Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Proline Promass 80S, 83S

Coriolis Mass Flow Measuring System
The single-tube system with a "fit-and-forget" design: Easy to clean – hygienic – drainable – does not harm the material being measured – chemical-resistant materials

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 food industry processes such as:
  - Milk, cheese and yogurt
  - Beer, wine, mineral water, soft drink, fruit and vegetable juice
  - Oil, fat, margarine, chocolate and confectionery
  - Cleaning agents and solvents
- Fluid temperatures up to +150 °C (+302 °F)
- Process pressures up to 63 bar (914 psi)
- Mass flow measurement up to 70 t/h (2570 lb/min)

Approvals for hazardous area:
- ATEX, FM, CSA, TIIS, IECEx, NEPSI

Approvals in the food industry/hygiene sector:
- 3A, EHEDG

Connection to all common process control systems:
- HART, PROFIBUS PA/DP, FOUNDATION Fieldbus, MODBUS

Relevant safety aspects:
- Secondary containment up to 16 bar (232 psi), Pressure Equipment Directive, SIL-2

Your benefits
The Promass measuring devices make it possible to simultaneously record several process variables (mass/density/temperature) for various process conditions during measuring operation.

The uniform **Proline transmitter concept** includes:
- Modular device and operating concept resulting in a higher degree of efficiency
- Software options for batching and concentration measurement for extended range of application
- Diagnostic ability and data back-up for increased process quality

The **Promass sensors**, tried and tested in over 100 000 applications, offer:
- Multivariable flow measurement in compact design
- Insensitivity to vibrations thanks to balanced single-tube measuring system
- Efficient protection against forces from piping thanks to robust construction
- Easy installation without taking inlet and outlet runs into account

TI076D/06/en/10.09
71105841

Endress+Hauser
People for Process Automation

Table of contents

Function and system design

Measuring principle

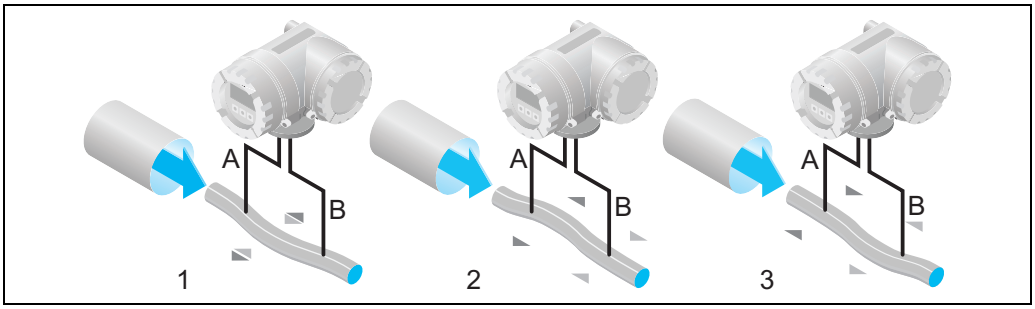
The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present when both translational and rotational movements are superimposed.

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



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.

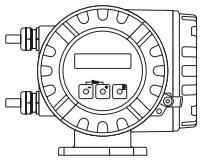
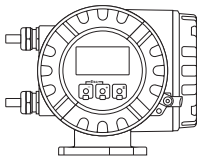
Temperature measurement

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.

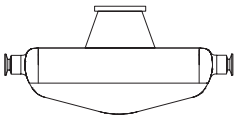
Measuring system

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.

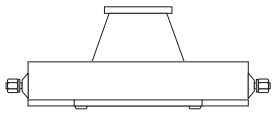
Transmitter

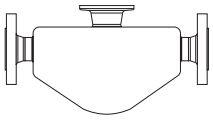
Promass 80  a0003671	■ Two-line liquid-crystal display ■ Operation with push buttons
Promass 83  a0003672	■ Four-line liquid-crystal display ■ Operation with “Touch control” ■ Application-specific Quick Setup ■ Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. fluid concentrations)

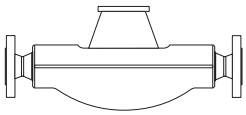
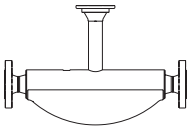
Sensor

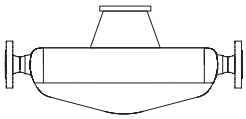
S  a0006828	■ Single bent tube. Hygienic design, low pressure loss, for fluid temperatures up to 150 °C (+302 °F) ■ Nominal diameters DN 8 to 50 (3/8" to 2") ■ Material: Stainless steel, EN 1.4539/ASTM 904L, EN 1.4435/ASTM 316L	Documentation No. TI076D

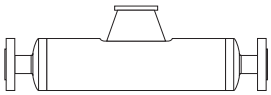
Other sensors can be found in the separate documentation

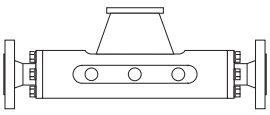
A  a0003679	■ Single-tube system for highly accurate measurement of very small flows ■ Nominal diameters DN 1 to 4 (1/24" to 1/8") ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L , Alloy C-22 DIN 2.4602 (process connection)	Documentation No. TI054D

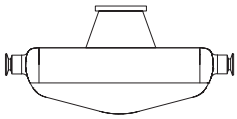
E  a0002271	■ General purpose sensor, ideal replacement for volumetric flowmeters. ■ Nominal diameters DN 8 to 80 (3/8" to 3") ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L	Documentation No. TI061D

F  a0003673	■ 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	Documentation No. TI101D
F (High-temperature)  a0003675	■ 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	

H  a0003677	■ 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	Documentation No. TI074D

I  a0003678	■ 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	Documentation No. TI075D

M  a0003676	■ 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	Documentation No. TI102D

P  a0006828	■ 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	Documentation No. TI078D

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]	[inch]	[kg/h]	[lb/min]
8	3/8"	0 to 2000	0 to 73.5
15	½"	0 to 6500	0 to 238
25	1"	0 to 18000	0 to 660
40	1 ½"	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:

$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} / x$ [kg/m³]

$\dot{m}_{max(G)}$ = 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
[mm]	[inch]	
8	3/8"	60
15	½"	80
25	1"	90
40	1 ½"	90
50	2"	90

Here, $_{mmax(G)}$ can never be greater than $_{mmax(F)}$

Calculation example for gas:

- Sensor type: Promass S, 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 S, DN 50)

Max. possible full scale value:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} \div x$ [kg/m³] = 70000 kg/h · 60.3 kg/m³ ÷ 90 kg/m³ = 46900 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 kΩ, 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 kΩ, galvanically isolated.
Switch level: ±3…±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 kΩ, galvanically isolated.
Switch level: ±3…±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 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.f.s./°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:

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 × Analog Input, 2 × 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 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)

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 × Analog Input, 3 × 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 → 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 × Analog Input, 3 × 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 → 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 → 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: 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
- Function blocks: 7 × Analog Input, 1 × Digital Output, 1 × PID
- 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)

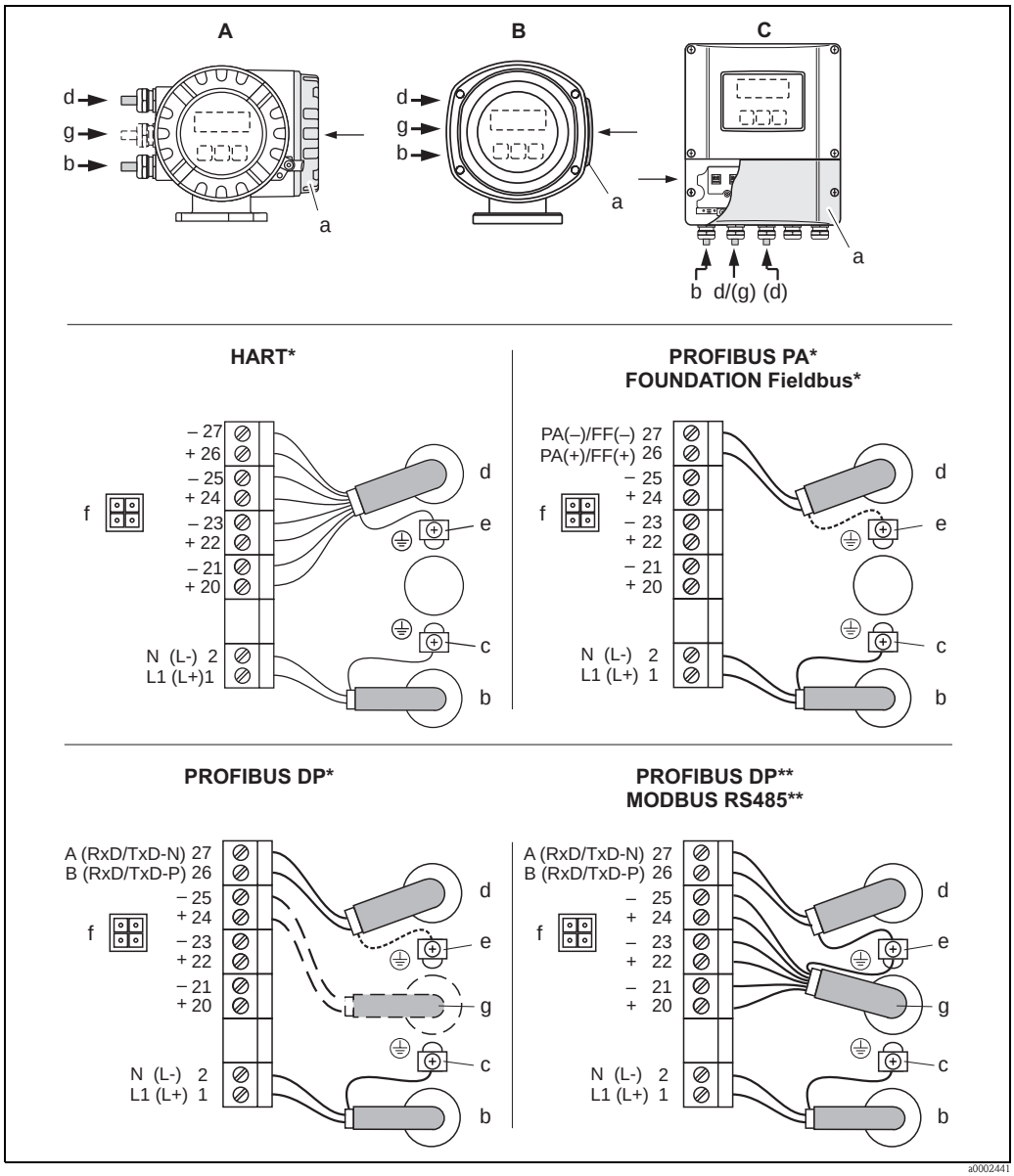
- Open collector
- max. 30 V DC / 250 mA
- galvanically isolated
- Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values

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

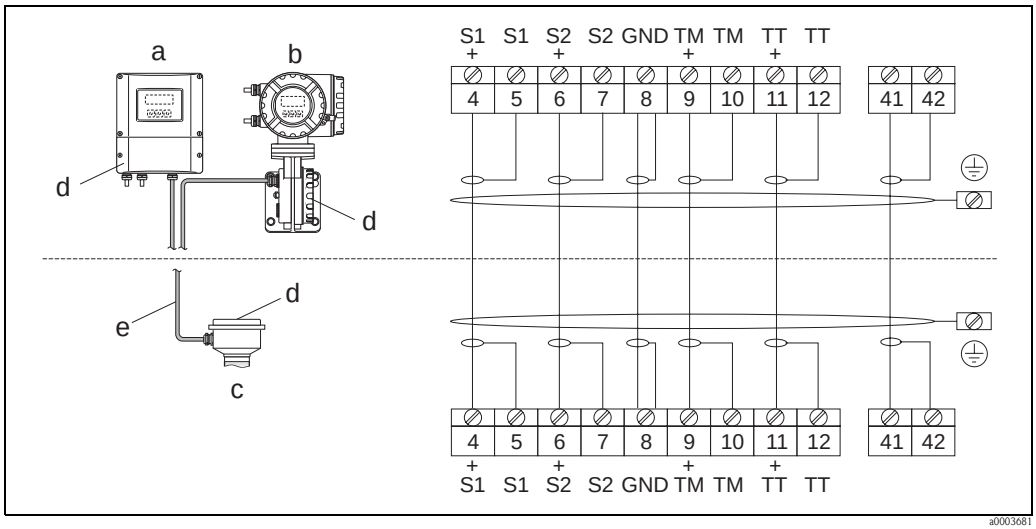
Promass 83

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 (–)
Fixed communication boards (permanent assignment)				
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
Flexible communication boards				
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	Frequency 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: 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

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 × 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)
- Permanent 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 IEC/EN 61326, and NAMUR recommendation NE 21/43.

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.)

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, typically 20 to 30 °C (68 to 86 °F); 2 to 4 bar (30 to 60 psi)
- Data according to calibration protocol ±5 °C (±9 °F) and ±2 bar (±30 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 µA. Design fundamentals → 16.

o.r. = of reading

Mass flow and volume flow (liquids

Promass 83S:
- ±0.10% o.r.

Promass 80S:
- ±0.15% o.r.

Mass flow (gases)

Promass 83S, 80S: ±0.50% o.r.

Density (liquid)

- ±0.0005 g/cc (under reference conditions)
- ±0.0005 g/cc (after field density calibration under process conditions)
- ±0.002 g/cc (after special density calibration)
- ±0.01 g/cc (over the entire measuring range of the sensor)

1 g/cc = 1 kg/l

Special density calibration (optional):
- Calibration range: 0.8 to 1.8 g/cc, +5 to +80 °C (+41 to +176 °F)
- Operation range : 0.0 to 5.0 g/cc, –50 to +150 °C (–58 to +302 °F)

Temperature

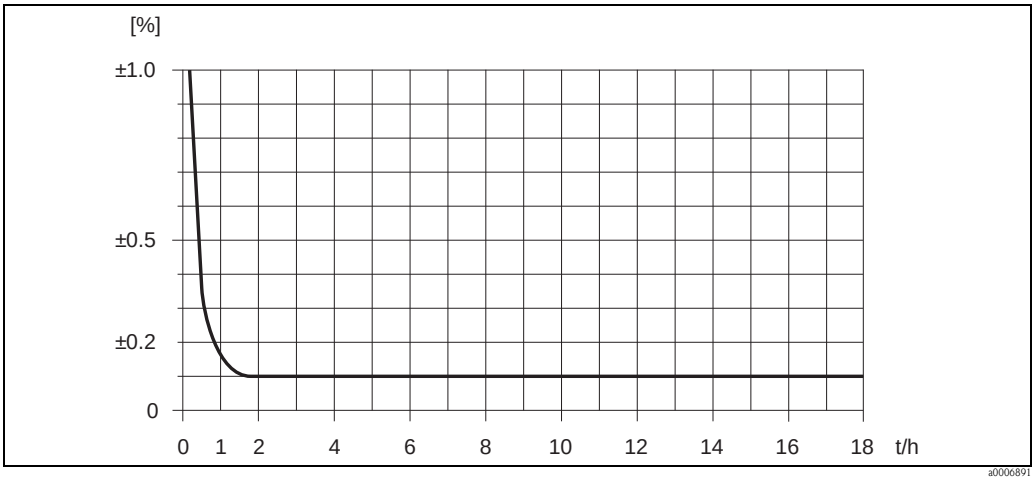
±0.5 °C ± 0.005 · T °C
(±1 °F ± 0.003 · (T - 32) °F)

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	½"	0.65	0.024
25	1"	1.80	0.066
40	1½"	4.50	0.165
50	2"	7.00	0.257

Sample calculation



Max. measured error in % of measured value (example: Promass 83S / DN 25)

Flow values (example)

Design fundamentals → 16

Turn down	Flow		Max. measured error
	[kg/h] or [l/h]	[lb/min]	[% o.r.]
250 : 1	72	2.646	2.50
100 : 1	180	6.615	1.00
25 : 1	720	26.46	0.25
10 : 1	1800	66.15	0.10
2 : 1	9000	330.75	0.10

o.r. = of reading

Repeatability

Design fundamentals → 16.

o.r. = of reading

Mass flow and volume flow (liquids)

Promass 80S, 83S: ±0.05% o.r.

Mass flow (gases)

Promass 80S, 83S: ±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 S
[mm]	[inch]	[% o.r./bar]
8	3/8"	–0.002
15	½"	–0.006
25	1"	–0.005
40	1½"	–0.005
50	2"	–0.005

o.r. = of reading

Design fundamentals

Dependent on the flow:

- Flow ≥ Zero point stability ÷ (base accuracy ÷ 100)
  - Max. measured error: ±base accuracy in % o.r.
  - Repeatability: ± ½ · base accuracy in % o.r.
- Flow < Zero point stability ÷ (base accuracy ÷ 100)
  - Max. measured error: ± (zero point stability ÷ measured value) · 100% o.r.
  - Repeatability: ± ½ · (zero point stability ÷ measured value) · 100% o.r.

o.r. = of reading

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

Operating conditions: Installation

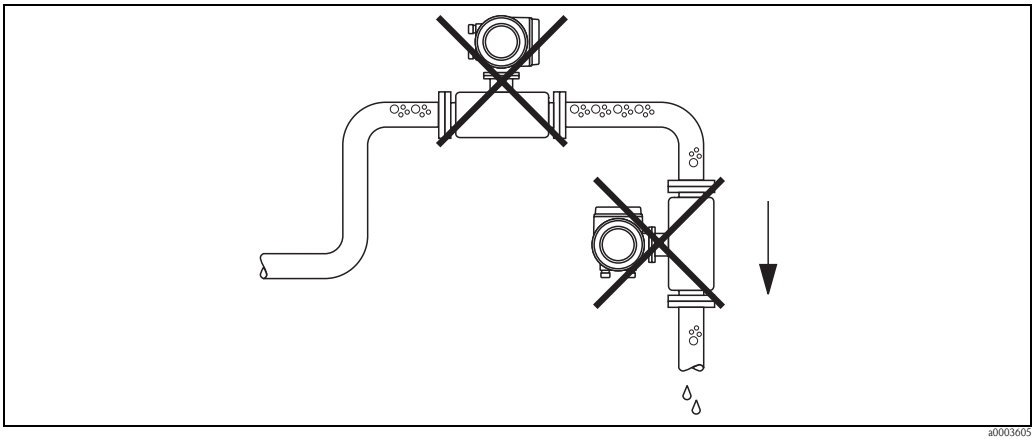
Installation instructions

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.

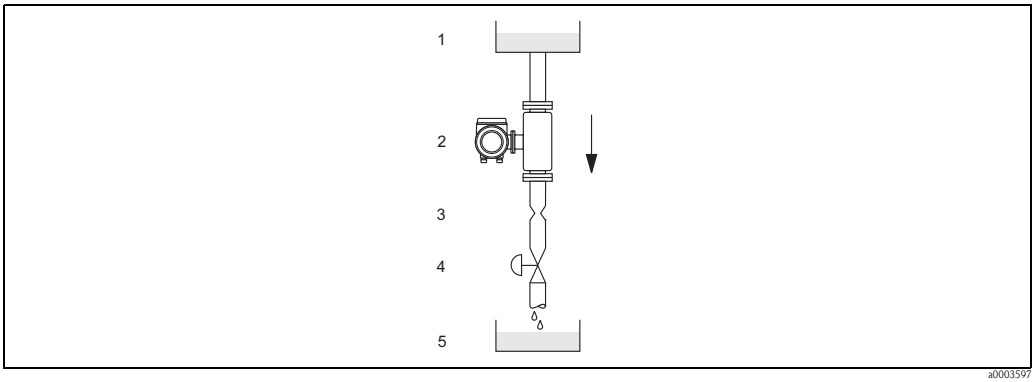
Mounting location

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		∅ Orifice plate, pipe restriction	
[mm]	[inch]	[mm]	[inch]
8	3/8"	6	0.24
15	½"	10	0.39
25	1"	14	0.55
40	1½"	22	0.87
50	2"	28	1.10

Orientation

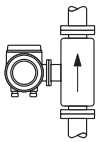
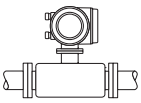
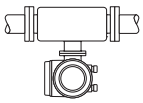
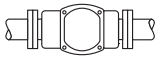
Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction of fluid flow through the pipe.

Vertical (view 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 (views H1, H2, H3)

The transmitter can be installed in any orientation in a horizontal pipe run.
Please note the special installation instructions → 19.

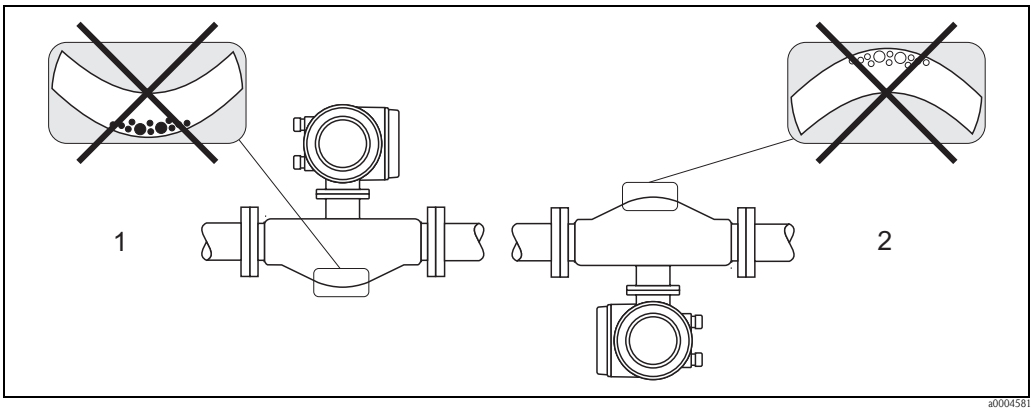
Orientation:	**Vertikal**	**Horizontal, Transmitter head up**	**Horizontal, Transmitter head down**	**Horizontal, Transmitter head to the side**
	 a0004572 *View V*	 a0004576 *View H1*	 a0004580 *View H2*	 a0007558 *View H3*
Standard, Compact version	✔✔	✔✔ ①	✔✔	✔✔
Standard, Remote version	✔✔	✔✔ ①	✔✔	✔✔

✔✔ = Recommended orientation; ✔ = Orientation recommended in certain situations; ✘ = Impermissible orientation

① = To ensure that the maximum permitted ambient temperature for the transmitter is not exceeded, for low-temperature fluids, we recommend the horizontal orientation with the transmitter head up (View H1) or the vertical orientation (View V).

Special installation instructions

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

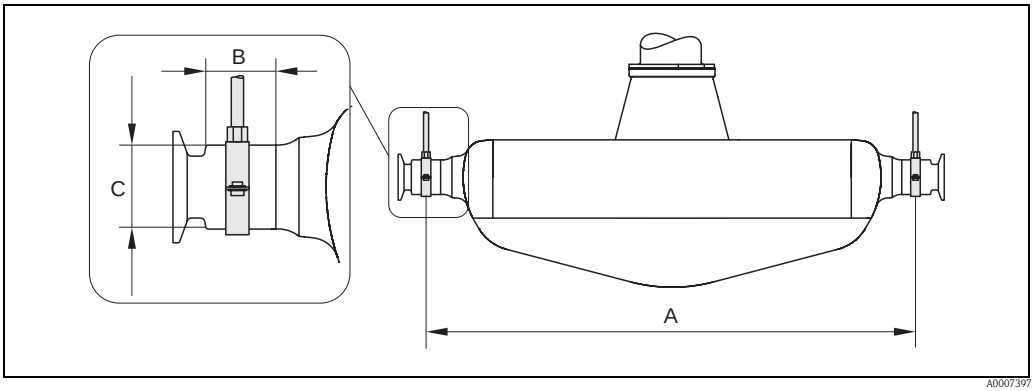


Horizontal installation for sensors with a bent measuring tube

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

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.

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



Mounted 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	½"	402	15.83	33.0	1.30	28	1.10
25	1"	542	21.34	33.0	1.30	38	1.50
40	1½"	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.

Caution!
- 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 $d \geq 0.35$ 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.

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 (65 ft), remote version

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

Operating conditions: Environment

Ambient temperature range

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

Note!
- 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 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 +150 °C (–58 to +302 °F)

Fluid pressure range (nominal pressure)

Flanges

- according to DIN PN 40…63
- according to ASME B16.5 Cl 150, Cl 300
- JIS 10K, 20K, 40K

Pressure ranges of secondary containment:

DN 8 to 40 (3/8" to 1 ½"): 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 → 24

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

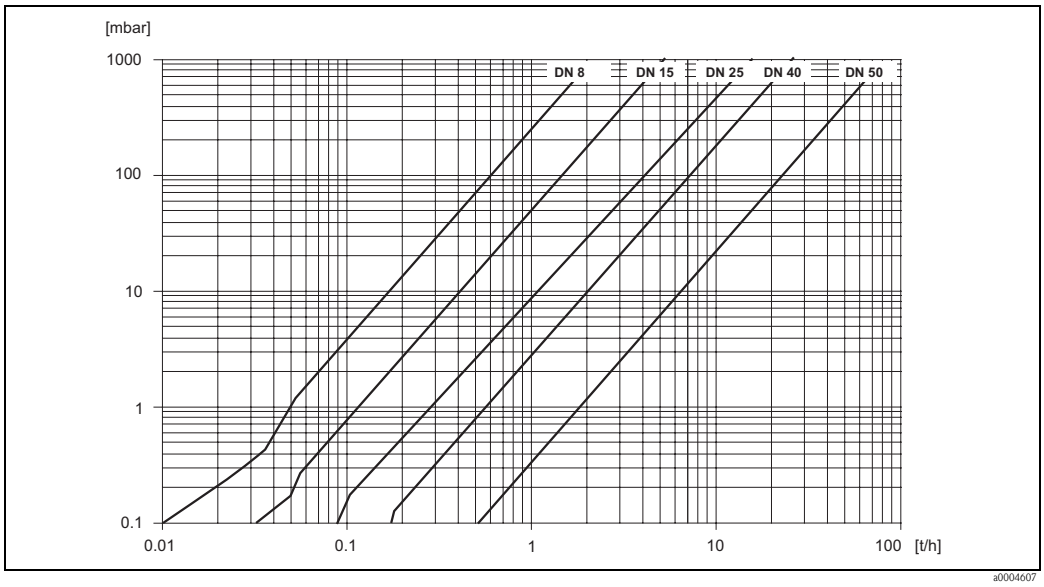
Pressure loss depends on the fluid properties and on the flow rate. The following formulae can be used to approximately calculate the pressure loss:

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
Δp = pressure loss [mbar] ν = kinematic viscosity [m²/s] $\dot{m}$ = mass flow [kg/s]	ρ = fluid density [kg/m³] d = inside diameter of measuring tubes [m] K to K3 = constants (depending on nominal diameter)
* To compute the pressure loss for gases, always use the formula for Re ≥ 2300.	

Pressure loss coefficients

DN		d[m]	K	K1	K3
[mm]	[inch]				
8	3/8"	$8.31 \cdot 10^{-3}$	$8.78 \cdot 10^{6}$	$3.53 \cdot 10^{7}$	$1.30 \cdot 10^{6}$
15	½"	$12.00 \cdot 10^{-3}$	$1.81 \cdot 10^{6}$	$9.99 \cdot 10^{6}$	$1.87 \cdot 10^{5}$
25	1"	$17.60 \cdot 10^{-3}$	$3.67 \cdot 10^{5}$	$2.76 \cdot 10^{6}$	$4.99 \cdot 10^{4}$
40	1½"	$26.00 \cdot 10^{-3}$	$8.00 \cdot 10^{4}$	$7.96 \cdot 10^{5}$	$1.09 \cdot 10^{4}$
50	2"	$40.50 \cdot 10^{-3}$	$1.41 \cdot 10^{4}$	$1.85 \cdot 10^{5}$	$1.20 \cdot 10^{3}$

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 program in order to optimize the design of measuring system. The software is used for the following calculations:

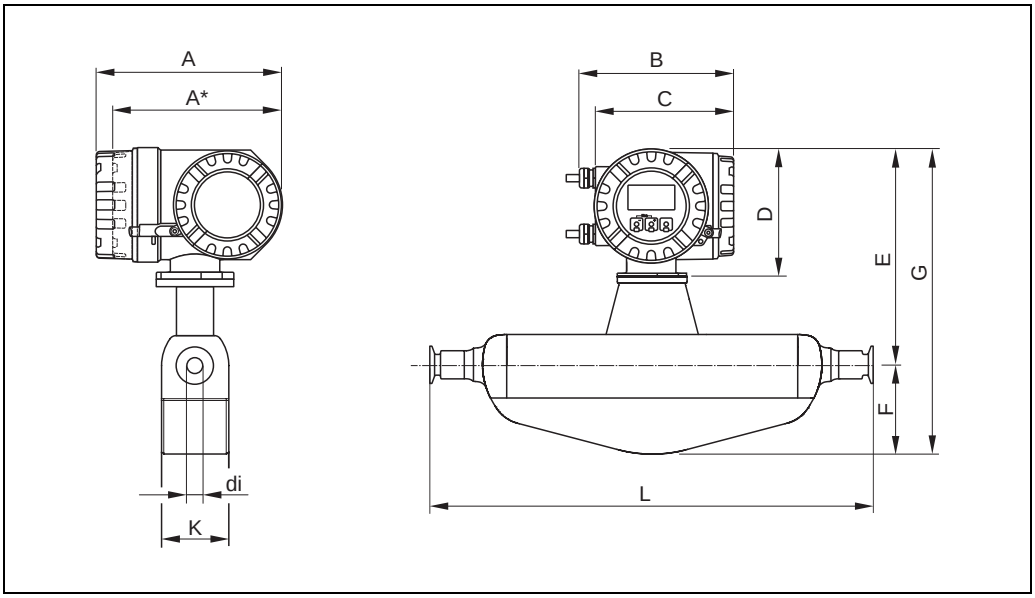
- Nominal diameter of the sensor with fluid characteristics such as viscosity, density, etc.
- Pressure loss downstream of the measuring point.
- Converting mass flow to volume flow, etc.
- Simultaneous display of various meter size.
- Determining measuring ranges.

The Applicator runs on any IBM compatible PC with windows.

Mechanical construction

Design/dimensions

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



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)

* (without local display)
1) dependent on respective process connection
All dimensions in [mm]

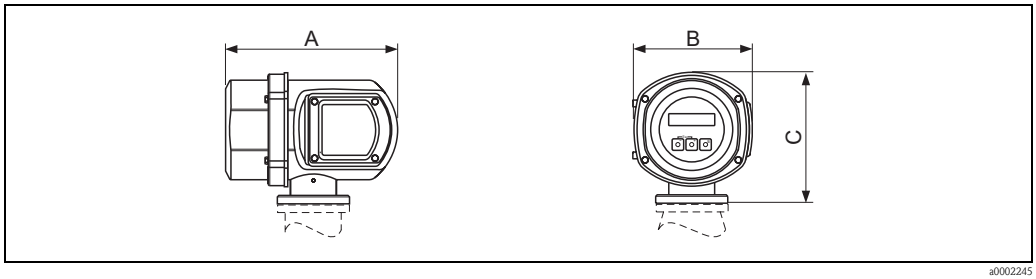
Dimensions in US units

DN	A	A*	B	C	D	E	F	G	K	L	di
3/8"	9.08	8.28	7.48	6.72	6.4	11.02	4.25	15.28	3.62	1)	1)
½"	9.08	8.28	7.48	6.72	6.4	11.02	4.25	15.28	3.62	1)	1)
1"	9.08	8.28	7.48	6.72	6.4	11.02	4.76	15.79	3.62	1)	1)
1½"	9.08	8.28	7.48	6.72	6.4	11.97	6.81	18.78	5.20	1)	1)
2"	9.08	8.28	7.48	6.72	6.4	12.40	9.49	21.89	6.57	1)	1)

* (without local display)
1) dependent on respective process connection
All dimensions in [inch]

Note!
Dimensions for transmitters II2G/Zone 1 → 26.

Transmitter compact version, stainless steel

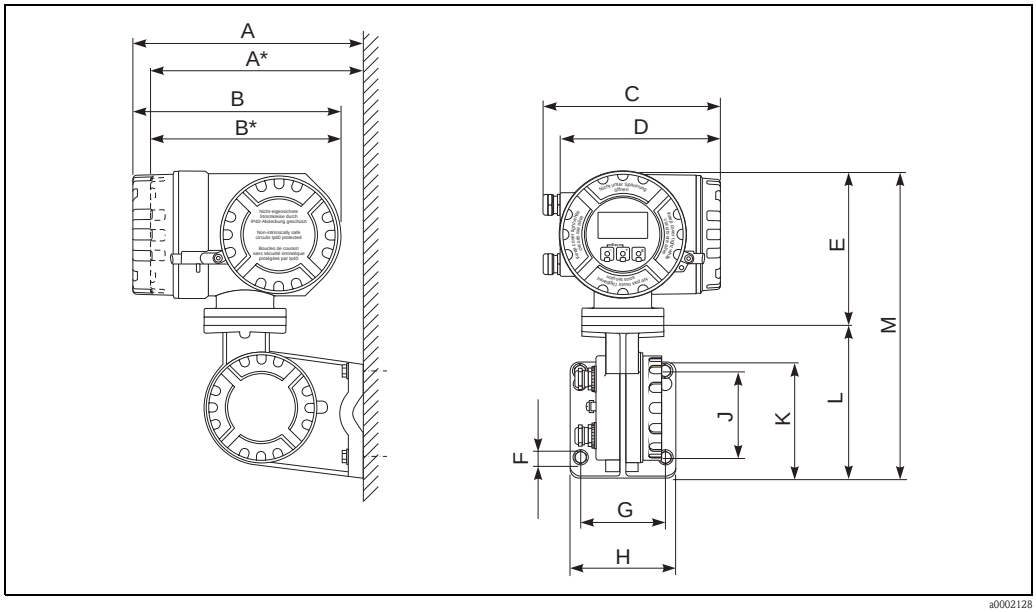


a0002245

Dimensions in SI and US units

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

Transmitter connection housing remote version (II2G/Zone 1)



a0002128

Dimensions in SI units

A	A*	B	B*	C	D	E	F ∅	G	H	J	K	L	M
265	242	240	217	206	186	178	8.6 (M8)	100	130	100	144	170	348

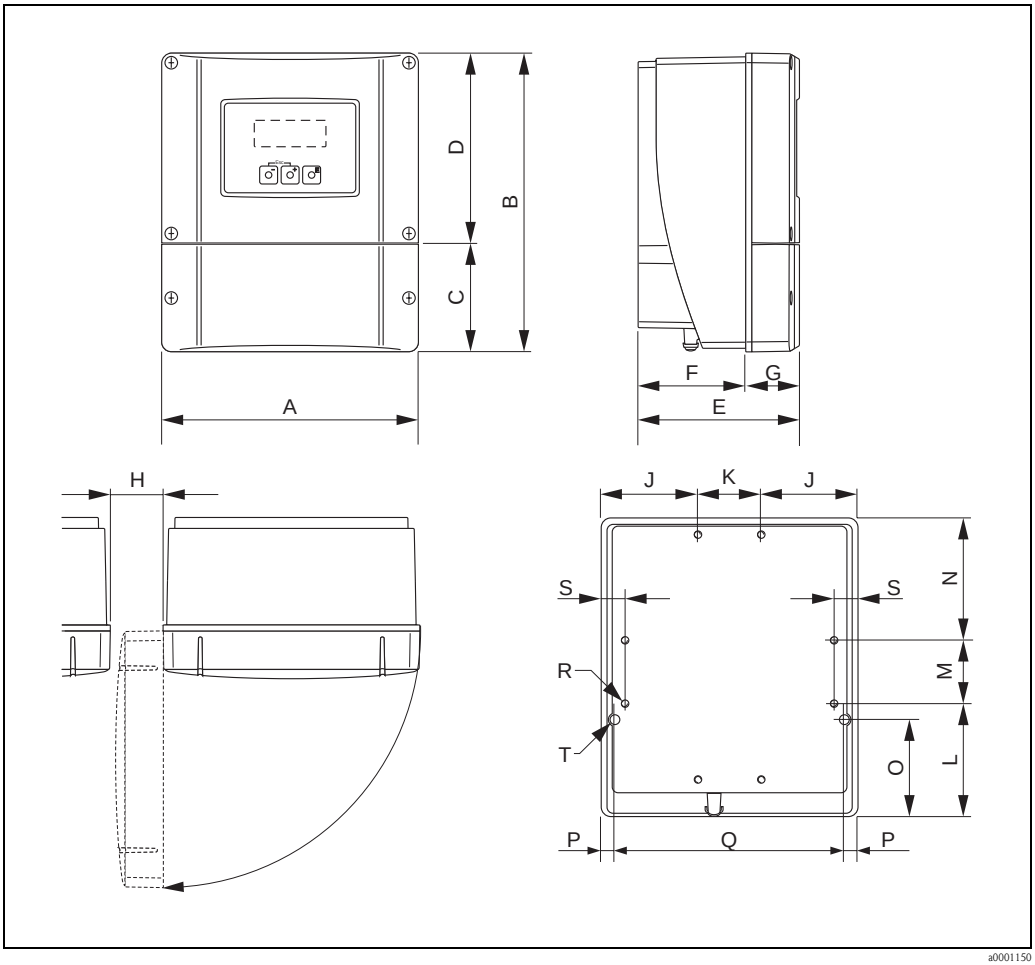
* Blind version (without local display)
All dimensions in [mm]

Dimensions in US units

A	A*	B	B*	C	D	E	F ∅	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

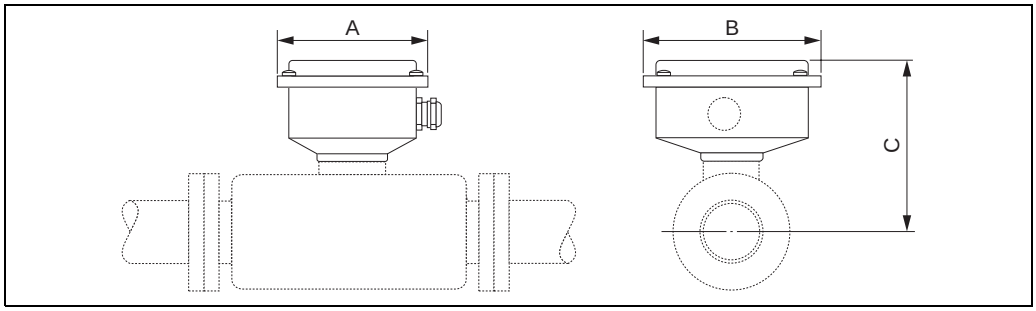
All dimensions in [mm]

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



a0002516

Dimensions in SI units

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

All dimensions in [mm]

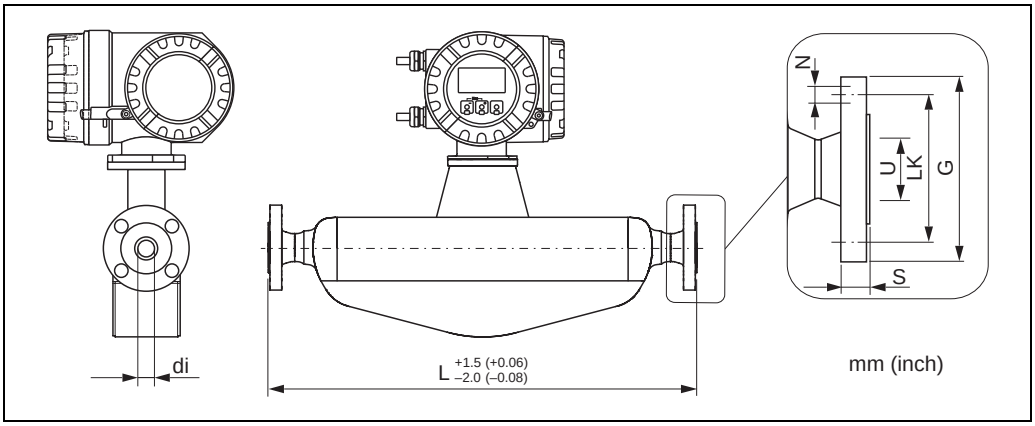
Dimensions in US units

DN	A	B	C
3/8"	4.67	5.41	5.43
½"	4.67	5.41	5.43
1"	4.67	5.41	5.43
1½"	4.67	5.41	5.98
2"	4.67	5.41	6.57
3"	4.67	5.41	7.72

All dimensions in [inch]

Process connections in SI units

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



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Flange connections EN (DIN)

Flange according to EN 1092-1 (DIN 2501) / PN 40: 1.4404/316L/316 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 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

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

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 / 10K: 1.4404/316L/316 Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
50	155	1071	4 × Ø19	16.0	120.0	50.00	41.50

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

Flange JIS B2220 / 20K: 1.4404/316L/316 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	41.50

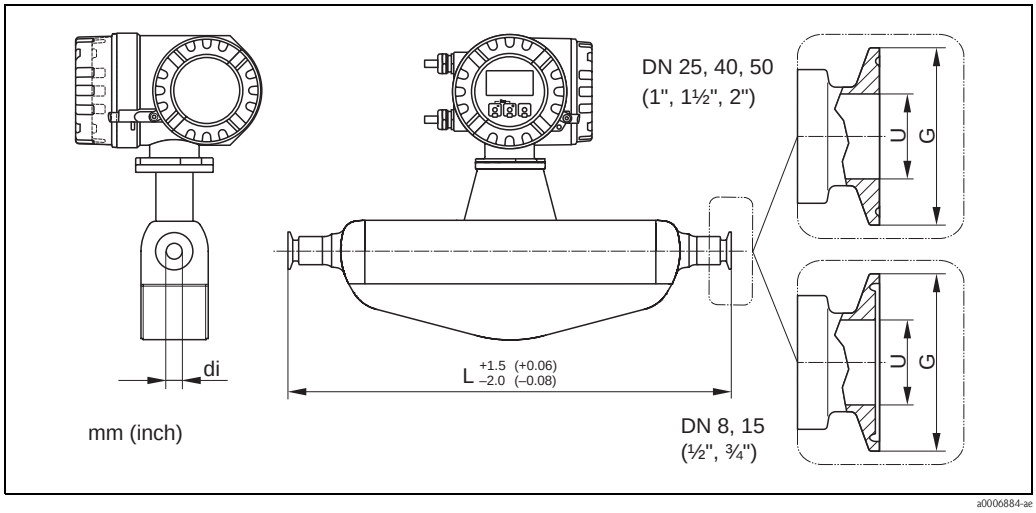
[1] DN 8 with DN 15 flanges as standard
All dimensions in [mm]

Flange JIS B2220 / 40K: 1.4404/316L/316 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

All Tri-Clamp connections correspond to the relevant ASME BPE hygienic clamp dimensions.



Tri-Clamp: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
8	½"	25.0	362	9.50	8.31
15	¾"	25.0	466	16.00	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 (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
8	1"	50.4	362	22.10	8.31
15	1"	50.4	466	22.10	12.00

All dimensions in [mm]

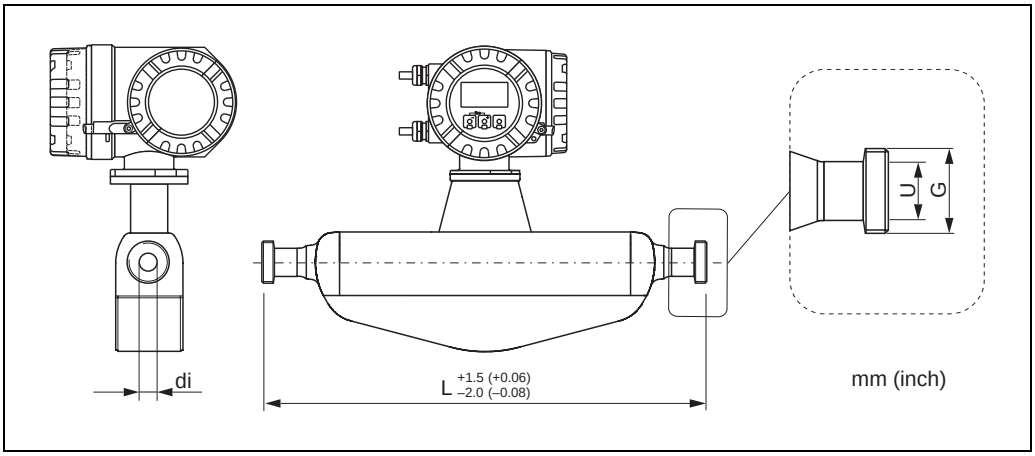
¾" Tri-Clamp: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
8	¾"	25.0	362	16.00	8.31

All dimensions in [mm]

½" Tri-Clamp: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
15	½"	25.0	466	9.50	12.00

All dimensions in [mm]

DIN 11851 (threaded hygienic connection)



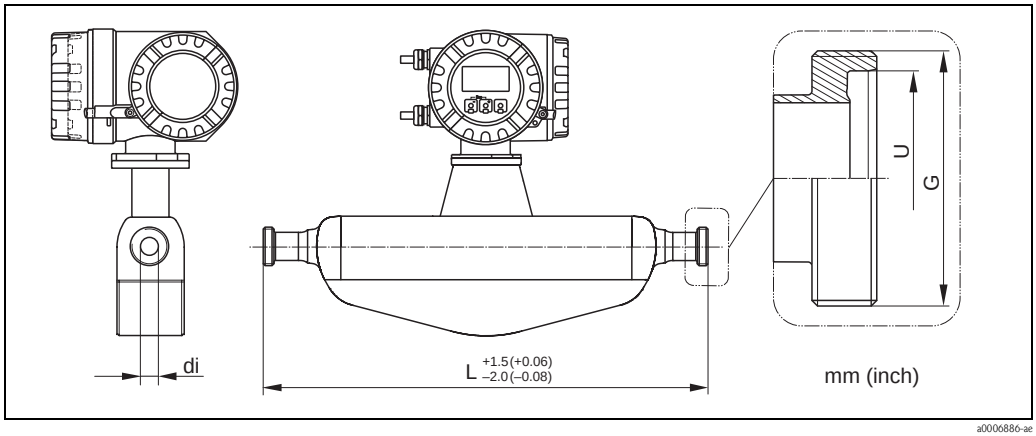
Threaded hygienic connection DIN 11851: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
DN	G	L	U	di
8	Rd 34 × 1/8"	362	16.00	8.31
15	Rd 34 × 1/8"	466	16.00	12.00
25	Rd 52 × 1/6"	606	26.00	17.60
40	Rd 65 × 1/6"	825	38.00	26.00
50	Rd 78 × 1/6"	1107	50.00	40.50

All dimensions in [mm]

Rd 28 × 1/8" - **Threaded hygienic connection DIN 11851:** 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
DN	G	L	U	di
8	Rd 28x 1/8"	362	10.00	8.31
15	Rd 28x 1/8"	466	10.00	12.00

All dimensions in [mm]

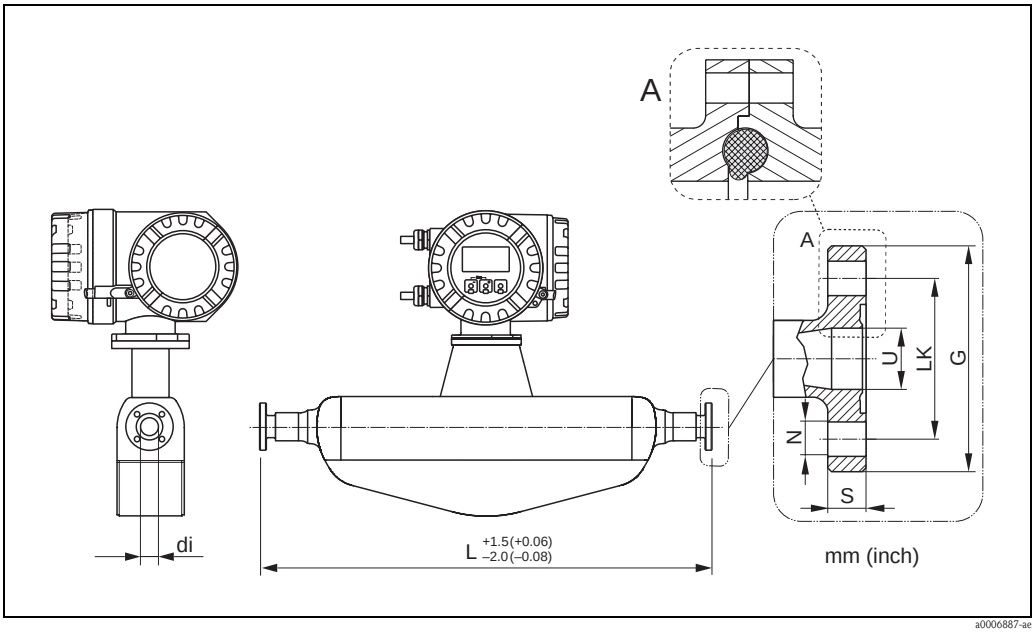
DIN 11864-1 Form A (threaded hygienic connection)



Threaded hygienic connection DIN 11864-1 Form A: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
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 (flat flange with groove)

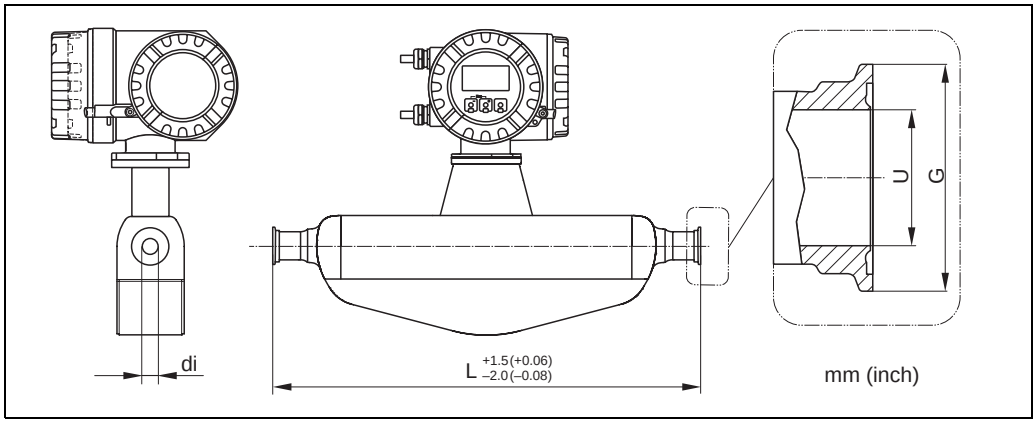


Detail A: The flange has the smaller groove for the O-ring on the sensor side. When mounting the sensor the corresponding flange must have accordingly a larger groove.

DIN 11864-2 Form A (flat flange with groove): 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)							
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	626	4 × Ø9	10	53	26.00	17.60
40	82	840	4 × Ø9	10	65	38.00	26.00
50	94	1120	4 × Ø9	10	77	50.00	40.50

All dimensions in [mm]

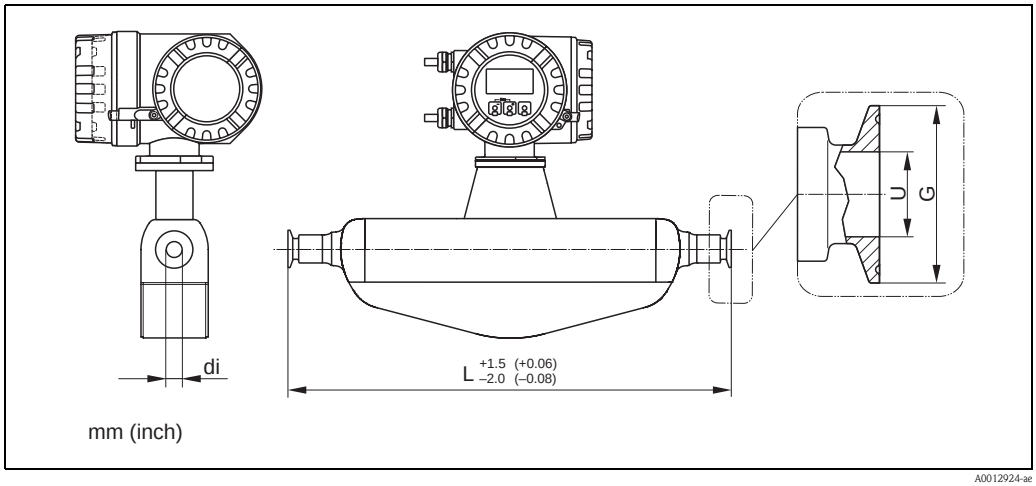
DIN 11864-3 Form A (clamp)



Clamp DIN 11864-3 Form A: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
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]

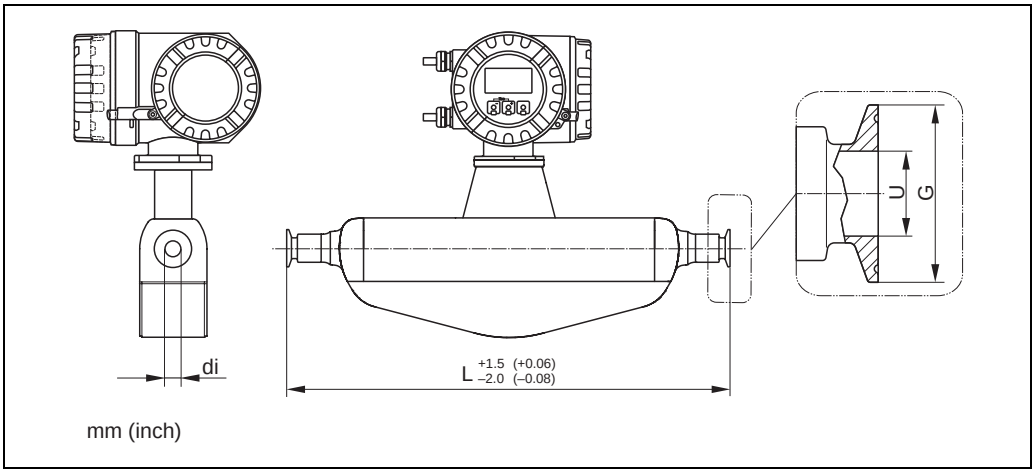
DIN 32676 (clamp)



Clamp DIN 32676: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
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]

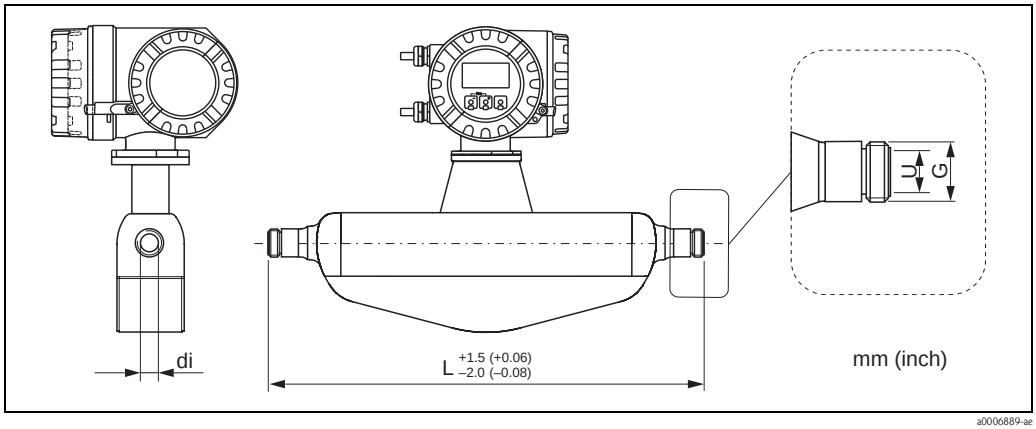
ISO 2852 (clamp)



Clamp ISO 2852: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
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]

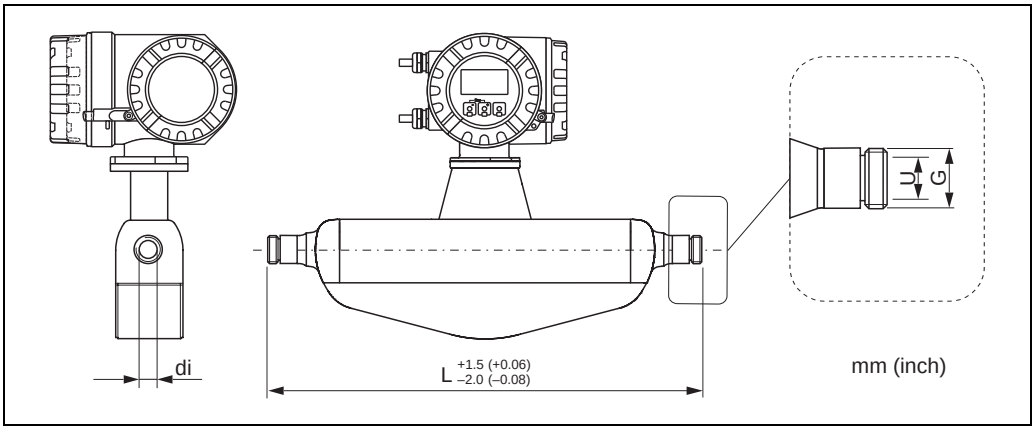
ISO 2853 (threaded hygienic connection)



Threaded hygienic connection ISO 2853: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
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]

SMS 1145 (threaded hygienic connection)

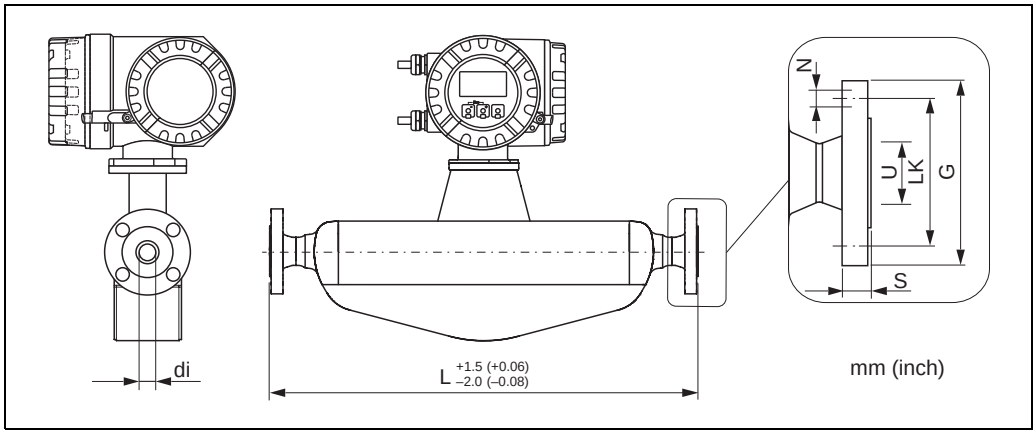


Threaded hygienic connection SMS 1145: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
DN	G	L	U	di
8	Rd 40 × 1/6"	362	22.50	8.31
15	Rd 40 × 1/6"	466	22.50	12.00
25	Rd 40 × 1/6"	606	22.50	17.60
40	Rd 60 × 1/6"	829	35.50	26.00
50	Rd 70 × 1/6"	1107	48.50	40.50

All dimensions in [mm]

Process connections in US units

Flange connections ASME B16.5



Flange according to ASME B16.5 / Cl 150: 1.4404/316L/316

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
½"	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 ½"	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 ½" flange as standard
All dimensions in [inch]

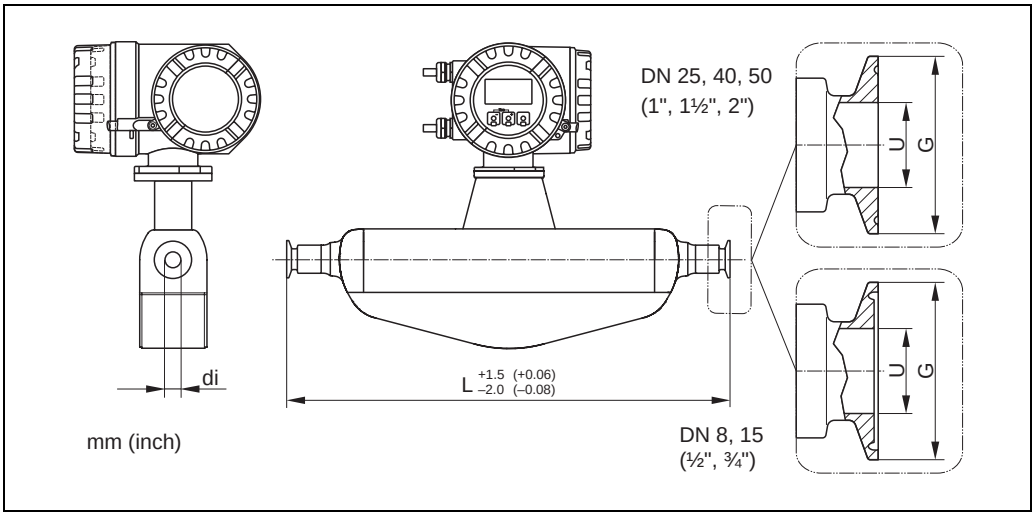
Flange according to ASME B16.5 / Cl 300: 1.4404/316L/316

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
½"	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 ½"	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 ½" flange as standard
All dimensions in [inch]

Tri-Clamp



Tri-Clamp: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
3/8"	½"	0.98	14.25	0.37	0.33
½"	¾"	0.98	18.35	0.63	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 ≤ 0.8 µm/150 grit.)					
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]

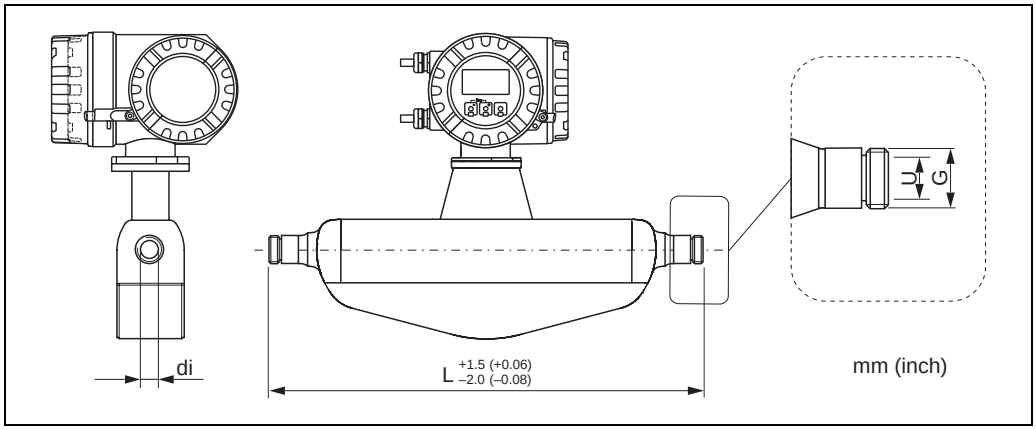
¾" Tri-Clamp: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
3/8"	¾"	0.98	14.25	0.63	0.33

All dimensions in [inch]

½" Tri-Clamp: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)					
DN	Clamp	G	L	U	di
½"	½"	0.98	18.35	0.37	0.47

All dimensions in [inch]

SMS 1145 (threaded hygienic connection)

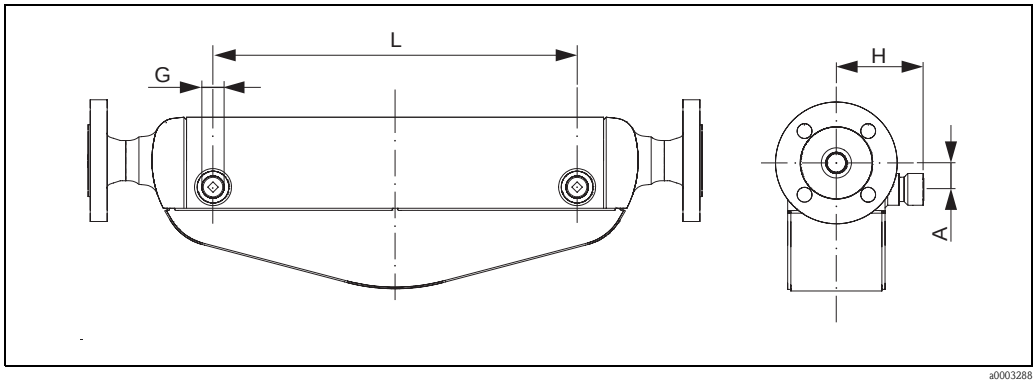


Threaded hygienic connection SMS 1145: 1.4435/316L (Ra ≤ 0.8 µm/150 grit.)				
DN	G	L	U	di
3/8"	Rd 40 × 1/6"	14.25	0.89	0.33
½"	Rd 40 × 1/6"	18.35	0.89	0.47
1"	Rd 40 × 1/6"	23.86	0.89	0.69
1 ½"	Rd 60 × 1/6"	32.64	1.40	1.02
2"	Rd 70 × 1/6"	43.58	1.91	1.59

All dimensions in [inch]

Purge connections / secondary containment monitoring

Caution!
The secondary containment is filled with dry nitrogen (N_2). 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"	½"-NPT	25	0.98	82	3.23	3.57	110	4.34
15	½"	½"-NPT	25	0.98	82	3.23	3.57	204	8.04
25	1"	½"-NPT	25	0.98	82	3.23	3.57	348	13.54
40	1½"	½"-NPT	45	1.77	102	4.02	4.07	526	20.70
50	2"	½"-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"	½"	1"	1½"	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 aluminium
- Stainless steel housing: stainless steel 1.4301/ASTM 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

- Stainless steel 1.4404/316/316L
  Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / JIS B2220
- Stainless steel 1.4435/316L
  - DIN 11864-2 Form A (flat flange with groove)
  - Threaded hygienic connection:
    - DIN 11851
    - SMS 1145
    - ISO 2853
    - DIN 11864-1 Form A
  - Tri-Clamp
  - Clamp aseptic according to:
    - DIN 11864-3, Form A
    - DIN 32676
    - ISO 2852

Measuring tubes

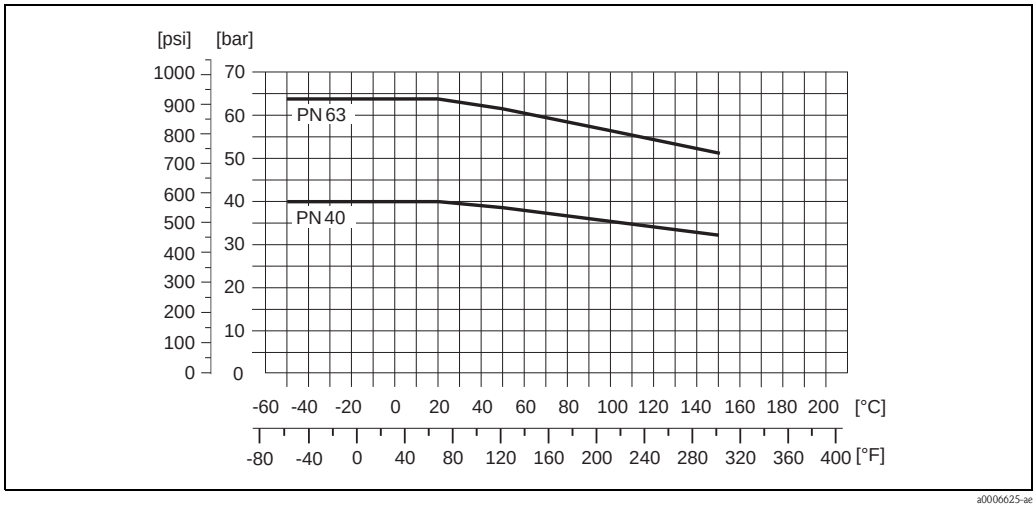
- Stainless steel EN 1.4539 / ASTM 904L
- Wetted parts surface finish (measuring tube and process connection)
- Finish quality: Ra ≤ 0.8 µm/150 grit (mechanically polished)

Material load curves

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

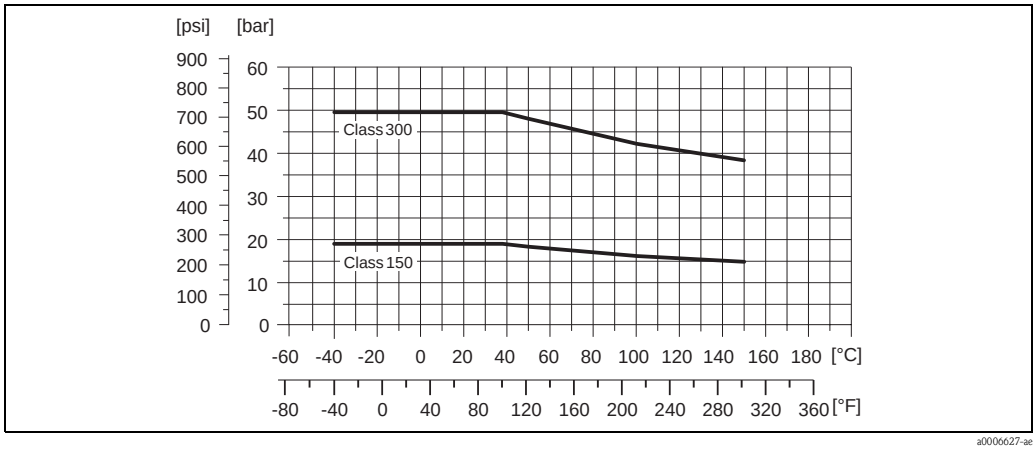
Flange connection according to EN 1092-1 (DIN 2501)

Flange material: 1.4404



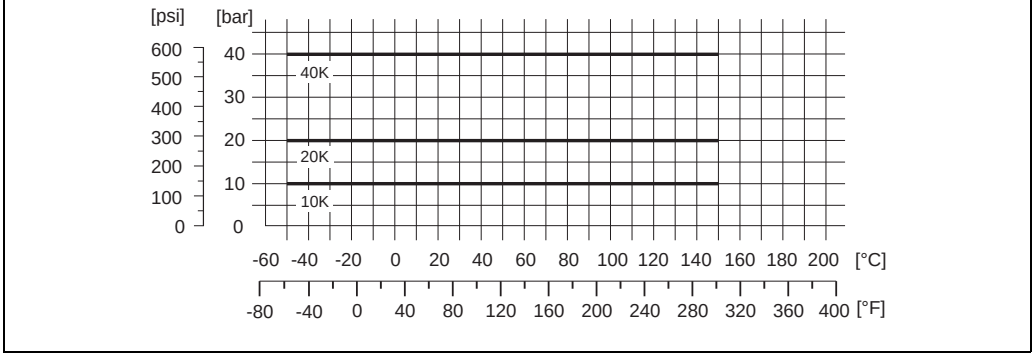
Flange connection according to ASME B16.5

Flange material: 316/316L



Flange connection to JIS B2220

Flange material: 1.4435/316/316L



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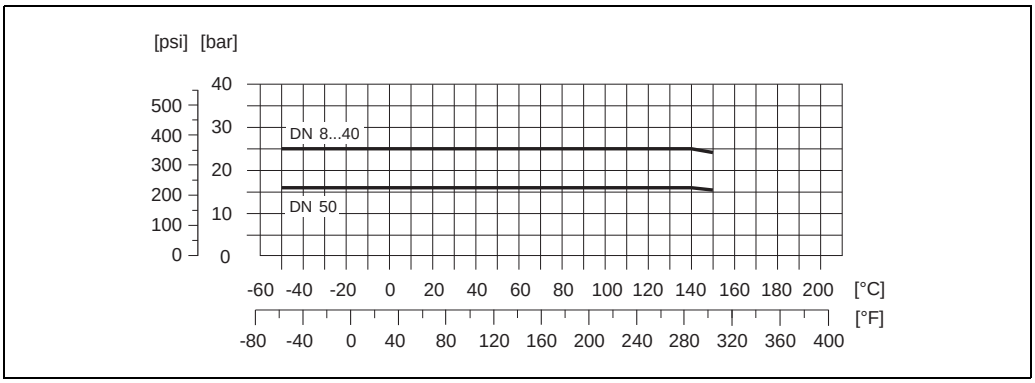
Tri-Clamp, ISO 2852 (clamp), DIN 32676 (clamp)

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.

DIN 11864-2 Form A (flat flange with groove)

Flange material: 1.4435/316L



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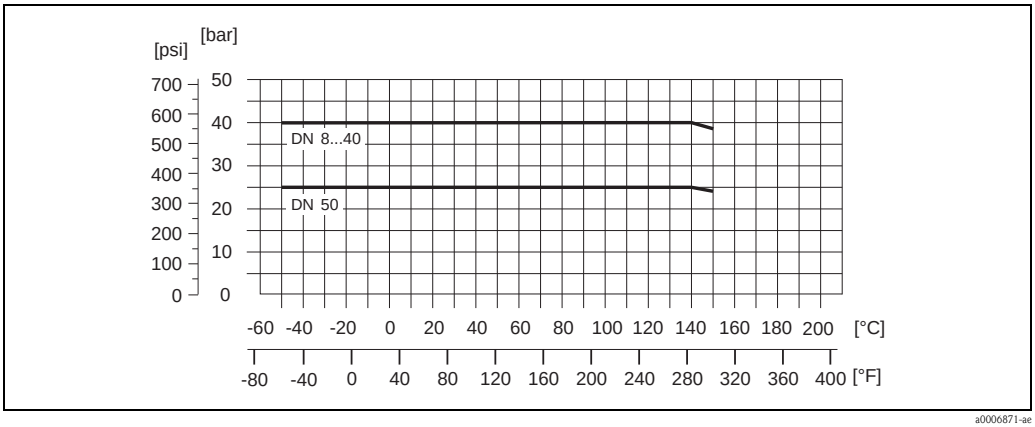
DIN 11864-1 Form A (threaded hygienic connection) / DIN 11864-3 Form A (clamp)

Connection material: 1.4435/316L



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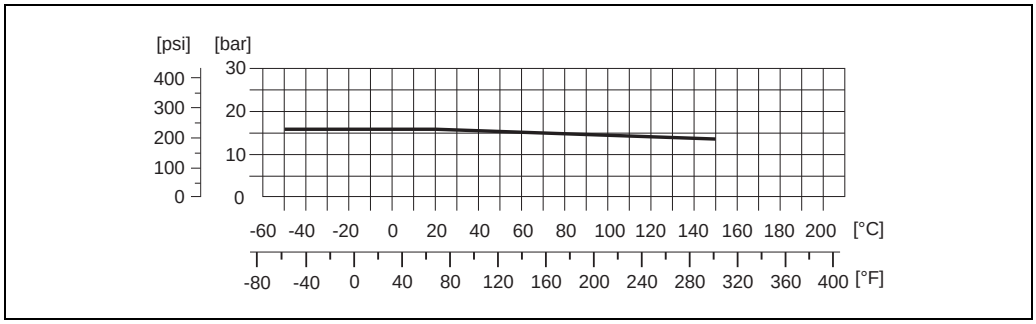
ISO 2853 (threaded hygienic connection)

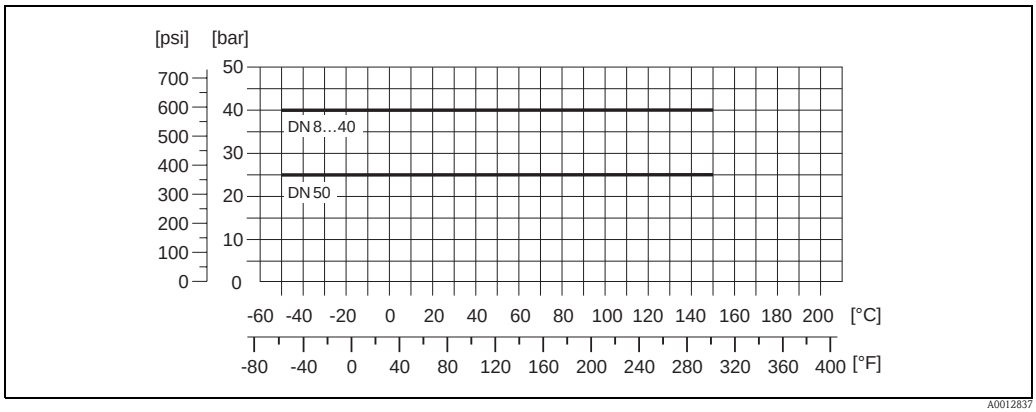
Connection material: 1.4435/316L



a0003308-ae

Process connection to DIN 11851

Connection material: 1.4404/316L

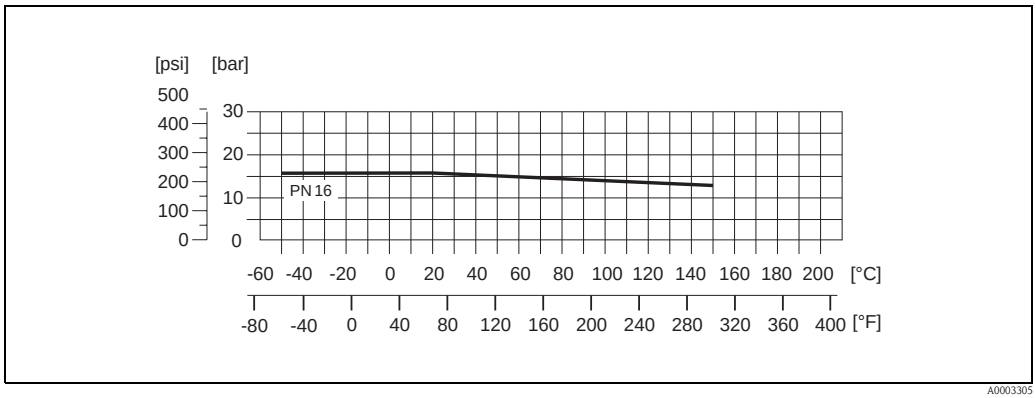


A0012837

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



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.

Process connections

Welded process connections

- Flanges according to EN 1092-1 (DIN 2501), according to ASME B16.5, JIS B2220
- Sanitary connections: Tri-Clamp, threaded hygienic connections (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1 Form A), DIN 11864-2 Form A (flat flange with groove)

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

Promass 83:

- Local operation with three optical keys (⊟/⊞/Ⓔ)
- 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.

Sanitary compatibility

- 3A approval
- EHEDG tested

TSE compliance

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.
In addition we do not use any material of animal origin during the polishing processes.
Endress+Hauser therefore can confirm to TSE compliance.

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 no.: 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.

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.
- 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

Measuring devices with a nominal diameter smaller than or equal to DN 25 correspond to Article 3(3) of the EC Directive 97/23/EC (Pressure Equipment Directive) and have been designed and manufactured according to good engineering practice. For larger nominal diameters, optional approvals according to Cat. II/III are available when required (depends on fluid and process pressure).

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.

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 80P, 83P (TI078D)
- 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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FM+SGML6.0 ProMoDo