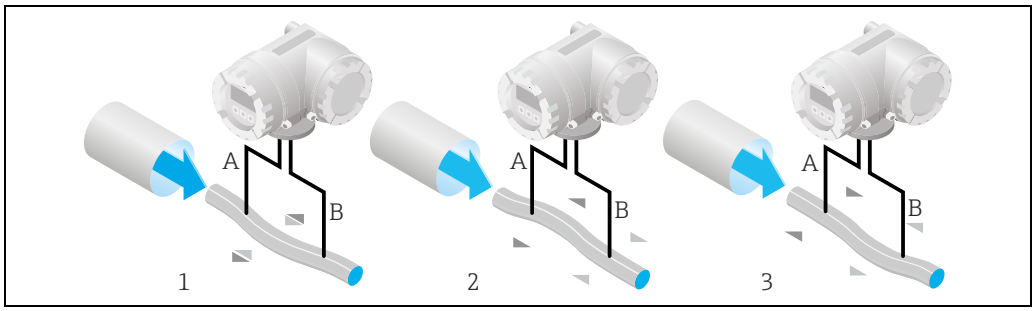
The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present when both translational and rotational movements are superimposed.

$F_C = 2 \cdot \Delta m\ (v \cdot \omega)$
F_C = Coriolis force
Δm = moving mass
ω = rotational velocity
v = velocity of the moving mass in a 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).



a0003383

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.

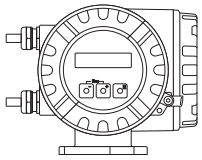
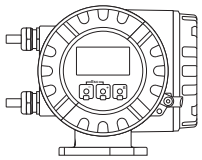
Density measurement
The measuring tube is continuously excited at its resonance frequency. A change in the mass and thus the density of the oscillating system (comprising the measuring tube and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency is 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.

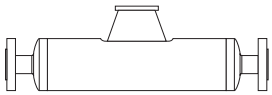
Measuring system

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

Promass 80  a0003671	▪ Two-line liquid-crystal display ▪ Operation with push buttons
Promass 83  a0003672	▪ 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

I  a0003678	▪ Sensitive fluid handling thanks to straight single-tube system ▪ Simultaneous measurement of viscosity, flow, volume flow, density and temperature (multivariable ▪ Immune to process influences ▪ Nominal diameters DN 8 to 80 (3/8" to 3") ▪ Materials: – Sensor: stainless steel, 1.4301/1.4307 (304L) – Measuring tube: titanium Grade 9 – Process connections: stainless steel, 1.4301 (304); wetted parts: titanium Grade 2

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) $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
8	⅜	0 to 2000	0 to 73.50
15	½	0 to 6500	0 to 238.9
15 FB	½ FB	0 to 18000	0 to 661.5
25	1	0 to 18000	0 to 661.5
25 FB	1 FB	0 to 45000	0 to 1654
40	1 ½	0 to 45000	0 to 1654
40 FB	1 ½ FB	0 to 70000	0 to 2573
50	2	0 to 70000	0 to 2573
50 FB	2 FB	0 to 180000	0 to 6615
80	3	0 to 180000	0 to 6615

FB = Full bore

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:

$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} \div x$

$\dot{m}_{max(G)}$ = max. full scale value for gas [kg/h]
$\dot{m}_{max(F)}$ = max. full scale value for liquid [kg/h]
$\rho_{(G)}$ = Gas density in [kg/m³] at operating conditions

DN		X	DN		X
[mm]	[in]		[mm]	[in]	
8	⅜	60	40	1½	90
15	½	80	40 FB	1½ FB	90
15 FB	½ FB	90	50	2	90
25	1	90	50 FB	2 FB	110
25 FB	1 FB	90	80	3	110

FB = Full bore

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

Calculation example for gas:

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

Max. possible full scale value:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} \div x = 70000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 \div 90 \text{ kg/m}^3 = 46900 \text{ kg/h}$

Recommended full scale values

See information in the "Limiting flow" section → 25 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 kΩ, galvanically isolated.
Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment start, batching start/stop (optional).

Status input (auxiliary input) with PROFIBUS DP

U = 3 to 30 V DC, R_i = 3 kΩ, galvanically isolated.
Switching level: ±3 to ±30 V DC, polarity-independent.
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 kΩ, galvanically isolated.
Switching level: ±3 to ±30 V DC, polarity-independent.
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 µA
- 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.r./°C, resolution: 0.5 µA
- Active: 0/4 to 20 mA, R_L < 700 Ω (for HART: R_L ≥ 250 Ω)
- Passive: 4 to 20 mA; supply voltage U_S 18 to 30 V DC; R_i ≥ 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 x Analog Input, 2 x 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.r./°C, resolution: 0.5 µA
- 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

Active/passive selectable, galvanically isolated
- Active: 24 V DC, 25 mA (max. 250 mA during 20 ms), R_L > 100 Ω
- 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)

HART protocol

Order code "Power supply; Display", option A, B, C, D, E, F, G, H, X, 7, 8 (HART 5)
- Valid until software: 3.01.XX

Order code "Power supply; Display", option P, Q, R, S, T, U, 4, 5 (HART 7)
- Valid as of software: 3.07.XX

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 x Analog Input, 3 x 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 → 🖹 9

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 x Analog Input, 3 x 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 → 🖹 9

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 → 🖹 9

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: per18 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

Terminal assignment

Promass 80

Order characteristic for "inputs/outsputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
A	-	-	Frequency output	Current output, HART
D	Status input	Status output	Frequency output	Current output, HART
H	-	-	-	PROFIBUS PA
S	-	-	Frequency output Ex i, passive	Current output Ex i active, HART
T	-	-	Frequency output Ex i, passive	Current output Ex i passive, HART
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 characteristic for "inputs/outsputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
Fixed communication boards (permanent assignment)				
A	-	-	Frequency output	Current output, HART
B	Relay output	Relay output	Frequency output	Current output, HART
F	-	-	-	PROFIBUS PA, Ex i
G	-	-	-	FOUNDATION Fieldbus Ex i
H	-	-	-	PROFIBUS PA
J	-	-	+5V (ext. termination)	PROFIBUS DP
K	-	-	-	FOUNDATION Fieldbus
Q	-	-	Status input	Modbus RS485
R	-	-	Current output 2 Ex i active	Current output 1 Ex i active, HART
S	-	-	Frequency output Ex i passive	Current output Ex i active, HART

Order characteristic for "inputs/outsputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
T	-	-	Frequency output Ex i passive	Current output Ex i passive, HART
U	-	-	Current output 2 Ex i passive	Current output 1 Ex i passive, HART
Flexible communication boards				
C	Relay output 2	Relay output 1	Frequency output	Current output, HART
D	Status input	Relay output	Frequency output	Current output, HART
E	Status input	Relay output	Current output 2	Current output 1, HART
L	Status input	Relay output 2	Relay output 1	Current output, HART
M	Status input	Frequency output 2	Frequency output 1	Current output, HART
N	Current output	Frequency output	Status input	Modbus RS485
P	Current output	Frequency output	Status input	PROFIBUS DP
V	Relay output 2	Relay output 1	Status input	PROFIBUS DP
W	Relay output	Current output 3	Current output 2	Current output 1, HART
0	Status input	Current output 3	Current output 2	Current output 1, HART
2	Relay output	Current output 2	Frequency output	Current output 1, HART
3	Current input	Relay output	Current output 2	Current output 1, HART
4	Current input	Relay output	Frequency output	Current output, HART
5	Status input	Current input	Frequency output	Current output, HART
6	Status input	Current input	Current output 2	Current output 1, HART
7	Relay output 2	Relay output 1	Status input	Modbus RS485

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

Power consumption

AC: <15 VA (including sensor)
DC: <15 W (including sensor)

Switch-on current:
- Max. 13.5 A (< 50 ms) at 24 V DC
- Max. 3 A (< 5 ms) at 260 V AC

Power supply failure

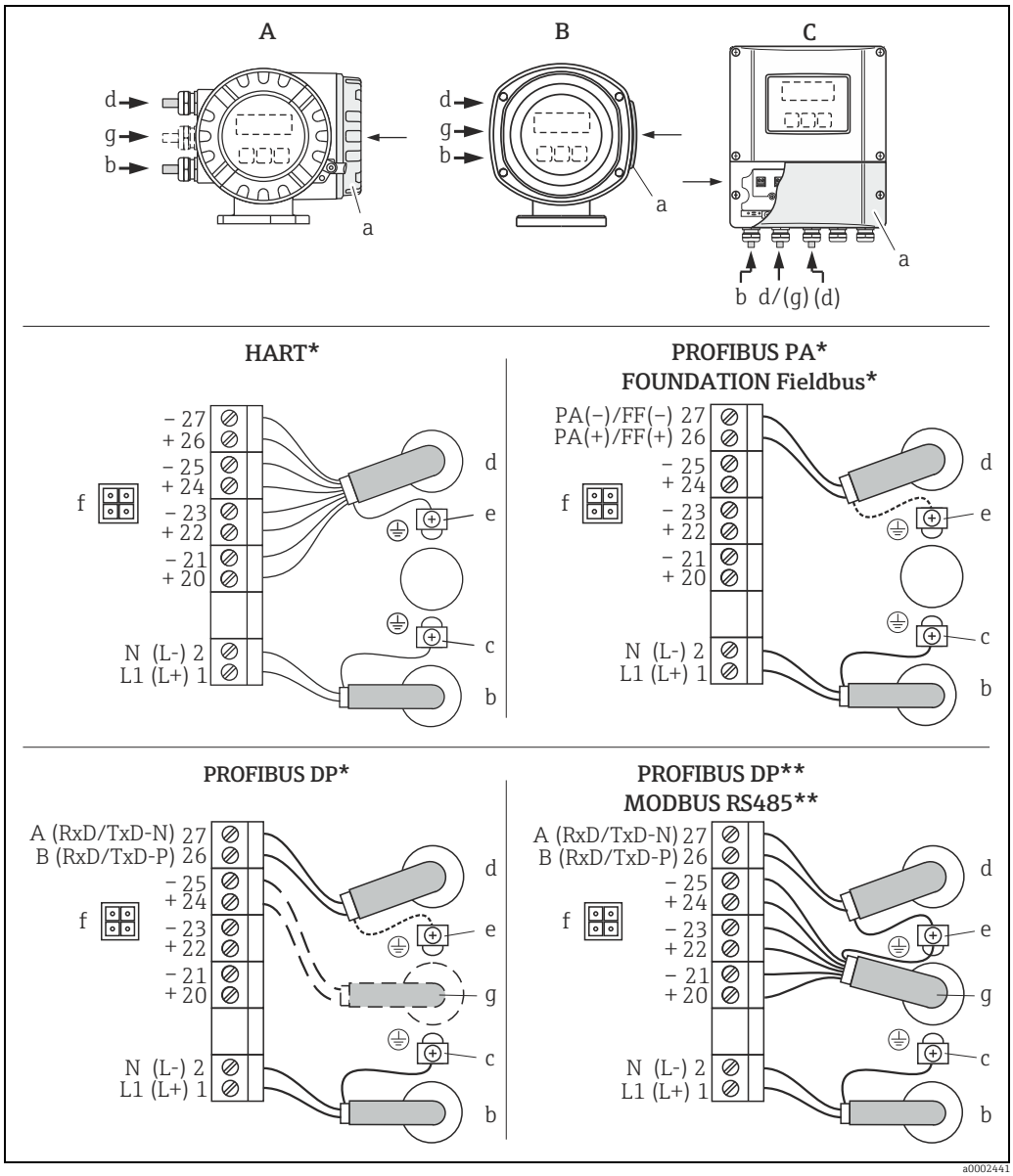
Promass 80

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.)

Electrical connection

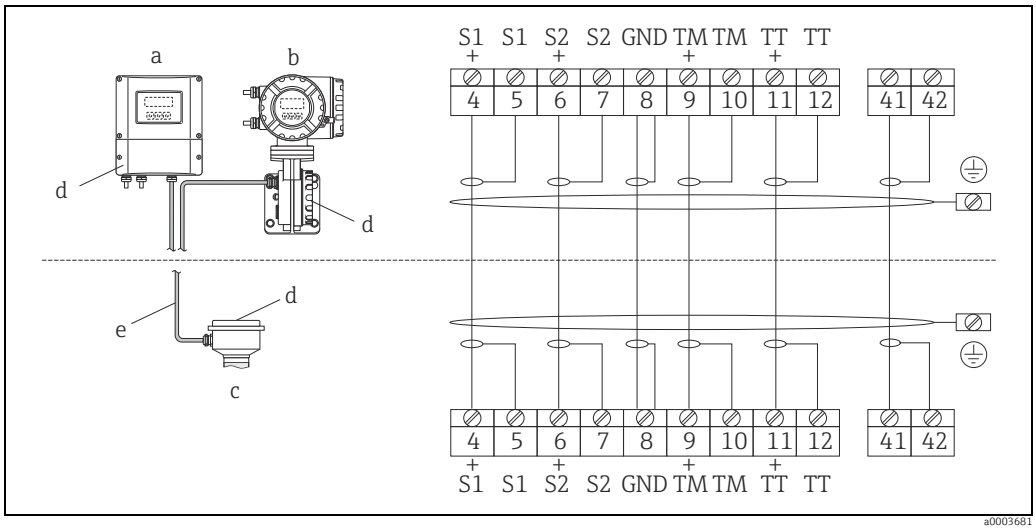


Connecting the transmitter, cable cross-section: max. 2.5 mm²

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 → 🖹 9
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 → 🖹 9
Cable for external termination (only for PROFIBUS DP with permanent assignment communication board):
Terminal No. 24: +5 V
Terminal No. 25: DGND

Electrical connection remote version



Connecting the remote version

a Wall-mount housing: non-hazardous area and ATEX II3G, zone 2 → see separate "Ex documentation"
b Wall-mount housing: 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

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.

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 specifications

- 6 × 0.38 mm² PVC cable with common shield and individually shielded cores
- Conductor resistance: ≤50 Ω/km (≤0.015 Ω/ft)
- Capacitance: core/shield: ≤420 pF/m (≤128 pF/ft)
- Cable length: max. 20 m (65 ft)
- Operating temperature: max. +105 °C (+221 °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 ICE/EN 61326, and NAMUR recommendation NE 21/43.

Performance characteristics

Reference operating conditions

- Error limits following ISO 11631
- Water with 15 to 45 °C (59 to 113 °F); 2 to 6 bar (29 to 87 psi)
- Data according to calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025

To obtain measured errors, use the Applicator sizing tool *Applicator*: → 🖹 58.

Maximum measured error

Design fundamentals → 🖹 16

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

Base accuracy

Mass flow and volume flow (liquids)

Promass 83I:
- ±0.10% o.r.

Promass 80I:
- ±0.15% o.r.

Mass flow (gases)

±0.50% o.r.

Density (liquids)

- Reference conditions: ±0.0005 g/cm³
- Field density calibration: ±0.0005 g/cm³ (valid after field density calibration under process conditions)
- Standard density calibrations: ±0.02 g/cm³ (valid over the entire measuring range of the sensor → 🖹 21)
- Special density calibration: ±0.004 g/cm³ (optional, valid range: +10 to +80 °C (+50 to +176 °F) and 0 to 2.0 g/cm³)

Temperature

±0.5 °C ± 0.005 · T °C (±1 °F ± 0.003 · (T - 32) °F)

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
8	⅜	0.150	0.0055
15	½	0.488	0.0179
15 FB	½ FB	1.350	0.0496
25	1	1.350	0.0496
25 FB	1 FB	3.375	0.124
40	1½	3.375	0.124
40 FB	1½ FB	5.250	0.193
50	2	5.250	0.193
50 FB	2 FB	13.50	0.496
80	3	13.50	0.496

FB = Full bore

Flow values

Flow values as turndown parameter depending on nominal diameter.

SI units

DN [mm]	1:1 [kg/h]	1:10 [kg/h]	1:20 [kg/h]	1:50 [kg/h]	1:100 [kg/h]	1:500 [kg/h]
8	2000	200.0	100.0	40.00	20.00	4.000
15	6500	650.0	625.0	130.0	65.00	13.00
15 FB	18000	1800	900.0	360.0	180.0	36.00
25	18000	1800	900.0	360.0	180.0	36.00
25 FB	45000	4500	2250	900.0	450.0	90.00
40	45000	4500	2250	900.0	450.0	90.00
40 FB	70000	7000	3500	1400	700.0	140.0
50	70000	7000	3500	1400	700.0	140.0
50 FB	180000	18000	9000	3600	1800	360.0
80	180000	18000	9000	3600	1800	360.0

US units

DN [in]	1:1 [lb/min]	1:10 [lb/min]	1:20 [lb/min]	1:50 [lb/min]	1:100 [lb/min]	1:500 [lb/min]
⅜	73.50	7.350	3.675	1.470	0.735	0.147
½	238.9	23.89	11.95	4.778	2.389	0.478
½ FB	238.9	23.89	11.95	4.778	2.389	0.478
1	661.5	66.15	33.08	13.23	6.615	1.323
1 FB	1654	165.4	82.70	33.08	16.54	3.308
1½	1654	165.4	82.70	33.08	16.54	3.308
1½ FB	2573	257.3	128.7	51.46	25.73	5.146
2	2573	257.3	128.7	51.46	25.73	5.146
2 FB	6615	661.5	330.8	132.3	66.15	13.23
3	6615	661.5	330.8	132.3	66.15	13.23

Accuracy of outputs

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

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

Current output

Accuracy: Max. ±0,05 % o.f.s. or ±5 µA

Pulse/frequency output

Accuracy: Max. ±50 % ppm o.r.

Repeatability

Design fundamentals → 🖹 16

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

Base repeatability

Mass flow and volume flow (liquids)

±0.05% o.r.

Mass flow (gases)

±0.25% o.r.

Density (liquids)

±0.00025 g/cm³

Temperature

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

Response time

- The response time depends on the configuration (damping).
- Response time in the event of erratic changes in the measured variable (only mass flow): after 100 ms 95 % of the full scale value.

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 I
[mm]	[in]	[% o.r./bar]
8	⅜	no influence
15	½	no influence
15 FB	½ FB	0.003
25	1	0.003
25 FB	1 FB	no influence
40	1½	no influence
40 FB	1½ FB	no influence
50	2	no influence
50 FB	2 FB	no influence
80	3	no influence

o.r. = of reading; FB = Full bore

Design fundamentals

o.r. = of reading
BaseAccu = base accuracy in % o.r.
BaseRepeat = base repeatability in % o.r.
MeasValue = measured value (in flow units consistent with the zero point stability value → 🖹 13)
ZeroPoint = zero point stability

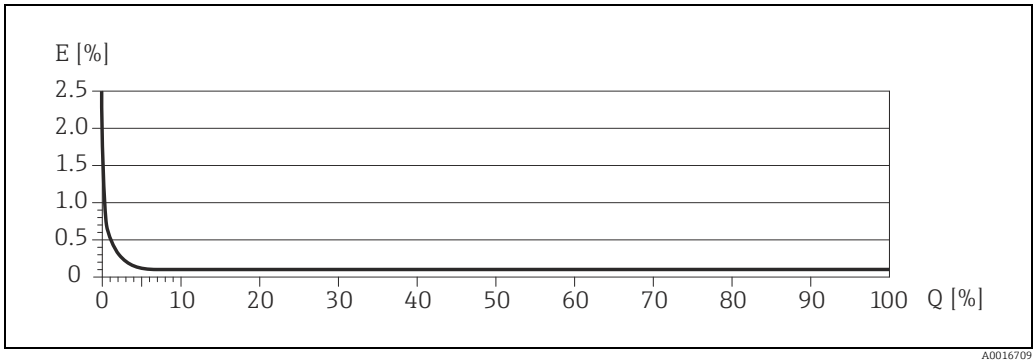
Calculation of the maximum measured error depending on flowrate

Flowrate (in flow units consistent with the zero point stability value → 🖹 13)	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ A0021332	$\pm$ BaseAccu A0021339
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ A002133	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021334

Calculation of the repeatability depending on flowrate

Flowrate (in flow units consistent with the zero point stability value → 🖹 13)	Repeatability in % o.r.
$\geq \frac{½ \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021335	$\pm$ BaseRepeat A0021340
$< \frac{½ \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021336	$\pm ½ \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021337

Example for maximum measured error



A0016709

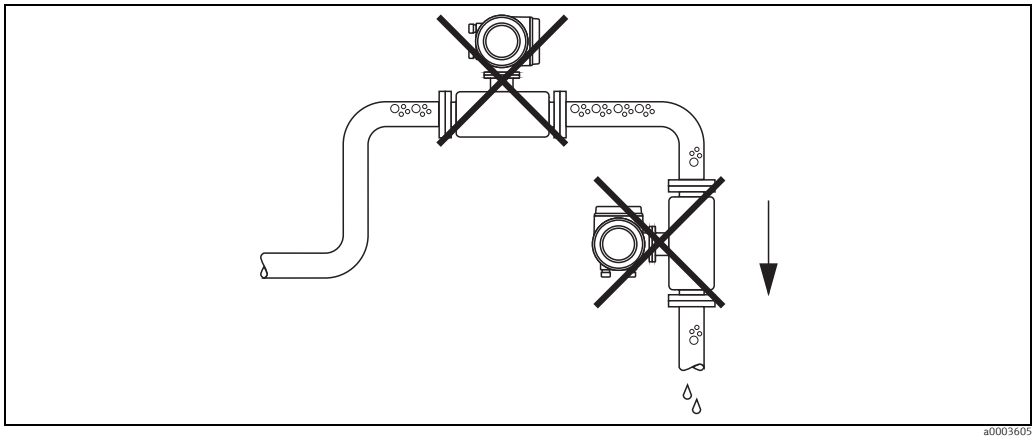
E = Error: Maximum measured error as % o.r. (example Promass 83I)

Q = Flow rate as %

Installation

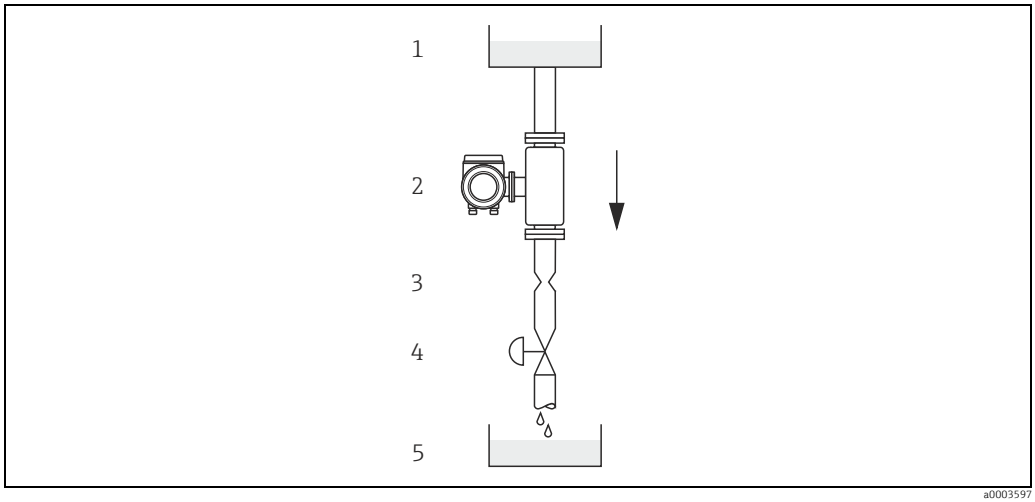
Mounting location

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]	[in]	mm	inch
8	⅜	6	0.24
15	½	10	0.39
15 FB	½ FB	15	0.59
25	1	14	0.55
25 FB	1 FB	24	0.94
40	1½	22	0.87
40 FB	1½ FB	35	1.38
50	2	28	1.10
50 FB	2 FB	54	2.13
80	3	50	1.97

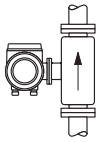
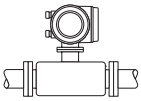
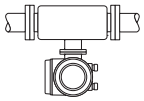
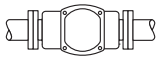
FB = Full bore

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. The measuring tubes can be completely drained and protected against solids buildup.

Horizontal (Fig. H1, H2, H3)
The transmitter can be installed in any orientation in a horizontal pipe run.

Orientation:	Vertikal	Horizontal, Transmitter head up	Horizontal, Transmitter head down	Horizontal, Transmitter head to the side
	 a0004572 *Fig. V*	 a0004576 *Fig. H1*	 a0004580 *Fig. H2*	 a0007558 *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 (→ 🖹 5) 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).

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.

Inlet and outlet runs

There are no installation requirements regarding inlet and outlet runs.

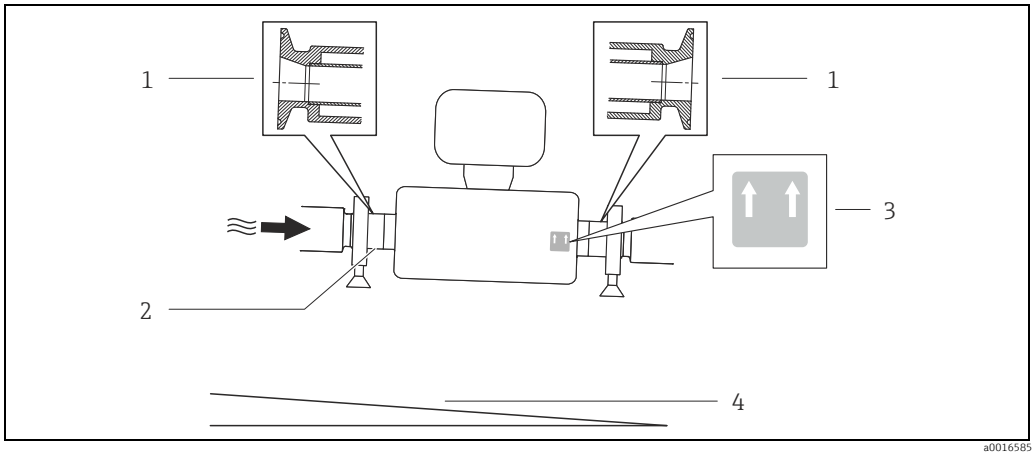
Length of connecting cable

Max. 20 meters (65 feet), remote version

Special installation

Eccentric Tri-clamps

Eccentric Tri-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 (electronic has to face upwards), to ensure full drainability in the horizontal position. Markings on the sensor show the correct mounting position to optimize drainability.

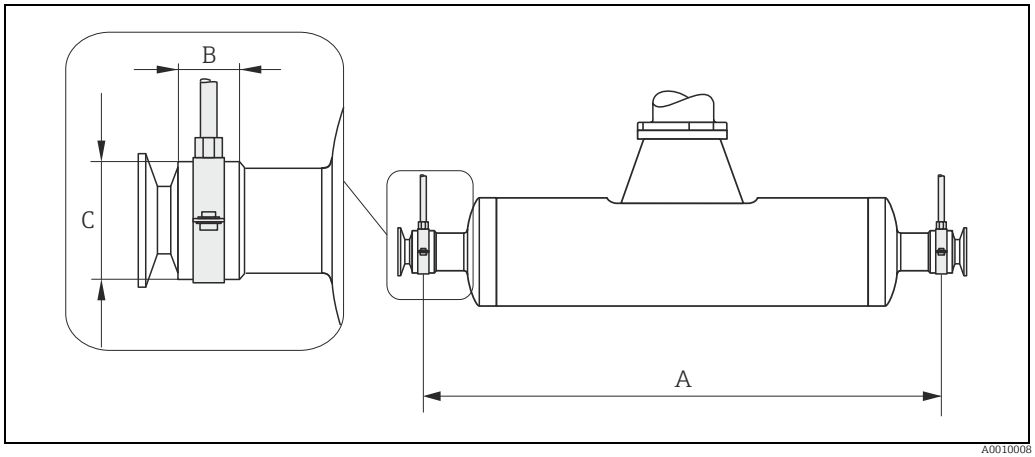


a0016585

1 Eccentric clamp connection
2 Line on the underside indicates the lowest point of the eccentric process connection.
3 "This side up" label indicates which side is up
4 Slope the device in accordance with the hygiene guidelines. Slope: approx. 2 % or 21mm/m (0.24 in/feet)

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.



A0010008

Mounted with mounting clamp

DN		A		B		C	
[mm]	[in]	mm	inch	mm	inch	mm	inch
8	⅜	373	14.69	20	0.79	40	1.57
15	½	409	16.10	20	0.79	40	1.57
15 FB	½ FB	539	21.22	30	1.18	44.5	1.75
25	1	539	21.22	30	1.18	44.5	1.75
25 FB	1 FB	668	26.30	28	1.10	60	2.36
40	1½	668	26.30	28	1.10	60	2.36
40 FB	1½ FB	780	30.71	35	1.38	80	3.15
50	2	780	30.71	35	1.38	80	3.15
50 FB	2 FB	1152	45.35	57	2.24	90	3.54
80	3	1152	45.35	57	2.24	90	3.54

FB = Full bore

Zero point adjustment

All measuring devices are calibrated to state-of-the-art technology. Calibration takes place under reference operating conditions → 🖹 13. Consequently, the zero point adjustment is generally not necessary.

Experience shows that the zero point adjustment is advisable only in special cases:
- To achieve highest measuring accuracy also with small flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

Environment

Ambient temperature range

Sensor, transmitter:
- Standard: −20 to +60 °C (−4 to +140 °F)
- Optional: −40 to +60 °C (−40 to +140 °F)

- 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 +175 °F), preferably +20 °C (+68 °F)

Degree of protection

Standard: IP 67 (NEMA 4X) for transmitter and sensor

Shock resistance

According to IEC/EN 60068-2-31

Vibration resistance

Acceleration up to 1 g, 10 to 150 Hz, following IEC/EN 60068-2-6

Electromagnetic compatibility (EMC)

As per IEC/EN 61326 and NAMUR recommendation NE 21

Process

Fluid temperature range

Sensor

−50 to +150 °C (−58 to +302 °F)

Medium density

0 to 5000 kg/m³ (0 to 312 lb/ft³)

Fluid pressure range (nominal pressure)

Flanges

- According to DIN PN 40 to 100
- According to ASME B16.5 Cl 150, Cl 300, Cl 600
- JIS 10K, 20K, 40K, 63K

Secondary containment pressure rating

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

The following secondary containment pressure rating is only valid for a fully welded sensor housing and/or a device equipped with closed purge connections (never opened, as delivered).

DN		Secondary containment rating (designed with a safety factor ≥ 4)		Burst pressure of secondary containment	
[mm]	[in]	[bar]	[psi]	[bar]	[psi]
8	⅜	40	580	220	3190
15	½	40	580	220	3190
15 FB	½ FB	40	580	235	3405
25	1	40	580	235	3405
25 FB	1 FB	40	580	220	3190
40	1½	40	580	220	3190
40 FB	1½ FB	40	580	235	3405
50	2	40	580	235	3405
50 FB	2 FB	40	580	460	6670
80	3	40	580	460	6670

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 circulation and/or gas detection (dimensions → 🖹 26).

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).

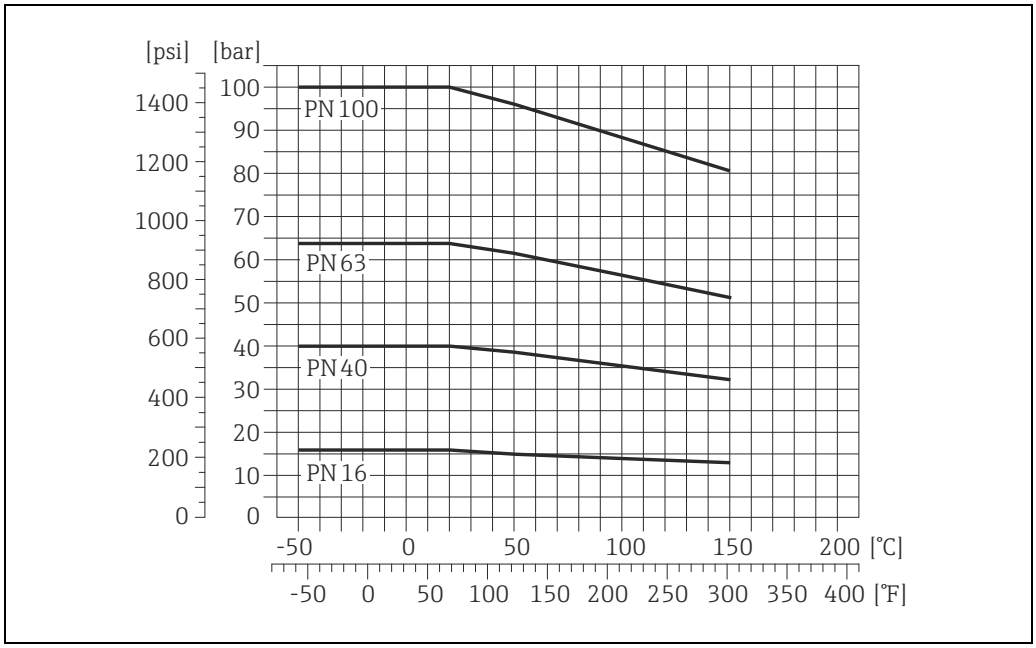
If a device equipped with purge connections is connected to the purge system, the maximum pressure rating is defined by the purge system itself or the device, whichever is lower.

Pressure-temperature ratings

The following pressure-temperature ratings refer to the entire sensor and not just the process connection.

Flange according to EN 1092-1 (DIN 2501)

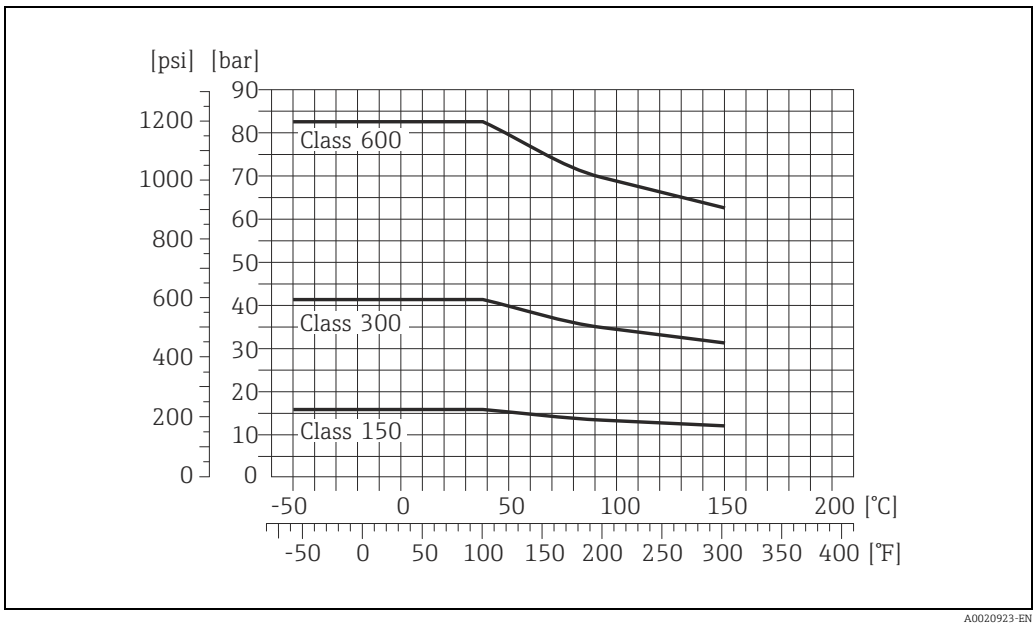
Flange material: 1.4301 (304)
Fluid wetted parts: titanium



A0020873-EN

Flange according to ASME B16.5

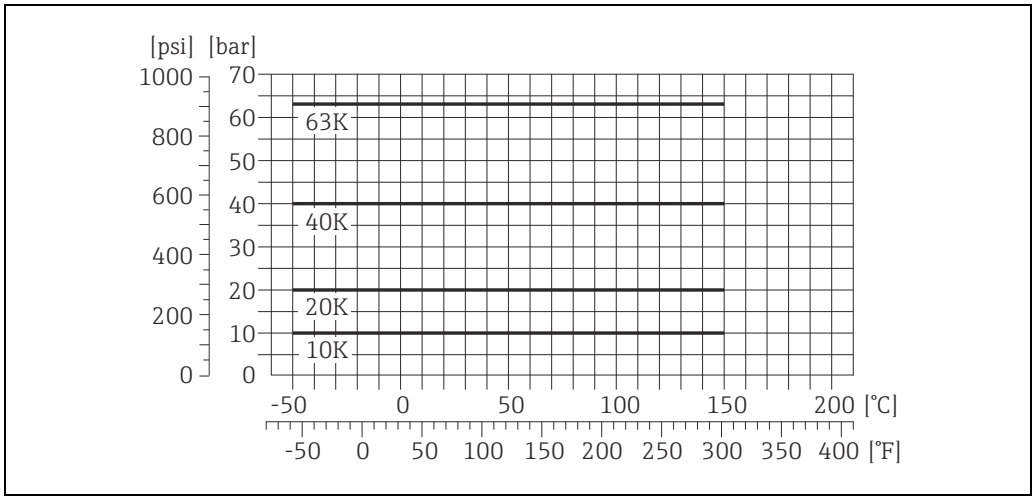
Flange material: 1.4301 (304)
Fluid wetted parts: titanium



A0020923-EN

JIS B2220 flange

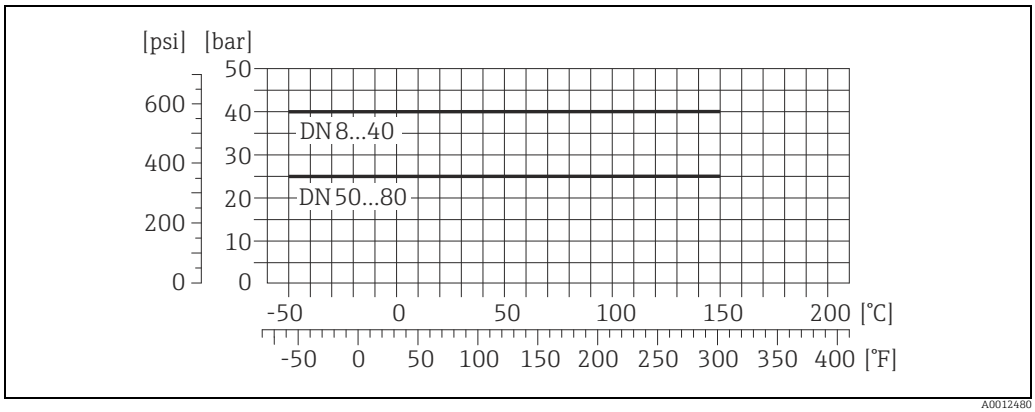
Flange material: 1.4301 (304)
Fluid wetted parts: titanium



A0020924-EN

DIN 11851 thread

Connection material: titanium

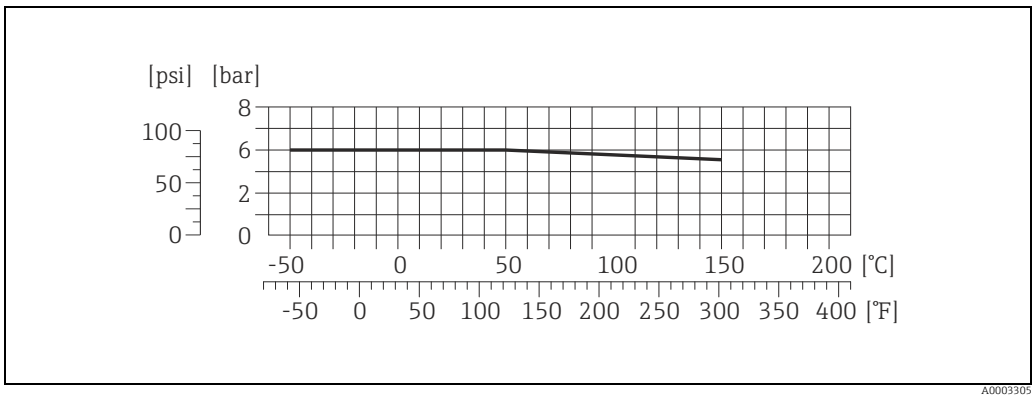


A0012480

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.

SMS 1145 thread

Connection material: titanium

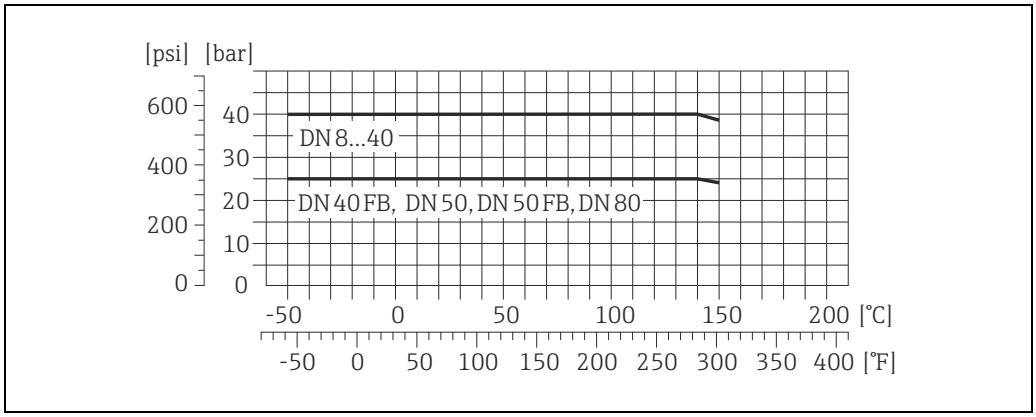


A0003305

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.

DIN 11864-1A thread

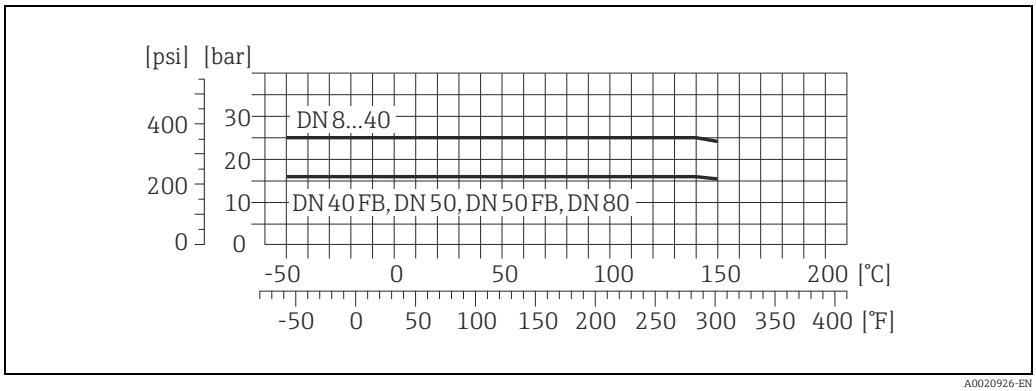
Connection material: titanium



A0020925-EN

DIN 11864-2A flange

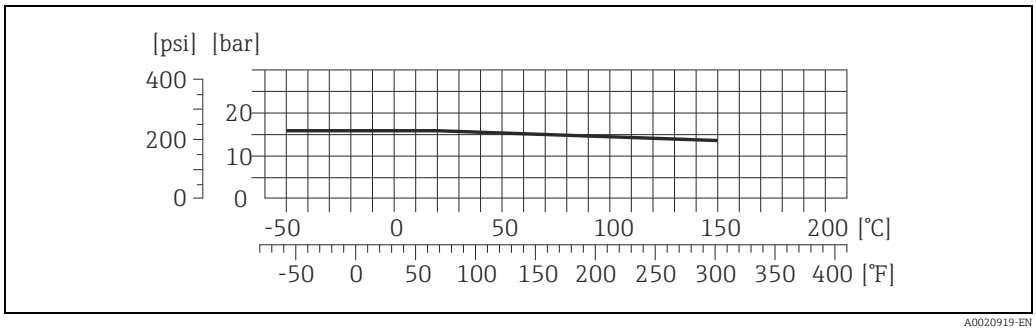
Connection material: titanium



A0020926-EN

ISO 2853 thread

Connection material: titanium



A0020919-EN

Tri-Clamp

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.

Limiting flow

See information in the "Measuring range" section → 🖹 5

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 → 🖹 5

Pressure loss

To calculate the pressure loss, use the *Applicator* sizing tool (→ 🖹 58).

System pressure

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.
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.

Therefore, the following locations should be preferred for installation:
- Downstream from pumps (no danger of vacuum)
- At the lowest point in a vertical pipe

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.

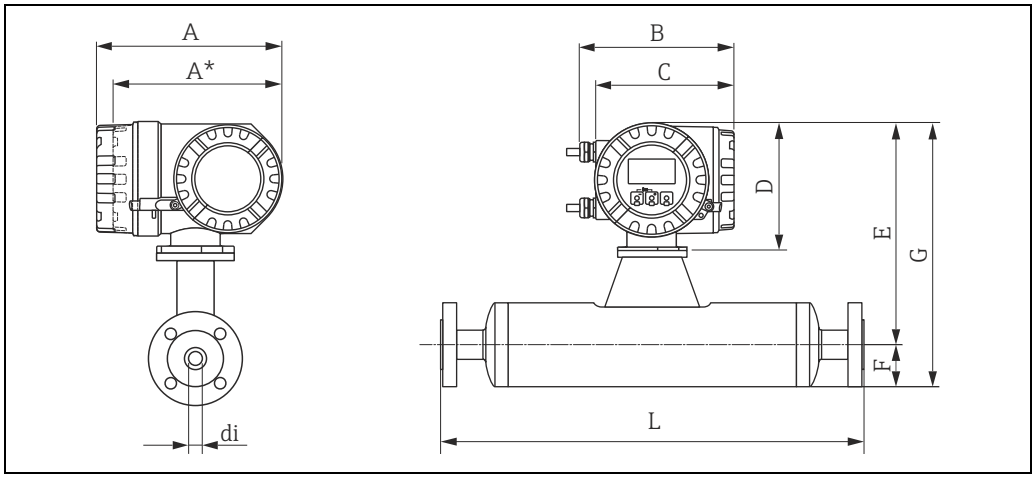
- Risk of electronics overheating! Make sure that the maximum permissible ambient temperature for the transmitter is not exceeded. Consequently, make sure that the adapter between the sensor and transmitter and the connection housing of the remote version always remain free of insulating material. Note that a certain orientation might be required, depending on the fluid temperature → 🖹 21.
- 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 $d \geq 0.35$ mm (0.014")
- Information on permitted temperature ranges → 🖹 21.

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

Mechanical construction

Design, dimensions

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



A0006964

Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	L	di
8 [1]	227	207	187	168	160	291	59	350	[2]	[2]
15	227	207	187	168	160	291	59	350	[2]	[2]
15 FB	227	207	187	168	160	291	59	350	[2]	[2]
25	227	207	187	168	160	291	59	350	[2]	[2]
25 FB	227	207	187	168	160	305	72	377	[2]	[2]
40	227	207	187	168	160	305	72	377	[2]	[2]
40 FB	227	207	187	168	160	320	86	406	[2]	[2]
50	227	207	187	168	160	320	86	406	[2]	[2]
50 FB	227	207	187	168	160	349	110	458.1	[2]	[2]
80	227	207	187	168	160	349	110	458.1	[2]	[2]

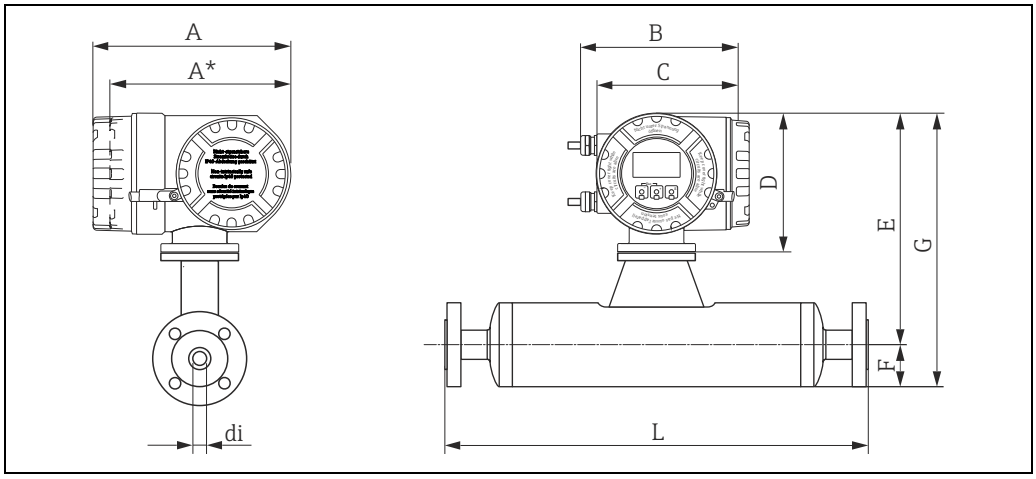
[1] DN 8 with DN 15 flanges as standard; [2] dependent on respective process connection
FB = Full bore; * blind version (without local display)
All dimensions in [mm]

Dimensions in US units

DN	A	A*	B	C	D	E	F	G	L	di
⅜" [1]	9.08	8.28	7.48	6.72	6.40	11.46	2.32	13.78	[2]	[2]
½"	9.08	8.28	7.48	6.72	6.40	11.46	2.32	13.78	[2]	[2]
½" FB	9.08	8.28	7.48	6.72	6.40	11.46	2.32	13.78	[2]	[2]
1"	9.08	8.28	7.48	6.72	6.40	11.46	2.32	13.78	[2]	[2]
1" FB	9.08	8.28	7.48	6.72	6.40	12.01	2.83	14.84	[2]	[2]
1½"	9.08	8.28	7.48	6.72	6.40	12.01	2.83	14.84	[2]	[2]
1½" FB	9.08	8.28	7.48	6.72	6.40	12.60	3.39	15.98	[2]	[2]
2"	9.08	8.28	7.48	6.72	6.40	12.60	3.39	15.98	[2]	[2]
2" FB	9.08	8.28	7.48	6.72	6.40	13.74	4.33	18.04	[2]	[2]
3"	9.08	8.28	7.48	6.72	6.40	13.74	4.33	18.04	[2]	[2]

[1] DN ⅜" with DN ½" flanges as standard; [2] dependent on respective process connection
FB = Full bore; * blind version (without local display)
All dimensions in [in]

Field housing compact version, powder-coated die-cast aluminium (II2G, zone 1)



A0013831

Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	L	di
8 [1]	240	217	206	186	178	309	59	368	[2]	[2]
15	240	217	206	186	178	309	59	368	[2]	[2]
15 FB	240	217	206	186	178	309	59	368	[2]	[2]
25	240	217	206	186	178	309	59	368	[2]	[2]
25 FB	240	217	206	186	178	323	72	395	[2]	[2]
40	240	217	206	186	178	323	72	395	[2]	[2]
40 FB	240	217	206	186	178	383	86	424	[2]	[2]
50	240	217	206	186	178	383	86	424	[2]	[2]
50 FB	240	217	206	186	178	366	110	476	[2]	[2]
80	240	217	206	186	178	366	110	476	[2]	[2]

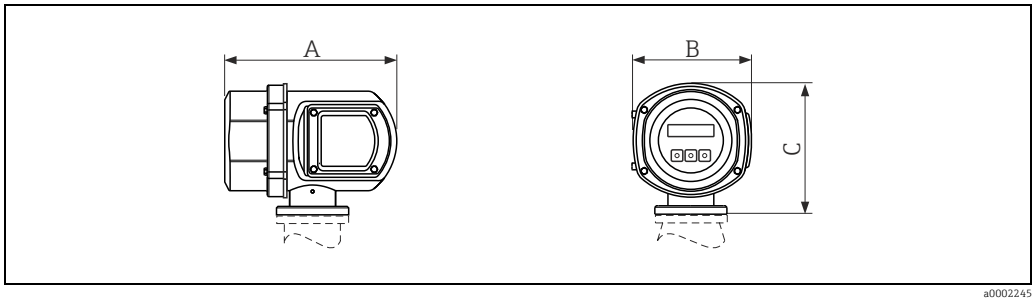
[1] DN 8 with DN 15 flanges as standard; [2] dependent on respective process connection
FB = Full bore; * blind version (without local display)
All dimensions in [mm]

Dimensions in US units

DN	A	A*	B	C	D	E	F	G	L	di
⅜" [1]	9.45	8.54	8.11	7.32	7.01	12,16	2,32	14.48	[2]	[2]
½"	9.45	8.54	8.11	7.32	7.01	12,16	2,32	14.48	[2]	[2]
½" FB	9.45	8.54	8.11	7.32	7.01	12,16	2,32	14.48	[2]	[2]
1"	9.45	8.54	8.11	7.32	7.01	12,16	2,32	14.48	[2]	[2]
1" FB	9.45	8.54	8.11	7.32	7.01	12,71	2,83	15.54	[2]	[2]
1½"	9.45	8.54	8.11	7.32	7.01	12,71	2,83	15.54	[2]	[2]
1½" FB	9.45	8.54	8.11	7.32	7.01	13,29	3,39	16.68	[2]	[2]
2"	9.45	8.54	8.11	7.32	7.01	13,29	3,39	16.68	[2]	[2]
2" FB	9.45	8.54	8.11	7.32	7.01	14,41	4,33	18.74	[2]	[2]
3"	9.45	8.54	8.11	7.32	7.01	14,41	4,33	18.74	[2]	[2]

[1] DN ⅜" with DN ½" flanges as standard; [2] dependent on respective process connection
FB = Full bore; * blind version (without local display)
All dimensions in [in]

Transmitter compact version, stainless steel

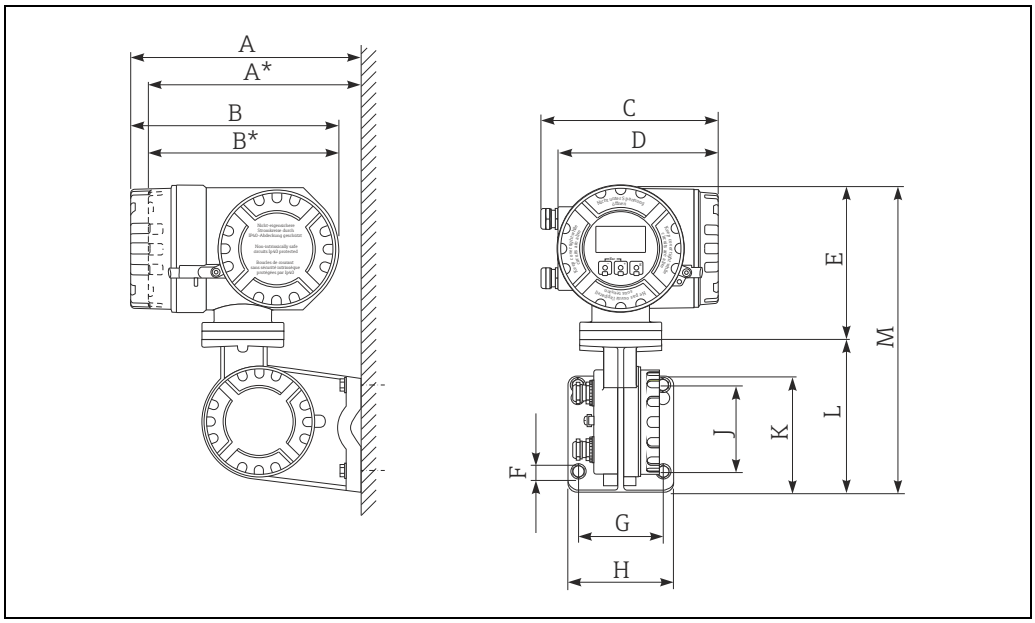


a0002245

Dimensions in SI and US units

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

Transmitter remote version, connection housing (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

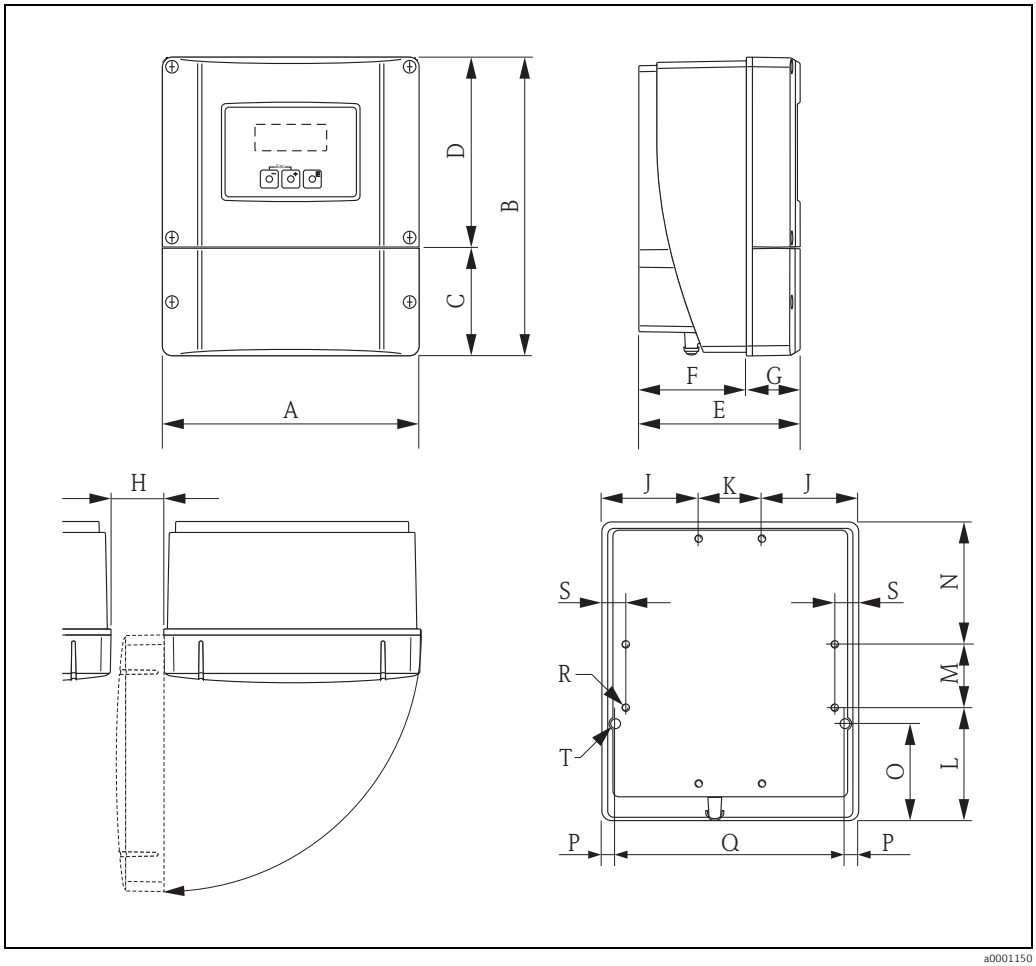
* Blind version (without local display)
All dimensions in [mm]

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 [in]

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



a0001150

Dimensions (SI units)

A	B	C	D	E	F	G	H	J	K
215	250	90.5	159.5	135	90	45	> 50	81	53
L	M	N	O	P	Q	R	S	T [1]	
95	53	102	81.5	11.5	192	8 × M5	20	2 × Ø 6.5	

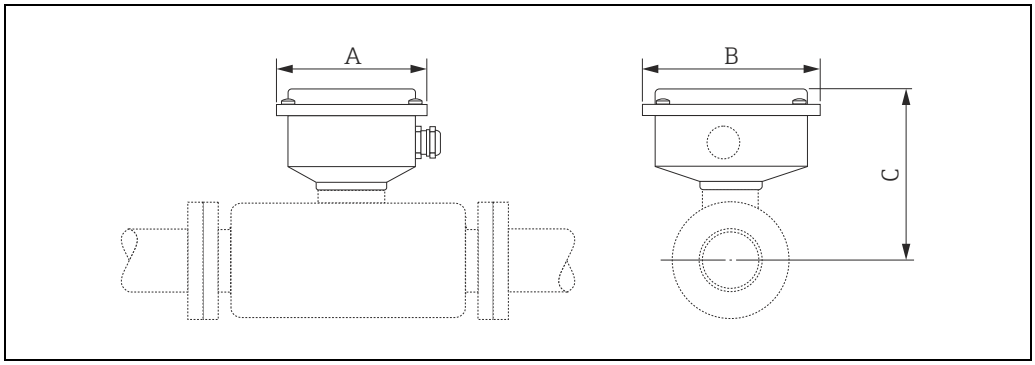
[1] Securing screw for wall mounting: M6 (screw head max. 10.5 mm)
All dimensions in [mm]

Dimensions (US units)

A	B	C	D	E	F	G	H	J	K
8.46	9.84	3.56	6.27	5.31	3.54	1.77	> 1.97	3.18	2.08
L	M	N	O	P	Q	R	S	T [1]	
3.74	2.08	4.01	3.20	0.45	7.55	8 × M5	0.79	2 × Ø 0.26	

[1] Securing screw for wall mounting: M6 (screw head max. 0.41")
All dimensions in [in]

Sensor remote version, connection housing



a0002516

Dimensions in SI units

DN	A	B	C
8	118.5	137.5	138
15	118.5	137.5	138
15 FB	118.5	137.5	138
25	118.5	137.5	138
25 FB	118.5	137.5	152
40	118.5	137.5	152
40 FB	118.5	137.5	167
50	118.5	137.5	167
50 FB	118.5	137.5	196
80	118.5	137.5	196

All dimensions in [mm]

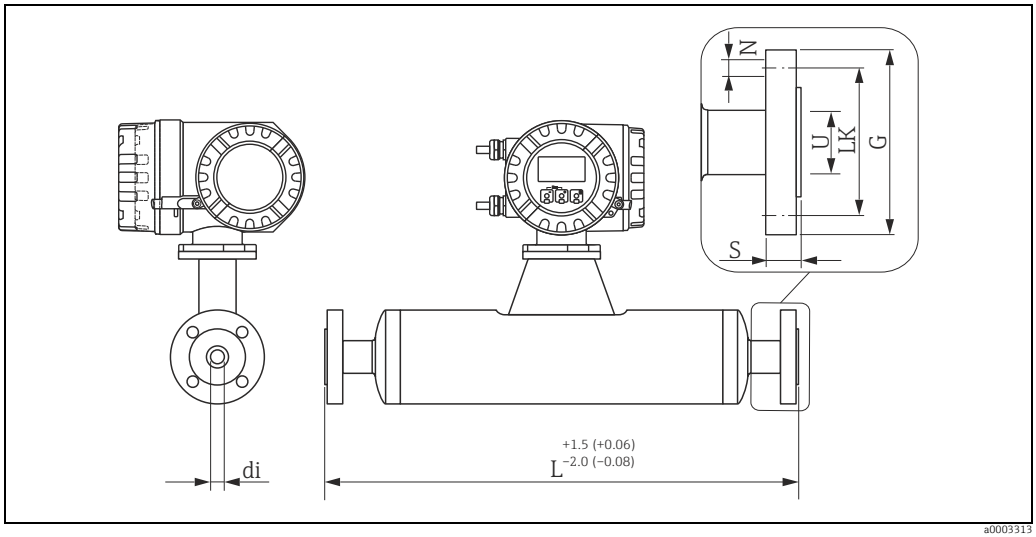
Dimensions in US units

DN	A	B	C
⅜"	4.67	5.41	5.43
½"	4.67	5.41	5.43
½" FB	4.67	5.41	5.43
1"	4.67	5.41	5.43
1" FB	4.67	5.41	5.98
1½"	4.67	5.41	5.98
1½" FB	4.67	5.41	6.57
2"	4.67	5.41	6.57
2" FB	4.67	5.41	7.72
3"	4.67	5.41	7.72

All dimensions in [in]

Process connections in SI units

Flange according to EN 1092-1 (DIN 2501), PN 40
Flange according to EN 1092-1 (DIN 2501), PN 63
Flange according to EN 1092-1 (DIN 2501), PN 100



Engineering unit mm (in)

Flange according to EN 1092-1 (DIN 2501), PN 40: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm Order code for "Process connection", option D2W							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
8 [1]	95	402	4 x Ø14	20	65	17.30	8.55
15	95	438	4 x Ø14	20	65	17.30	11.38
15 FB	95	572	4 x Ø14	19	65	17.07	17.07
25	115	578	4 x Ø14	23	85	28.50	17.07
25 FB	115	700	4 x Ø14	22	85	26.40	26.40
40	150	708	4 x Ø18	26	110	43.10	26.40
40 FB	150	819	4 x Ø18	24	110	35.62	35.62
50	165	827	4 x Ø18	28	125	54.50	35.62
50 FB	165	1210	4 x Ø18	40	125	54.8	54.8
80	200	1210	8 x Ø18	37	160	82.5	54.8

[1] DN 8 with DN 15 flange as standard; FB = Full bore
All dimensions in [mm]

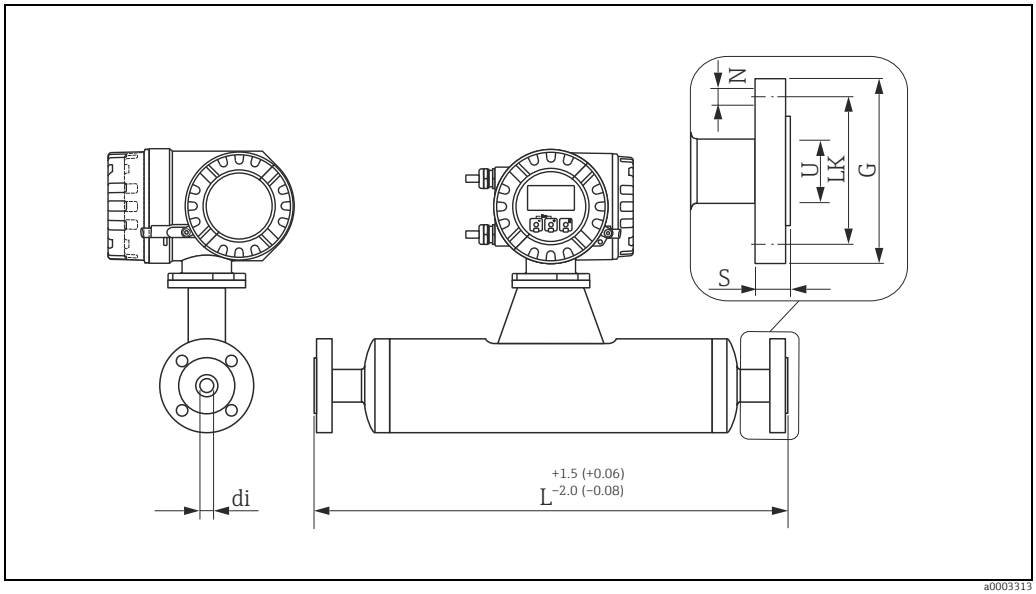
Flange according to EN 1092-1 EN 1092-1 (DIN 2501), PN 63: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form E), Ra 0.8 to 3.2 µm Order code for "Process connection", option D3W							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
50	180	832	4 x Ø22	34	135	54.5	35.62
50 FB	180	1210	4 x Ø22	45	135	54.8	54.8
80	215	1210	8 x Ø22	41	170	81.7	54.8

FB = Full bore
All dimensions in [mm]

Flange according to EN 1092-1(DIN 2501), PN 100: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form E), Ra 0.8 to 3.2 µm Order code for "Process connection", option D4W							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
8 [1]	105	402	4 x Ø14	25	75	17.30	8.55
15	105	438	4 x Ø14	25	75	17.30	11.38
15 FB	105	578	4 x Ø14	26	75	17.07	17.07
25	140	578	4 x Ø18	29	100	28.50	17.07
25 FB	140	706	4 x Ø18	31	100	25.60	25.60
40	170	708	4 x Ø22	32	125	42.50	25.60
40 FB	170	825	4 x Ø22	33	125	35.62	35.62
50	195	832	4 x Ø26	36	145	53.90	35.62
50 FB	195	1210	4 x Ø26	48	145	54.8	54.8
80	230	1236	8 x Ø26	58	180	80.9	54.8

[1] DN 8 with DN 15 flange as standard; FB = Full bore
All dimensions in [mm]

Flange according to ASME B16.5, Cl 150
Flange according to ASME B16.5, Cl 300
Flange according to ASME B16.5, Cl 600



Engineering unit mm (in)

Flange according to ASME B16.5, Cl 150: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): Ra 3.2 to 6.3 µm Order code for "Process connection", option AAW							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
8 [1]	88.9	402	4 x Ø15.7	20	60.5	15.70	8.56
15	88.9	438	4 x Ø15.7	20	60.5	15.70	11.38
15 FB	88.9	572	4 x Ø15.7	19	60.5	17.07	17.07
25	108.0	578	4 x Ø15.7	23	79.2	26.70	17.07
25 FB	108.0	700	4 x Ø15.7	22	79.2	25.60	26.37
40	127.0	708	4 x Ø15.7	26	98.6	40.90	26.37
40 FB	127.0	819	4 x Ø15.7	24	98.6	35.62	35.62
50	152.4	827	4 x Ø19.1	28	120.7	52.60	35.62
50 FB	152.4	1210	4 x Ø19.1	40	120.7	54.8	54.76
80	190,5	1210	4 x Ø19,1	37	152,4	78	54.76

[1] DN 8 with DN 15 flange as standard; FB = Full bore
All dimensions in [mm]

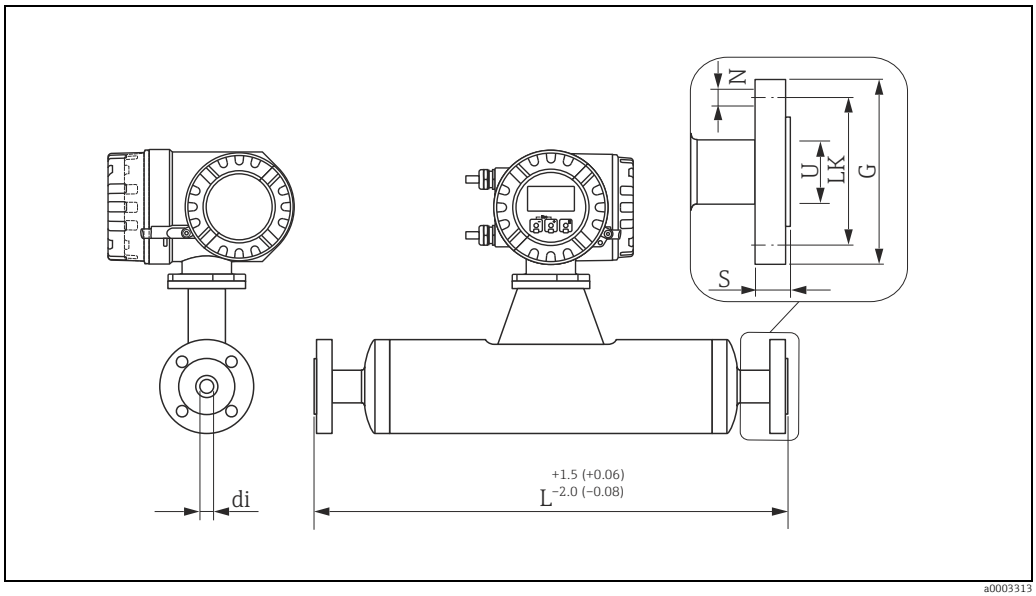
Flange according to ASME B16.5, Cl 300: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): Ra 3.2 to 6.3 µm Order code for "Process connection", option ABW							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
8 [1]	95.3	402	4 x Ø15.7	20	66.5	15.70	8.55
15	95.3	438	4 x Ø15.7	20	66.5	15.70	11.38
15 FB	95.3	572	4 x Ø15.7	19	66.5	17.07	17.07
25	124.0	578	4 x Ø19.1	23	88.9	26.70	17.07
25 FB	124.0	700	4 x Ø19.1	22	88.9	25.60	25.60
40	155.4	708	4 x Ø22.4	26	114.3	40.90	25.60
40 FB	155.4	819	4 x Ø22.4	24	114.3	35.62	35.62
50	165.1	827	8 x Ø19.1	28	127.0	52.60	35.62
50 FB	165.1	1210	8 x Ø19.1	43	127	54.8	54.8
80	209.5	1210	8 x Ø22.3	42	168.1	78	54.8

[1] DN 8 with DN 15 flange as standard; FB = Full bore
All dimensions in [mm]

Flange according to ASME B16.5, Cl 600: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): Ra 3.2 to 6.3 µm Order code for "Process connection", option ACW							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
8 [1]	95.3	402	4 x Ø15.7	20	66.5	13.80	8.55
15	95.3	438	4 x Ø15.7	20	66.5	13.80	11.38
15 FB	95.3	578	4 x Ø15.7	22	66.5	17.07	17.07
25	124.0	578	4 x Ø19.1	23	88.9	24.40	17.07
25 FB	124.0	706	4 x Ø19.1	25	88.9	25.60	25.60
40	155.4	708	4 x Ø22.4	28	114.3	38.10	25.60
40 FB	155.4	825	4 x Ø22.4	29	114.3	35.62	35.62
50	165.1	832	8 x Ø19.1	33	127.0	49.30	35.62
50 FB	165.1	1210	8 x Ø19.1	46	127	54.8	54.8
80	209.5	1222	8 x Ø22.3	53	168.1	73.7	54.8

[1] DN 8 with DN 15 flange as standard; FB = Full bore
All dimensions in [mm]

JIS B2220 flange, 10K
JIS B2220 flange, 20K
JIS B2220 flange, 40K
JIS B2220 flange, 63K



Engineering unit mm (in)

JIS B2220, flange, 10K: 1.4301 (304), fluid wetted parts: Titanium
Surface roughness (flange): Ra 3.2 to 6.3 µm
Order code for "Process connection", option NDW

DN	G	L	N	S	LK	U	di
50	155	827	4 x Ø19	28	120	50	35.62
50 FB	195	1210	4 x Ø26	48	145	54.8	54.8
80	200	1210	8 x Ø18	37	160	82.5	54.8

FB = Full bore
All dimensions in [mm]

JIS B2220, flange, 20K: 1.4301 (304), fluid wetted parts: Titanium
Surface roughness (flange): Ra 3.2 to 6.3 µm
Order code for "Process connection", option NEW

DN	G	L	N	S	LK	U	di
8 [1)]	95	402	4 x Ø15	20	70	15.00	8.55
15	95	438	4 x Ø15	20	70	15.00	11.38
15 FB	95	572	4 x Ø15	19	70	17.07	17.07
25	125	578	4 x Ø19	23	90	25.00	17.07
25 FB	125	700	4 x Ø19	22	90	25.60	25.60
40	140	708	4 x Ø19	26	105	40.00	25.60
40 FB	140	819	4 x Ø19	24	105	35.62	35.62
50	155	827	8 x Ø19	28	120	50.00	35.62
50 FB	155	1210	8 x Ø19	42	120	54.8	54.8
80	200	1210	8 x Ø23	36	160	80	54.8

[1)] DN 8 with DN 15 flange as standard; FB = Full bore;
All dimensions in [mm]

JIS B2220, flange, 40K: 1.4301 (304), fluid wetted parts: Titanium
Surface roughness (flange): Ra 3.2 to 6.3 µm
Order code for "Process connection", option NGW

DN	G	L	N	S	LK	U	di
8 [1]	115	402	4 x Ø19	25	80	15.00	8.55
15	115	438	4 x Ø19	25	80	15.00	11.38
15 FB	115	578	4 x Ø19	26	80	17.07	17.07
25	130	578	4 x Ø19	27	95	25.00	17.07
25 FB	130	706	4 x Ø19	29	95	25.60	25.60
40	160	708	4 x Ø23	30	120	38.00	25.60
40 FB	160	825	4 x Ø23	31	120	35.62	35.62
50	165	827	8 x Ø19	32	130	50.00	35.62
50 FB	165	1210	8 x Ø19	43	130	54.8	54.8
80	210	1210	8 x Ø23	46	170	75	54.8

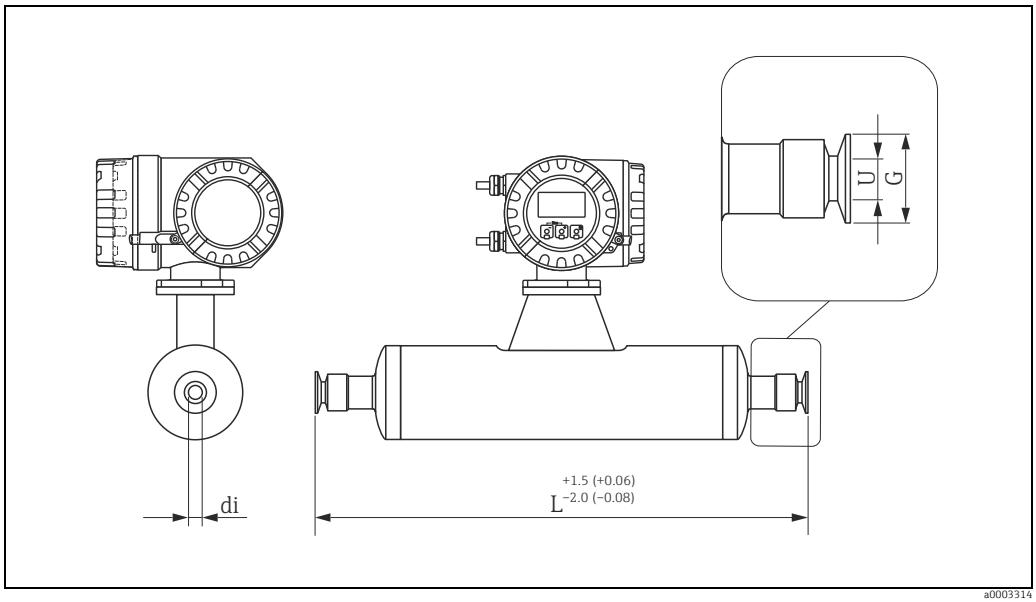
[1] DN 8 with DN 15 flanges as standard; FB = Full bore
All dimensions in [mm]

JIS B2220, flange, 63K: 1.4301 (304), fluid wetted parts: Titanium
Surface roughness (flange): Ra 3.2 to 6.3 µm
Order code for "Process connection", option NHW

DN	G	L	N	S	LK	U	di
8 [1]	120	402	4 x Ø19	28	85	12.00	8.55
15	120	438	4 x Ø19	28	85	12.80	11.38
15 FB	120	578	4 x Ø19	29	85	17.07	17.07
25	140	578	4 x Ø23	30	100	22.00	17.07
25 FB	140	706	4 x Ø23	32	100	25.60	25.60
40	175	708	4 x Ø25	36	130	35.00	25.60
40 FB	175	825	4 x Ø25	37	130	35.62	35.62
50	185	832	8 x Ø23	40	145	48.00	35.62
50 FB	185	1210	8 x Ø23	47	145	54.8	54.8
80	230	1226	8 x Ø25	55	185	73	54.8

[1] DN 8 with DN 15 flanges as standard; FB = Full bore
All dimensions in [mm]

Tri-Clamp, DIN 11866 line C
Tri-Clamp 2½", DIN 11866 line C
Tri-Clamp ¾", DIN 11866 line C
Tri-Clamp ½", DIN 11866 line C



Engineering unit mm (in)

Tri-Clamp, DIN 11866 line C: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FTA Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FTD					
DN	**Clamp**	**G**	**L**	**U**	**di**
8	1"	50.4	427	22.1	8.55
15	1"	50.4	463	22.1	11.38
15 FB	see Tri-Clamp, ¾" connection				
25	1"	50.4	603	22.1	17.07
25 FB	1"	50.4	730	22.1	25.60
40	1 ½"	50.4	731	34.8	25.60
40 FB	1 ½"	50.4	849	34.8	35.62
50	2"	63.9	850	47.5	35.62
50 FB	see Tri-Clamp, 2 ½" connection				
80	3"	90.9	1268	72.9	54.8

FB = Full bore
All dimensions in [mm]

Tri-Clamp, DIN 11866 line C: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FRA Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FRD					
DN	**Clamp**	**G**	**L**	**U**	**di**
50 FB	2 ½"	77.4	1268	60.3	54.8

FB = Full bore
All dimensions in [mm]

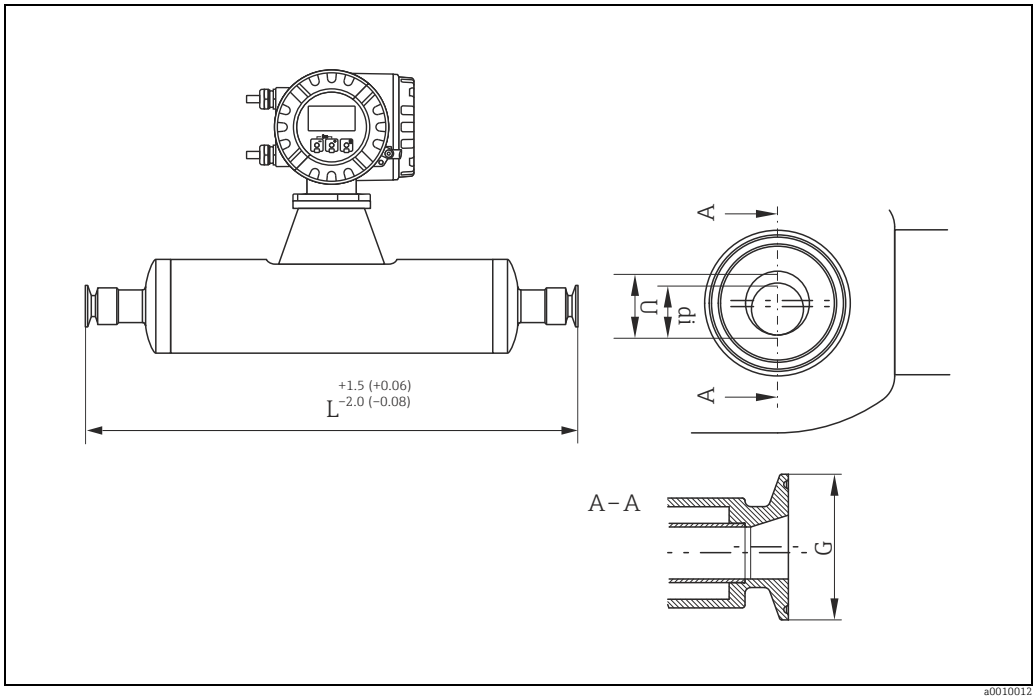
Tri-Clamp ¾", DIN 11866 line C: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FPA Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FPD					
DN	**Clamp**	**G**	**L**	**U**	**di**
8	¾"	25.0	426	16.0	8.55
15	¾"	25.0	462	16.0	11.38
15 FB	¾"	25.0	602	16.0	17.07

FB = Full bore
All dimensions in [mm]

Tri-Clamp ½", DIN 11866 line C: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FUA Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FUD					
DN	**Clamp**	**G**	**L**	**U**	**di**
8	½"	25.0	426	9.5	8.55
15	½"	25.0	462	9.5	11.38

All dimensions in [mm]

Tri-Clamp eccentric, DIN 11866 line C



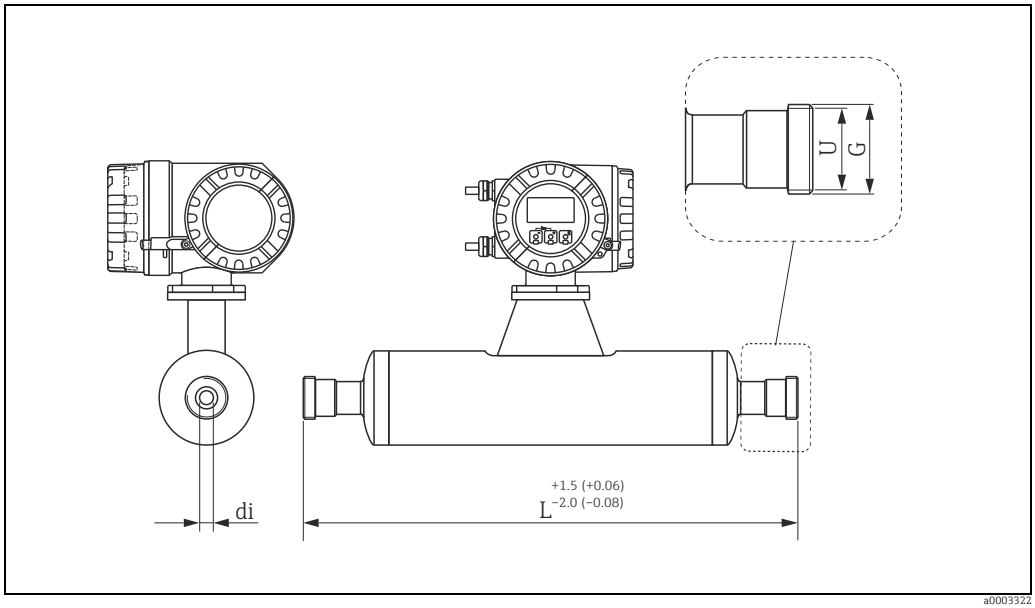
Engineering unit mm (in)

Ti-Clamp eccentric, DIN 11866 line C: Titanium							
DN	**Ra_{max} = 0.8 µm Order code for "Process connection", option**	**Ra_{max} = 0.4 µm Order code for "Process connection", option**	**Clamp**	**G**	**L**	**U**	**di**
8	EBA	EBD	½"	25,0	427	9,5	8,5
15	EPA	EPD	¾"	25,0	463	15,75	11,3
15 FB	EAA	EAD	1"	50,4	603	22,1	17
25	EAA	EAD	1"	50,4	603	22,1	17
25 FB	EUA	EUD	1½"	50,4	730	34,8	26,4
40	EUA	EUD	1½"	50,4	730	34,8	26,4
40 FB	ESA	ESD	2"	63,9	849	47,5	35,6
50	ESA	ESD	2"	63,9	849	47,5	35,6
50 FB	ERA	ERD	2 ½"	77,4	1268	60,3	54,8
50 FB	ECA	ECD	3"	91	1268	72,9	54,8
80	ERA	ERD	2 ½"	77,4	1268	60,3	54,8
80	ECA	ECD	3"	91	1268	72,9	54,8

FB = Full bore
All dimension in [in]

Further information refer to "Eccentric Tri-clamps" → 🖹 19

DIN 11851 thread, DIN 11866 line A
DIN 11851 thread Rd 28 × ⅛", DIN 11866 line A



Engineering unit mm (in)

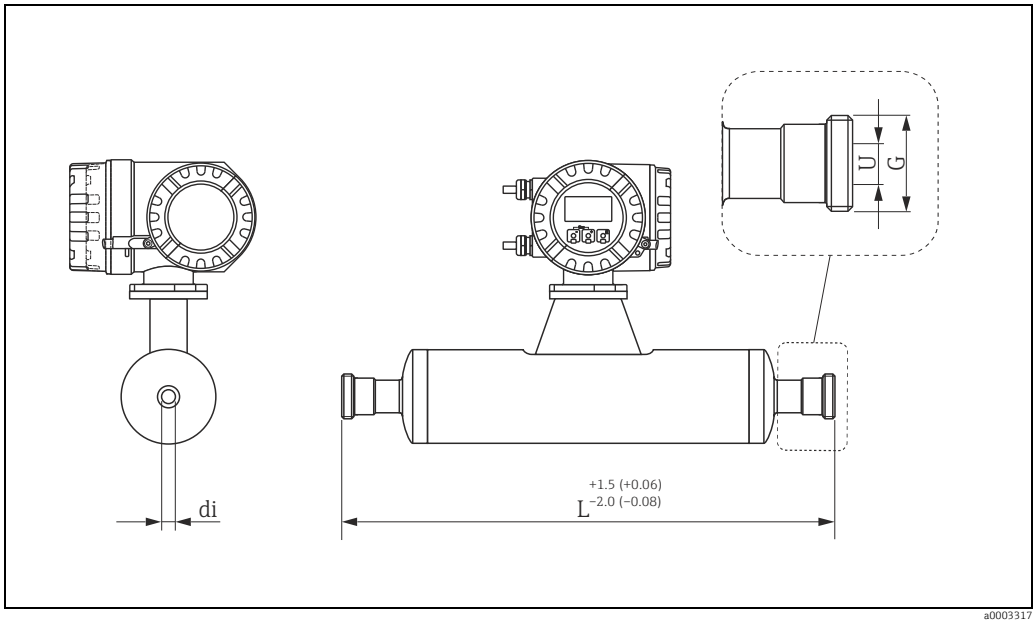
DIN 11851 thread, DIN 11866 line A: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit Order code for "Process connection", option FMA				
DN	**G**	**L**	**U**	**di**
8	Rd 34 x ⅛"	427	16	8.55
15	Rd 34 x ⅛"	463	16	11.38
15 FB	Rd 34 x ⅛"	602	16	17.07
25	Rd 52 x 1/6"	603	26	17.07
25 FB	Rd 52 x 1/6"	736	26	25.60
40	Rd 65 x 1/6"	731	38	25.60
40 FB	Rd 65 x 1/6"	855	38	35.62
50	Rd 78 x 1/6"	856	50	35.62
50 FB	Rd 78 x 1/6"	1268	50	54.8
80	Rd 110 x 1/4"	1268	81	54.8

FB = Full bore; all dimension s in [mm]

DIN 11851 thread Rd 28 x ⅛", DIN 11866 line A: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit Order code for "Process connection", option FGA				
DN	**G**	**L**	**U**	**di**
8	Rd 28 x ⅛"	426	10	8.55
15	Rd 28x ⅛"	462	10	11.38

All dimensions in [mm]

DIN 11864-1A thread, DIN 11866 line A

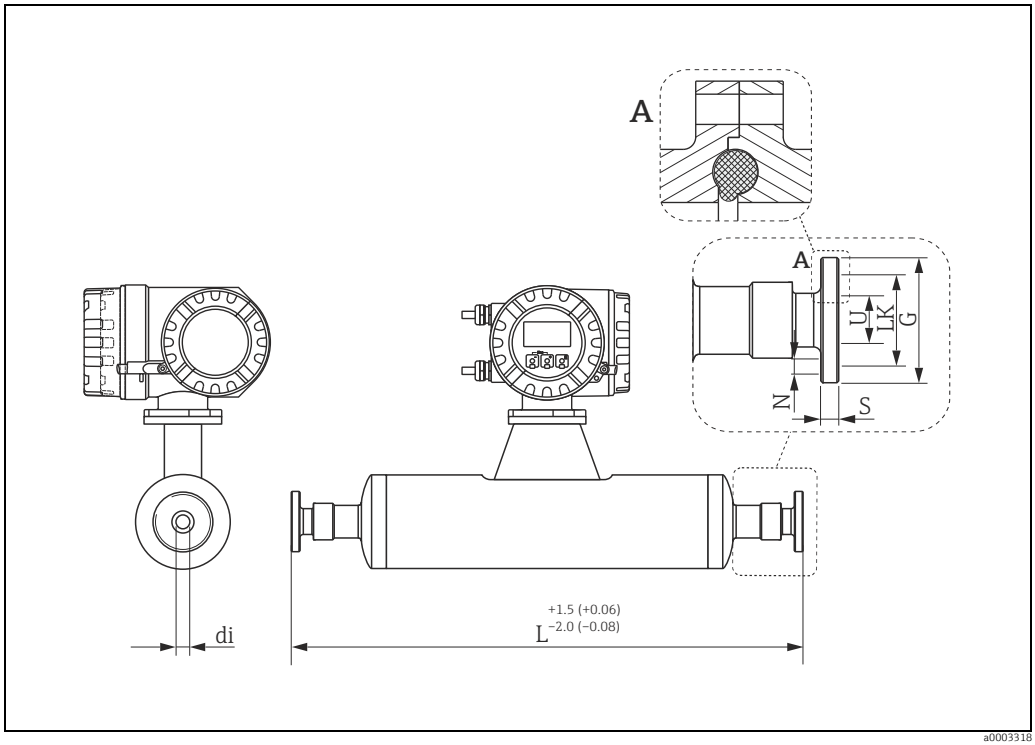


Engineering unit mm (in)

DIN 11864-1A thread, DIN 11866 line A: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FLA Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FLD				
DN	**G**	**L**	**U**	**di**
8 [1)]	Rd 28 x ⅛"	428	10	8.55
15	Rd 34 x ⅛"	463	16	11.38
15 FB	Rd 34 x ⅛"	602	16	17.07
25	Rd 52 x 1/6"	603	26	17.07
25 FB	Rd 52 x 1/6"	734	26	25.60
40	Rd 65 x 1/6"	731	38	25.60
40 FB	Rd 65 x 1/6"	855	38	35.62
50	Rd 78 x 1/6"	856	50	35.62
50 FB	Rd 78 x 1/6"	1268	50	54.8
80	Rd 110 x 1/4"	1268	81	54.8

[1)] DN 8 with DN 10 threaded adapter as standard
FB = Full bore
All dimensions in [mm]

DIN 11864-2A flange, DIN 11866 line A, flange with notch



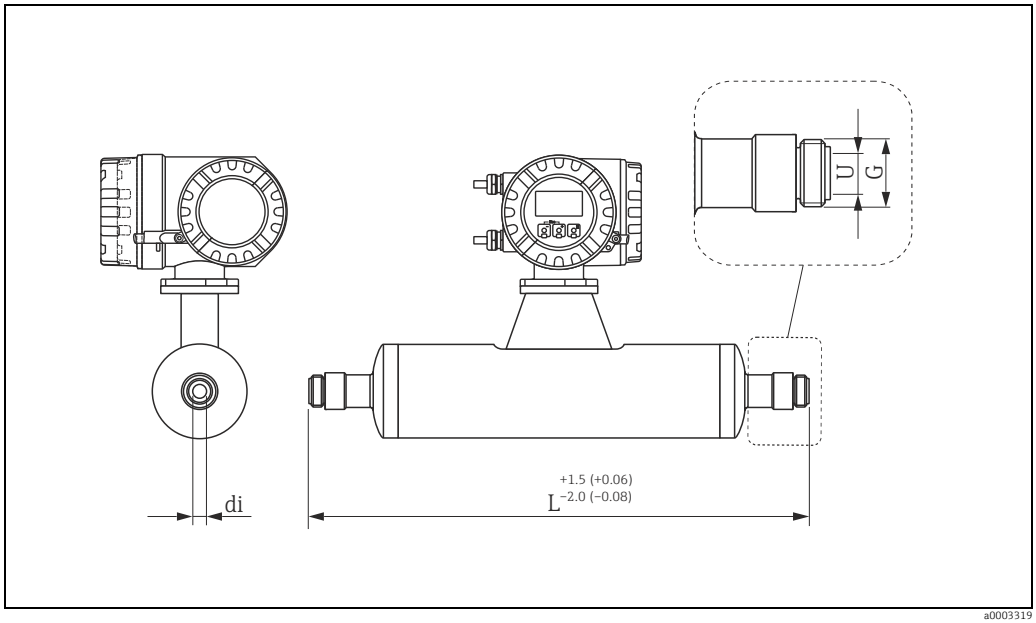
Detail A: The flange has the smaller groove for the O-ring on the sensor side. When mounting the sensor the corresponding flange must have accordingly a larger groove. Engineering unit mm (in).

DIN 11864-2A flange, DIN 11866 line A, flange with notch: Titanium
Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FKA
Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FKD

DN	G	L	N	S	LK	U	di
8 [1)]	54	449	4 x Ø9	10	37	10	8.55
15	59	485	4 x Ø9	10	42	16	11.38
25	70	625	4 x Ø9	10	53	26	17.07
40	82	753	4 x Ø9	10	65	38	25.60
50	94	874	4 x Ø9	10	77	50	35.62
80	133	1268	8 x Ø11	12	112	81	54.8

[1)] DN 8 with DN 10 threaded adapter as standard
FB = Full bore
All dimensions in [mm]

ISO 2853 thread, ISO 2037

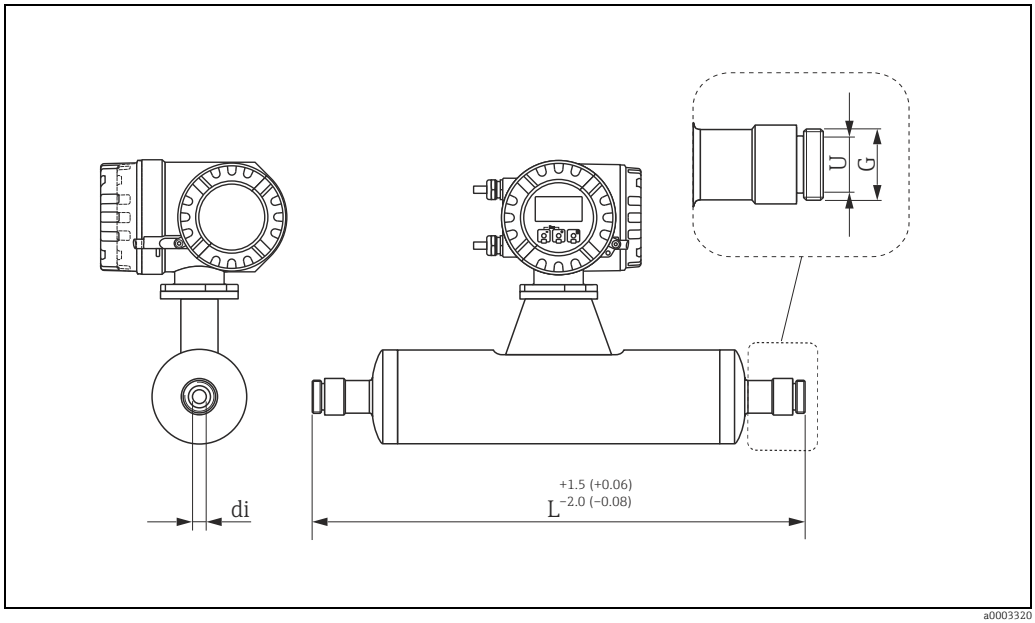


Engineering unit mm (in)

ISO 2853 thread, ISO 2037: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit: Order code for "Process connection", option FJA Surface roughness Ra ≤ 0.4 µm/240 grit: Order code for "Process connection", option FJD				
DN	**G**	**L**	**U**	**di**
8 [1]	37.13	435	22.6	8.55
15	37.13	471	22.6	11.38
15 FB	37.13	610	22.6	17.07
25 FB	37.13	744	22.6	25.60
40	50.65	737	35.6	25.60
40 FB	50.65	859	35.6	35.62
50	64.16	856	48.6	35.62
50 FB	64.1	1268	48.6	54.8
80	91.19	1268	72.9	54.8

[1] DN 8 with DN 10 threaded adapter as standard
FB = Full bore
All dimensions in [mm]

SMS 1145 thread



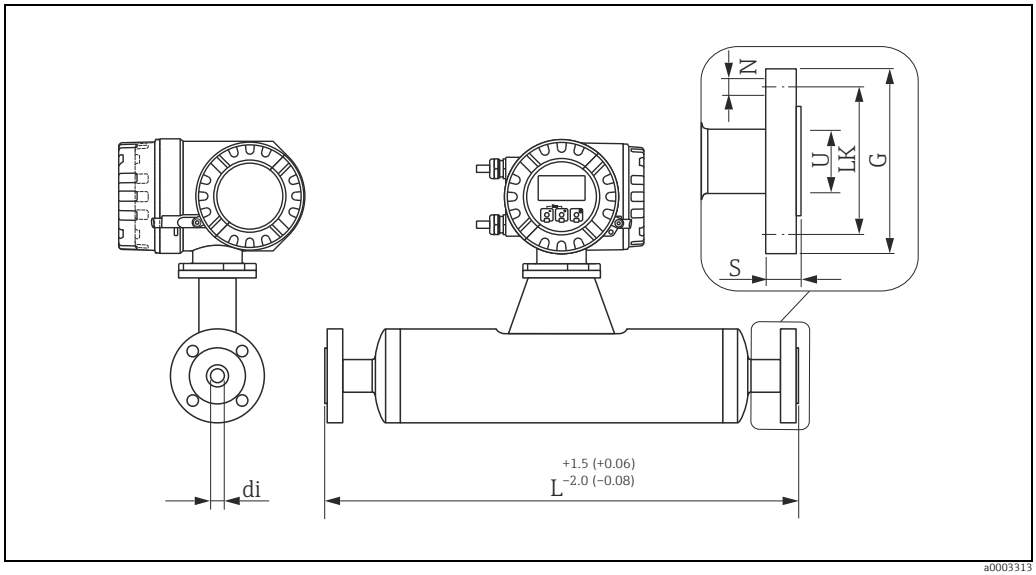
Engineering unit mm (in)

SMS 1145 thread: Titanium Surface roughness Ra ≤ 0.8 µm/150 grit Order code for "Process connection", option FSA				
DN	**G**	**L**	**U**	**di**
8	Rd 40 x 1/6"	427	22.5	8.55
15	Rd 40 x 1/6"	463	22.5	11.38
25	Rd 40 x 1/6"	603	22.5	17.07
25 FB	Rd 40 x 1/6"	736	22.5	25.60
40	Rd 60 x 1/6"	738	35.5	25.60
40 FB	Rd 60 x 1/6"	857	35.5	35.62
50	Rd 70 x 1/6"	858	48.5	35.62
40 FB	Rd 70 x 1/6"	1258	48.5	54.8
80	Rd 98 x 1/6"	1268	72	54.8

FB = Full bore
All dimensions in [mm]

Process connections in US units

Flange according to ASME B16.5, Cl 150
Flange according to ASME B16.5, Cl 300
Flange according to ASME B16.5, Cl 600



Engineering unit mm (in)

Flange according to ASME B16.5, Cl 150: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): Ra 125 to 248 µin Order code for "Process connection", option AAW							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
⅜" [1]	3.50	15.83	4 x Ø0.62	0.79	2.38	0.62	0.34
½"	3.50	17.24	4 x Ø0.62	0.79	2.38	0.62	0.45
½" FB	3.50	22.52	4 x Ø0.62	0.75	2.38	0.67	0.67
1"	4.25	22.76	4 x Ø0.62	0.91	3.12	1.05	0.67
1" FB	4.25	27.56	4 x Ø0.62	0.87	3.12	1.01	1.01
1½"	5.00	27.87	4 x Ø0.62	1.02	3.88	1.61	1.01
1½" FB	5.00	32.24	4 x Ø0.62	0.94	3.88	1.40	1.40
2"	6.00	32.56	4 x Ø0.75	1.10	4.75	2.07	1.40
2" FB	6.00	47.64	4 x Ø0.75	1.57	4.75	2.16	2.16
3"	7.50	47.64	4 x Ø0.75	1.46	6.00	3.07	2.16

[1] DN ⅜" with DN ½" flange as standard
FB = Full bore
All dimension in [in]

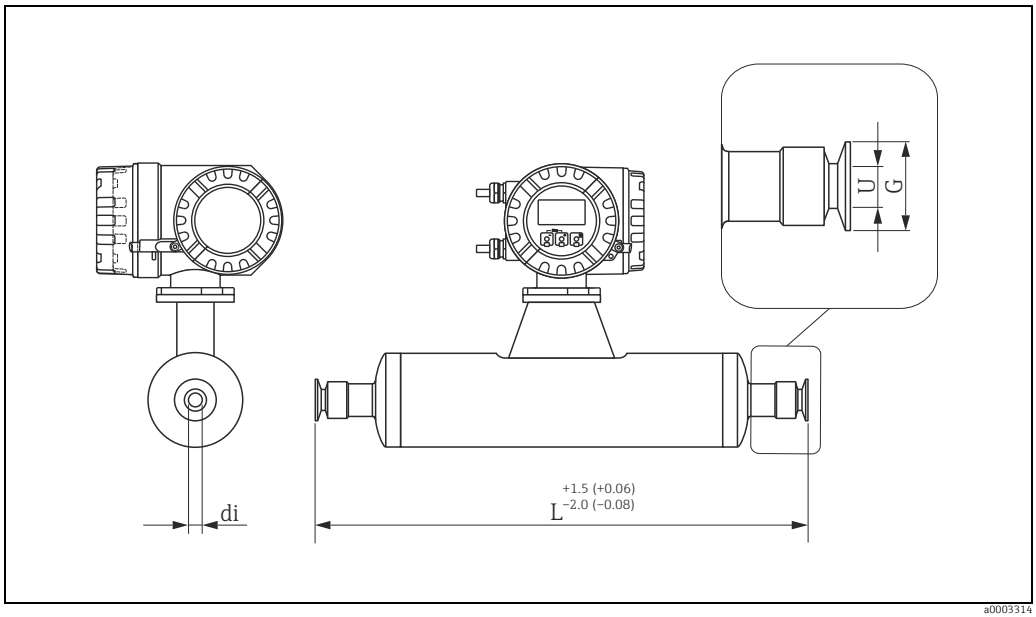
Flange according to ASME B16.5, Cl 300: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): Ra 125 to 248 µin Order code for "Process connection", option ABW							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
⅜" [1]	3.75	15.83	4 x Ø0.62	0.79	2.62	0.62	0.34
½"	3.75	17.24	4 x Ø0.62	0.79	2.62	0.62	0.45
½" FB	3.75	22.52	4 x Ø0.62	0.75	2.62	0.67	0.67
1"	4.88	22.76	4 x Ø0.75	0.91	3.50	1.05	0.67
1" FB	4.88	27.56	4 x Ø0.75	0.87	3.50	1.01	1.01
1½"	6.12	27.87	4 x Ø0.88	1.02	4.50	1.61	1.01
1½" FB	6.12	32.24	4 x Ø0.88	0.94	4.50	1.40	1.40
2"	6.50	32.56	8 x Ø0.75	1.10	5.00	2.07	1.40
2" FB	6.50	47.64	8 x Ø0.75	1.69	5.00	2.16	2.16
3"	8.25	47.64	8 x Ø0.88	1.65	6.62	3.07	2.16

[1] DN ⅜" with DN ½" flange as standard
FB = Full bore
All dimensions in [in]

Flange according to ASME B16.5, Cl 600: 1.4301 (304), fluid wetted parts: Titanium Surface roughness (flange): Ra 125 to 248 µin Order code for "Process connection", option ACW							
DN	**G**	**L**	**N**	**S**	**LK**	**U**	**di**
⅜" [1]	3.75	15.83	4 x Ø15.7	0.79	2.62	0.54	0.34
½"	3.75	17.24	4 x Ø15.7	0.79	2.62	0.54	0.45
½" FB	3.75	22.76	4 x Ø15.7	0.87	2.62	0.67	0.67
1"	4.88	22.76	4 x Ø19.1	0.91	3.50	0.96	0.67
1" FB	4.88	27.80	4 x Ø19.1	0.98	3.50	1.01	1.01
1½"	6.12	27.87	4 x Ø22.4	1.10	4.50	1.50	1.01
1½" FB	6.12	32.48	4 x Ø22.4	1.14	4.50	1.40	1.40
2"	6.50	32.76	8 x Ø19.1	1.30	5.00	1.94	1.40
2" FB	6.50	47.64	8 x Ø19.1	1.81	5.00	2.16	2.16
3"	8.25	48.11	8 x Ø22.3	2.09	6.62	2.90	2.16

[1] DN ⅜" with DN ½" flange as standard
FB = Full bore version of Promass I; all dimensions in [in]

Tri-Clamp, DIN 11866 line C
Tri-Clamp 2½", DIN 11866 line C
Tri-Clamp ¾", DIN 11866 line C
Tri-Clamp ½", DIN 11866 line C



Engineering unit mm (in)

Tri-Clamp, DIN 11866 line C: Titanium Surface roughness Ra ≤ 32 µin/150 grit: Order code for "Process connection", option FTA Surface roughness Ra ≤ 16 µin/240 grit: Order code for "Process connection", option FTD					
DN	**Clamp**	**G**	**L**	**U**	**di**
⅜"	1"	1.98	16.81	0.87	0.34
½"	1"	1.98	18.23	0.87	0.45
½" FB	see Tri-Clamp, ¾" connection				
1"	1"	1.98	23.74	0.87	0.67
1" FB	1"	1.98	28.74	0.87	1.01
1½"	1 ½"	1.98	28.78	1.37	1.01
1½" FB	1 ½"	1.98	33.43	1.37	1.40
2"	2"	2.52	33.46	1.87	1.40
2 FB	see Tri-Clamp, 2½" connection				
3"	3"	3.58	49.92	2.87	2.16

FB = Full bore
All dimension in [in]

Tri-Clamp 2½", DIN 11866 line C: Titanium Surface roughness Ra ≤ 32 µin/150 grit: Order code for "Process connection", option FRA Surface roughness Ra ≤ 16 µin/240 grit: Order code for "Process connection", option FRD					
DN	**Clamp**	**G**	**L**	**U**	**di**
2" FB	2 ½"	3.05	49.92	2.37	2.16

FB = Full bore
All dimension in [in]

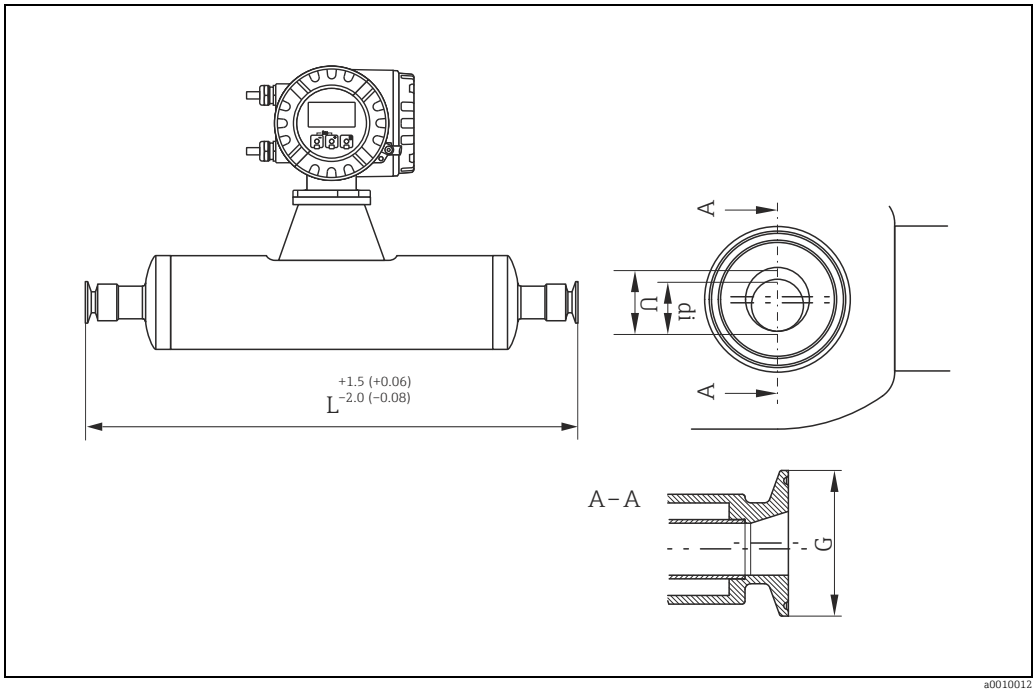
Tri-Clamp ¾", DIN 11866 line C: Titanium Surface roughness Ra ≤ 32 µin/150 grit: Order code for "Process connection", option FPA Surface roughness Ra ≤ 16 µin/240 grit: Order code for "Process connection", option FPD					
DN	**Clamp**	**G**	**L**	**U**	**di**
⅜"	¾"	0.98	16.77	0.63	0.34
½"	¾"	0.98	18.19	0.63	0.45
½" FB	¾"	0.98	23.70	0.63	0.67

FB = Full bore
All dimensions in [in]

Tri-Clamp ½", DIN 11866 line C: Titanium Surface roughness Ra ≤ 32 µin/150 grit: Order code for "Process connection", option FUA Surface roughness Ra ≤ 16 µin/240 grit: Order code for "Process connection", option FUD					
DN	**Clamp**	**G**	**L**	**U**	**di**
⅜"	½"	0,98	16,77	0,37	0,34
½"	½"	0,98	18,19	0,37	0,45

All dimension in [in]

Tri-Clamp eccentric, DIN 11866 line C



a0010012

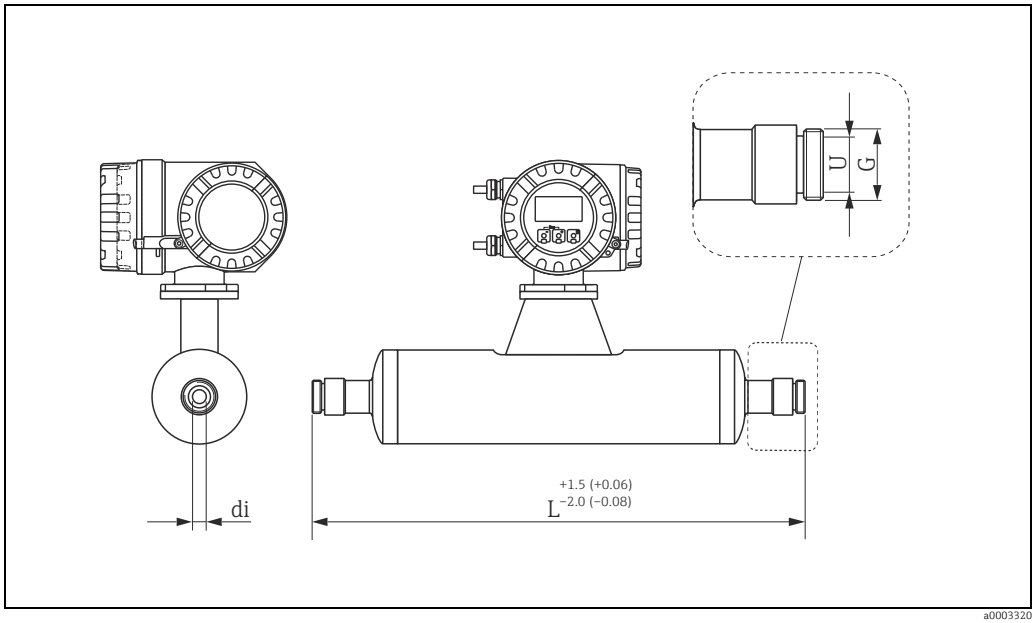
Engineering unit mm (in)

Tri-Clamp eccentric, DIN 11866 line C: Titanium							
DN	**Ra_{max} = 32 µin Order code for "Process connection", option**	**Ra_{max} = 16 µin Order code for "Process connection", option**	**Clamp**	**G**	**L**	**U**	**di**
⅜"	EBA	EBD	½"	0.98	16.8	0.37	0.33
½"	EPA	EPD	¾"	0.98	18.2	0.62	0.44
½" FB	EAA	EAD	1"	1.97	23.7	0.87	0.67
1"	EAA	EAD	1"	1.97	23.7	0.87	0.67
1" FB	EUA	EUD	1½"	1.97	28.7	1.37	1.04
1½"	EUA	EUD	1½"	1.97	28.7	1.37	1.04
1½" FB	ESA	ESD	2"	2.52	33.4	1.87	1.40
2"	ESA	ESD	2"	2.52	33.4	1.87	1.40
2" FB	ERA	ERD	2 ½"	3.05	49.9	2.37	2.16
2" FB	ECA	ECD	3"	3.58	49.9	2.87	2.16
80	ERA	ERD	2 ½"	3.05	49.9	2.37	2.16
80	ECA	ECD	3"	3.58	49.9	2.87	2.16

FB = Full bore
All dimension in [in]

Further information refer to "Eccentric Tri-clamps" → 19

SMS 1145 thread



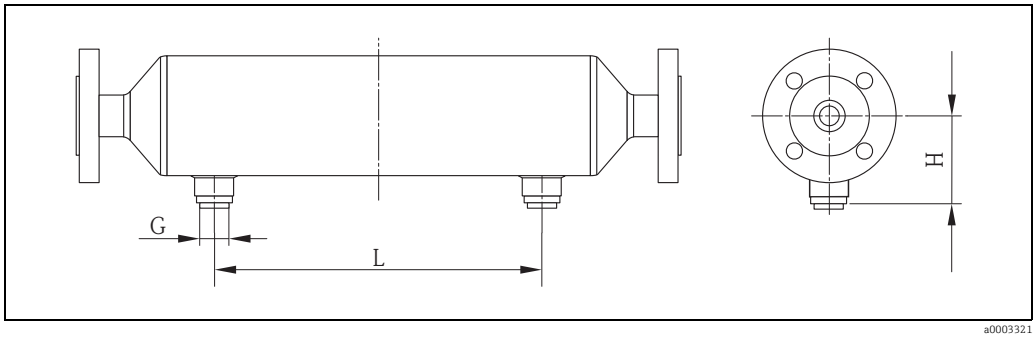
Engineering unit mm (in)

SMS 1145 thread: Titanium Surface roughness Ra ≤ 32 µin/150 grit Order code for "Process connection", option FSA				
DN	**G**	**L**	**U**	**di**
⅜"	Rd 40 x 1/6"	16.81	0.89	0.34
½"	Rd 40 x 1/6"	18.23	0.89	0.45
½" FB	Rd 40 x 1/6"	23.74	0.89	0.67
1"	Rd 40 x 1/6"	28.98	0.89	1.01
1" FB	Rd 60 x 1/6"	29.06	1.40	1.01
1½"	Rd 60 x 1/6"	33.74	1.40	1.40
1½" FB	Rd 70 x 1/6"	33.78	1.91	1.40
2"	Rd 70 x 1/6"	49.53	1.91	2.16
2" FB	Rd 98 x 1/6"	49.92	2.83	2.16

FB = Full bore
All dimension in [in]

Purge connections, secondary containment monitoring

Purge connections or secondary containment monitoring can not be combined with separately available heating jacket.



a0003321

DN		G	H		L	
[mm]	[in]		[mm]	[in]	[mm]	[in]
8	⅜"	½"-NPT	90.65	3.57	122	4.80
15	½	½"-NPT	90.65	3.57	158	6.22
15 FB	½ FB	½"-NPT	90.65	3.57	158	6.22
25	1	½"-NPT	90.65	3.57	296	11.66
25 FB	1 FB	½"-NPT	90.65	3.57	296	11.66
40	1½	½"-NPT	103.35	4.07	392	15.44
40 FB	1½ FB	½"-NPT	103.35	4.07	392	15.44
50	2	½"-NPT	117.75	4.64	488	19.22
50 FB	2 FB	½"-NPT	145.5	5.73	814	32.40
80	3	½"-NPT	145.5	5.73	814	32.40

FB = Full bore

Weight

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

Weight in SI units

DN [mm]	8	15	15 FB	25	25 FB	40	40 FB	50	50 FB	80
Compact version	13	15	21	22	41	42	67	69	120	124
Remote version	11	13	19	20	39	40	65	67	118	122

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

Weight in US units

DN [in]	⅜"	½"	½" FB	1"	1" FB	1½"	1½" FB	2"	2" FB	3"
Compact version	29	33	42	44	88	90	143	148	265	273
Remote version	24	29	37	40	84	86	139	143	260	269

FB = Full bore, All values (weight) refer to devices with EN/DIN PN 40 flanges.
Weight information in [lbs]

Materials

Transmitter housing

Compact version
- Powder coated die-cast aluminium
- Stainless steel housing: stainless steel, 1.4301 (304)
- Window material: Glass or polycarbonate

Remote version
- Remote field housing: powder coated die-cast aluminium
- Wall-mount housing: powder coated die-cast aluminium
- 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

- Flanges according to EN 1092-1 (DIN 2501); Flanges according to ASME B16.5; JIS B2220 flange:
  - Stainless steel, 1.4301 (304)
  - Wetted parts: Grade 2 titanium
- All other process connections: Grade 2 titanium

Measuring tubes

- Grade 9 titanium
- Grade 2 titanium (flange disk)

Seals

Welded process connections without internal seals

Process connections

- Flanges:
  - according to EN 1092-1 (DIN 2501)
  - according to ASME B16.5
  - JIS B2220
  - DIN 11864-2A
- Threaded connection:
  - DIN 11864-1A
  - DIN 11851
  - SMS 1145
  - ISO 2853
- Clamp connection:
  - Tri-Clamp
- Eccentric clamp (to be used to ensure complete drainability when mounted horizontally):
  - Tri-Clamp

Surface roughness

Surface roughness of process wetted parts.
- Ra_{max} = 0.8 µm (32 µin) mechanically polished
- Ra_{max} = 0.4 µm (16 µin) mechanically polished

Operability

Local operation

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 (⊟⊞Ⓔ)
- Quick Setup menus for straightforward commissioning

Promass 83:

- Local operation with three optical keys (⊟⊞Ⓔ)
- Application-specific Quick Setup menus for straightforward commissioning

Language group

Language groups available for operation in different countries:

Valid until software version 3.01.xx			
Order code	**Option**		**Content**
Power Supply; Display	WEA	Western Europe and America	English, German, Spanish, Italian, French, Dutch and Portuguese
	EES	Eastern Europe and Scandinavia	English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
	SEA	South and East Asia	English, Japanese, Indonesian
	only Promass 83		
	CN	China	English, Chinese

Valid as of software version 3.07.xx (only Promass 83)		
Order code	**Option**	**Content**
Power Supply; Display	P, Q	English, German, Spanish, Italian, French
	R, S	English, Russian, Portuguese, Dutch, Czech
	T, U	English, Japanese, Swedish, Norwegian, Finnish
	4, 5	English, Chinese, Indonesian, Polish

You can change the language group via the operating program "FieldCare".

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.

Sanitary compatibility

- 3A approval
- EHEDG tested

Functional safety

SIL -2: accordance IEC 61508/IEC 61511-1 (FDIS)

"4 to 20 mA" output according to the following order code:
A, B, C, D, E, L, M, R, S, T, U, W, 0, 2, 3, 4, 5, 6, 8
See also "Terminal assignment" → 🖹 9

HART certification

The flowmeter has successfully passed all the test procedures carried out and is certified and registered by the HCF (Hart Communication Foundation). The device thus meets all the requirements of the following specifications:

- Certified in accordance with HART Revisions 5 and 7 (device certification number: available on request)
- The measuring device can also be operated with certified devices of other manufacturers (interoperability).

FOUNDATION Fieldbus certification

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:

- 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

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:

- 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

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.

Pressure Equipment Directive

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.

- 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:
  - Fluids of Group 1 and 2 with a steam pressure greater than, or smaller and equal to 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.

Other standards and guidelines

- EN 60529
  Degrees of protection by housing (IP code)
- EN 61010-1
  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures
- EN 61508
  Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
- 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

Ordering Information

Detailed ordering information is available from the following sources:
- In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: www.endress.com/worldwide

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

Accessories

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

Device-specific accessories

For the Transmitter

Accessories	Description
Transmitter	Transmitter for replacement or for stock. Use the order code to define the following specifications: ▪ Approvals ▪ Degree of protection, version ▪ Cable entries, ▪ Display, power supply, operation ▪ Software ▪ Outputs, inputs
Inputs/outputs for Proline Promass 83 HART	Conversion kit with appropriate plug-in point modules for converting the input/ output configuration in place to date to a new version.
Software packages for Proline Promass 83	Software add-ons on F-Chip, can be ordered individually: ▪ Advanced diagnostics ▪ Batching functions ▪ Concentration measurement
Mounting set for transmitter	Mounting set for wall-mount housing (remote version). Suitable for: ▪ Wall mounting ▪ Pipe mounting ▪ Installation in control panel Mounting set for aluminum field housing: Suitable for pipe mounting (¾" to 3")

For the Sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids. If using oil as a heating medium, please consult with Endress+Hauser. For details, see Operating Instructions BA00099D

Communication-specific accessories

Accessories	Description
HART Communicator Field Xpert handheld terminal	Handheld terminal for remote parameterization and for obtaining measured values via the current output HART (4 to 20 mA). Contact your Endress +Hauser representative for more information.
Commubox FXA195 HART	The Commubox FXA195 connects intrinsically safe smart transmitters with the HART protocol with the USB port of a personal computer. This enables remote operation of the transmitter with operating software (e.g. FieldCare). Power is supplied to the Commubox via the USB port.

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://wapps.endress.com/applicator ▪ On CD-ROM for local PC installation
W@M	Life cycle management for your plant. W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation
Fieldcheck	Tester/simulator for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.
FieldCare	FieldCare is Endress+Hauser's FDT-based plant asset management tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple but effective tool for monitoring devices. The Proline flowmeters are accessed via a service interface or via the service interface FXA193.
FXA193	Service interface from the measuring device to the PC for operation via FieldCare.

System components

Accessories	Description
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a DSD card or USB stick. Memograph M boasts a modular design, intuitive operation and a comprehensive security concept. The ReadWin® 2000 PC software is part of the standard package and is used for configuring, visualizing and archiving the data captured. The mathematics channels which are optionally available enable continuous monitoring of specific power consumption, boiler efficiency and other parameters which are important for efficient energy management.

Documentation

- Flow measuring technology (FA00005D)
- Technical Information
  - Promass 80A, 83A (TI00054D)
  - Promass 80E, 83E (TI00061D)
  - Promass 80F, 83F (TI00101D)
  - Promass 80H, 83H (TI00074D
  - Promass 80P, 83P (TI00078D)
  - Promass 80S, 83S (TI00076D)
- Operating Instructions/Description of Device Functions
  - Promass 80 HART (BA00057D/BA00058D)
  - Promass 80 PROFIBUS PA (BA00072D/BA00073D)
  - Promass 83 HART (BA00059D/BA00060D)
  - Promass 83 FOUNDATION Fieldbus (BA00065D/BA00066D)
  - Promass 83 PROFIBUS DP/PA (BA00063D/BA00064D)
  - Promass 83 Modbus (BA00107D/BA00108D)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, IECEx NEPSI
- Functional safety manual Promass 80, 83 (SD00077D)

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 SCHNEIDER AUTOMATION, INC.

Applicator®, FieldCare®, Fieldcheck®, HistoROM™, F-CHIP®, S-DAT®, T-DAT™
Registered or registration-pending trademarks of the Endress+Hauser Group

www.addresses.endress.com

Endress+Hauser

People for Process Automation