



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Proline Promass 84M

Coriolis Mass Flow Measuring System

The universal and multivariable flowmeter for liquids and gases for custody transfer



Applications

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

- Extremely accurate, verified measurement of liquids (other than water) and for gases under high pressure > 100 bar (> 1450 psi)
- Fluid temperatures up to +150 °C (+302 °F)
- Process pressures up to 350 bar (5075 psi)
- Mass flow measurement up to 180 t/h (6600 lb/min)

Approvals for custody transfer:

- PTB, METAS, BEV, MID, NTEP, MC

Approvals for hazardous area:

- ATEX, FM, CSA, TIIS, IECEx, NEPSI

Approvals in the food industry/hygiene sector:

- 3A

Connection to the common process control system:

- HART, MODBUS

Relevant safety aspects:

- Secondary containment up to 100 bar (1450 psi), Pressure Equipment Directive, AD 2000
- Purge connections (optional)

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 **Proline transmitter concept** comprises:

- Modular device and operating concept resulting in a higher degree of efficiency
- Diagnostic ability and data back-up for increased process quality

The **Promass sensors**, tried and tested in over 100000 applications, offer:

- Multivariable flow measurement in compact design
- Insensitivity to vibrations thanks to balanced two-tube measuring system
- Immune from external piping forces due to robust design
- Easy installation without taking inlet and outlet runs into consideration

Table of contents

Function and system design	3	Operating conditions: Process	16
Measuring principle	3	Medium temperature range	16
Measuring system	4	Medium pressure range (nominal pressure)	16
Input	5	Limiting flow	16
Measured variable	5	Pressure loss	17
Measuring range in non-custody transfer mode	5	Custody transfer measurement	19
Measuring range in custody transfer mode	6	Custody transfer variables	19
Operable flow range	6	Suitability for custody transfer, metrological control, obligation to subsequent verification	19
Input signal	6	Verification (Example)	19
Output	7	Stamp points	20
Output signal	7	Mechanical construction	21
Signal on alarm	7	Design, dimensions	21
Load	7	Weight	45
Low flow cutoff	7	Material	46
Galvanic isolation	7	Material load diagram	47
Switching output	7	Process connections	51
Power supply	8	Human interface	52
Electrical connection measuring unit	8	Display elements	52
Terminal assignment	9	Operating elements	52
Electrical connection remote version	9	Language groups	52
Switching on the power supply in custody transfer mode	10	Remote operation	52
Supply voltage	10	Certificates and approvals	53
Cable entries	10	CE mark	53
Remote version cable specifications	10	C-tick mark	53
Power consumption	10	Ex approval	53
Power supply failure	10	Sanitary compatibility	53
Potential equalisation	10	MODBUS RS485 certificate	53
Performance characteristics	10	Other standards and guidelines	53
Reference operating conditions	10	Pressure device approval	53
Maximum measured error	10	Measuring Instruments Directive	53
Repeatability	12	Approval for custody transfer	54
Influence of medium temperature	12	Suitability for custody transfer measurement	54
Influence of medium pressure	12	Ordering Information	55
Operating conditions: Installation	13	Accessories	55
Installation instructions	13	Documentation	55
Inlet and outlet runs	15	Registered trademarks	55
Length of connecting cable	15		
System pressure	15		
Operating conditions: Environment	15		
Ambient temperature range	15		
Storage temperature	15		
Ambient class	15		
Degree of protection	15		
Shock resistance	15		
Vibration resistance	15		
CIP cleaning	15		
SIP cleaning	15		
Electromagnetic compatibility (EMC)	15		

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

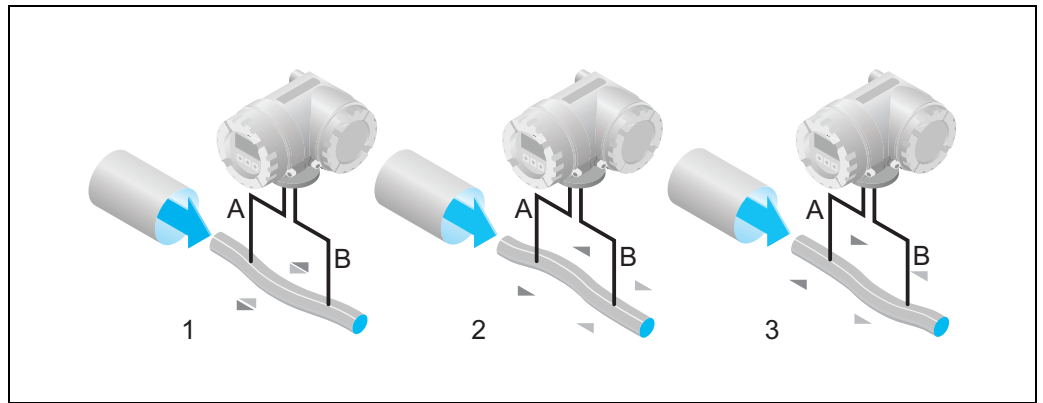
ω = rotational velocity

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.

The measuring tubes through which the measured material flows are brought into oscillation. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):

- At zero flow, in other words when the fluid is at a standstill, the two tubes oscillate in phase (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. Electrodynamical sensors register the tube oscillations at the inlet and outlet.

System balance is ensured by the antiphase oscillation of the two measuring tubes. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement

The measuring tubes are continuously excited at their resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tubes and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency is thus a function of fluid density. The micro-processor utilises this relationship to obtain a density signal.

Temperature measurement

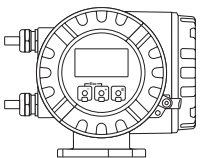
The temperature of the measuring tubes is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output. The temperature measurement cannot be used to generate data for invoicing in applications subject to legal metrology controls.

Measuring system

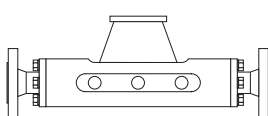
The measuring system consists of a transmitter and a sensor. Two versions are available:

- Compact version: transmitter and sensor form a single mechanical unit.
- Remote version: transmitter and sensor are installed separately.

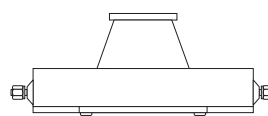
Transmitter

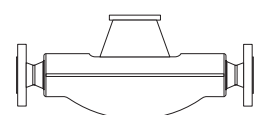
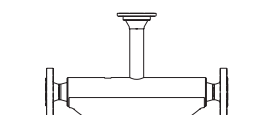
<p>Promass 84</p>  <p>a0003672</p>	<ul style="list-style-type: none"> ■ Four-line liquid-crystal display ■ Operation with "Touch control" ■ Application-specific Quick Setup ■ Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. corrected volume flow)
--	--

Sensor

<p>M</p>  <p>a0003676</p>	<ul style="list-style-type: none"> ■ Robust sensor for extreme process pressures, high requirements for the secondary containment and fluid temperatures up to +150 °C (+302 °F) ■ Nominal diameters DN 8 to 80 (3/8" to 3") ■ Material: Titanium, Ti Grade 2, Ti Grade 9 	<p>Documentation No. TI104D</p>
---	--	-------------------------------------

Further sensor in separate documentation

<p>A</p>  <p>a0003679</p>	<ul style="list-style-type: none"> ■ Single-tube system for highly accurate measurement of very small flows ■ Nominal diameters DN 1 to 4 (1/24" to 1/8") ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 (process connection) 	<p>Documentation TI068D</p>
---	---	---------------------------------

<p>F</p>  <p>a0003673</p>	<ul style="list-style-type: none"> ■ Universal sensor for fluid temperatures up to +200 °C (+392 °F). ■ Nominal diameters DN 8 to 250 (3/8" to 10"). ■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 	<p>Documentation No. TI103D</p>
<p>F (High-temperature)</p>  <p>a0003675</p>	<ul style="list-style-type: none"> ■ Universal high-temperature sensor for fluid temperatures up to +350 °C (+662 °F). ■ Nominal diameters DN 25, 50, 80 (1", 2", 3") ■ Material: Alloy C-22, DIN 2.4602, EN 1.4404/ASTM 316L 	

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 in non-custody transfer mode

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	1/2"	0 to 6500	0 to 238
25	1"	0 to 18000	0 to 660
40	1 1/2"	0 to 45000	0 to 1650
50	2"	0 to 70000	0 to 2570
80	3"	0 to 180000	0 to 6600

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:

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

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

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

$$\rho_{(G)} = \text{gas density in [kg/m}^3\text{] under process conditions}$$

DN		X
[mm]	[inch]	
8	3/8"	60
15	1/2"	80
25	1"	90
40	1 1/2"	90
50	2"	90
80	3"	110

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

Calculation example for gas:

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

Max. possible full scale value:

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

Recommended full scale values

See information in chapter "Limiting flow" → 16

Measuring range in custody transfer mode

The following are example data for German PTB approval (liquids other than water).

Measuring ranges for liquids in mass flow

DN		Mass flow (liquids) Q_{\min} to Q_{\max}		Smallest measured quantity	
[mm]	[inch]	[kg/min]	[lbs/min]	[kg]	[lbs]
8	3/8"	1.5 to 30	3.3075 to 66.15	0.5	1.10
15	1/2"	5 to 100	11.025 to 220.5	2	4.41
25	1"	15 to 300	33.075 to 661.5	5	11.0
40	1 1/2"	35 to 700	77.175 to 1543.5	20	44.1
50	2"	50 to 1000	110.25 to 2205.0	50	110.25
80	3"	150 to 3000	330.75 to 6615.0	100	220.50

Measuring ranges for liquids in volume flow (also LPG)

DN		Volume flow (liquids) Q_{\min} to Q_{\max}		Smallest measured quantity	
[mm]	[inch]	[l/min]	[gal/hr]	[l]	[gal]
80	3"	150 to 3000	2376.0 to 47520	100	26.40

Measuring ranges for high pressure fuel gases CNG

DN		Mass flow (liquids) Q_{\min} to Q_{\max}		Smallest measured quantity	
[mm]	[inch]	[kg/min]	[lbs/min]	[kg]	[lbs]
8	3/8"	0.1 to 10	0.2205 to 22.05	0.2	0.4410
15	1/2"	0.3 to 40	0.6615 to 88.20	0.5	1.1025
25	1"	1.0 to 100	2.2050 to 220.5	2.0	4.4100

Max. Pressure = 250 bar (3625 psi) resp. 350 bar (5075 psi) for high-pressure version



Note!

For information about the other approvals → see corresponding certificate.

Operable flow range

Over 20 : 1 for verified device

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

U = 3 to 30 V DC, $R_i = 5 \text{ k}\Omega$, galvanically isolated

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

Status input (auxiliary input), MODBUS RS485

U = 3 to 30 V DC, $R_i = 3 \text{ k}\Omega$, galvanically isolated, switch level: ± 3 to ± 30 V DC, independent of polarity

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

Output

Output signal

Current output, HART

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 μ A

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

Pulse / frequency output, HART

For custody transfer measurement, two pulse outputs can be operated.

Passive, galvanically isolated, 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. In "Phase-shifted pulse outputs" operating mode, the end frequency is limited to a maximum of 5000 Hz.
- Pulse output: Pulse value and pulse polarity selectable, pulse width configurable (0.05 to 2000 ms)

Pulse / frequency output, MODBUS

Active/passive selectable, galvanically isolated

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

MODBUS interface

- MODBUS device type: slave
- Address range: 1 to 247
- Functions codes supported: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Physical interface: RS485 in accordance with standard EIA/TIA-485
- Baud rate supported: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Transmission mode: RTU or ASCII
- Response time:
 - Direct data access = typically 25 to 50 ms
 - Auto-scan buffer (data area) = typically 3 to 5 ms
- Possible output combinations →  9

Signal on alarm

- Current output: Failsafe mode selectable (e.g. in accordance with NAMUR Recommendation NE 43)
- Pulse/frequency output: Failsafe mode selectable
- Relay output: De-energised by fault or power supply failure
- MODBUS RS485: If an error occurs, the value NaN (not a number) is output for the process variables

Load

See "Output signal"

Low flow cutoff

Switch points for low flow cutoff are selectable.

Galvanic isolation

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

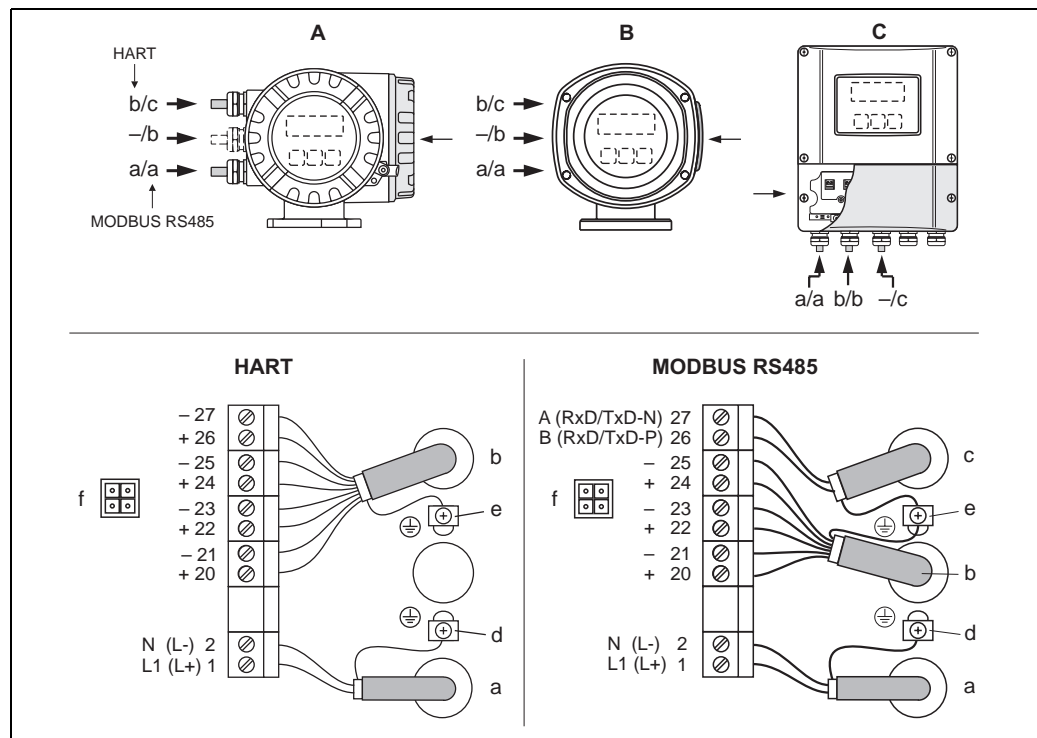
Switching output

Relay output

- 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)

a 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

b Signal cable: Terminal assignment → 9

c Fieldbus cable: Terminal assignment → 9

d Ground terminal for protective earth

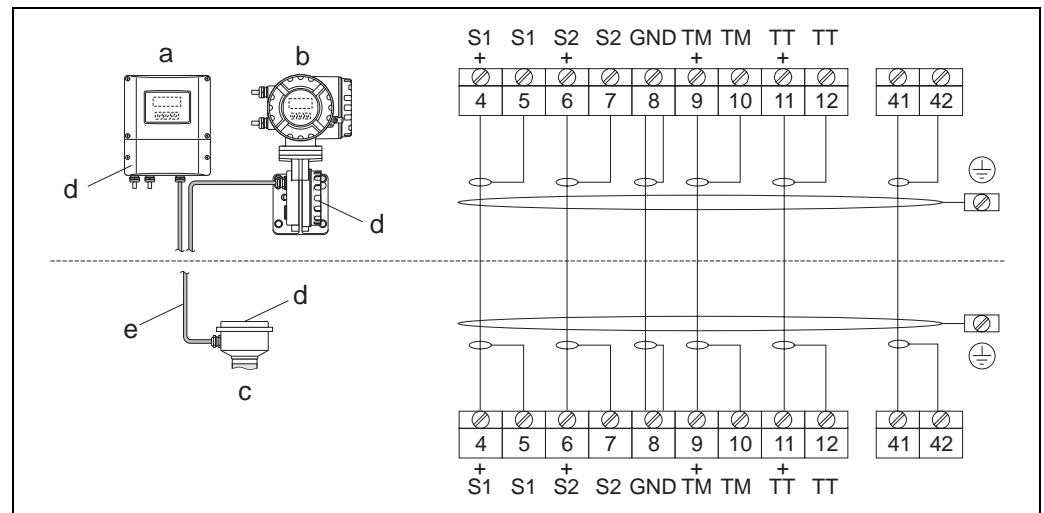
e Ground terminal for Signal cable/RS485 line

f Service connector for connecting service interface FXA 193 with Proline adapter cable (Fieldcheck, FieldCare)

Terminal assignment

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 variant	Terminal No. (inputs/outputs)			
	20 (+) / 21 (–)	22 (+) / 23 (–)	24 (+) / 25 (–)	26 (+) / 27 (–)
<i>Fixed communication boards (permanent assignment)</i>				
84***_*****S	–	–	Pulse/freq. output Ex i, passive	Current output Ex i active, HART
84***_*****T	–	–	Pulse/freq. output Ex i, passive	Current output Ex i passive, HART
<i>Flexible communication boards</i>				
84***_*****D	Status input	Relay output	Pulse/frequency out- put	Current output HART
84***_*****M	Status input	Pulse/frequency out- put 2	Pulse/frequency out- put 1	Current output HART
84***_*****N	Current output	Pulse/frequency out- put	Status input	MODBUS RS485
84***_*****Q	–	–	Status input	MODBUS RS485
84***_*****1	Relay output	Pulse/frequency out- put 2	Pulse/frequency out- put 1	Current output HART
84***_*****2	Relay output	Current output 2	Pulse/frequency out- put	Current output 1 HART
84***_*****7	Relay output 2	Relay output 1	Status input	MODBUS RS485

Electrical connection remote version

Connection of 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 = grey; 6/7 = green; 8 = yellow; 9/10 = pink; 11/12 = white; 41/42 = brown

Switching on the power supply in custody transfer mode

If the device is started in custody transfer mode, for example also after a power outage, system error No. 271 "POWER BRK. DOWN" flashes on the local display. The fault message can be acknowledged or reset using the "Enter" key or by means of the status input configured accordingly.

Note!

For correct measuring operation, it is not mandatory to reset the fault message.

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"

Remote version 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.

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

Lasting min. 1 power cycle:

- EEPROM and T-DAT save 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.)
- See also "Switching on the power supply in custody transfer mode" → 10.

Potential equalisation

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. Deviation at the current output is typically ±5 µA.
o.r. = of reading

Mass flow (liquids):

- ±0.10% ± [(zero point stability ÷ measured value) · 100]% o.r.

Mass flow (gases):

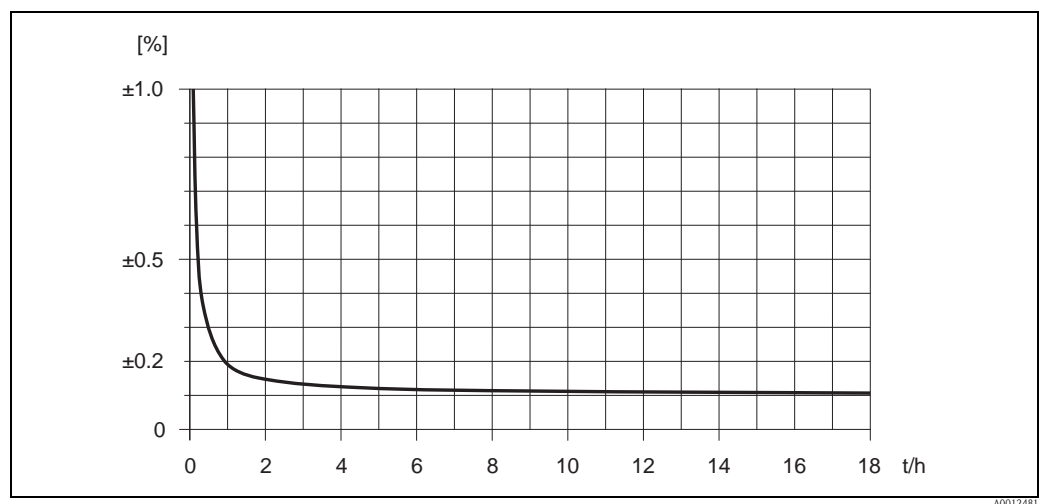
- $\pm 0.50\% \pm [(zero\ point\ stability \div measured\ value) \cdot 100]\%$ o.r.

Volume flow (liquids)

- $\pm 0.25\% \pm [(zero\ point\ stability \div measured\ value) \cdot 100]\%$ o.r.

Zero point stability

DN		Max. full scale value		Zero point stability	
[mm]	[inch]	[kg/h] or [l/h]	[lb/min]	[kg/h] or [l/h]	[lb/min]
8	3/8"	2000	73.5	0.100	0.004
15	1/2"	6500	238	0.325	0.012
25	1"	18000	660	0.90	0.033
40	1 1/2"	45000	1650	2.25	0.083
50	2"	70000	2570	3.50	0.129
80	3"	180000	6600	9.00	0.330

Example maximum measured error

Maximum measured error in % of reading (example: Promass 84M / DN25)

Calculation example (mass flow liquid):

Given: Promass 84M / DN25, measured value flow = 8000 kg/h

Maximum measured error: $\pm 0.10\% \pm [(zero\ point\ stability \div measured\ value) \cdot 100]\%$ o.r.

Maximum measured error: $\pm 0.10\% \pm [(0.90\ kg/h \div 8000\ kg/h) \cdot 100]\% = \pm 0.111\%$

Density (liquid)

- $\pm 0.0010\ g/cc$ (under reference conditions)
- $\pm 0.0010\ g/cc$ (after field density calibration under process conditions)
- $\pm 0.002\ g/cc$ (after special density calibration)
- $\pm 0.02\ g/cc$ (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

$$\pm 0.5\text{ °C} \pm 0.005 \cdot T\text{ °C}$$

$$(\pm 1\text{ °F} \pm 0.003 \cdot (T - 32)\text{ °F})$$

T = medium temperature

Repeatability

o.r. = of reading

Mass flow (liquids)

$$\pm 0.05\% \pm [\frac{1}{2} \cdot (\text{zero point stability} \div \text{measured value}) \cdot 100]\% \text{ o.r.}$$

Mass flow (gases)

$$\pm 0.25\% \pm [\frac{1}{2} \cdot (\text{zero point stability} \div \text{measured value}) \cdot 100]\% \text{ o.r.}$$

Volume flow (liquids)

$$\pm 0.10\% \pm [\frac{1}{2} \cdot (\text{zero point stability} \div \text{measured value}) \cdot 100]\% \text{ o.r.}$$

Calculation example (mass flow liquid):

Given: Promass 83M / DN 25. measured value flow = 8000 kg/h

Repeatability: $\pm 0.05\% \pm [\frac{1}{2} \cdot (\text{zero point stability} \div \text{measured value}) \cdot 100]\% \text{ o.r.}$ Repeatability: $\pm 0.05\% \pm [\frac{1}{2} \cdot (0.90\text{ kg/h} \div 8000\text{ kg/h}) \cdot 100\%] = \pm 0.056\%$ **Density (liquid)**

$$\pm 0.00025\text{ g/cc}$$

$$1\text{ g/cc} = 1\text{ kg/l}$$

Temperature

$$\pm 0.25\text{ °C} \pm 0.0025 \cdot T\text{ °C}$$

$$(\pm 1\text{ °F} \pm 0.003 \cdot (T - 32)\text{ °F})$$

T = medium temperature

Influence of medium 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 $\pm 0.0002\%$ of the full scale value / °C ($\pm 0.0001\%$ of the full scale value / °F).

Influence of medium pressure

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

DN		Promass M	Promass M high-pressure version
[mm]	[inch]	[% o.r./bar]	[% o.r./bar]
8	3/8"	0.009	0.006
15	1/2"	0.008	0.005
25	1"	0.009	0.003
40	1 1/2"	0.005	–
50	2"	no influence	–
80	3"	no influence	–

o.r. = of reading

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 in order to protect the pipe, it is advisable to support heavy sensors.
- Please refer to the verification ordinances for the installation conditions of the approval for custody transfer in question.

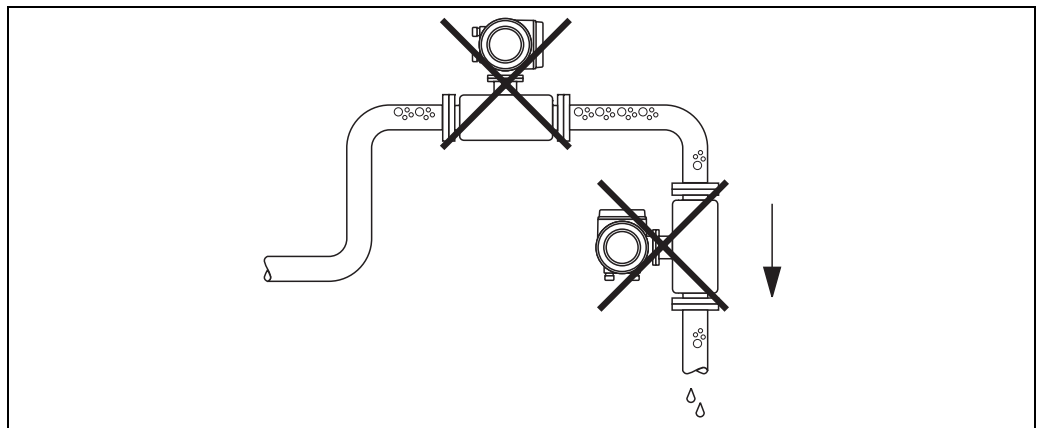
The necessary steps for creating a measuring system and obtaining approval from the Standards Authorities must be clarified with the authority for legal metrology controls responsible.

Mounting location

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

Avoid the following locations:

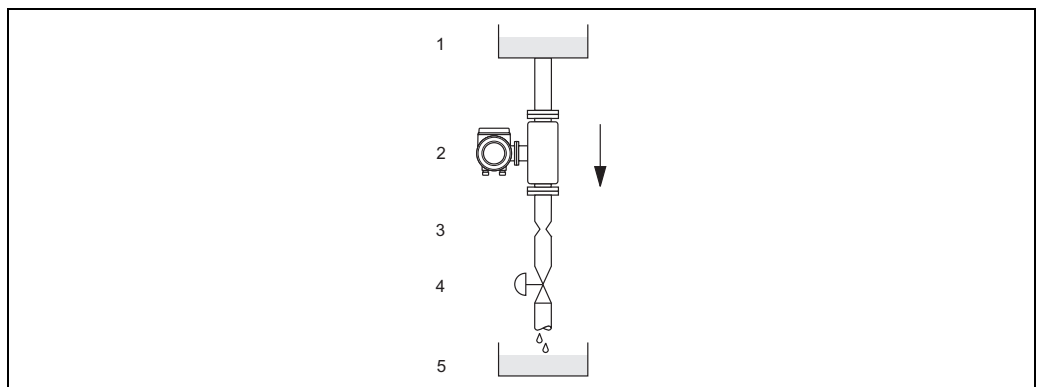
- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream of a free pipe outlet in a vertical pipeline.



a0003605

Mounting location

The proposed configuration in the following diagram, however, permits installation in a vertical pipeline. Pipe restrictors or the use of an orifice plate with a smaller cross-section than the nominal diameter prevent the sensor from running empty during measurement.



a0003597

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

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

DN		Ø Orifice plate, pipe restriction	
[mm]	[inch]	mm	inch
8	3/8"	6	0.24
15	1/2"	10	0.40
25	1"	14	0.55
40	1 1/2"	22	0.87
50	2"	28	1.10
80	3"	50	2.00

Orientation

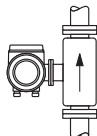

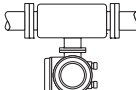
Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction in which the fluid flows through the pipe).

Vertical (View V)

Recommended orientation with upward direction of flow (View V). 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 build-up.

Horizontal (Views H1, H2)

The measuring tubes must be horizontal and beside each other. When installation is correct the transmitter housing is above or below the pipe (Views H1, H2). Always avoid having the transmitter housing in the same horizontal plane as the pipe.

Orientation:	Vertikal	Horizontal, Transmitter head up	Horizontal, Transmitter head down
	 View V	 View H1	 View H2
Standard, Compact version	✓✓	✓✓ ①	✓✓ ②
Standard, Remote version	✓✓	✓✓ ①	✓✓ ②

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

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


① = For fluids with low temperatures, we recommend the horizontal orientation with the transmitter head pointing upwards (View H1) or the vertical orientation (View V).

② = For fluids with high-temperatures, we recommend the horizontal orientation with the transmitter head pointing downwards (View H2) or the vertical orientation (View V).

Thermal insulation

Some fluids require suitable measures to avoid loss of heat at the sensor. A wide range of materials can be used to provide the required thermal insulation.

Zero point adjustment

All measuring devices are calibrated with 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 operating conditions →  10.


Consequently, the zero point adjustment is generally **not** necessary for Promass!

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

- To achieve highest measuring accuracy also with very small flow rates.
- 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 m (65 ft), remote version
System pressure	<p>It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.</p> <p>In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapour pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.</p> <p>Consequently, it is generally best to install the sensor:</p> <ul style="list-style-type: none"> ■ downstream from pumps (no danger of vacuum) ■ at the lowest point in a vertical pipe.

Operating conditions: Environment

Ambient temperature range	<p>Sensor, transmitter</p> <ul style="list-style-type: none"> ■ Standard: -20 to +60 °C (-4 to +140 °F) ■ Optional: -40 to +60 °C (-40 to +140 °F) <p> Note!</p> <ul style="list-style-type: none"> ■ Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions. ■ At ambient temperatures below -20 °C (-4 °F) the readability of the display may be impaired.
Storage temperature	-40 to +80 °C (-40 to +175 °F), preferably +20 °C (+68 °F)
Ambient class	B, C, I
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
CIP cleaning	yes
SIP cleaning	yes
Electromagnetic compatibility (EMC)	To ICE/EN 61326 and NAMUR recommendation NE 21

Operating conditions: Process

Medium temperature range

Sensor

–50 to +150 °C (–58 to +302 °F)

Seals

- EPDM: –40 to +160 °C (–40 to +320 °F)
- Kalrez: –20 to +275 °C (–4 to +528 °F)
- Silicone: –60 to +200 °C (–76 to +392 °F)
- Viton: –15 to +200 °C (+5 to +392 °F)
- FEP sheathed (not for gas applications): –60 to +200 °C (–76 to +392 °F)

Medium pressure range (nominal pressure)

Flanges

- Standard:
 - according to DIN PN 40 to 100
 - according to ASME B16.5 Cl 150, Cl 300, Cl 600
 - JIS 10K, 20K, 40K, 63K
- High-pressure version: measuring tubes, connector, thread connections max. 350 bar (5075 psi)

Pressure ranges of secondary containment

100 bar (1450 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 circulation and/or detection. (Dimensions → 21)

Limiting flow

See "Measuring range" section. → 5

Select nominal diameter by optimising between required flow range and permissible pressure loss. An overview of max. possible full scale values can be found in the "Measuring range" Section.

- 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

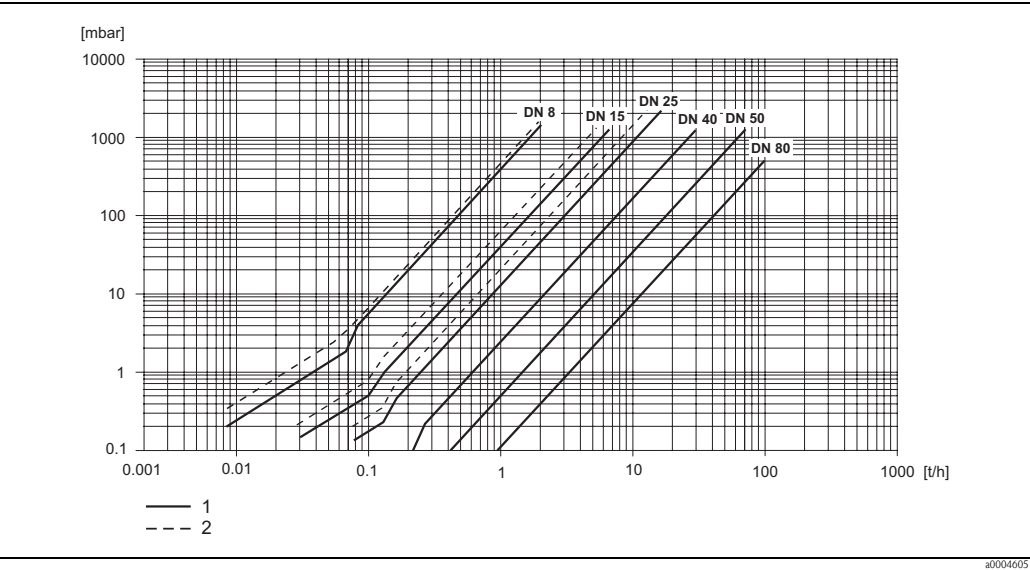
Pressure loss

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

Reynolds number	$Re = \frac{2 \cdot \dot{m}}{\pi \cdot d \cdot v \cdot \rho}$ <div>a0004623</div>
$Re \geq 2300^{1)}$	$\Delta p = K \cdot v^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$ <div>a0004626</div>
$Re < 2300$	$\Delta p = K1 \cdot v \cdot \dot{m} + \frac{K2 \cdot v^{0.25} \cdot \dot{m}^2}{\rho}$ <div>a0004628</div>
<div>Δp = pressure loss [mbar] v = kinematic viscosity [m²/s] \dot{m} = mass flow [kg/s] ρ = fluid density [kg/m³] d = inside diameter of measuring tubes [m] K to K2 = constants (depending on nominal diameter)</div> <div>1) To compute the pressure loss for gases, always use the formula for $Re \geq 2300$.</div>	

Pressure loss coefficient

DN		d[m]	K	K1	K2
[mm]	[inch]				
8	3/8"	$5.53 \cdot 10^{-3}$	$5.2 \cdot 10^7$	$8.6 \cdot 10^7$	$1.7 \cdot 10^7$
15	1/2"	$8.55 \cdot 10^{-3}$	$5.3 \cdot 10^6$	$1.7 \cdot 10^7$	$9.7 \cdot 10^5$
25	1"	$11.38 \cdot 10^{-3}$	$1.7 \cdot 10^6$	$5.8 \cdot 10^6$	$4.1 \cdot 10^5$
40	1 1/2"	$17.07 \cdot 10^{-3}$	$3.2 \cdot 10^5$	$1.2 \cdot 10^6$	$1.2 \cdot 10^5$
50	2"	$25.60 \cdot 10^{-3}$	$6.4 \cdot 10^4$	$4.5 \cdot 10^5$	$1.3 \cdot 10^4$
80	3"	$38.46 \cdot 10^{-3}$	$1.4 \cdot 10^4$	$8.2 \cdot 10^4$	$3.7 \cdot 10^4$
High-pressure version					
8	3/8"	$4.93 \cdot 10^{-3}$	$6.0 \cdot 10^7$	$1.4 \cdot 10^8$	$2.8 \cdot 10^7$
15	1/2"	$7.75 \cdot 10^{-3}$	$8.0 \cdot 10^6$	$2.5 \cdot 10^7$	$1.4 \cdot 10^6$
25	1"	$10.20 \cdot 10^{-3}$	$2.7 \cdot 10^6$	$8.9 \cdot 10^6$	$6.3 \cdot 10^5$



Pressure loss diagram for water

- 1 Promass M
- 2 Promass M (high-pressure version)

Pressure loss (US units)

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

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

The Applicator runs on any IBM compatible PC with windows.

Custody transfer measurement

Promass 84 is a flowmeter suitable for custody transfer measurement for liquids (other than water) and gases.

Custody transfer variables

- Mass flow
- Volume flow
- Density

Suitability for custody transfer, metrological control, obligation to subsequent verification



Promass 84 flowmeters are usually verified on site using reference measurements. Only once it has been verified on site by the Verification Authority for legal metrology controls may the measuring device be regarded as verified and used for applications subject to legal metrology controls. The associated seal (stamp) on the measuring device ensures this status.

Caution!

Only flowmeters verified by the Verification Authorities may be used for invoicing in applications subject to legal metrology controls. For all verification processes, both the corresponding approvals and the country-specific requirements resp. regulations (e.g. such as the German Verification Act) must be observed. The owner / user of the instrument is obliged to subsequent verification.

Approval for custody transfer

The requirements of the following legal metrology authorities are taken into consideration:

- **PTB**, Germany; (www.eichamt.de)
- **METAS**, Switzerland; (www.metas.ch)
- **BEV**, Austria; (www.bev.gv.at)
- **NTEP**, USA; (www.ncwm.net)
- **MC**, Canada; (www.ic.gc.ca)

Switching on the power supply in custody transfer mode

If the device is started in custody transfer mode, for example also after a power outage, system error No. 271 "POWER BRK. DOWN" flashes on the local display. The fault message can be acknowledged or reset using the "Enter" key or by means of the status input configured accordingly.



Note!

For correct measuring operation, it is not mandatory to reset the fault message.

Verification (Example)

Type-approved measuring systems for liquids other than water are always verified at their place of deployment. For this purpose, the facility's owner-operator must make everything available when the Verification Authorities come to inspect and verify the system. This includes:

- Scales or container with a reading unit with a load or volumetric capacity that corresponds to the operation of the system at Q_{\max} for one minute. The resolution of the scales display or the reading unit must be at least 0.1 % of the minimum measured quantity.
- Unit for removing the medium being measured after the totalizer to fill the scales or the container.
- Making a sufficient quantity of the medium being measured available. The quantity is derived from the operation of the system. The following rule of thumb applies – quantity at:
 - 3×1 minute at Q_{\min} ,
 - plus 3×1 minute at $\frac{1}{2} Q_{\max}$,
 - plus 3×1 minute at Q_{\max} ,
 - plus adequate quantity in reserve.
- Approval certificates



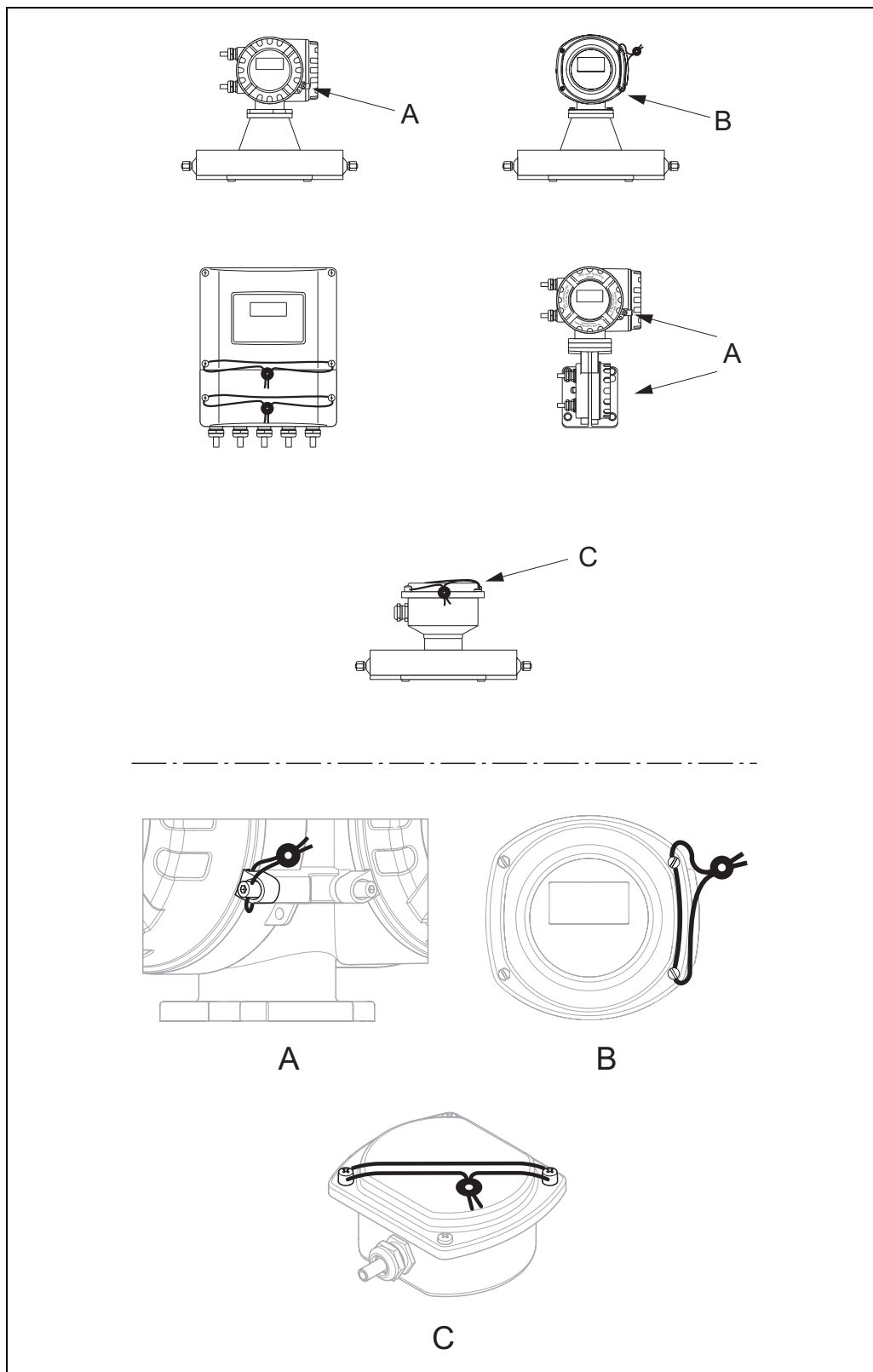
Note!

All issues should be clarified in advance with the authority responsible to ensure the successful verification of the measuring system.

Setting up custody transfer mode

A detailed description of the "setting up custody transfer mode" process is provided in the Operating Instructions supplied with the device.

Stamp points



a0003467

Examples of how to seal the various device versions.

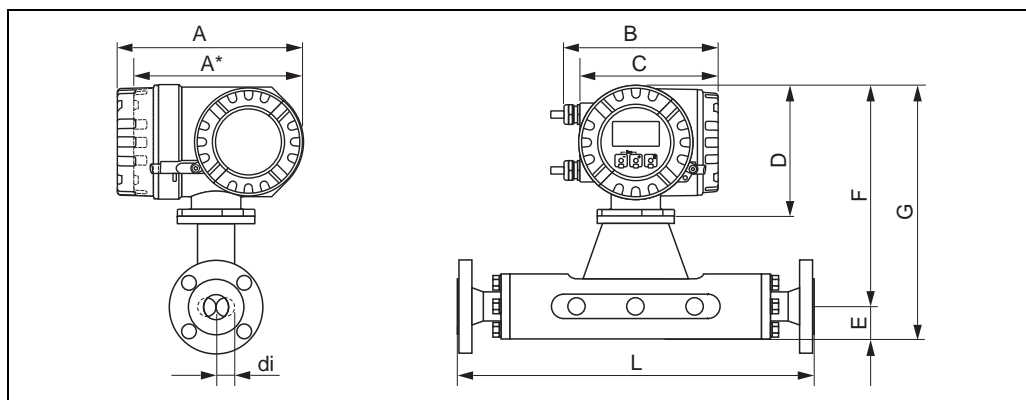
Disabling custody transfer mode

A detailed description of the "disabling custody transfer mode" process is provided in the Operating Instructions supplied with the device.

Mechanical construction

Design, dimensions

Dimensions:	
Field housing compact version, powder-coated die-cast aluminium	→ 22
Transmitter compact version, stainless steel	→ 23
Transmitter connection housing remote version (II2G/Zone 1)	→ 23
Transmitter wall-mount housing (non Ex-zone and II3G/Zone 2)	→ 24
Connection housing remote version	→ 25
Process connection SI units	
Flange connections EN (DIN)	→ 26
Flange connections ASME B16.5	→ 27
Flange connection JIS B2220	→ 28
Tri-Clamp	→ 30
DIN 11851 (threaded hygienic connection)	→ 31
DIN 11864-1 Form A (threaded hygienic connection)	→ 31
DIN 11864-2 Form A (flat flange with groove)	→ 32
ISO 2853 (threaded hygienic connection)	→ 33
SMS 1145 (threaded hygienic connection)	→ 33
High-pressure version: ½"-NPT, 3/8"-NPT and G 3/8"	→ 34
High-pressure version: ½"-SWAGELOK	→ 35
High-pressure version: Connector with internal thread 7/8-14 UNF	→ 35
Process connection in US units	
Flange connections ASME B16.5	→ 36
Tri-Clamp	→ 38
SMS 1145 (threaded hygienic connection)	→ 39
high-pressure version: ½"-NPT, 3/8"-NPT and G 3/8"	→ 40
High-pressure version: ½"-SWAGELOK	→ 41
High-pressure version: Connector with internal thread 7/8-14 UNF	→ 41
Promass M without process connections (SI units)	→ 42
Promass M without process connections (US units)	→ 43
Purge connections / secondary containment monitoring	→ 44

Field housing compact version, powder-coated die-cast aluminium*Dimensions in SI units*

DN	A	A*	B	C	D	E	F	G	L	di
8	227	207	187	168	160	75	266	341	¹⁾	¹⁾
15	227	207	187	168	160	75	266	341	¹⁾	¹⁾
25	227	207	187	168	160	75	266	341	¹⁾	¹⁾
40	227	207	187	168	160	105	271	376	¹⁾	¹⁾
50	227	207	187	168	160	141	283	424	¹⁾	¹⁾
80	227	207	187	168	160	200	305	505	¹⁾	¹⁾

* Blind version (without local display)

¹⁾ dependent on respective process connection

All dimensions in [mm]

Dimensions in US units

DN	A	A*	B	C	D	E	F	G	L	di
3/8"	8.94	8.15	7.68	6.61	6.30	2.95	10.5	13.4	¹⁾	¹⁾
1/2"	8.94	8.15	7.68	6.61	6.30	2.95	10.5	13.4	¹⁾	¹⁾
1"	8.94	8.15	7.68	6.61	6.30	2.95	10.5	13.4	¹⁾	¹⁾
1 1/2"	8.94	8.15	7.68	6.61	6.30	4.13	10.7	14.8	¹⁾	¹⁾
2"	8.94	8.15	7.68	6.61	6.30	5.55	11.1	16.7	¹⁾	¹⁾
3"	8.94	8.15	7.68	6.61	6.30	7.87	12.0	19.9	¹⁾	¹⁾

*Blind version (without local display)

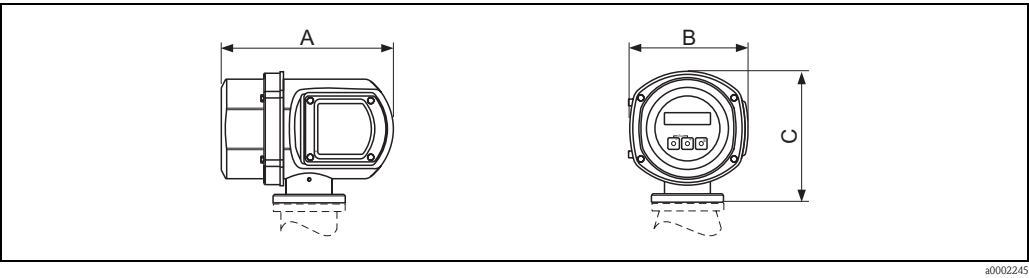
¹⁾ dependent on respective process connection

All dimensions in [inch]

**Note!**

Dimensions for transmitters II2G/Zone 1 → 23.

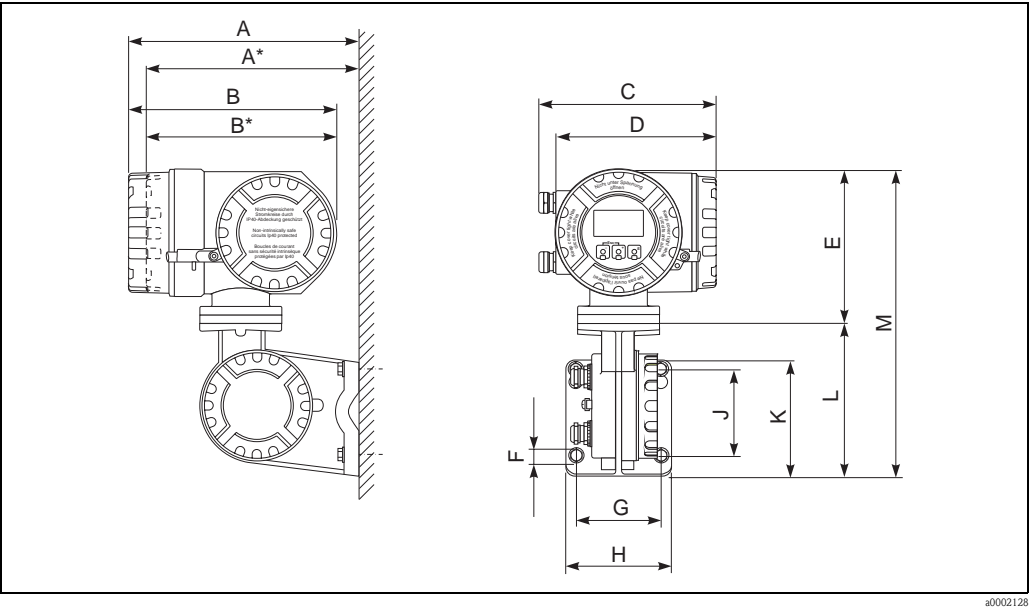
Transmitter compact version, stainless steel



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)



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

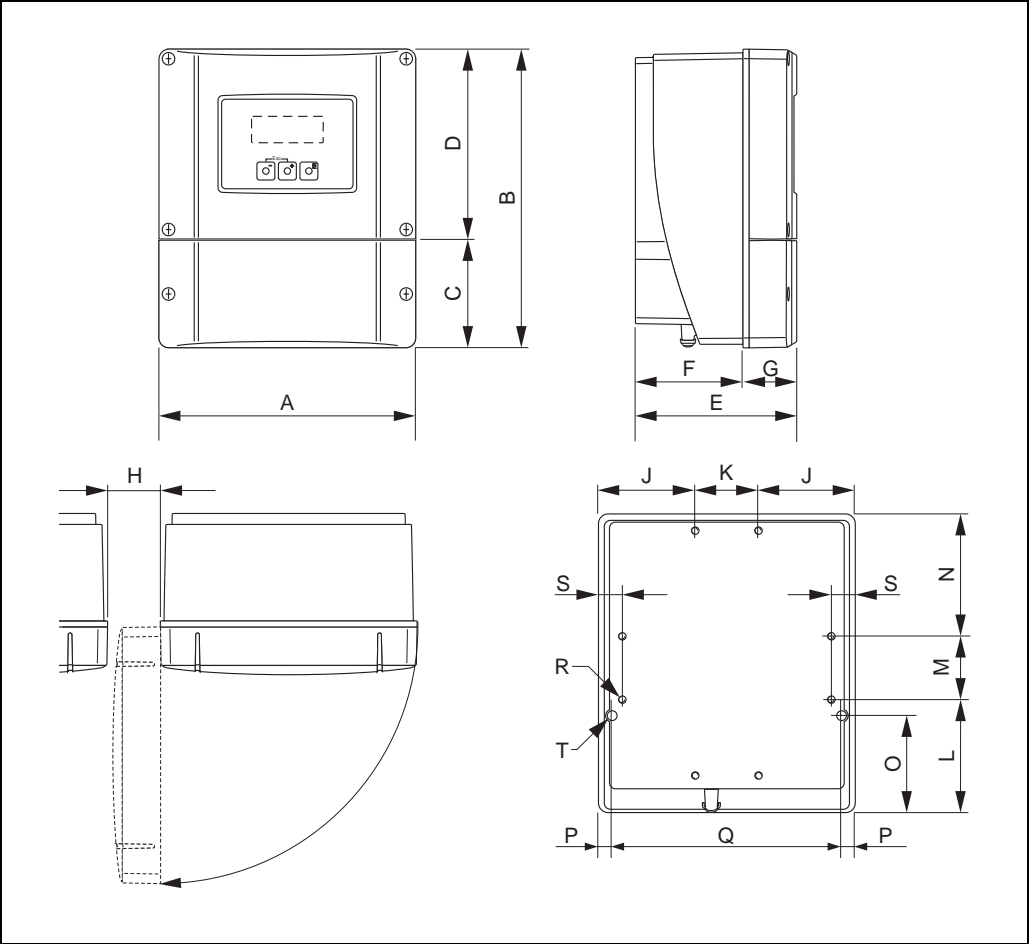
* Blind version (without display)
All dimensions in [mm]

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 display)
All dimensions in [inch]

Transmitter wall-mount housing (non Ex-zone and II3G/Zone 2)



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

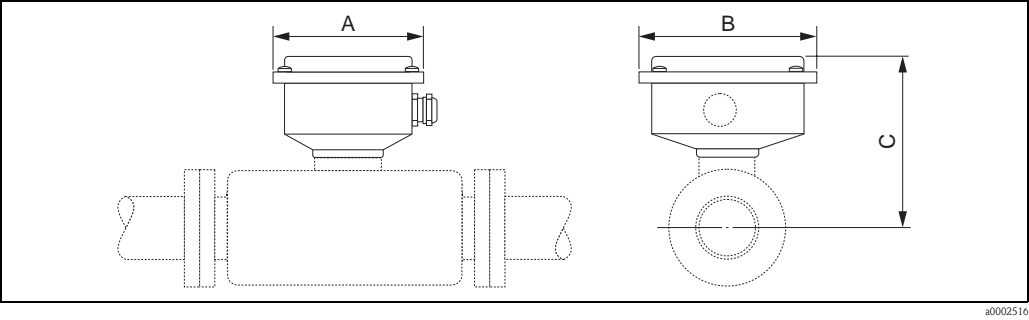
All dimensions in [mm]

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]

Connection housing remote version



Dimensions in SI units

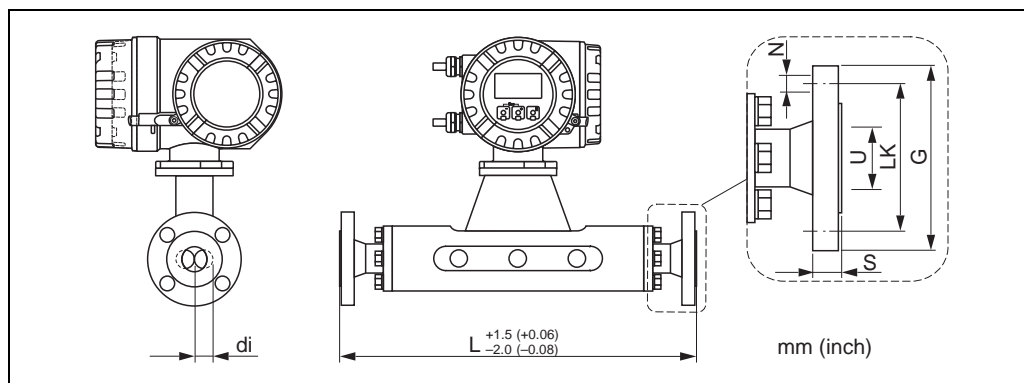
DN	A	B	C
8	118.5	137.5	113
15	118.5	137.5	115
25	118.5	137.5	119
40	118.5	137.5	130
50	118.5	137.5	140
80	118.5	137.5	156

All dimensions in [mm]

Dimensions in US units

DN	A	B	C
3/8"	4.67	5.41	4.52
1/2"	4.67	5.41	4.60
1"	4.67	5.41	4.76
1 1/2"	4.67	5.41	5.20
2"	4.67	5.41	5.60
3"	4.67	5.41	6.24

All dimensions in [inch]

Process connections in SI units*Flange connections EN (DIN), ASME B16.5, JIS B2220*

s0002525-ae

Flange connections EN (DIN)

Flange according to EN 1092-1 (DIN 2501) / PN 16: PVDF							
DN	G	L	N	S	LK	U	di
8	95	370	4 × Ø14	16	65	16.1	5.53
15	95	404	4 × Ø14	16	65	16.1	8.55
25	115	440	4 × Ø14	18	85	28.5	11.38
40	150	550	4 × Ø18	18	110	43.1	17.07
50	165	715	4 × Ø18	20	125	54.5	25.60

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N ¹⁾) / PN 40: 1.4404/316L, Titanium							
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	95	370	4 × Ø14	16	65	17.3	5.53
15	95	404	4 × Ø14	16	65	17.3	8.55
25	115	440	4 × Ø14	18	85	28.5	11.38
40	150	550	4 × Ø18	18	110	43.1	17.07
50	165	715	4 × Ø18	20	125	54.5	25.60
80	200	840	8 × Ø18	24	160	82.5	38.46

¹⁾ Flange with groove according to EN 1092-1 Form D (DIN 2512N) available

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501) / PN 40 (with DN 25 flange): 1.4404/316L							
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	115	440	4 × Ø14	18	85	28.5	5.53
15	115	440	4 × Ø14	18	85	28.5	8.55

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N ¹⁾) / PN 63: 1.4404/316L, Titanium							
Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form E), Ra 0.8 to 3.2 µm							
DN	G	L	N	S	LK	U	di
50	180	724	4 × Ø22	26	135	54.5	25.60
80	215	875	8 × Ø22	28	170	81.7	38.46

¹⁾ Flange with groove according to EN 1092-1 Form D (DIN 2512N) available
All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N ¹⁾) / PN 100: 1.4404/316L, Titanium							
Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form E), Ra 0.8 to 3.2 µm							
DN	G	L	N	S	LK	U	di
8	95	400	4 × Ø14	20	65	17.3	5.53
15	95	420	4 × Ø14	20	65	17.3	8.55
25	115	470	4 × Ø14	24	85	28.5	11.38
40	150	590	4 × Ø18	26	110	43.1	17.07
50	165	740	4 × Ø18	28	125	54.5	25.60
80	230	885	8 × Ø26	32	180	80.9	38.46

¹⁾ Flange with groove according to EN 1092-1 Form D (DIN 2512N) available
All dimensions in [mm]

Flange connections ASME B16.5

Flange according to ASME B16.5 / CI 150: 1.4404/316L, Titanium							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8	88.9	370	4 × Ø15.7	11.2	60.5	15.7	5.53
15	88.9	404	4 × Ø15.7	11.2	60.5	15.7	8.55
25	108.0	440	4 × Ø15.7	14.2	79.2	26.7	11.38
40	127.0	550	4 × Ø15.7	17.5	98.6	40.9	17.07
50	152.4	715	4 × Ø19.1	19.1	120.7	52.6	25.60
80	190.5	840	4 × Ø19.1	23.9	152.4	78.0	38.46

All dimensions in [mm]

Flange according to ASME B16.5 / CI 150: PVDF							
DN	G	L	N	S	LK	U	di
8	88.9	370	4 × Ø15.7	16	60.5	15.7	5.53
15	88.9	404	4 × Ø15.7	16	60.5	15.7	8.55
25	108.0	440	4 × Ø15.7	18	79.2	26.7	11.38
40	127.0	550	4 × Ø15.7	21	98.6	40.9	17.07
50	152.4	715	4 × Ø19.1	28	120.7	52.6	25.60

All dimensions in [mm]

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

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
8	95.2	370	4 × Ø15.7	14.2	66.5	15.7	5.53
15	95.2	404	4 × Ø15.7	14.2	66.5	15.7	8.55
25	123.9	440	4 × Ø19.0	17.5	88.9	26.7	11.38
40	155.4	550	4 × Ø22.3	20.6	114.3	40.9	17.07
50	165.1	715	8 × Ø19.0	22.3	127.0	52.6	25.60
80	209.5	840	8 × Ø22.3	28.4	168.1	78.0	38.46

All dimensions in [mm]

Flange according to ASME B16.5 / Cl 600: 1.4404/316L, Titanium

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
8	95.3	400	4 × Ø15.7	20.6	66.5	13.8	5.53
15	95.3	420	4 × Ø15.7	20.6	66.5	13.8	8.55
25	124.0	490	4 × Ø19.1	23.6	88.9	24.4	11.38
40	155.4	600	4 × Ø22.4	28.7	114.3	38.1	17.07
50	165.1	742	8 × Ø19.1	31.8	127.0	49.3	25.60
80	209.6	900	8 × Ø22.4	38.2	168.1	73.7	38.46

All dimensions in [mm]

*Flange connection JIS B2220***Flange JIS B2220 / 10K: 1.4404/316L, Titanium**

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
50	155	715	4 × Ø19	16	120	50	25.60
80	185	832	8 × Ø19	18	150	80	38.46

All dimensions in [mm]

Flange JIS B2220 / 10K: 1.4404/316L, PVDF

DN	G	L	N	S	LK	U	di
8	95	370	4 × Ø15	16	70	15	5.53
15	95	404	4 × Ø15	16	70	15	8.55
25	125	440	4 × Ø19	18	90	25	11.38
40	140	550	4 × Ø19	21	105	40	17.07
50	155	715	4 × Ø19	22	120	50	25.60

All dimensions in [mm]

Flange JIS B2220 / 20K: 1.4404/316L, Titanium

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
8	95	370	4 × Ø15	16	70	15	5.53
15	95	404	4 × Ø15	16	70	15	8.55
25	125	440	4 × Ø19	18	90	25	11.38
40	140	550	4 × Ø19	21	105	40	17.07
50	155	715	4 × Ø19	22	120	50	25.60
80	200	832	8 × Ø23	22	160	80	38.46

All dimensions in [mm]

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

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
8	115	400	4 × Ø19	20	80	15	5.35
15	115	425	4 × Ø19	20	80	15	8.55
25	130	485	4 × Ø19	22	95	25	11.38
40	160	600	4 × Ø23	24	120	38	17.07
50	165	760	8 × Ø19	26	130	50	25.60
80	210	890	8 × Ø23	32	170	75	38.46

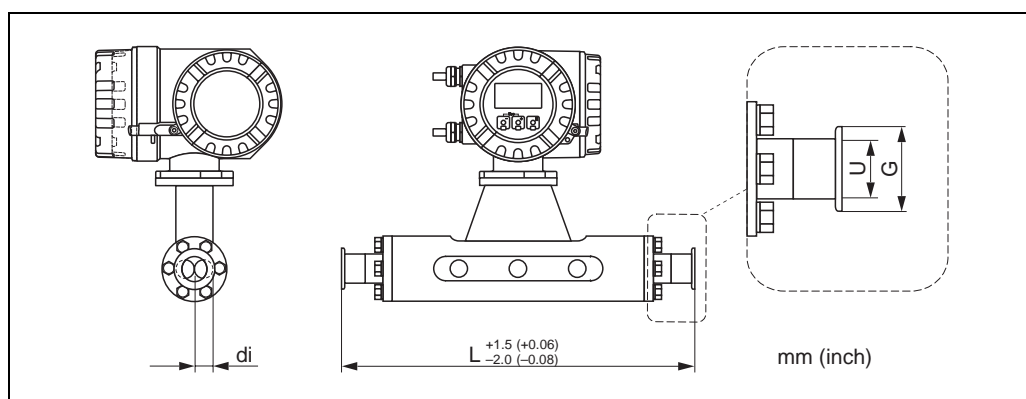
All dimensions in [mm]

Flange JIS B2220 / 63K: 1.4404/316L, Titanium

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
8	120	420	4 × Ø19	23	85	12	5.53
15	120	440	4 × Ø19	23	85	12	8.55
25	140	494	4 × Ø23	27	100	22	11.38
40	175	620	4 × Ø25	32	130	35	17.07
50	185	775	8 × Ø23	34	145	48	25.60
80	230	915	8 × Ø25	40	185	73	38.46

All dimensions in [mm]

Tri-Clamp

a0002526-ae

Tri-Clamp: 1.4404/316L

DN	Clamp	G	L	U	di
8	1"	50.4	367	22.1	5.53
15	1"	50.4	398	22.1	8.55
25	1"	50.4	434	22.1	11.38
40	1½"	50.4	560	34.8	17.07
50	2"	63.9	720	47.5	25.60
80	3"	90.9	801	72.9	38.46

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [mm]

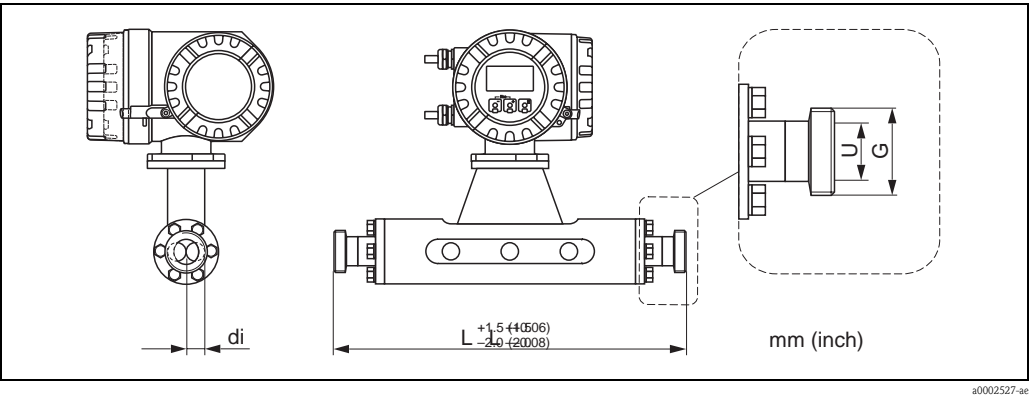
½"-Tri-Clamp: 1.4404/316L

DN	Clamp	G	L	U	di
8	½"	25.0	36	9.5	5.53
15	½"	25.0	398	9.5	8.55

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [mm]

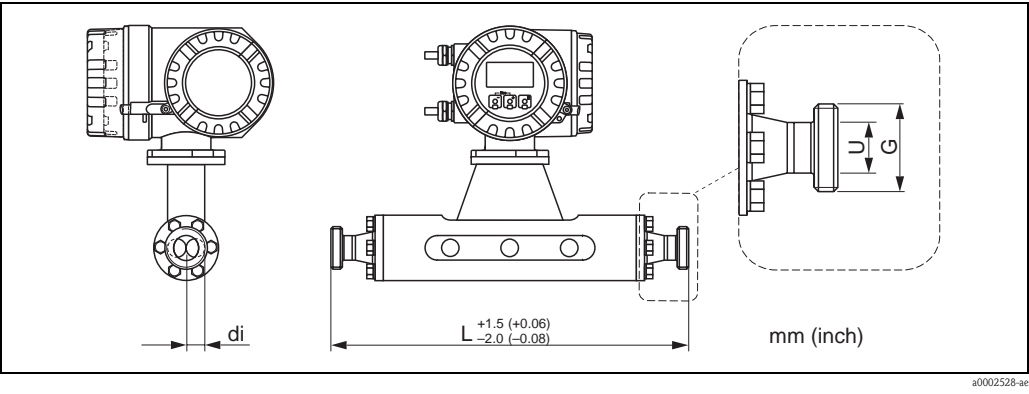
DIN 11851 (threaded hygienic connection)



Threaded hygienic connection DIN 11851: 1.4404/316L				
DN	G	L	U	di
8	Rd 34 × 1/8"	367	16	5.53
15	Rd 34 × 1/8"	398	16	8.55
25	Rd 52 × 1/6"	434	26	11.38
40	Rd 65 × 1/6"	560	38	17.07
50	Rd 78 × 1/6"	720	50	25.60
80	Rd 110 × 1/4"	815	81	38.46

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [mm]

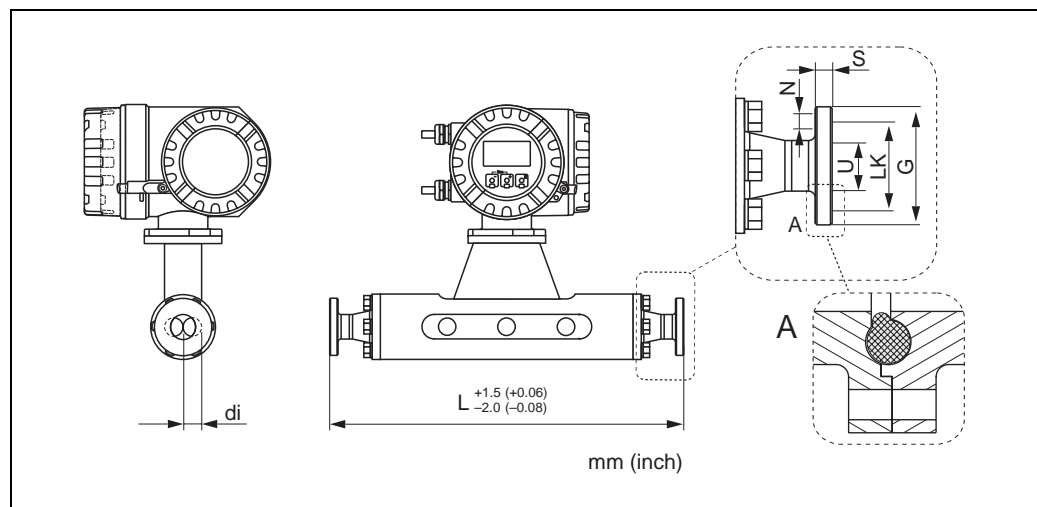
DIN 11864-1 Form A (threaded hygienic connection)



Threaded hygienic connection DIN 11864-1 Form A: 1.4404/316L				
DN	G	L	U	di
8	Rd 28x 1/8"	367	10	5.53
15	Rd 34 × 1/8"	398	16	8.55
25	Rd 52 × 1/6"	434	26	11.38
40	Rd 65 × 1/6"	560	38	17.07
50	Rd 78 × 1/6"	720	50	25.60
80	Rd 110 × 1/4"	815	81	38.46

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [mm]

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



A0002529-ae

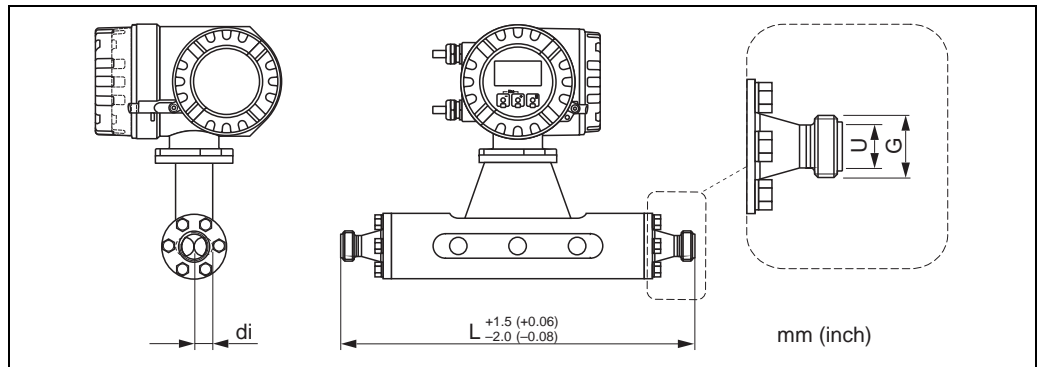
Detail A: The flange has the smaller groove for the O-ring on the sensor side. When mounting the sensor the corresponding flange must have accordingly a larger groove.

DIN 11864-2 Form A (flat flange with groove): 1.4404/316L

DN	G	L	N	S	LK	U	di
8	54	367	4 × Ø9	10	37	10	5.53
15	59	398	4 × Ø9	10	42	16	8.55
25	70	434	4 × Ø9	10	53	26	11.38
40	82	560	4 × Ø9	10	65	38	17.07
50	94	720	4 × Ø9	10	77	50	25.60
80	133	815	8 × Ø11	12	112	81	38.46

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [mm]

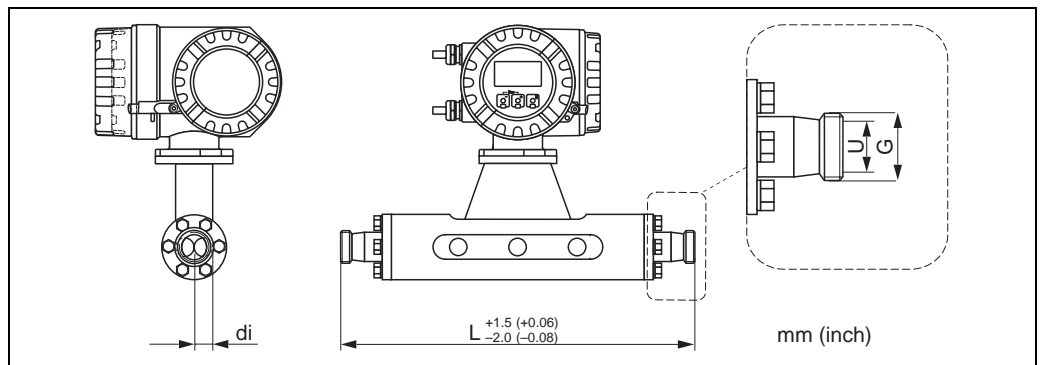
ISO 2853 (threaded hygienic connection)

a0002530-ae

Threaded hygienic connection ISO 2853: 1.4404/316L

DN	G ¹⁾	L	N	di
8	37.13	367	22.6	5.53
15	37.13	398	22.6	8.55
25	37.13	434	22.6	11.38
40	52.68	560	35.6	17.07
50	64.16	720	48.6	25.60
80	91.19	815	72.9	38.46

¹⁾ Max. thread diameter to ISO 2853 Annex A
 3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
 All dimensions in [mm]

SMS 1145 (threaded hygienic connection)

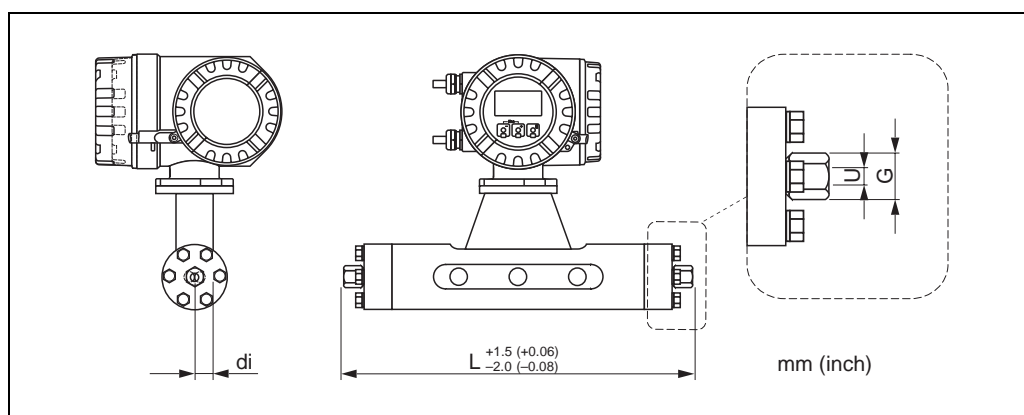
a0002531-ae

Threaded hygienic connection SMS 1145: 1.4404/316L

DN	G	L	U	di
8	Rd 40 × 1/6"	367	22.5	5.53
15	Rd 40 × 1/6"	398	22.5	8.55
25	Rd 40 × 1/6"	434	22.5	11.38
40	Rd 60 × 1/6"	560	35.5	17.07
50	Rd 70 × 1/6"	720	48.5	25.60
80	Rd 98 × 1/6"	792	72.0	38.46

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
 All dimensions in [mm]

High-pressure version: 1/2"-NPT, 3/8"-NPT and G 3/8"



a0002532-ae

1/2"-NPT: 1.4404/316L

DN	G	L	U	di
8	AF 1 1/16"	370	10.2	4.93
15	AF 1 1/16"	400	10.2	7.75
25	AF 1 1/16"	444	10.2	10.20

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [mm]

3/8"-NPT: 1.4404/316L

DN	G	L	U	di
8	AF 1 5/16"	355.8	10.2	4.93
15	AF 1 5/16"	385.8	10.2	7.75
25	AF 1 5/16"	429.8	10.2	10.20

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [mm]

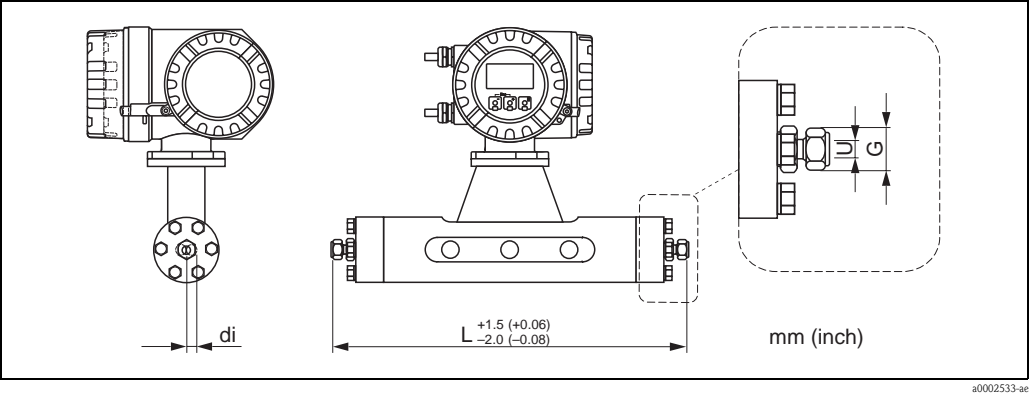
G 3/8": 1.4404/316L

DN	G	L	U	di
8	AF 24	355.8	10.2	4.93
15	AF 24	385.8	10.2	7.75
25	AF 24	429.8	10.2	10.20

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [mm]

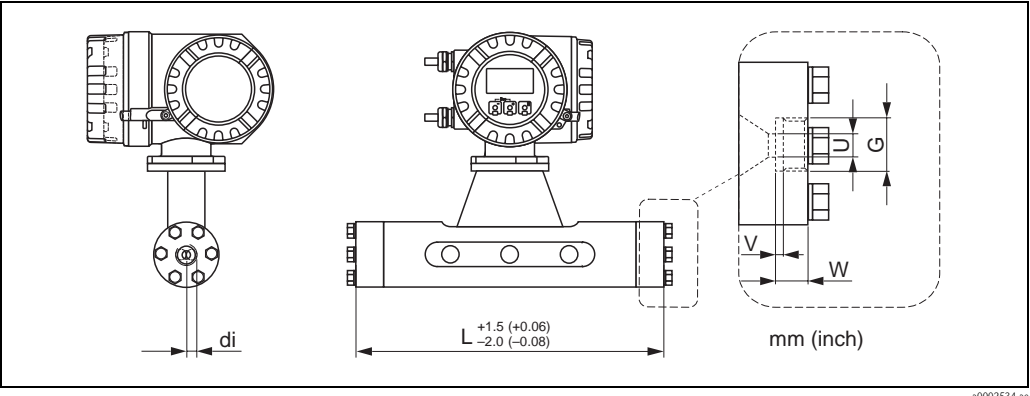
High-pressure version: 1/2"-SWAGELOK



1/2"-SWAGELOK: 1.4404/316L				
DN	G	L	U	di
8	7/8"	366.4	10.2	4.93
15	7/8"	396.4	10.2	7.75
25	7/8"	440.4	10.2	10.20

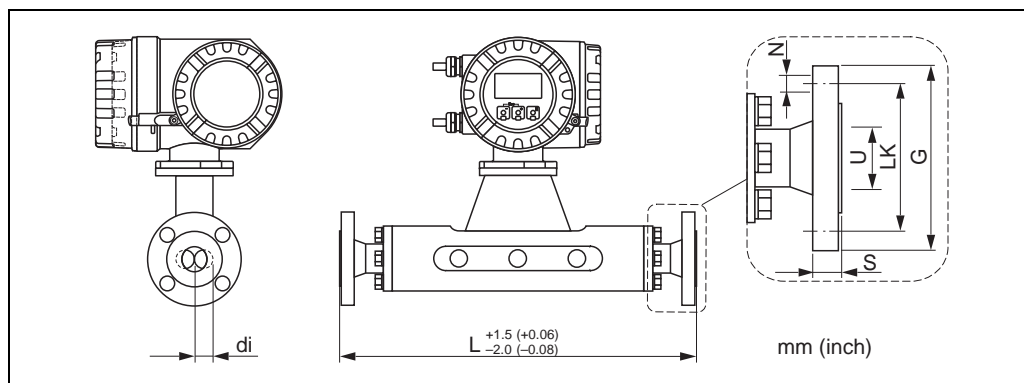
3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [mm]

High-pressure version: Connector with internal thread 7/8-14 UNF



Internal thread 7/8-14-UNF: 1.4404/316L						
DN	G	L	U	V	W	di
8	7/8-14UNF	304	10.2	3	14	4.93
15	7/8-14UNF	334	10.2	3	14	7.75
25	7/8-14UNF	378	10.2	3	14	10.20

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [mm]

Process connections in US units*Flange connections ASME B16.5*

s0002525-ae

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

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
3/8"	3.50	14.6	4 × Ø 0.62	0.44	2.38	0.62	0.22
1/2"	3.50	15.9	4 × Ø 0.62	0.44	2.38	0.62	0.34
1"	4.25	17.3	4 × Ø 0.62	0.56	3.12	1.05	0.45
1 1/2"	5.00	21.7	4 × Ø 0.62	0.69	3.88	1.61	0.67
2"	6.00	28.1	4 × Ø 0.75	0.75	4.75	2.07	1.01
3"	7.50	33.1	4 × Ø 0.75	0.94	6.00	3.07	1.51

All dimensions in [inch]

Flange according to ASME B16.5 / Cl 150: PVDF

DN	G	L	N	S	LK	U	di
3/8"	3.50	14.6	4 × Ø 0.62	0.63	2.38	0.62	0.22
1/2"	3.50	15.9	4 × Ø 0.62	0.63	2.38	0.62	0.34
1"	4.25	17.3	4 × Ø 0.62	0.81	3.12	1.05	0.45
1 1/2"	5.00	21.7	4 × Ø 0.62	0.83	3.88	1.61	0.67
2"	6.00	28.1	4 × Ø 0.75	1.10	4.75	2.07	1.01

All dimensions in [inch]

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

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
3/8"	3.75	14.6	4 × Ø 0.62	0.56	2.62	0.62	0.22
½"	3.75	15.9	4 × Ø 0.62	0.56	2.62	0.62	0.34
1"	4.88	17.3	4 × Ø 0.75	0.69	3.50	1.05	0.45
1½"	6.12	21.7	4 × Ø 0.88	0.81	4.50	1.51	0.67
2"	6.50	28.1	8 × Ø 0.75	0.88	5.00	2.07	1.01
3"	8.25	33.1	8 × Ø 0.88	1.12	6.62	3.07	1.51

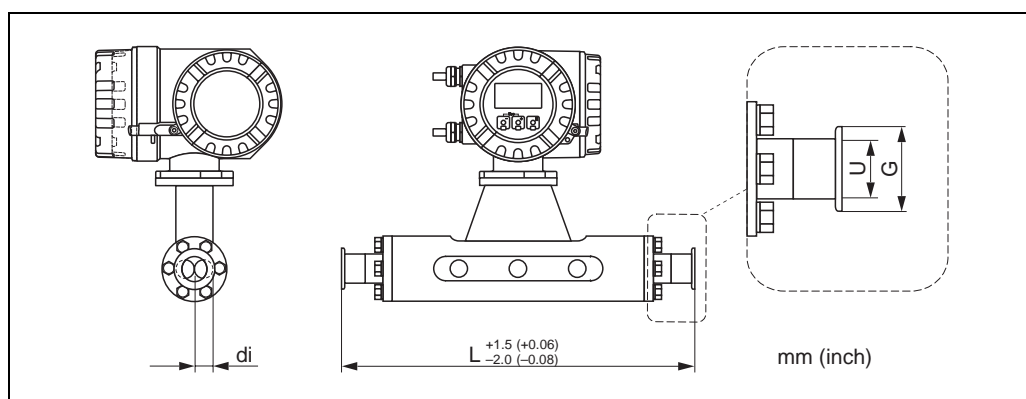
All dimensions in [inch]

Flange according to ASME B16.5 / Cl 600: 1.4404/316L, Titanium

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
3/8"	3.75	15.7	4 × Ø 0.62	0.81	2.62	0.54	0.22
½"	3.75	16.5	4 × Ø 0.62	0.81	2.62	0.54	0.34
1"	4.88	19.3	4 × Ø 0.75	0.93	3.50	0.96	0.45
1½"	6.12	23.6	4 × Ø 0.88	1.13	4.50	1.50	0.67
2"	6.50	29.2	8 × Ø 0.75	1.25	5.00	1.94	1.01
3"	8.25	35.1	8 × Ø 0.88	1.50	6.62	2.90	1.51

All dimensions in [inch]

Tri-Clamp

a0002526-ae

Tri-Clamp: 1.4404/316L

DN	Clamp	G	L	U	di
3/8"	1"	1.98	14.4	0.87	0.22
1/2"	1"	1.98	15.7	0.87	0.34
1"	1"	1.98	17.1	0.87	0.45
1 1/2"	1 1/2"	1.98	22.0	1.37	0.67
2"	2"	2.52	28.3	1.87	1.01
3"	3"	3.60	32.5	2.87	1.51

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [inch]

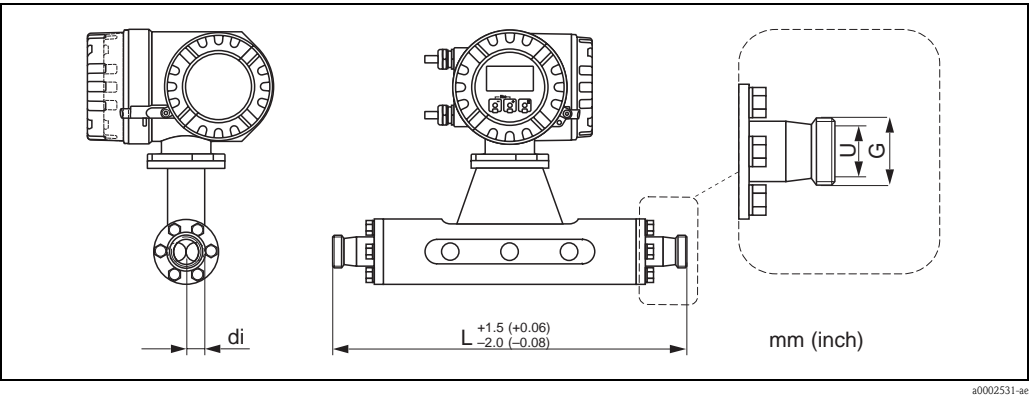
1/2"-Tri-Clamp: 1.4404/316L

DN	Clamp	G	L	U	di
3/8"	1/2"	1.98	14.4	0.37	0.22
1/2"	1/2"	1.98	15.7	0.37	0.34

3A version also available ($R_a \leq 0.8 \mu\text{m}/150$ grit)

All dimensions in [inch]

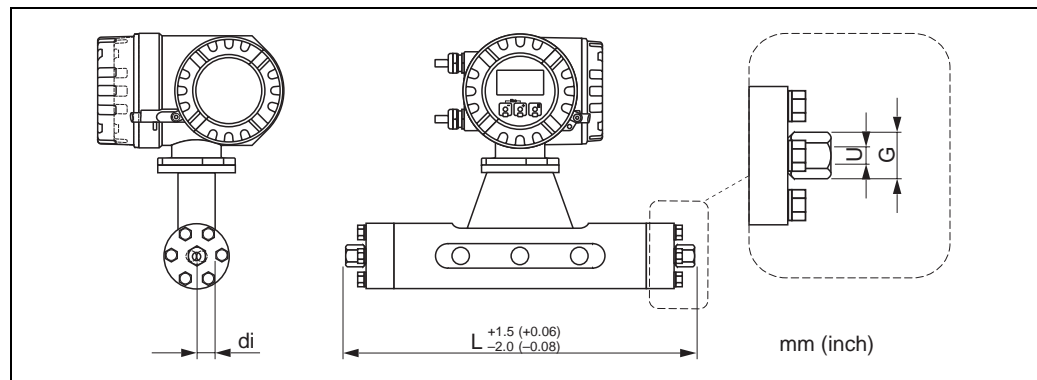
SMS 1145 (threaded hygienic connection)



Threaded hygienic connection SMS 1145: 1.4404/316L				
DN	G	L	U	di
3/8"	Rd 40 × 1/6"	14.68	0.90	0.221
1/2"	Rd 40 × 1/6"	15.92	0.90	0.342
1"	Rd 40 × 1/6"	17.36	0.90	0.455
1 1/2"	Rd 60 × 1/6"	22.40	1.42	0.683
2"	Rd 70 × 1/6"	28.80	1.94	1.024
3"	Rd 98 × 1/6"	31.68	2.88	1.538

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [inch]

high-pressure version: 1/2"-NPT, 3/8"-NPT and G 3/8"



a0002532-ae

1/2"-NPT: 1.4404/316L

DN	G	L	U	di
3/8"	AF 1 1/16"	14.5	0.40	0.19
1/2"	AF 1 1/16"	15.7	0.40	0.31
1"	AF 1 1/16"	17.5	0.40	0.40

3A version also available ($R_a \leq 0.8 \mu\text{m}/150 \text{ grit}$)

All dimensions in [inch]

3/8"-NPT: 1.4404/316L

DN	G	L	U	di
3/8"	AF 1 5/16"	14.0	0.40	0.19
1/2"	AF 1 5/16"	15.2	0.40	0.31
1"	AF 1 5/16"	16.9	0.40	0.40

3A version also available ($R_a \leq 0.8 \mu\text{m}/150 \text{ grit}$)

All dimensions in [inch]

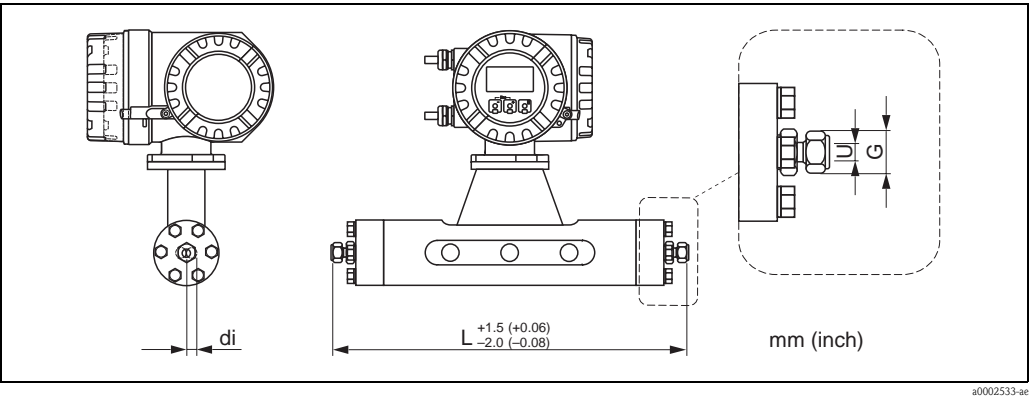
G 3/8": 1.4404/316L

DN	G	L	U	di
3/8"	AF 24	14.2	0.40	0.19
1/2"	AF 24	15.4	0.40	0.31
1"	AF 24	17.2	0.40	0.40

3A version also available ($R_a \leq 0.8 \mu\text{m}/150 \text{ grit}$)

All dimensions in [inch]

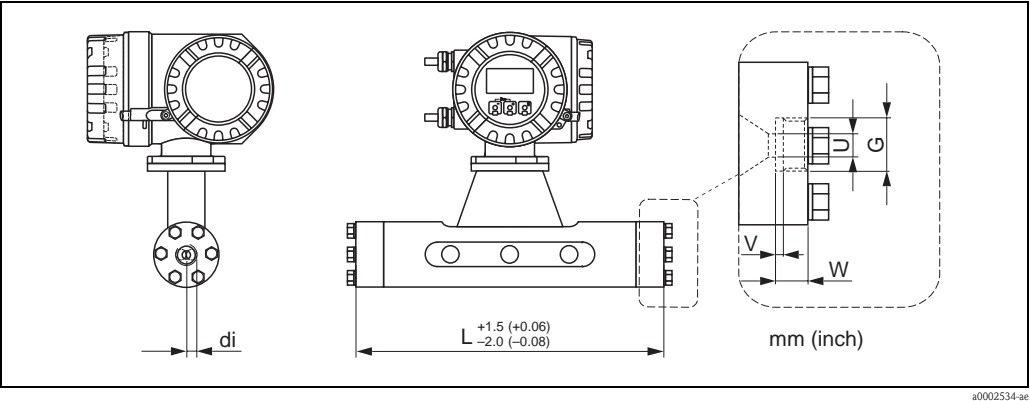
High-pressure version: 1/2"-SWAGELOK



1/2"-SWAGELOK: 1.4404/316L				
DN	G	L	U	di
3/8"	7/8"	14.4	0.55	0.16
1/2"	7/8"	15.6	0.55	0.31
1"	7/8"	17.3	0.55	0.40

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [inch]

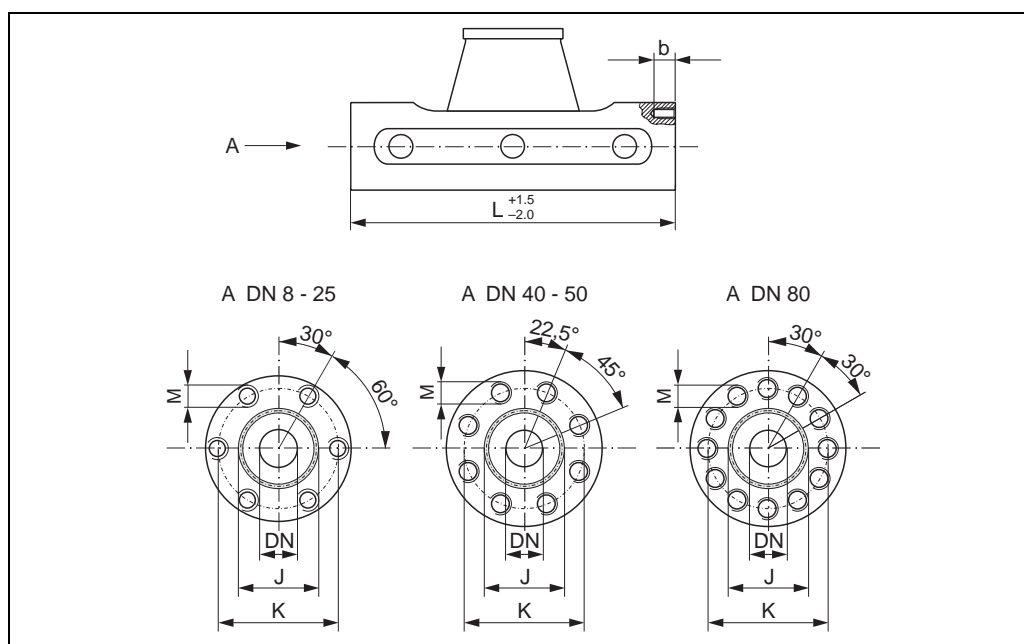
High-pressure version: Connector with internal thread 7/8-14 UNF



Internal thread 7/8-14-UNF: 1.4404/316L						
DN	G	L	U	V	W	di
3/8"	7/8-14UNF	12.0	0.40	0.12	0.55	0.16
1/2"	7/8-14UNF	13.1	0.40	0.12	0.55	0.31
1"	7/8-14UNF	14.9	0.40	0.12	0.55	0.40

3A version also available ($Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$)
All dimensions in [inch]

Promass M without process connections (SI units)



a0002535-en

DN	L	J	K	M	b _{max.}	b _{min.}
8	256	27	54	6 × M8	12	10
8 ¹⁾	256	27	54	6 × M8	12	10
15	286	35	56	6 × M8	12	10
15 ¹⁾	286	35	56	6 × M8	12	10
25	310	40	62	6 × M8	12	10
25 ¹⁾	310	40	62	6 × M8	12	10
40	410	53	80	8 × M10	15	13
50	544	73	94	8 × M10	15	13
80	644	102	128	12 × M12	18	15

¹⁾ High-pressure version; permitted screws: A4 - 80; lubricant: Molykote P37

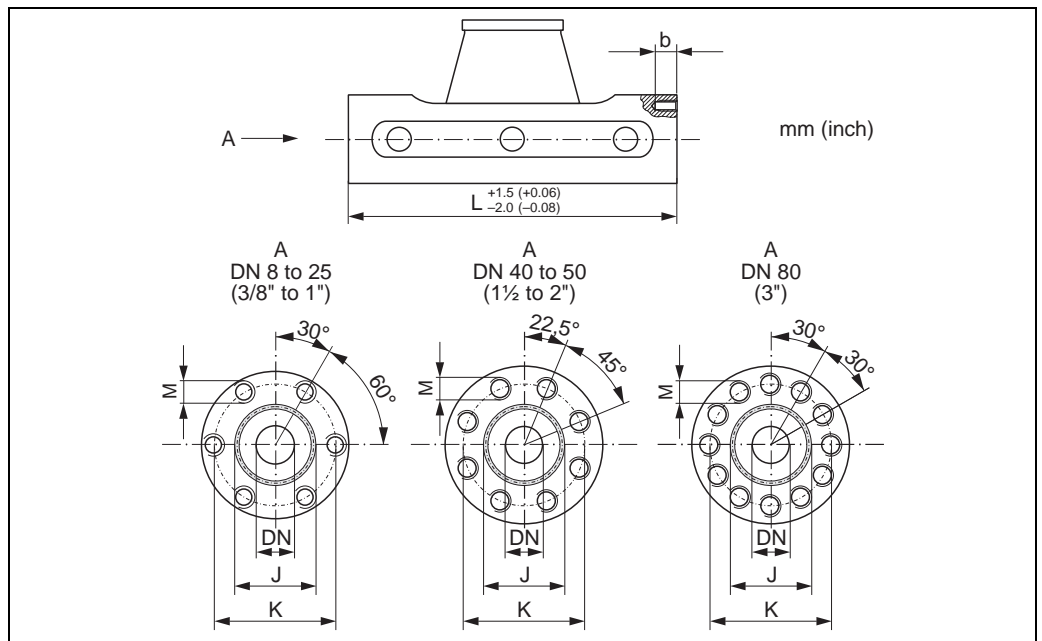
All dimensions in [mm]

DN	Tightening torque Nm	Lubricated thread yes/no	O-ring	
			Thickness	Inside Ø
8	30.0	no	2.62	21.89
8 ¹⁾	19.3	yes	2.62	21.89
15	30.0	no	2.62	29.82
15 ¹⁾	19.3	yes	2.62	29.82
25	30.0	no	2.62	34.60
25 ¹⁾	19.3	yes	2.62	34.60
40	60.0	no	2.62	47.30
50	60.0	yes	2.62	67.95
80	100.0	yes	3.53	94.84

¹⁾ High-pressure version; permitted screws: A4 - 80; lubricant: Molykote P37

All dimensions in [mm]

Promass M without process connections (US units)



a0002535-ae

DN	L	J	K	M	b _{max.}	b _{min.}
3/8"	10.1	1.06	2.12	6 × M8	0.47	0.39
3/8" ¹⁾	10.1	1.06	2.12	6 × M8	0.47	0.39
1/2"	11.3	1.38	2.20	6 × M8	0.47	0.39
1/2" ¹⁾	11.3	1.38	2.20	6 × M8	0.47	0.39
1"	12.2	1.57	2.44	6 × M8	0.47	0.39
1" ¹⁾	12.2	1.57	2.44	6 × M8	0.47	0.39
1 1/2"	16.1	2.09	3.15	8 × M10	0.59	0.51
2"	21.4	2.87	3.70	8 × M10	0.59	0.51
3"	25.5	4.01	5.04	12 × M12	0.71	0.59

¹⁾ High-pressure version; permitted screws: A4 - 80; lubricant: Molykote P37

All dimensions in [inch]

DN	Tightening torque lbf ft	Lubricated thread yes/no	O-ring	
			Thickness	Inside Ø
3/8"	22	no	0.103	0.86
3/8" ¹⁾	14	yes	0.103	0.86
1/2"	22	no	0.103	1.17
1/2" ¹⁾	14	yes	0.103	1.17
1"	22	no	0.103	1.36
1" ¹⁾	14	yes	0.103	1.36
1 1/2"	44	no	0.103	1.86
2"	44	yes	0.103	2.68
3"	74	yes	0.139	3.73

¹⁾ High-pressure version; permitted screws: A4 - 80; lubricant: Molykote P37

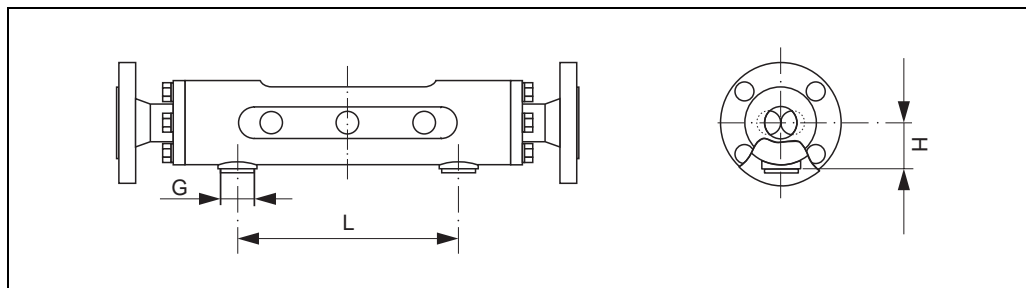
All dimensions in [inch]



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



a0002536

DN		G	H		L	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]
8	3/8"	1/2"-NPT	44.0	1.73	85	3.35
15	1/2"	1/2"-NPT	46.5	1.83	100	3.94
25	1"	1/2"-NPT	50.0	1.97	110	4.33
40	1 1/2"	1/2"-NPT	59.0	2.32	155	6.10
50	2"	1/2"-NPT	67.5	2.66	210	8.27
80	3"	1/2"-NPT	81.5	3.21	210	8.28

Weight

- Compact version: see tables below
- Remote version
 - Transmitter: see the tables below
 - Wall-mount housing: 5 kg (11 lbs)

Weight information in SI units

DN [mm]	8	15	25	40	50	80
Compact version	11	12	15	24	41	67
Remote version	9	10	13	22	39	65

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

Weight information in US

DN [inch]	3/8"	½"	1"	1½"	2"	3"
Compact version	24	26	33	53	90	148
Remote version	20	22	29	48	86	143

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

Material**Transmitter housing**

Compact version

- 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
- DN 8 to 50 (3/8" to 2"): steel, chemically nickel-plated
- DN 80 (3"): stainless steel

Connection housing, sensor (remote version)

- Stainless steel 1.4301/304 (standard)
- Powder coated die-cast aluminium (version for heating)

Process connections

- Stainless steel 1.4404/316L
 - Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / JIS B2220
 - DIN 11864-2 Form A (flat flange with groove)
 - PVDF coupling to DIN / according to ASME B16.5 / JIS
 - Threaded hygienic connection:
 - DIN 11851
 - SMS 1145
 - ISO 2853
 - DIN 11864-1 Form A
 - Tri-Clamp (OD-Tubes)
- Titanium Grade 2
 - Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / JIS B2220

High-pressure version:

- Connector → Stainless steel 1.4404/316L
- Coupling → Stainless steel 1.4401/316

Measuring tubes

- DN 8 to 50 (3/8" to 2"): Titanium grade 9
- DN 80 (3"): Titanium grade 2

High-pressure version:

- Titanium Grade 9

Seals

- Viton
- EPDM
- Silicone
- Kalrez 6375
- FEP sheathing (not for gas applications)

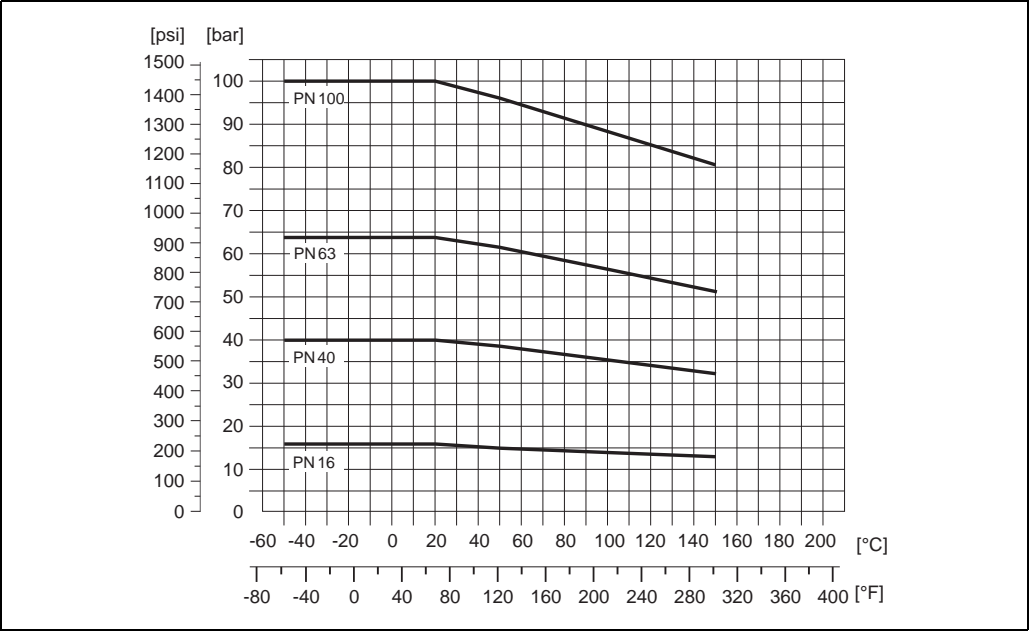
Material load diagram



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)

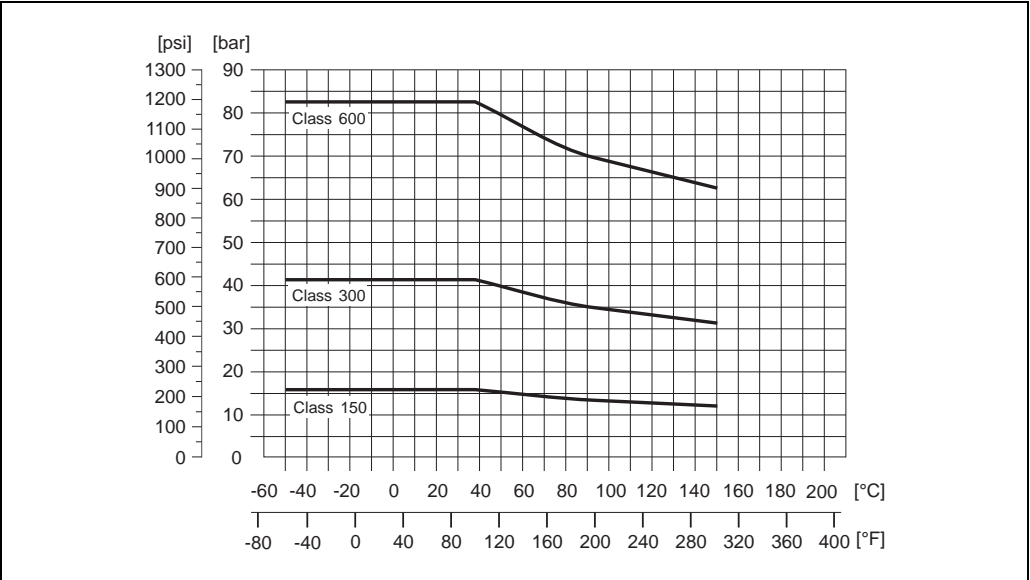
Flange material: 1.4404/316L, titanium grade 2



a0003293-ae

Flange connection according to ASME B16.5

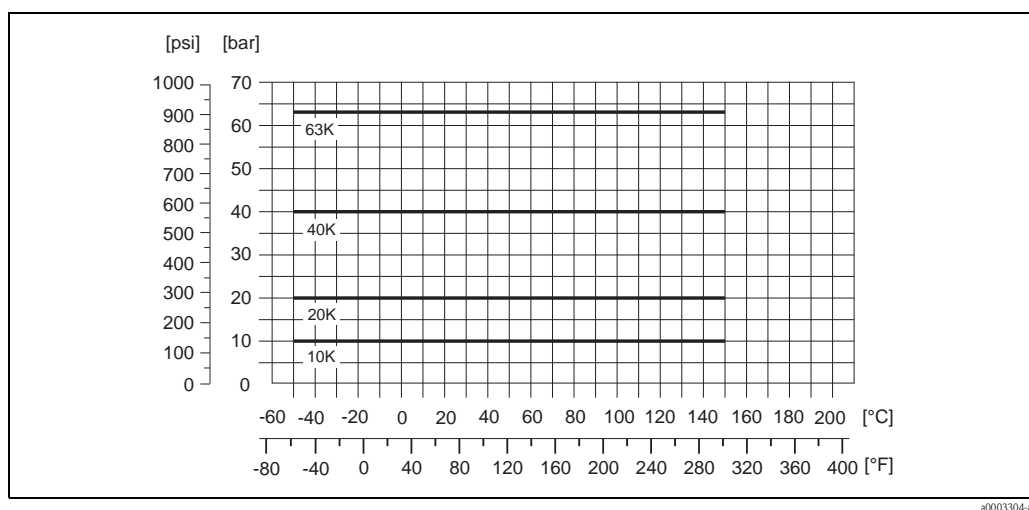
Flange material: 1.4404/316L, titanium grade 2



a0003297-ae

Flange connection to JIS B2220

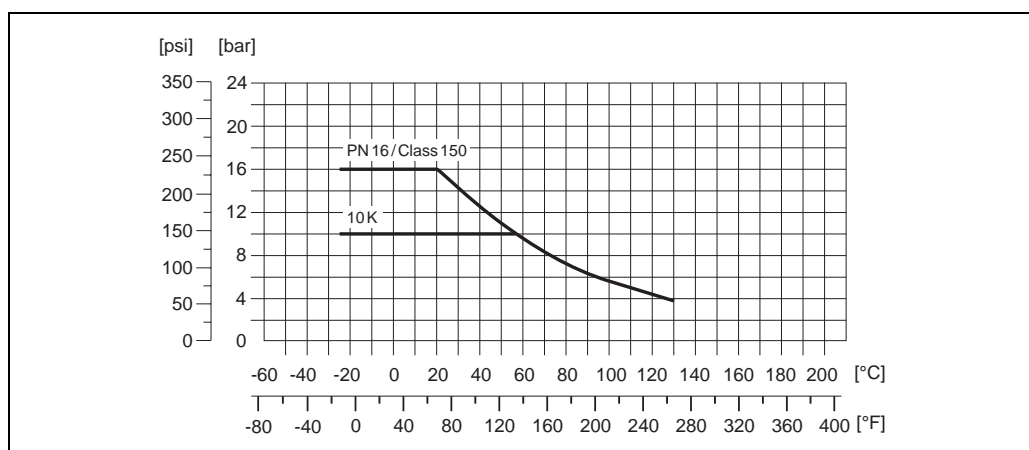
Flange material: 1.4404/316L, titanium grade 2



a0003304-ae

PVDF flange connection (to DIN 2501, according to ASME B16.5, JIS B2220)

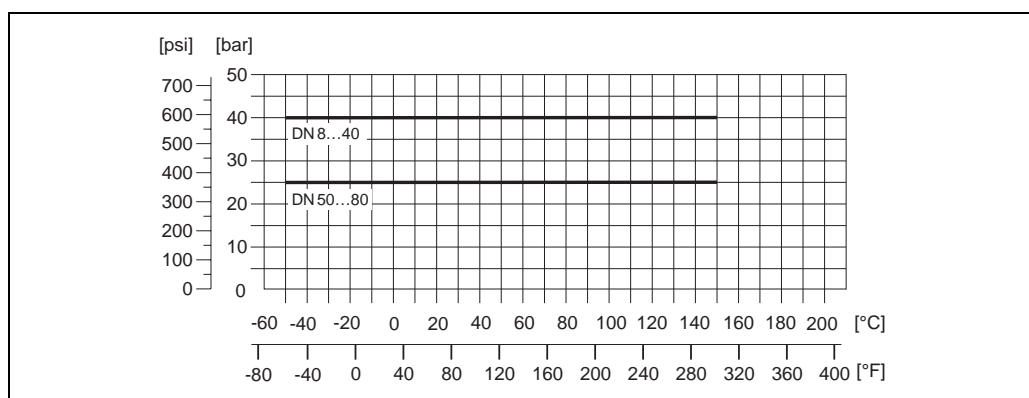
Flange material: PVDF



a0004661-ae

Process connection to DIN 11851

Connection material: 1.4404/316L

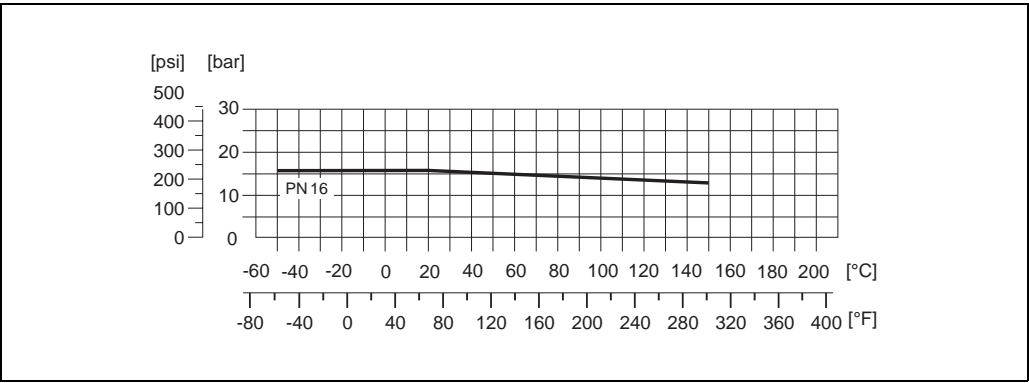


A0012480

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.

Process connection to SMS 1145

Connection material: 1.4404/316L

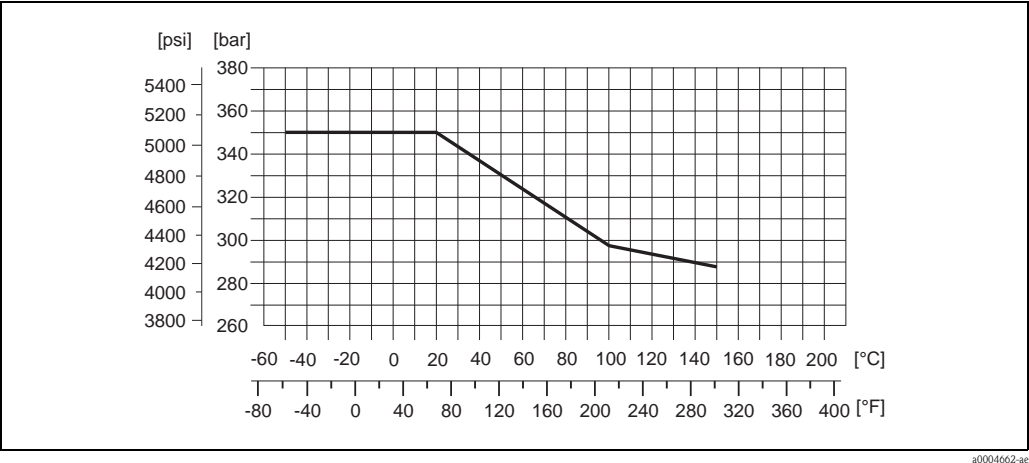


SMS 1145 allows for applications up to 6 bar (87 psi) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts as these components can limit the pressure and temperature range.

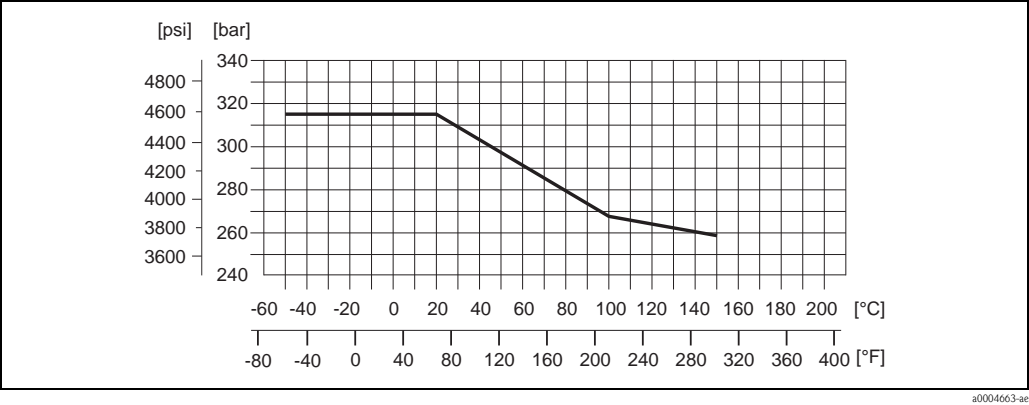
Process connections for high-pressure version

Connector material: 1.4404/316L

Material of thread connections (G 3/8", VCO with 1/2" SWAGELOK, NPT 3/8"): 14401/316



Material of thread connections (NPT 1/2"): 1.4401/316

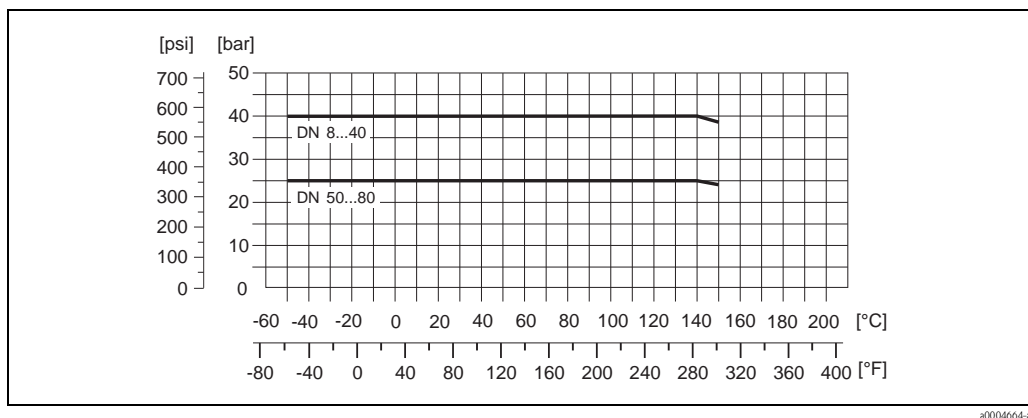


Tri-Clamp process connection

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.

Threaded hygienic connection to DIN 11864-1 Form A

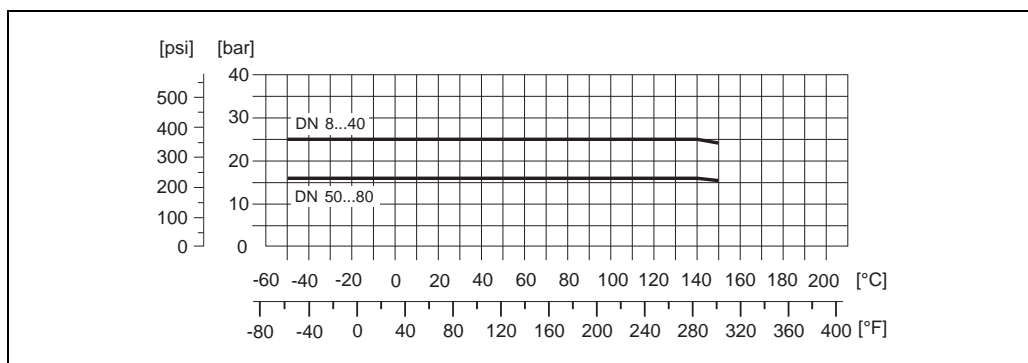
Connection material: 1.4404/316L



a0004664-ae

Flange connection to DIN 11864-2 Form A (flat flange)

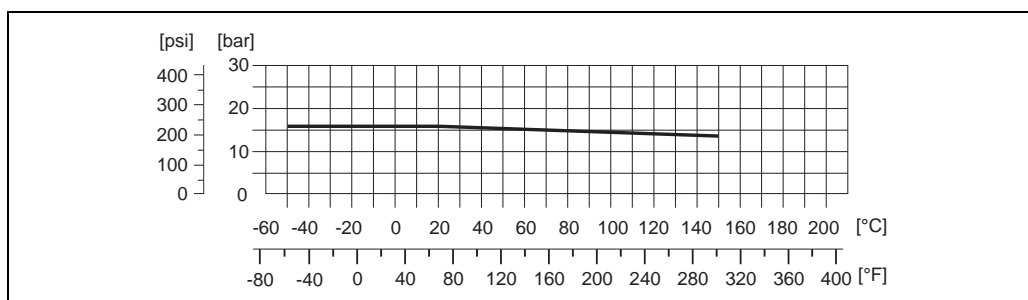
Flange material: 1.4404/316L



a0004665-ae

Threaded hygienic connection to ISO 2853

Connection material: 1.4404/316L



a0003308-ae

Process connections

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

High-pressure version

Thread connections: 3/8", 1/2" NPT, 3/8" NPT and 1/2" SWAGELOK couplings; connector with 7/8-14UNF internal thread

Human interface

Display elements	<ul style="list-style-type: none"> ■ Liquid crystal display: illuminated, four lines 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	<ul style="list-style-type: none"> ■ Local operation with three optical sensors (◀, ▶, ⏏) ■ Application specific Quick Setup menus for straightforward commissioning
---------------------------	--

Language groups	<p>Language groups available for operation in different countries:</p> <ul style="list-style-type: none"> ■ Western Europe and America (WEA): English, German, Spanish, Italian, French, Dutch and Portuguese ■ Eastern Europe and Scandinavia (EES): English, Russian, Polish, Norwegian, Finnish, Swedish and Czech ■ South and east Asia (SEA): English, Japanese, Indonesian ■ China (CIN): English, Chinese <p>You can change the language group via the operating program "FieldCare".</p>
------------------------	--

Remote operation	Operation via HART, 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 mark	The measuring system meets the EMC requirements of the Australian Communication and Media Authority (ACMA).
Ex approval	Information about currently available Ex versions (ATEX, FM, CSA, IECEx, NEPSI) can be supplied by your Endress+Hauser Sales Centre on request. All explosion protection data are given in a separate documentation which is available upon request.
Sanitary compatibility	3A approval
MODBUS RS485 certificate	The measuring device meets all the requirements of the MODBUS/TCP conformity and integration 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	<ul style="list-style-type: none"> ■ EN 60529 Degrees of protection by housing (IP code) ■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures. ■ IEC/EN 61326 "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements). ■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment. ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics
Pressure device approval	<p>Flowmeters with a nominal diameter smaller or equal DN 25 are covered by Art. 3 (3) of the European directive 97/23/EC (Pressure Equipment Directive) and are designed according to sound engineer practice. For larger nominal diameters, optional approvals according to Cat. II/III are available when required (depends on fluid and process pressure).</p> <p>Optionally flowmeters in accordance to the guidelines AD 2000 are available on request.</p>
Measuring Instruments Directive	<p>Measuring Instruments Directive 2004/22/EG (MID)</p> <p><i>Annex MI-005 (liquids other than water)</i></p> <ul style="list-style-type: none"> ■ This flowmeter which is a suitable component in measuring systems subject to legal metrology controls in accordance with Annex MI-005 of the European Measuring Instruments Directive 2004/22/EC (MID) Note: According to the Measuring Instruments Directive, however, only the complete measuring system is licensable, covered by an EC type-examination certificate and bears conformity marking. ■ This flowmeter is qualified to OIML R117-1 and has an MID Evaluation Certificate (1) which confirms compliance with the essential requirements of the Measuring Instruments Directive. The Evaluation Certificate results from the WELMEC (cooperation between the legal metrology services of the member states of the European Union and EFTA) towards voluntary modular approval for measuring systems in accordance with Annex MI-005 (measuring systems for the continuous and dynamic measurement of quantities of liquids other than water) of the Measuring Instruments Directive 2004/22/EC.

Approval for custody transfer

Promass 84 is a flowmeter suitable for custody transfer measurement for liquids (other than water) and for fuel gases under high pressure (> 100 bar (> 1450 psi)). The requirements of the following test centres are taken into consideration:

- PTB, Germany
- METAS, Switzerland
- BEV, Austria
- NTEP, USA
- MC, Canada

Information on custody transfer measurement →  19

Suitability for custody transfer measurement**PTB/METAS/BEV approval**

PTB, METAS and BEV approval for determining the mass and volume of liquids, other than water, and of fuel gases.

Sensor	DN		PTB /METAS /BEV approval		
Promass	[mm]	[inch]	For liquids other than water		
			Mass	Volume	Density
M	8 to 50	3/8" to 2"	YES	NO	NO
M	80	3"	YES	YES	YES
M (High-pressure version)	8 to 25	3/8" to 1"	NO	NO	NO

Sensor	DN		PTB /METAS /BEV approval		
Promass	[mm]	[inch]	High pressure gas (CNG)		
			Mass		
M	8 to 40	3/8" to 1½"	YES		
M	50 to 80	2" to 3"	NO		
M (High-pressure version)	8 to 25	3/8" to 1"	YES		

MID approval, Annex MI-005 (liquids other than water)

The device is qualified to OIML R117-1.

Sensor	DN		OIML R117-1/MID Evaluation Certificate (Europe)		
Promass	[mm]	[inch]	Liquids other than water		
			Mass	Volume	Density
M	8 to 80	3/8" to 3"	YES	NO	NO

NTEP approval

The measuring instrument is qualified in accordance with the National Type Evaluation Program (NTEP) Handbook 44 ("Specifications and Tolerances and other Technical Requirements for Weighing and Measuring Devices").

Sensor	DN		NTEP approval		
Promass	[mm]	[inch]	Liquids other than water		High-pressure gas
			Mass	Volume	(CNG) Mass
M	15 to 80	½" to 3"	YES	YES	NO
M (high-pressure version)	15 to 25	½" to 1"	NO	NO	YES

MC approval

The measuring instrument is qualified in accordance with "The Draft Ministerial Specifications - Mass Flow Meters" (1993-09-21).

Sensor	DN		MC approval	
Promass	[mm]	[inch]	Liquids other than water	
			Mass	Volume
M	8 to 150	3/8" to 3"	YES	NO

Ordering Information

The Endress +Hauser service organization can provide detailed ordering information and information on the order codes upon 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 84A (TI068D)
 - Promass 84F (TI103D)
- Operating Instructions/Description of Device Functions
 - Promass 84 (BA109D/BA110D)
 - Promass 84 MODBUS (BA129D/BA130D)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, IECEx, NEPSI

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

MODBUS®

Registered trademark of the MODBUS Organization

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

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

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser 
People for Process Automation