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Technical Information

Proline Promass 84F

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
- Fluid temperatures up to +350 °C (+660 °F)
- Process pressures up to 100 bar (1450 psi)
- Mass flow measurement up to 2200 t/h (80840 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, FDA, EHEDG

Connection to the common process control systems:
- HART, MODBUS

Relevant safety aspects:
- Secondary containment up to 40 bar (580 psi), Pressure Equipment Directive, AD 2000
- Purge connections or rupture disk (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:
- Best performance due to PremiumCal
- 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

TI103D/06/en/10.09
71105404

Endress+Hauser
People for Process Automation

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Function and system design

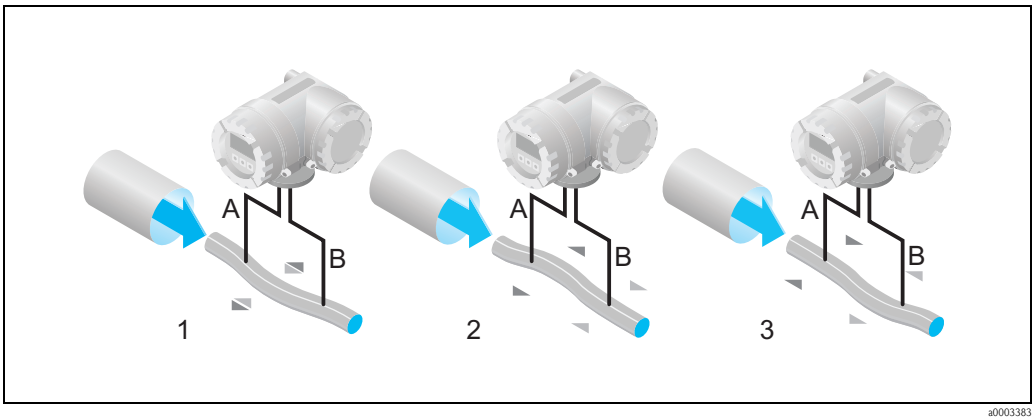
Measuring principle

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

$F_C = 2 \cdot \Delta m\ (v \cdot \omega)$
F_C = Coriolis force
Δm = moving mass
ω = rotational velocity
v = radial velocity in rotating or oscillating system

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

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).



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The phase difference (A-B) increases with increasing mass flow. Electrodynamic 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 microprocessor utilises this relationship to obtain a density signal.

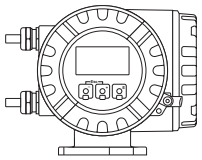
Temperature measurement

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.

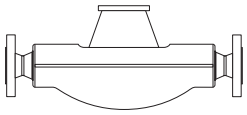
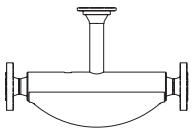
Measuring system

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.

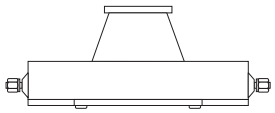
Transmitter

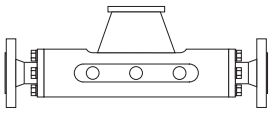
Promass 84  a0003672	■ Four-line liquid-crystal display ■ Operation with "Touch control" ■ Application-specific Quick Setup ■ Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. corrected volume flow)

Sensor

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. TI103D
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	

Further sensor in 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 316 (process connection), Alloy C-22/DIN 2.4602	Documentation TI068D

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. TI104D

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	½"	0 to 6500	0 to 238
25	1"	0 to 18000	0 to 660
40	1½"	0 to 45000	0 to 1650
50	2"	0 to 70000	0 to 2570
80	3"	0 to 180000	0 to 6600
100	4"	0 to 350000	0 to 12860
150	6"	0 to 800000	0 to 29400
250	10"	0 to 2200000	0 to 80840

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:

$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} \div x$ [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] under process conditions

DN		X	DN		X
[mm]	[inch]		[mm]	[inch]	
8	3/8"	60	80	3"	110
15	½"	80	100	4"	130
25	1"	90	150	6"	200
40	1½"	90	250	10"	200
50	2"	90			

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

Calculation example for gas:

- Sensor type: Promass F, 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 F 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 chapter "Limiting flow" → 19

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	½"	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	1½"	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
100	4"	200 to 4500	441.00 to 9922.5	200	441.00
150	6"	350 to 12000	771.75 to 26460	500	1102.5
250	10"	1500 to 35000	3307.5 to 77175	1000	2205.0

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]
8	3/8"	1.5 to 30	23.76 to 475.20	0.5	0.132
15	½"	5 to 100	79.20 to 1584.0	2.0	0.528
25	1"	15 to 300	237.6 to 4752.0	5.0	1.320
40	1½"	35 to 700	554.4 to 11088	20	5.280
50	2"	50 to 1000	792.0 to 15840	50	13.20
80	3"	150 to 3000	2376 to 47520	100	26.40
100	4"	200 to 4500	3168 to 71280	200	52.80
150	6"	350 to 12000	5544 to 190 080	500	132.0
250	10"	1500 to 35000	23760 to 554 400	1000	264.0

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 kΩ, 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 kΩ, 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 µA
- 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.

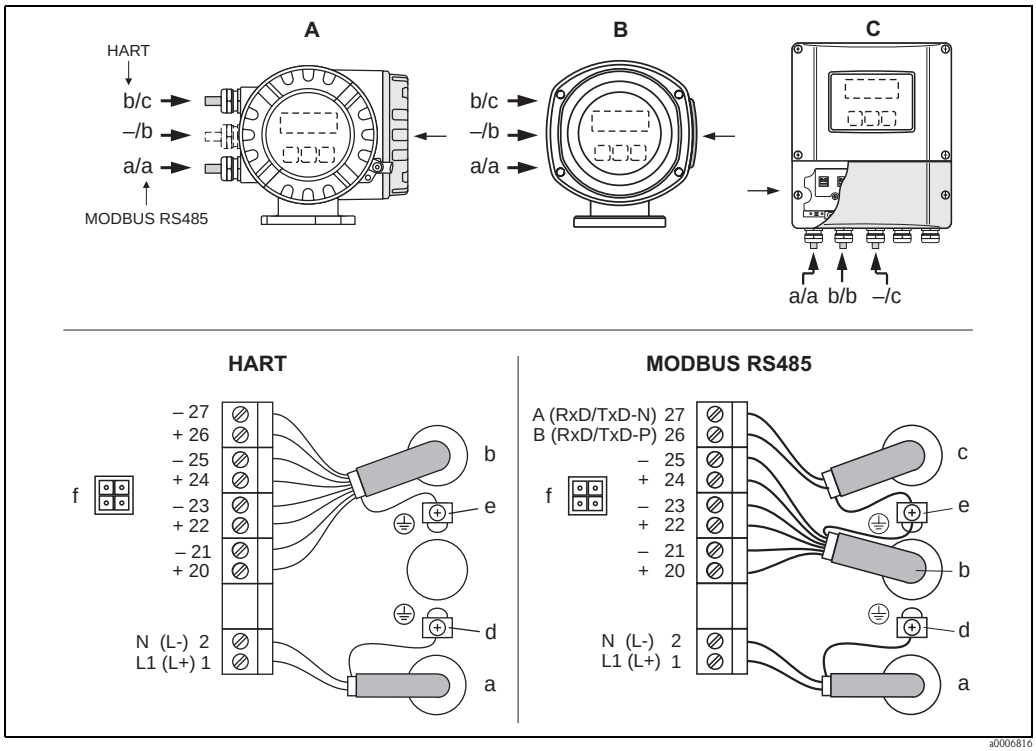
Switching output

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)

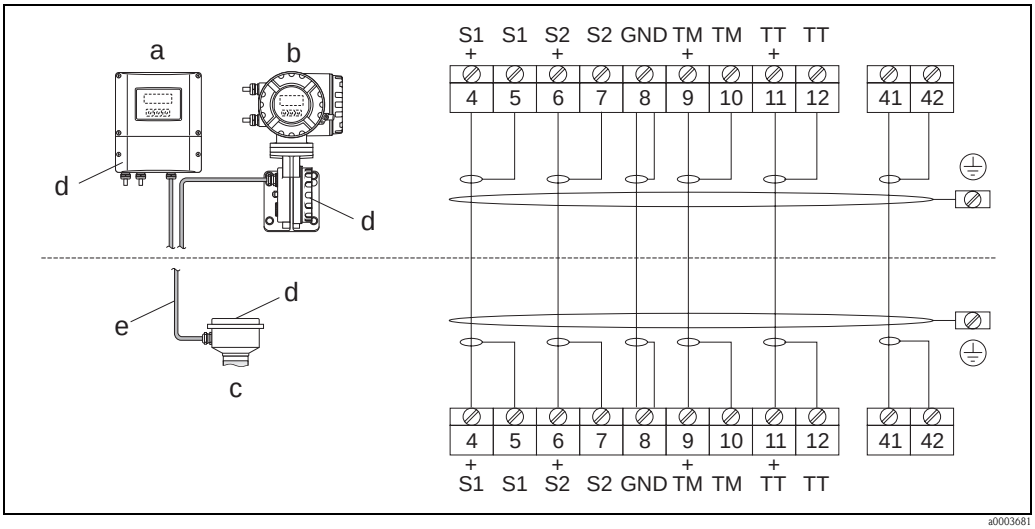
a Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC
– Terminal No. 1: L1 for AC, L+ for DC
– Terminal No 2: N for AC, L- for DC
b Signal cable: Terminal assignment → 9
c Fieldbus cable: Terminal assignment → 9
d Ground terminal for protective earth
e Ground terminal for Signal cable/RS485 cable
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 (–)
Fixed communication boards (permanent assignment)				
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
Flexible communication boards				
84***-**********D	Status input	Relay output	Pulse/frequency output	Current output HART
84***-**********M	Status input	Pulse/frequency output 2	Pulse/frequency output 1	Current output HART
84***-**********N	Current output	Pulse/frequency output	Status input	MODBUS RS485
84***-**********Q	–	–	Status input	MODBUS RS485
84***-**********1	Relay output	Pulse/frequency output 2	Pulse/frequency output 1	Current output HART
84***-**********2	Relay output	Current output 2	Pulse/frequency output	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 Remote version, flanged version
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 mm^2 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 or 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. Design fundamentals → 🖹 13.

o.r. = of reading

Mass flow and volume flow (liquids)

- ±0.05% o.r. (PremiumCal, for mass flow)
- ±0.10% o.r

Mass flow (gases)

±0.35% o.r.

Density (liquids)

- ±0.0005 g/cc (under reference conditions)
- ±0.0005 g/cc (after field density calibration under process conditions)
- ±0.001 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 +200 °C (–58 to +392 °F)

Temperature

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

T = medium temperature

Zero point stability

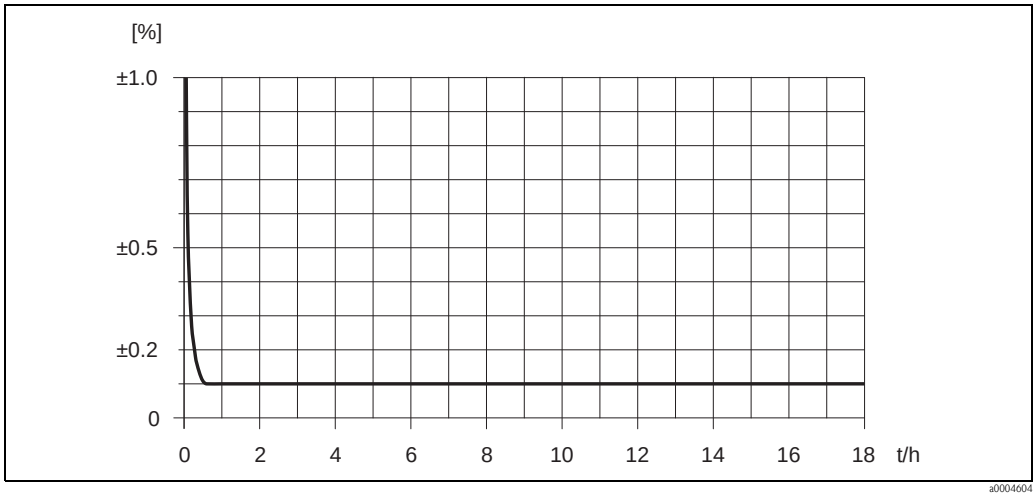
Promass F (Standard)

DN		Zero point stability	
[mm]	[inch]	[kg/h] or [l/h]	[lb/min]
8	3/8"	0.030	0.001
15	½"	0.200	0.007
25	1"	0.540	0.019
40	1½"	2.25	0.083
50	2"	3.50	0.129
80	3"	9.00	0.330
100	4"	14.00	0.514
150	6"	32.00	1.17
250	10"	88.00	3.23

Promass F (high-temperature version)

DN		Zero point stability	
[mm]	[inch]	[kg/h] or [l/h]	[lb/min]
25	1"	1.80	0.0661
50	2"	7.00	0.2572
80	3"	18.0	0.6610

Example for max. measured error



Max. measured error in % o.r. (example: Promass 84F / DN 25)

Flow values (example)

Design fundamentals → 🖹 13

Turn down	Flow		Max. measured error
	[kg/h]	[lb/min]	[% o.r.]
500:1	36	1.30	1.5
100:1	180	6.60	0.3
25:1	720	26.45	0.1
10:1	1800	66.15	0.1
2:1	9000	330.70	0.1

o.r. = of reading

Repeatability

Design fundamentals → 🖹 13.

o.r. = of reading

Mass flow and volume flow (liquids)

- ±0.025% o.r. (PremiumCal, for mass flow)
- ±0.05% o.r.

Mass flow (gases):

±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 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 ±0.0002% of the full scale value / °C (±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 F	Promass F High-temperature version
[mm]	[inch]	[% o.r./bar]	[% o.r./bar]
8	3/8"	no influence	–
15	½"	no influence	–
25	1"	no influence	no influence
40	1½"	–0.003	–
50	2"	–0.008	–0.008
80	3"	–0.009	–0.009
100	4"	–0.007	–
150	6"	–0.009	–
250	10"	–0.009	–

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	
Mass flow liquids, PremiumCal	0.05
Mass flow liquids	0.10
Volume flow liquids	0.10
Mass flow gases	0.35

Operating conditions: Installation

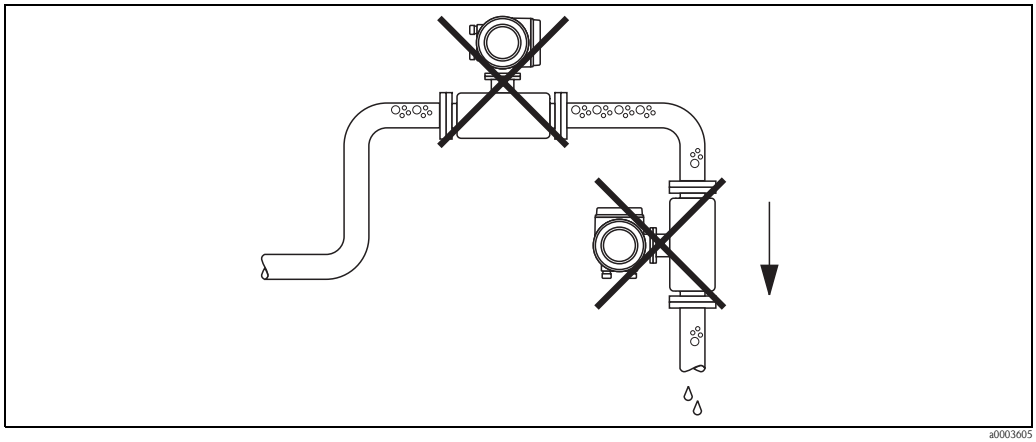
Installation instructions

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.

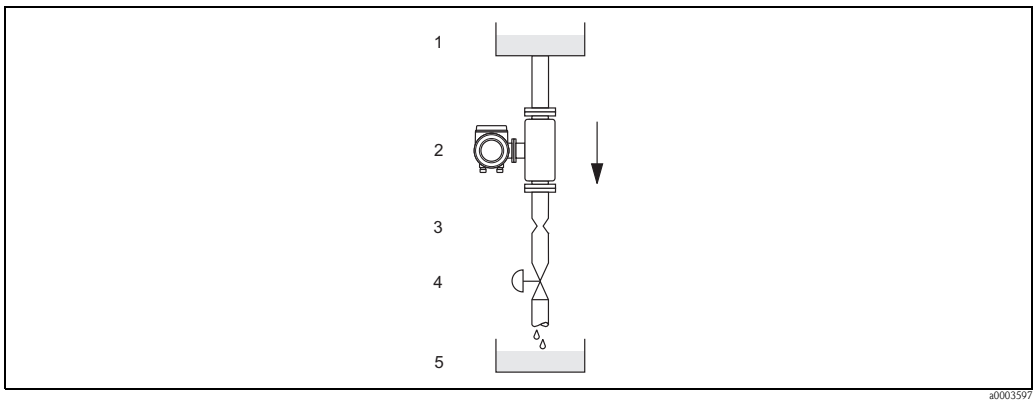
Mounting location

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.



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.



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	0.40
25	1"	14	0.55
40	1½"	22	0.87
50	2"	28	1.10
80	3"	50	2.00
100	4"	65	2.60
150	6"	90	3.54
250	10"	150	5.91

Orientation

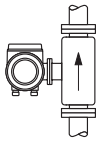
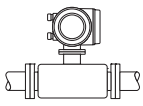
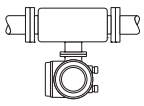
Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction in which the fluid flows through the pipe).

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 (View H1, H2). Always avoid having the transmitter housing in the same horizontal plane as the pipe. Please note the special installation instructions → 16.

Orientation	Vertical	Horizontal, Transmitter head up	Horizontal, Transmitter head down
	 a0004572 *View V*	 a0004576 *View H1*	 a0004580 *View H2*
Standard, Compact version	✔✔	✔✔	✔✔ ①
Standard, Remote version	✔✔	✔✔	✔✔ ①
High-temperature, Compact version	✔✔	✘ ② TM > 200 °C (> 392°F)	✔✔ ①
High-temperature, Compact version	✔✔	✘ ② TM > 200 °C (> 392°F)	✔✔ ①

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

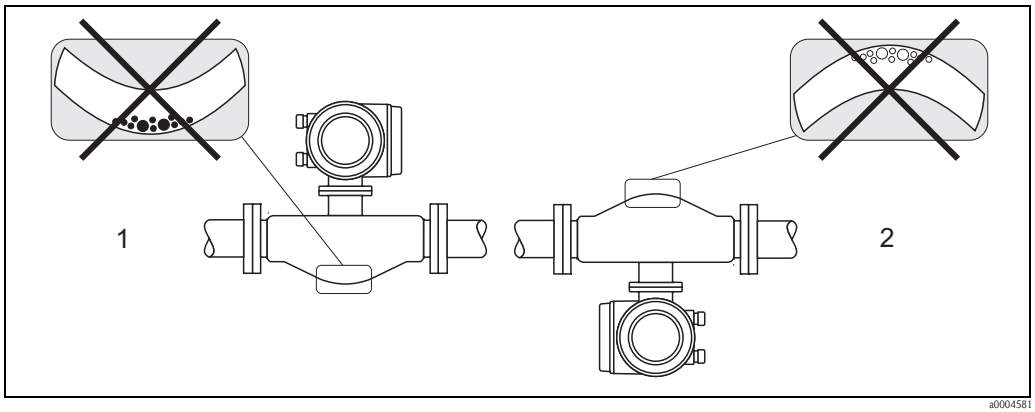
In order to ensure that the maximum permissible ambient temperature for the transmitter is not exceeded, we recommend the following orientations:

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, > +200 °C (> +392 °F), we recommend the horizontal orientation with the transmitter head pointing downwards (View H2) or the vertical orientation (View V).

Special installation instructions

Caution!
The two measuring tubes are slightly curved. The position of the sensor, therefore, has to be matched to the fluid properties when the sensor is installed horizontally .



Installed horizontally

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

Heating

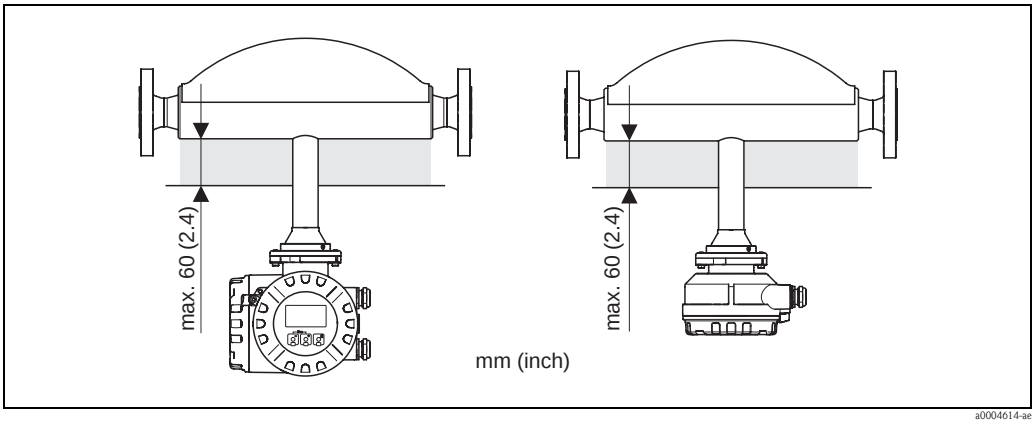
Some fluids require suitable measures to avoid loss of heat at the sensor. Heating can be electric, e.g. with heated elements, or by means of hot water or steam pipes made of copper or heating jackets.

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 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 → 19.
- With a fluid temperature between +200 °C to +350 °C (+392 °F to +662 °F) the remote version of the high-temperature version is preferable.
- When using electrical heat tracing whose heat is regulated using phase control or by pulse packs, it cannot be ruled out that the measured values are influenced by magnetic fields which may occur, (i.e. at values greater than those permitted by the EC standard (Sinus 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 privileged direction (e.g. V330-35A) with the following properties:
  – Relative magnetic permeability $\mu_r \geq 300$
  – Plate thickness $d \geq 0.35$ mm ($d \geq 0.014$")
- Information on permissible temperature ranges → 19

Special heating jackets which can be ordered as accessories from Endress+Hauser are available for the sensors.

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.



High-temperature version: maximum insulation thickness of 60 mm (2.4") in the area of the electronics/neck

If the Promass F high-temperature version is installed horizontally (with transmitter head pointing upwards), an insulation thickness of min. 10 mm (0.4") is recommended to reduce convection. The maximum insulation thickness of 60 mm (2.4") must be observed.

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

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 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.

Consequently, it is generally best to install the sensor:
- 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)

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 +200 °C (–58 to +392 °F)
- High-temperature version: –50 to +350 °C (–58 to +660 °F)

Medium pressure range (nominal pressure)

Flanges

- Standard:
  - according to DIN PN 16 to 100
  - according to ASME B16.5 Cl 150, Cl 300, Cl 600
  - JIS 10K, 20K, 40K, 63K
- High-temperature version:
  - according to DIN PN 40, 64, 100
  - according to ASME B16.5 Cl 150, Cl 300, Cl 600
  - JIS 10K, 20K, 63K

Pressure ranges of secondary containment

- DN 8 to 50 (3/8" to 2"): 40 bar (580 psi)
- DN 80 (3"): 25 bar (362 psi)
- DN 100 to 150 (4" to 6"): 16 bar (232 psi)
- DN 250 (10"): 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 circulation and/or detection (Dimensions → 51).

Rupture disk

Further information → 52

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

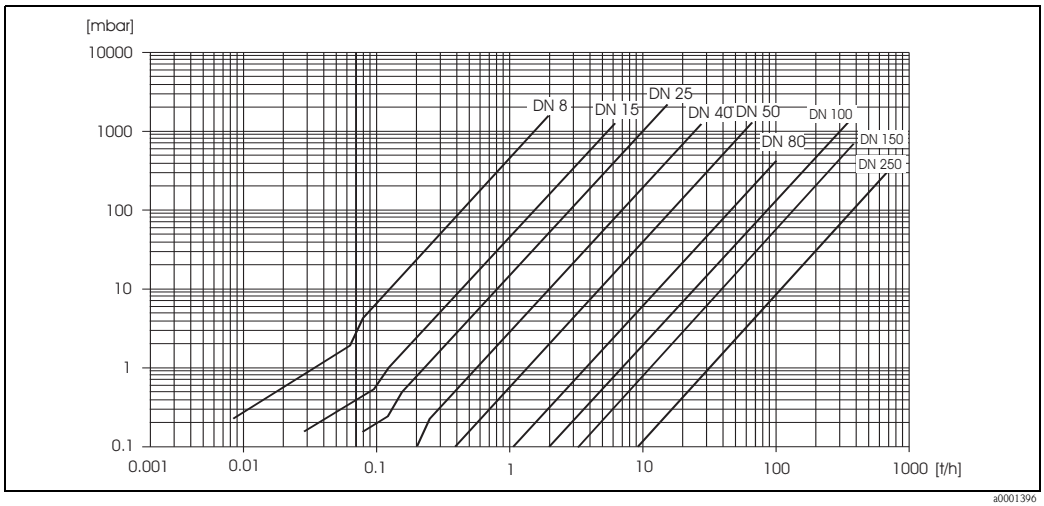
Pressure loss depends on the properties of the fluid and on its flow.
The following formulas can be used to approximately calculate the pressure loss:

Reynolds number	$Re = \frac{2 \cdot \dot{m}}{\pi \cdot d \cdot \nu \cdot \rho}$ a0004623
$Re \geq 2300$ [1]	$\Delta p = K \cdot \nu^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$ a0004626
	Promass F DN 250 $\Delta p = K \cdot \left\{ 1 - a + \frac{a}{e^{b \cdot (\nu - 10^{-6})}} \right\} \cdot \nu^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$ a0012135
$Re < 2300$	$\Delta p = K1 \cdot \nu \cdot \dot{m} + \frac{K2 \cdot \nu^{0.25} \cdot \dot{m}^2}{\rho}$ a0004628
Δp = pressure loss [mbar] ν = kinematic viscosity [m^2/s] $\dot{m}$ = Mass flow [kg/s] ρ = fluid density [kg/m^3]	d = inside diameter of measuring tubes [m] K to K2 = constants (depending on nominal diameter) a = 0.3 b = 91000

[1] To compute the pressure loss for gases, always use the formula for $Re \geq 2300$.

Pressure loss coefficient

DN [mm]	DN [inch]	d[m]	K	K1	K2
8	3/8"	$5.35 \cdot 10^{-3}$	$5.70 \cdot 10^{7}$	$9.60 \cdot 10^{7}$	$1.90 \cdot 10^{7}$
15	½"	$8.30 \cdot 10^{-3}$	$5.80 \cdot 10^{6}$	$1.90 \cdot 10^{7}$	$10.60 \cdot 10^{5}$
25	1"	$12.00 \cdot 10^{-3}$	$1.90 \cdot 10^{6}$	$6.40 \cdot 10^{6}$	$4.50 \cdot 10^{5}$
40	1½"	$17.60 \cdot 10^{-3}$	$3.50 \cdot 10^{5}$	$1.30 \cdot 10^{6}$	$1.30 \cdot 10^{5}$
50	2"	$26.00 \cdot 10^{-3}$	$7.00 \cdot 10^{4}$	$5.00 \cdot 10^{5}$	$1.40 \cdot 10^{4}$
80	3"	$40.50 \cdot 10^{-3}$	$1.10 \cdot 10^{4}$	$7.71 \cdot 10^{4}$	$1.42 \cdot 10^{4}$
100	4"	$51.20 \cdot 10^{-3}$	$3.54 \cdot 10^{3}$	$3.54 \cdot 10^{4}$	$5.40 \cdot 10^{3}$
150	6"	$68.90 \cdot 10^{-3}$	$1.36 \cdot 10^{3}$	$2.04 \cdot 10^{4}$	$6.46 \cdot 10^{2}$
250	10"	$102.26 \cdot 10^{-3}$	$3.00 \cdot 10^{2}$	$6.10 \cdot 10^{3}$	$1.33 \cdot 10^{2}$



Pressure loss diagram for water

Pressure loss (US units)

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

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

The Applicator runs on any IBM compatible PC with windows.

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:

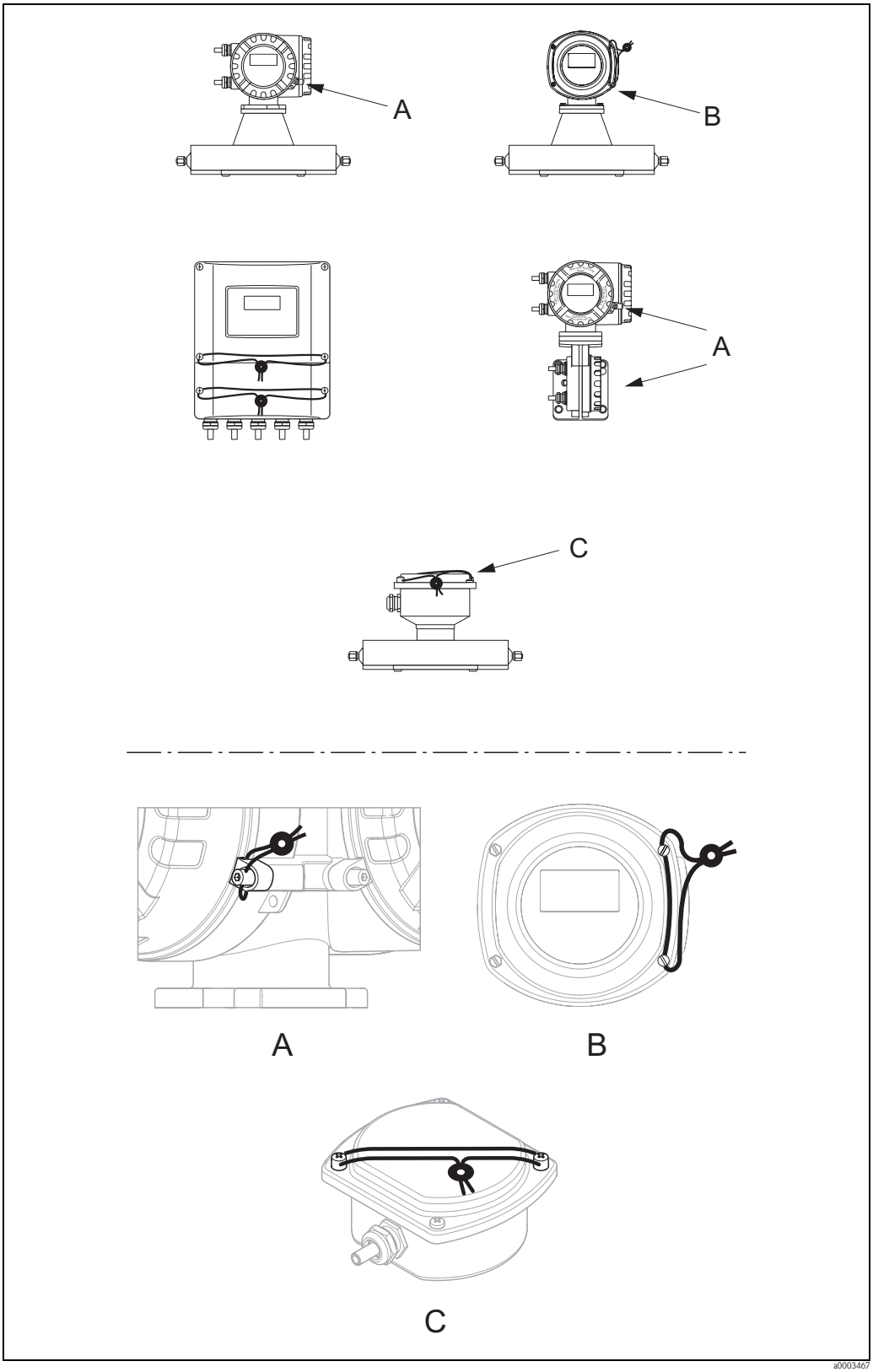
- Scales or container with a reading unit with a load or volumetric capacity that corresponds to the operation of the system at Q_{max} for one minute. The resolution of the scales display or the reading unit must be at least 0.1 % of the minimum measured quantity.
- Unit for removing the medium being 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 ½ 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



Examples of how to seal the various device versions.

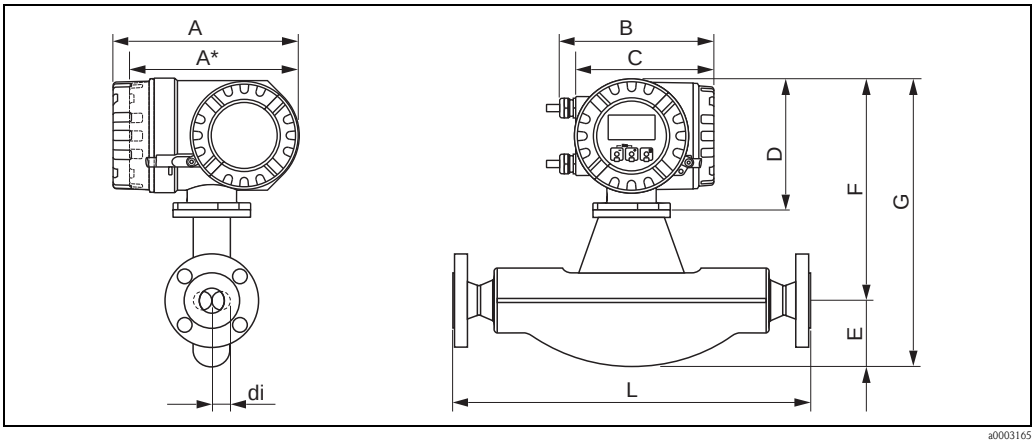
Disabling custody transfer mode

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

Mechanical construction

Design/dimensions

Transmitter compact version, powder coated die-cast aluminium field housing



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)
100	227	207	187	168	160	254	324	578	1)	1)
150	227	207	187	168	160	378	362	740	1)	1)
250	227	207	187	168	160	548	390	938	1)	1)

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

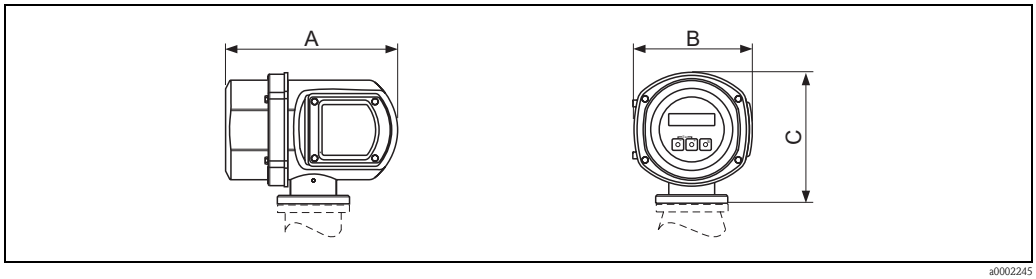
Dimensions in US units

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)
½"	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)
1½"	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)
4"	8.94	8.15	7.68	6.61	6.30	10.0	12.8	22.8	1)	1)
6"	8.94	8.15	7.68	6.61	6.30	14.9	14.3	29.1	1)	1)
10"	8.94	8.15	7.68	6.61	6.30	21.6	15.4	36.9	1)	1)

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

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

Transmitter compact version, stainless steel field housing

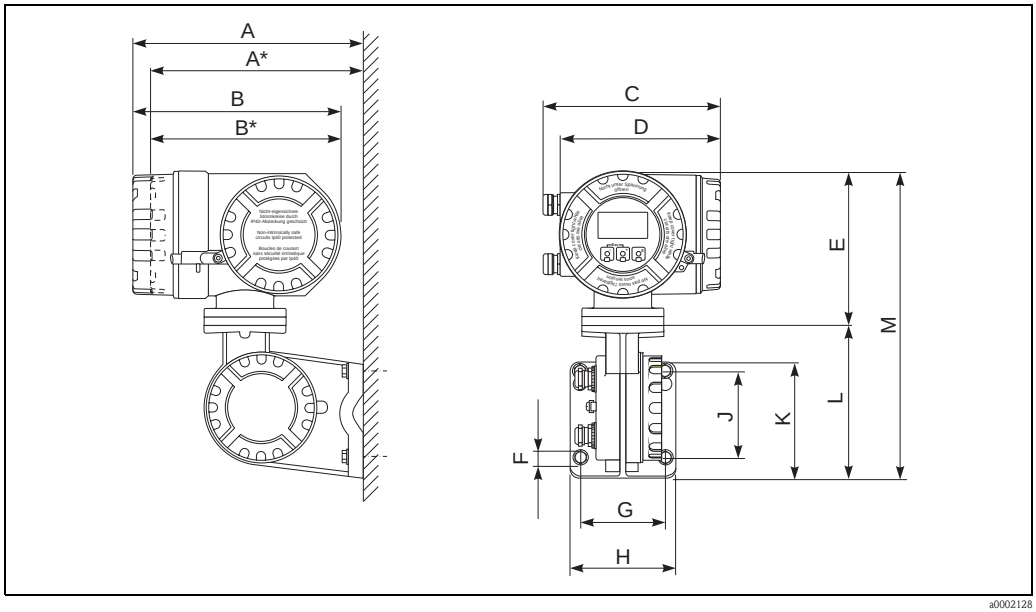


a0002245

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 and remote field housing (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

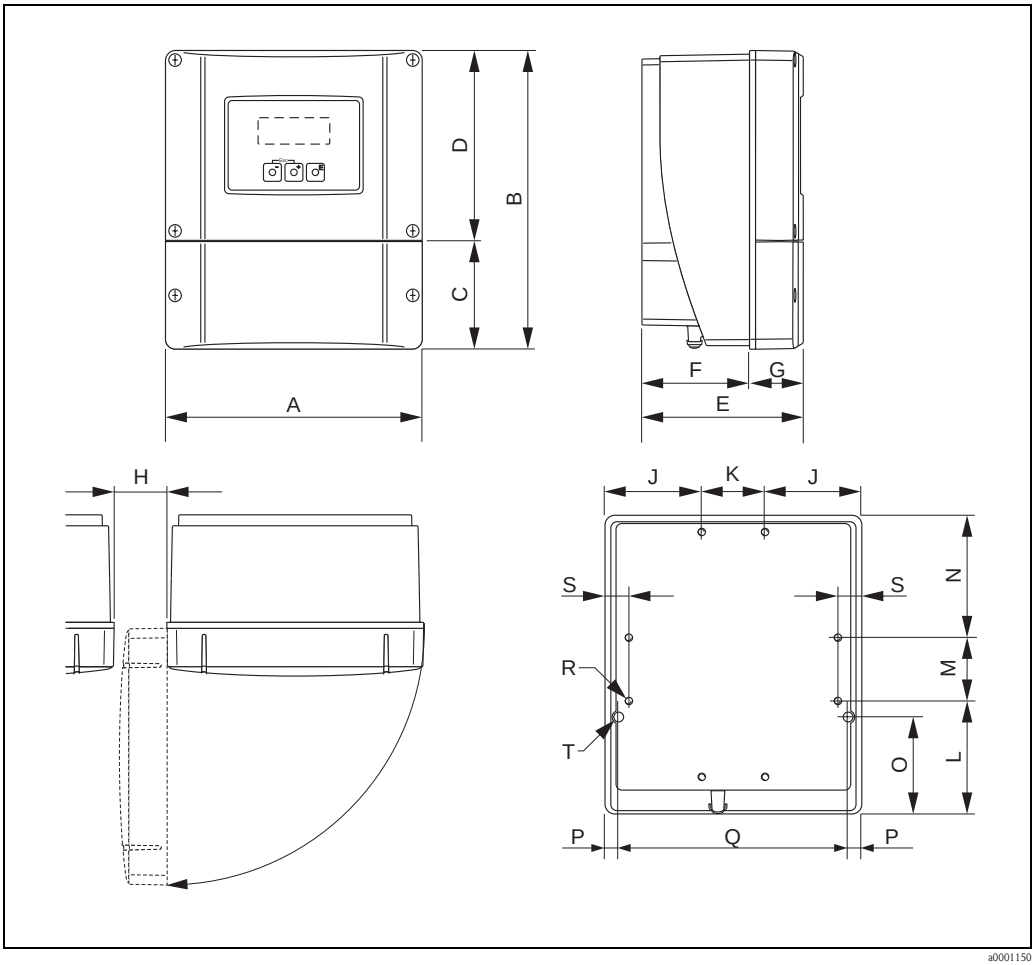
* Blind version (without display)
All dimensions in [mm]

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 display)
All dimensions in [inch]

Transmitter 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

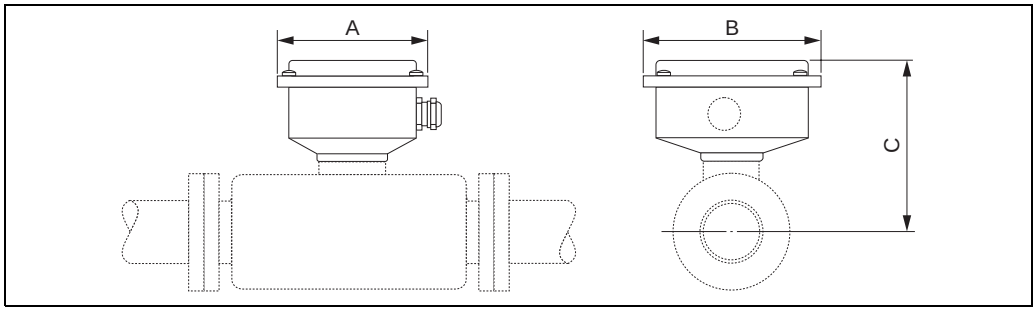
All dimensions in [mm]

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]

Connection housing remote version



Dimensions in SI units

DN	A	B	C
8	118.5	137.5	113
15	118.5	137.5	113
25	118.5	137.5	113
40	118.5	137.5	118
50	118.5	137.5	130
80	118.5	137.5	152
100	118.5	137.5	171
150	118.5	137.5	209
250	118.5	137.5	237

All dimensions in [mm]

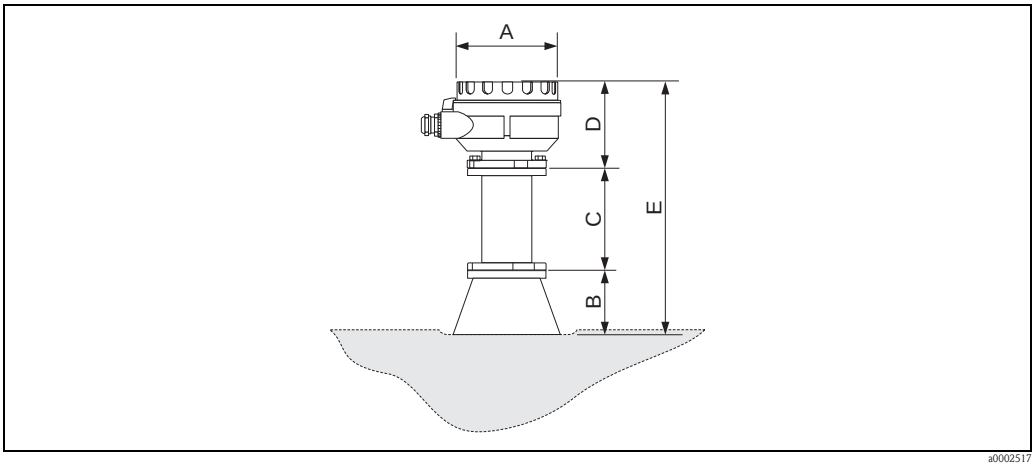
Dimensions in US units

DN	A	B	C
3/8"	4.67	5.41	4.52
½"	4.67	5.41	4.52
1"	4.67	5.41	4.52
1½"	4.67	5.41	4.72
2"	4.67	5.41	5.20
3"	4.67	5.41	6.08
4"	4.67	5.41	6.84
6"	4.67	5.41	8.36
10"	4.67	5.41	9.48

All dimensions in [inch]

Connection housing remote version, connection housing with an extended neck

Note!
Use this version in case of insulation or application of heating jacket.

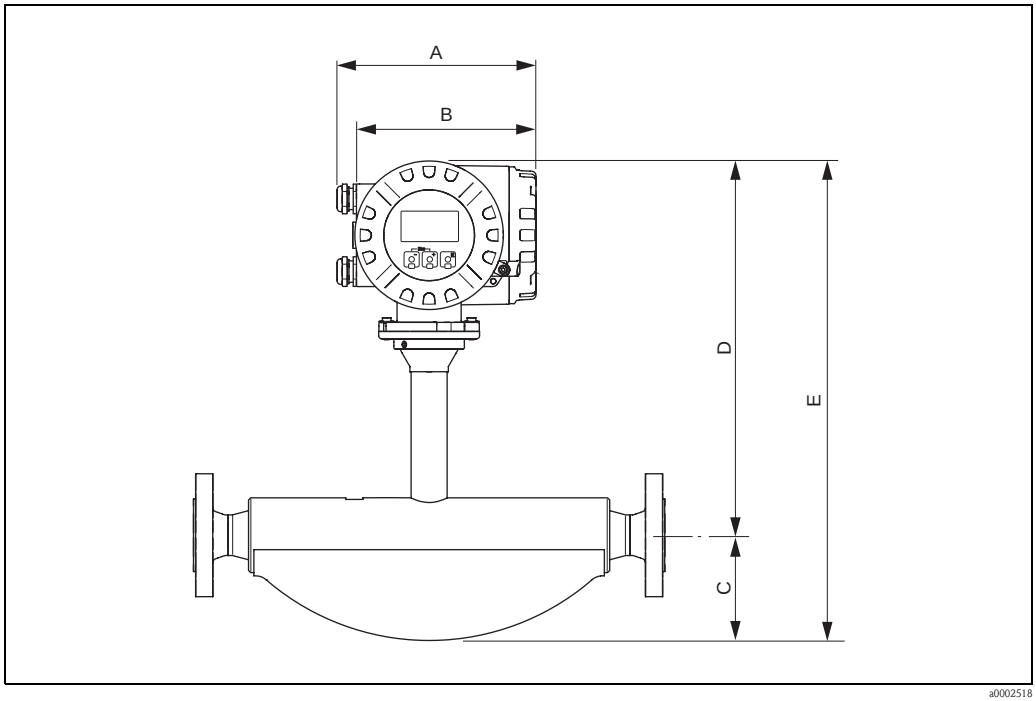


a0002517

Dimensions in SI and US units

A		B		C		D		E	
[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
129	5.08	80	3.15	110	4.33	102	4.02	292	11.5

High-temperature version (compact)



Dimensions in SI units

DN	A	B	C	D	E
25	187	168	100	350	450
50	187	168	141	365	506
80	187	168	200	385	585

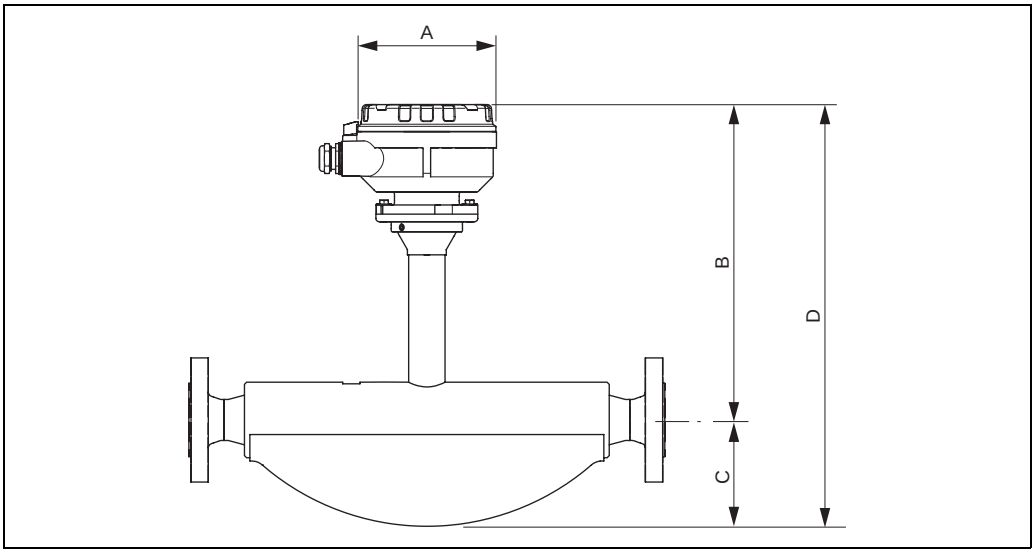
All dimensions in [mm]

Dimensions in US units

DN	A	B	C	D	E
1"	7.36	6.61	3.94	13.78	17.72
2"	7.36	6.61	5.55	14.37	19.92
3"	7.36	6.61	7.87	15.16	23.03

All dimensions in [inch]

High-temperature version (remote)



Dimensions in SI units

DN	A	B	C	D
25	129	292	105	397
50	129	307	141	448
80	129	327	200	527

All dimensions in [mm]

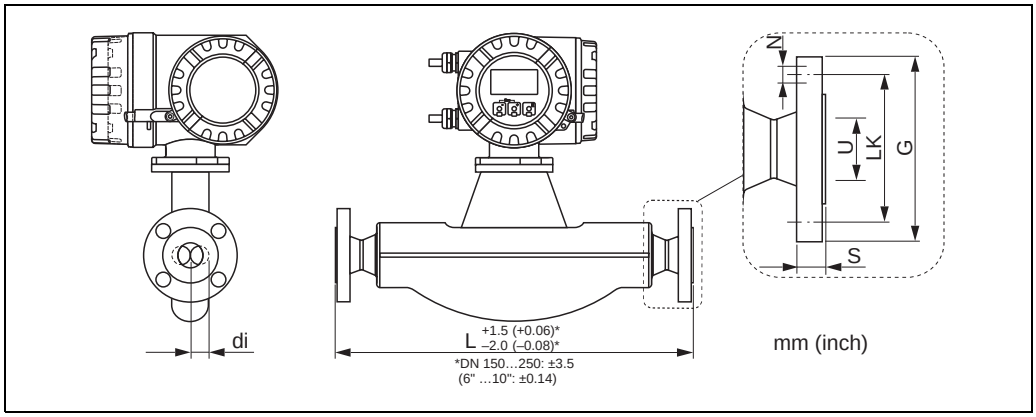
Dimensions in US units

DN	A	B	C	D
1"	5.08	11.50	4.13	15.63
2"	5.08	12.09	5.55	17.64
3"	5.08	12.87	7.87	20.75

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 / DIN 2512N [1]) / PN 16: 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
100	220	1128	8 × Ø18	20	180	107.1	51.20
150	285	1330	8 × Ø22	22	240	159.3	68.90
250[2]	405	1780	12 × Ø26	26	355	260.4	102.26

[1] Flange with groove according to EN 1092-1 Form D (DIN 2512N) available
[2] Not available in Alloy
All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 40: 1.4404/316L, Alloy C-22 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	5.35
15	95	404	4 × Ø14	16	65	17.3	8.30
25	115	440	4 × Ø14	18	85	28.5	12.00
40	150	550	4 × Ø18	18	110	43.1	17.60
50	165	715	4 × Ø18	20	125	54.5	26.00
80	200	840	8 × Ø18	24	160	82.5	40.50
100	235	1128	8 × Ø22	24	190	107.1	51.20
150	300	1370	8 × Ø26	28	250	159.3	68.90
250[2]	450	1850	12 × Ø33	38	385	258.8	102.26

[1] Flange with groove according to EN 1092-1 Form D (DIN 2512N) available
[2] Not available in Alloy
All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501) / PN 40 (with DN 25-Flanges): 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	5.35
15	115	440	4 × Ø14	18	85	28.5	8.30

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) extension-reduction / PN 16: 1.4404/316L
Only for nominal diameter DN 250 (on request)

Surface roughness (flange): Ra 0.8 to 3.2 µm

DN	G	L	N	S	LK	U	di
150	285	1980	8 × Ø22	22	240	159.3	102.26
200	340	1940	12 × Ø22	24	295	207.3	102.26
300	460	1940	12 × Ø26	28	410	309.7	102.26

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) extension-reduction / PN 40: 1.4404/316L
Only for nominal diameter DN 250 (on request)

Surface roughness (flange): Ra 0.8 to 3.2 µm

DN	G	L	N	S	LK	U	di
150	300	1980	8 × Ø26	28	250	159.3	102.26
200	375	1940	12 × Ø30	34	320	206.5	102.26
300	515	1940	16 × Ø33	42	450	307.9	102.26

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 63: 1.4404/316L, Alloy C-22

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	26.00
80	215	875	8 × Ø22	28	170	81.7	40.50
100	250	1128	8 × Ø26	30	200	106.3	51.20
150	345	1410	8 × Ø33	36	280	157.1	68.90
250[2]	470	1890	12 × Ø36	46	400	255.4	102.26

[1] Flange with groove according to EN 1092-1 Form D (DIN 2512N) available
[2] Not available in Alloy
All dimensions in [mm]

Flange EN 1092-1 (DIN 2501 / DIN 2512N [1]) / PN 100: 1.4404/316L, Alloy C-22 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	105	400	4 × Ø14	20	75	17.3	5.35
15	105	420	4 × Ø14	20	75	17.3	8.30
25	140	470	4 × Ø18	24	100	28.5	12.00
40	170	590	4 × Ø22	26	125	42.5	17.60
50	195	740	4 × Ø26	28	145	53.9	26.00
80	230	885	8 × Ø26	32	180	80.9	40.50
100	265	1128	8 × Ø30	36	210	104.3	51.20
150	355	1450	12 × Ø33	44	290	154.0	68.90

[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 / Cl 150: 1.4404/316L, Alloy C-22 Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8	88.9	370.0	4 × Ø15.7	11.2	60.5	15.7	5.35
15	88.9	404.0	4 × Ø15.7	11.2	60.5	15.7	8.30
25	108.0	440.0	4 × Ø15.7	14.2	79.2	26.7	12.00
40	127.0	550.0	4 × Ø15.7	17.5	98.6	40.9	17.60
50	152.4	715.0	4 × Ø19.1	19.1	120.7	52.6	26.00
80	190.5	840.0	4 × Ø19.1	23.9	152.4	78.0	40.50
100	228.6	1128.0	8 × Ø19.1	23.9	190.5	102.4	51.20
150	279.4	1398.0	8 × Ø22.4	25.4	241.3	154.2	68.90
250[1)]	406.4	1836.8	12 × Ø25.4	30.2	362.0	254.5	102.26

[1)] Not available in Alloy
All dimensions in [mm]

Flange according to ASME B16.5 / Cl 300: 1.4404/316L, Alloy C-22 Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
8	95.2	370.0	4 × Ø15.7	14.2	66.5	15.7	5.35
15	95.2	404.0	4 × Ø15.7	14.2	66.5	15.7	8.30
25	123.9	440.0	4 × Ø19.0	17.5	88.9	26.7	12.00
40	155.4	550.0	4 × Ø22.3	20.6	114.3	40.9	17.60
50	165.1	715.0	8 × Ø19.0	22.3	127.0	52.6	26.00
80	209.5	840.0	8 × Ø22.3	28.4	168.1	78.0	40.50
100	254.0	1128.0	8 × Ø22.3	31.7	200.1	102.4	51.20
150	317.5	1417.0	12 × Ø22.3	36.5	269.7	154.2	68.90
250[1)]	444.5	1868.2	16 × Ø28.4	47.4	387.3	254.5	102.26

[1)] Not available in Alloy
All dimensions in [mm]

Flange according to ASME B16.5 / Cl 600: 1.4404/316L, Alloy C-22

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
8	95.3	400.0	4 × Ø15.7	20.6	66.5	13.9	5.35
15	95.3	420.0	4 × Ø15.7	20.6	66.5	13.9	8.30
25	124.0	490.0	4 × Ø19.1	23.9	88.9	24.3	12.00
40	155.4	600.0	4 × Ø22.4	28.7	114.3	38.1	17.60
50	165.1	742.0	8 × Ø19.1	31.8	127.0	49.2	26.00
80	209.6	900.0	8 × Ø22.4	38.2	168.1	73.7	40.50
100	273.1	1158.0	8 × Ø25.4	48.4	215.9	97.3	51.20
150	355.6	1467.0	12 × Ø28.4	47.8	292.1	154.2	68.90
250[1)]	508.0	1951.2	16 × Ø35.1	69.9	431.8	254.5	102.26

[1)] Not available in Alloy
All dimensions in [mm]

Flange according to ASME B16.5 extension-reduction / Cl 150: 1.4404/316L
Only for nominal diameter DN 250 /10" (on request)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
150	279.4	1980	8 × Ø22.4	25.4	241.3	154.2	102.26
200	342.9	1940	8 × Ø22.4	28.4	298.5	202.7	102.26
300	482.6	1940	12 × Ø25.4	31.8	431.8	304.80	102.26

All dimensions in [mm]

Flange according to ASME B16.5 extension-reduction / Cl 300: 1.4404/316
Only for nominal diameter DN 250 /10" (on request)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
150	317.5	1980	12 × Ø22.4	36.5	269.7	154.2	102.26
200	381.0	1940	12 × Ø25.4	41.1	330.2	202.7	102.26
300	520.7	1940	16 × Ø31.7	50.8	450.8	304.80	102.26

All dimensions in [mm]

Flange according to ASME B16.5 extension-reduction / Cl 600: 1.4404/316L
Only for nominal diameter DN 250 /10" (on request)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
150	355.6	1980	12 × Ø28.4	54.2	292.1	154.2	102.26
200	419.1	1940	12 × Ø31.8	62.0	349.3	202.7	102.26

All dimensions in [mm]

Flange connections JIS B2220

Flange JIS B2220 / 10K: 1.4404/316L, Alloy C-22 Surface roughness (flange): Ra 1.6 to 3.2 µm							
DN	G	L	N	S	LK	U	di
50	155	715	4 × Ø19	16	120	50	26.00
80	185	832	8 × Ø19	18	150	80	40.50
100	210	1128	8 × Ø19	18	175	100	51.20
150	280	1354	8 × Ø23	22	240	150	68.90
250[1)]	400	1780	12 × Ø25	24	355	250	102.26

[1)] Not available in Alloy
All dimensions in [mm]

Flange JIS B2220 / 20K: 1.4404/316L, Alloy C-22 Surface roughness (flange): Ra 1.6 to 3.2 µm							
DN	G	L	N	S	LK	U	di
8	95	370	4 × Ø15	14	70	15	5.35
15	95	404	4 × Ø15	14	70	15	8.30
25	125	440	4 × Ø19	16	90	25	12.00
40	140	550	4 × Ø19	18	105	40	17.60
50	155	715	8 × Ø19	18	120	50	26.00
80	200	832	8 × Ø23	22	160	80	40.50
100	225	1128	8 × Ø23	24	185	100	51.20
150	305	1386	12 × Ø25	28	260	150	68.90
250[1)]	430	1850	12 × Ø27	34	380	250	102.26

[1)] Not available in Alloy
All dimensions in [mm]

Flange JIS B2220 / 40K: 1.4404/316L, Alloy C-22 Surface roughness (flange): Ra 1.6 to 3.2 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	8.30
25	130	485	4 × Ø19	22	95	25	12.00
40	160	600	4 × Ø23	24	120	38	17.60
50	165	760	8 × Ø19	26	130	50	26.00
80	210	890	8 × Ø23	32	170	75	40.50
100	250	1168	8 × Ø25	36	205	100	51.20
150	355	1498	12 × Ø33	44	295	150	68.90

All dimensions in [mm]

Flange JIS B2220 / 63K: 1.4404/316L, Alloy C-22

Surface roughness (flange): Ra 1.6 to 3.2 µm

DN	G	L	N	S	LK	U	di
8	120	420	4 × Ø19	23	85	12	5.35
15	120	440	4 × Ø19	23	85	12	8.30
25	140	494	4 × Ø23	27	100	22	12.00
40	175	620	4 × Ø25	32	130	35	17.60
50	185	775	8 × Ø23	34	145	48	26.00
80	230	915	8 × Ø25	40	185	73	40.50
100	270	1168	8 × Ø27	44	220	98	51.20
150	365	1528	12 × Ø33	54	305	146	68.90

All dimensions in [mm]

Flange JIS B2220 extension-reduction / 10K: 1.4404/316L
Only for nominal diameter DN 250 (on request)

Surface roughness (flange): Ra 1.6 to 3.2 µm

DN	G	L	N	S	LK	U	di
150	280	1980	8 × Ø23	22	240	150	102.26
200	330	1940	12 × Ø23	22	290	200	102.26
300	445	1940	16 × Ø25	24	400	300	102.26

All dimensions in [mm]

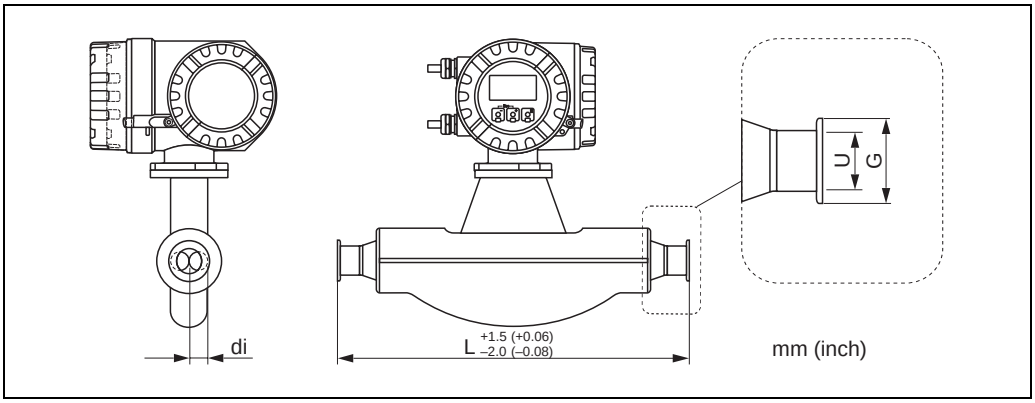
Flange JIS B2220 extension-reduction / 20K: 1.4404/316L
Only for nominal diameter DN 250 (on request)

Surface roughness (flange): Ra 1.6 to 3.2 µm

DN	G	L	N	S	LK	U	di
150	305	1980	12 × Ø25	28	260	150	102.26
200	350	1940	12 × Ø25	30	305	200	102.26
300	480	1940	16 × Ø27	36	430	300	102.26

All dimensions in [mm]

Tri-Clamp



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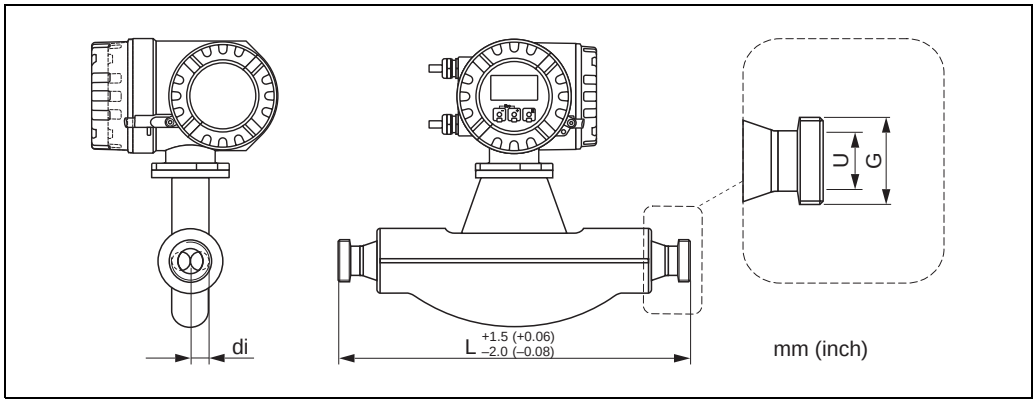
Tri-Clamp: 1.4404/316L					
DN	Clamp	G	L	U	di
8	1"	50.4	367	22.1	5.35
15	1"	50.4	398	22.1	8.30
25	1"	50.4	434	22.1	12.00
40	1½"	50.4	560	34.8	17.60
50	2"	63.9	720	47.5	26.00
80	3"	90.9	900	72.9	40.50
100	4"	118.9	1128	97.4	51.20

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [mm]

½"-Tri-Clamp: 1.4404/316L					
DN	Clamp	G	L	U	di
8	½"	25.0	367	9.5	5.35
15	½"	25.0	398	9.5	8.30

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [mm]

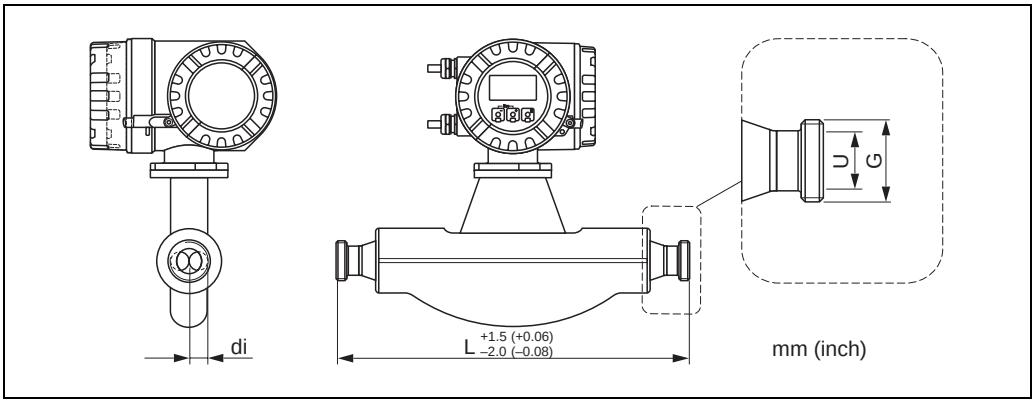
DIN 11851 (threaded hygienic connection)



Threaded hygienic connection DIN 11851: 1.4404/316L				
DN	G	L	U	di
8	Rd 34 × 1/8"	367	16	5.35
15	Rd 34 × 1/8"	398	16	8.30
25	Rd 52 × 1/6"	434	26	12.00
40	Rd 65 × 1/6"	560	38	17.60
50	Rd 78 × 1/6"	720	50	26.00
80	Rd 110 × 1/4"	900	81	40.50
100	Rd 130 × 1/4"	1128	100	51.20

3A version also available (Ra ≤ 0.8 µm/150 grit)
All dimensions in [mm]

DIN 11864-1 Form A (threaded hygienic connection)



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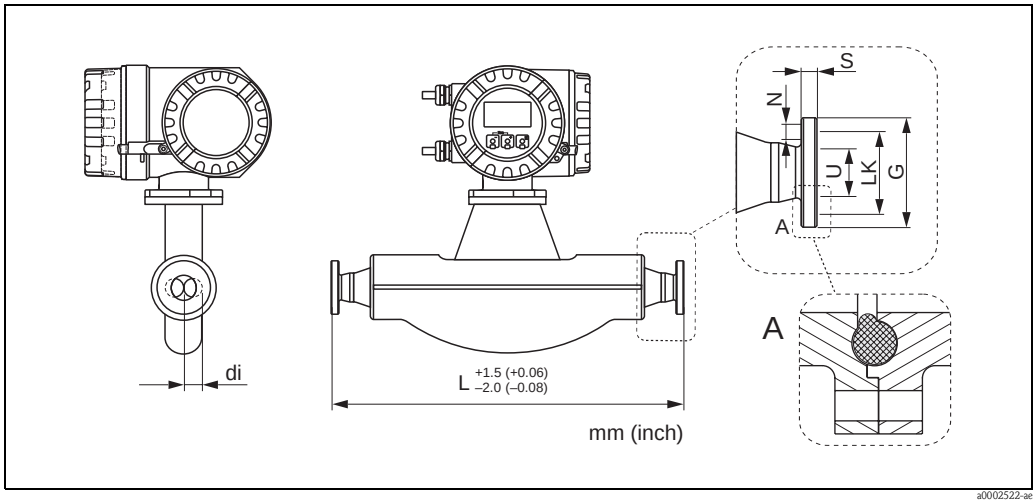
Threaded hygienic connection DIN 11864-1 Form A: 1.4404/316L				
DN	G	L	U	di
8	Rd 28 × 1/8"	367	10	5.35
15	Rd 34 × 1/8"	398	16	8.30
25	Rd 52 × 1/6"	434	26	12.00
40	Rd 65 × 1/6"	560	38	17.60
50	Rd 78 × 1/6"	720	50	26.00
80	Rd 110 × 1/4"	900	81	40.50
100	Rd 130 × 1/4"	1128	100	51.20

3A version also available (Ra ≤ 0.8 µm/150 grit)
All dimensions in [mm]

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

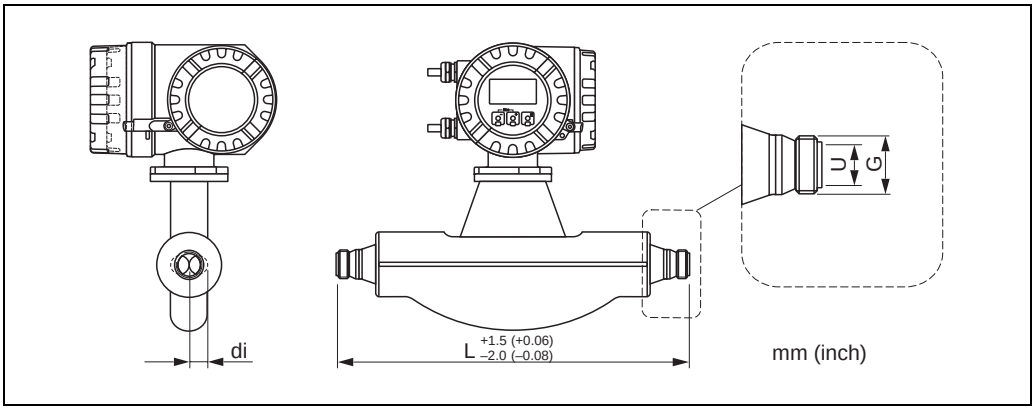


Detail A: The flange has the smaller groove for the O-ring on the sensor side. When mounting the sensor the corresponding flange must have accordingly a larger groove.

DIN 11864-2 Form A (flat flange with groove): 1.4404/316L							
DN	G	L	N	S	LK	U	di
8	54	387	4 × Ø9	10	37	10	5.35
15	59	418	4 × Ø9	10	42	16	8.30
25	70	454	4 × Ø9	10	53	26	12.00
40	82	560	4 × Ø9	10	65	38	17.60
50	94	720	4 × Ø9	10	77	50	26.00
80	133	900	8 × Ø11	12	112	81	40.50
100	159	1128	8 × Ø11	14	137	100	51.20

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [mm]

ISO 2853 (threaded hygienic connection)



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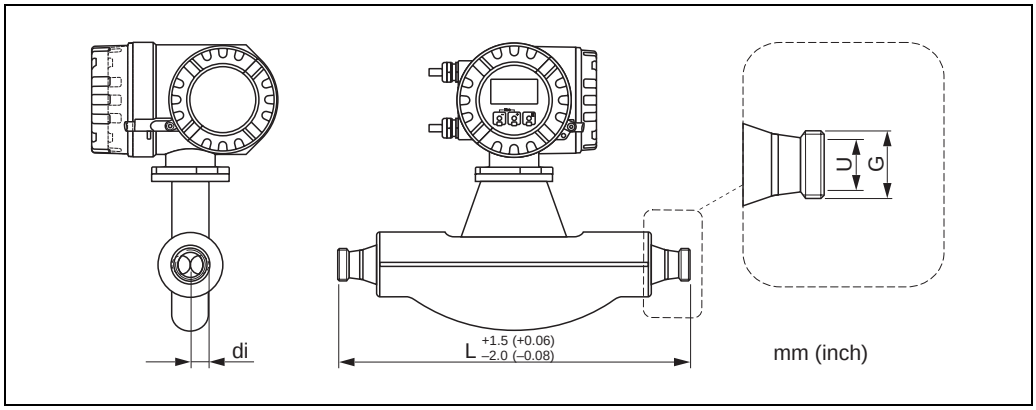
Threaded hygienic connection ISO 2853: 1.4404/316L				
DN	G [1]	L	N	di
8	37.13	367	22.6	5.35
15	37.13	398	22.6	8.30
25	37.13	434	22.6	12.00
40	52.68	560	35.6	17.60
50	64.16	720	48.6	26.00
80	91.19	900	72.9	40.50
100	118.21	1128	97.6	51.20

[1] Max. thread diameter to ISO 2853 Annex A
3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [mm]

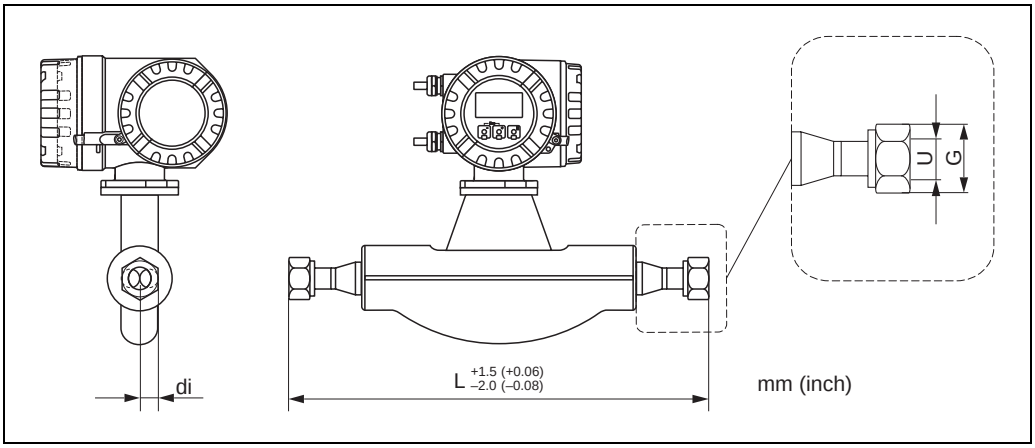
SMS 1145 (threaded hygienic connection)



Threaded hygienic connections SMS 1145: 1.4404/316L				
DN	G	L	U	di
8	Rd 40 x 1/6"	367	22.6	5.35
15	Rd 40 x 1/6"	398	22.6	8.30
25	Rd 40 x 1/6"	434	22.6	12.00
40	Rd 60 x 1/6"	560	35.6	17.60
50	Rd 70 x 1/6"	720	48.6	26.00
80	Rd 98 x 1/6"	900	72.9	40.50
100	Rd 132 x 1/6"	1128	97.6	51.20

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [mm]

VCO connections



8-VCO-4 (½"): 1.4404/316L				
DN	G	L	U	di
8	AF 1"	390	10.2	5.35

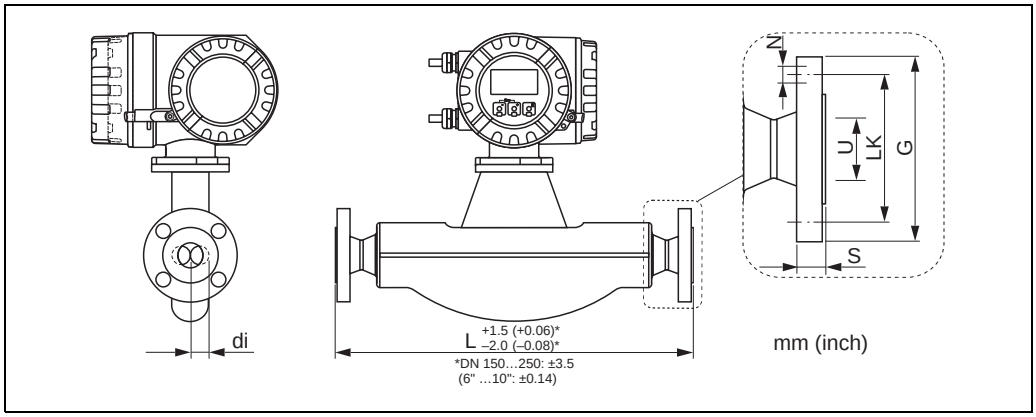
All dimensions in [mm]

12-VCO-4 (¾"): 1.4404/316L				
DN	G	L[1)]	U	di
15	AF 1½"	430	15,7	8,30

All dimensions in [mm]

Process connections in US units

Flange connections ASME B16.5



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Flange according to ASME B16.5 / Cl 150: 1.4404/316L, Alloy C-22 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	0.21
½"	3.50	15.9	4 × Ø 0.62	0.44	2.38	0.62	0.33
1"	4.25	17.3	4 × Ø 0.62	0.56	3.12	1.05	0.47
1½"	5.00	21.7	4 × Ø 0.62	0.69	3.88	1.61	0.69
2"	6.00	28.1	4 × Ø 0.75	0.75	4.75	2.07	1.02
3"	7.50	33.1	4 × Ø 0.75	0.94	6.00	3.07	1.59
4"	9.00	44.4	8 × Ø 0.75	0.94	7.50	4.03	2.01
6"	11.0	55.0	8 × Ø 0.88	0.99	9.50	6.07	2.71
10" [1]	16.0	72.3	12 × Ø 1.0	1.19	14.25	10.0	4.03

[1] Not available in Alloy
All dimensions in [inch]

Flange according to ASME B16.5 / Cl 300: 1.4404/316L, Alloy C-22 Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	G	L	N	S	LK	U	di
3/8"	3.75	14.57	4 × Ø0.62	0.56	2.62	0.62	0.21
½"	3.75	15.91	4 × Ø0.62	0.56	2.62	0.62	0.33
1"	4.88	17.32	4 × Ø0.75	0.69	3.50	1.05	0.47
1½"	6.12	21.65	4 × Ø0.88	0.81	4.50	1.61	0.69
2"	6.50	28.15	8 × Ø0.75	0.88	5.00	2.07	1.02
3"	8.25	33.07	8 × Ø0.88	1.12	6.62	3.07	1.59
4"	10.00	44.41	8 × Ø0.88	1.25	7.88	4.03	2.02
6"	12.50	55.79	12 × Ø0.88	1.44	10.62	6.07	2.71
10" [1]	17.50	73.55	16 × Ø1.12	1.87	15.25	10.02	4.03

[1] Not available in Alloy
All dimensions in [inch]

Flange according to ASME B16.5 / Cl 600: 1.4404/316L, Alloy C-22

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
3/8"	3.75	15.75	4 × Ø0.62	0.81	2.62	0.55	0.21
½"	3.75	16.54	4 × Ø0.62	0.81	2.62	0.55	0.33
1"	4.88	19.29	4 × Ø0.75	0.94	3.50	0.96	0.47
1½"	6.12	23.62	4 × Ø0.88	1.13	4.50	1.50	0.69
2"	6.50	29.21	8 × Ø0.75	1.25	5.00	1.94	1.02
3"	8.25	35.43	8 × Ø0.88	1.50	6.62	2.90	1.59
4"	10.75	45.59	8 × Ø1.00	1.91	8.50	3.83	2.02
6"	14.00	57.76	12 × Ø1.12	1.88	11.50	6.07	2.71
10" [1]	20.00	76.82	16 × Ø1.38	2.75	17.00	10.02	4.03

[1] Not available in Alloy
All dimensions in [inch]

Flange according to ASME B16.5 extension-reduction / Cl 150: 1.4404/316L
Only for nominal diameter DN 250 /10" (on request)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
6"	11.00	77.95	8 × Ø22.4	1.00	9.50	6.07	4.03
8"	13.50	76.38	8 × Ø22.4	1.12	11.75	7.98	4.03
12"	19.00	76.38	12 × Ø25.4	1.25	17.00	12.00	4.03

All dimensions in [inch]

Flange according to ASME B16.5 extension-reduction / Cl 300: 1.4404/316
Only for nominal diameter DN 250 /10" (on request)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
6"	12.5	78.0	12 × Ø 0.88	1.44	10.6	6.07	4.03
8"	15.0	76.4	12 × Ø 1.00	1.62	13.0	7.98	4.03
12"	20.5	76.4	16 × Ø 1.25	2.00	17.7	12.0	4.03

All dimensions in [inch]

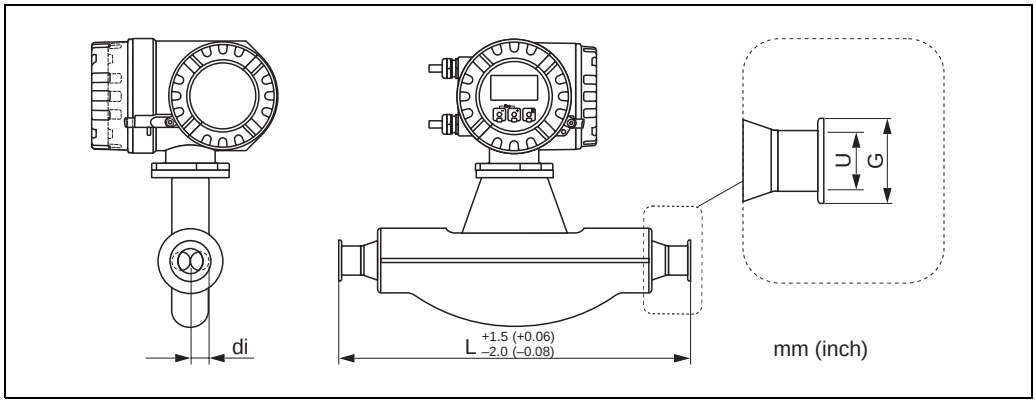
Flange according to ASME B16.5 extension-reduction / Cl 600: 1.4404/316L
Only for nominal diameter DN 250 /10" (on request)

Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
6"	14.0	78.0	12 × Ø 1.12	2.13	11.5	6.07	4.03
8"	16.5	76.4	12 × Ø 1.25	2.44	13.7	7.98	4.03

All dimensions in [inch]

Tri-Clamp



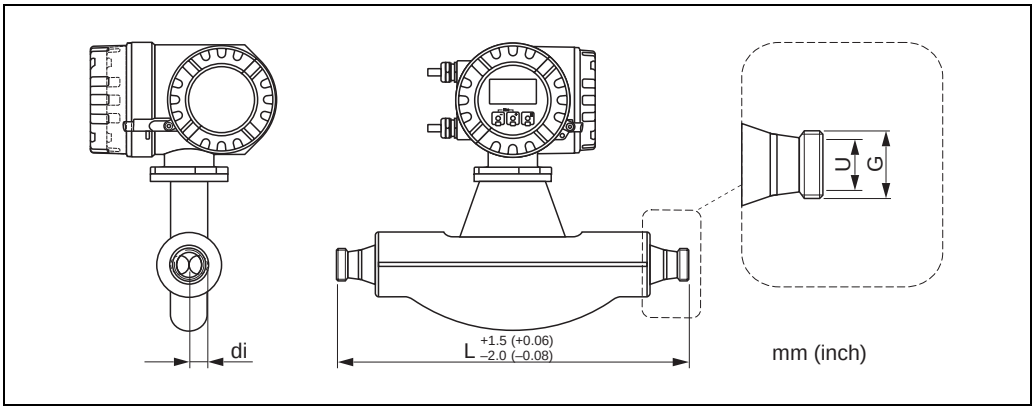
Tri-Clamp: 1.4404/316L					
DN	Clamp	G	L	U	di
3/8"	1"	1.98	14.4	0.87	0.21
½"	1"	1.98	15.7	0.87	0.33
1"	1"	1.98	17.1	0.87	0.47
1½"	1½"	1.98	22.0	1.37	0.69
2"	2"	2.52	28.3	1.87	1.02
3"	3"	3.58	35.4	2.87	1.59
4"	4"	4.68	44.4	3.83	2.01

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [inch]

½"-Tri-Clamp: 1.4404/316L					
DN	Clamp	G	L	U	di
3/8"	½"	0.98	14.4	0.37	0.21
½"	½"	0.98	15.7	0.37	0.33

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [inch]

SMS 1145 (Threaded hygienic connection)

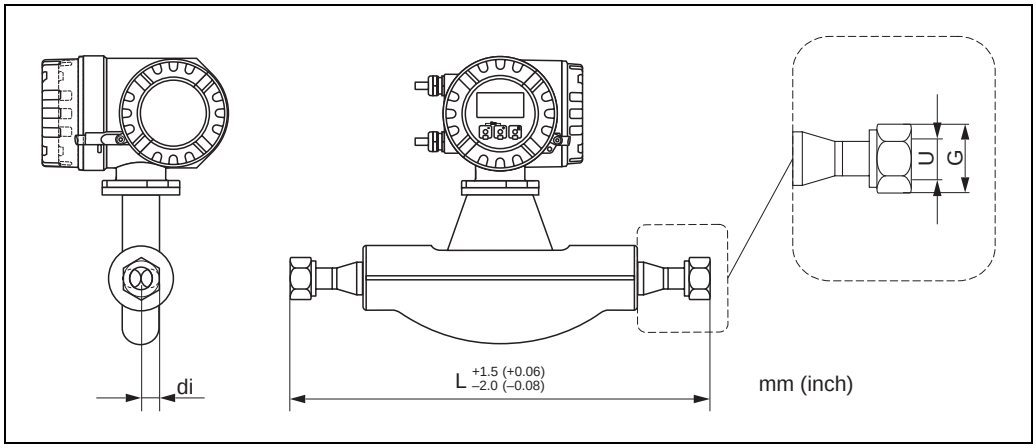


a0002524-ae

Threaded hygienic connection SMS 1145: 1.4404/316L				
DN	G	L	U	di
3/8"	Rd 40 × 1/6"	14.68	0.904	0.214
½"	Rd 40 × 1/6"	15.92	0.904	0.332
1"	Rd 40 × 1/6"	17.36	0.904	0.480
1½"	Rd 60 × 1/6"	22.40	1.424	0.704
2"	Rd 70 × 1/6"	28.80	1.944	0.104
3"	Rd 98 × 1/6"	36.00	2.916	1.620
4"	Rd 132 × 1/6"	45.12	3.904	2.048

3A version also available (Ra ≤ 0.8 µm/150 grit, Option: Ra ≤ 0.4 µm/240 grit)
All dimensions in [inch]

VCO connections



8-VCO-4 (½"): 1.4404/316L				
DN	G	L	U	di
3/8"	AF 1"	15.35	0.40	0.21

All dimensions in [inch]

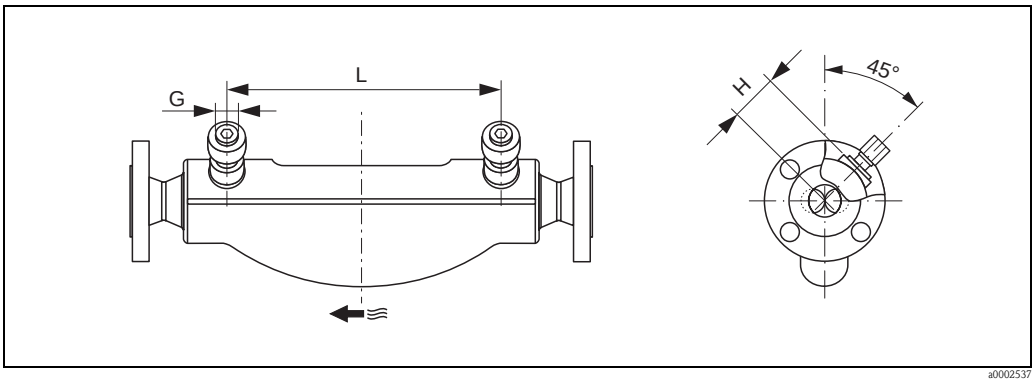
12-VCO-4 (¾"): 1.4404/316L				
DN	G	L[1)]	U	di
½"	AF 1½"	16.93	0.62	0.33

All dimensions in [inch]

Purge connections / secondary containment monitoring

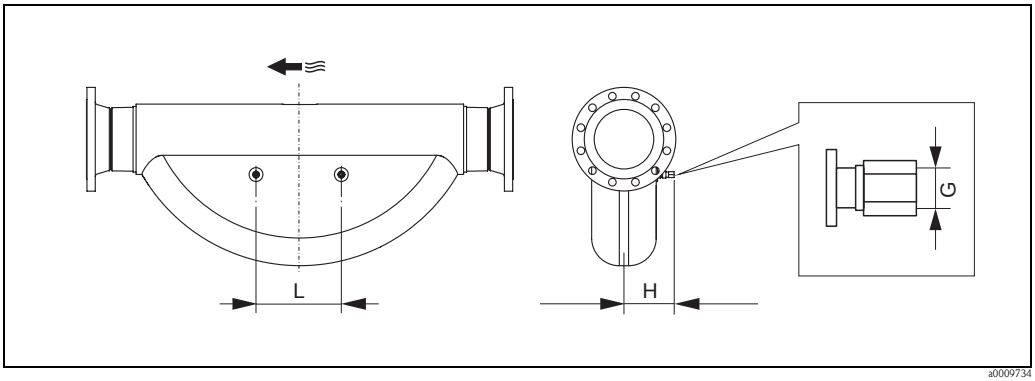
Caution!
- The secondary containment is filled with dry nitrogen (N_2). Do not open the purge connections unless the containment can be filled immediately with a dry inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar (72.5 psi).
- Purge connections or secondary containment monitioring can not be combined with separately available heating jacket.

Dimensions (not available for the Promass F high-temperature version)



DN 8 to DN 150 (3/8" to 6")

DN		G	H		L	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]
8	3/8"	½"-NPT	62	2.44	216	8.50
15	½"	½"-NPT	62	2.44	220	8.66
25	1"	½"-NPT	62	2.44	260	10.24
40	1½"	½"-NPT	67	2.64	310	12.20
50	2"	½"-NPT	79	3.11	452	17.78
80	3"	½"-NPT	101	3.98	560	22.0
100	4"	½"-NPT	120	4.72	684	27.0
150	6"	½"-NPT	141	5.55	880	34.6



DN 250 (10")

DN		G	H		L	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]
250	10"	½"-NPT	182	7.17	380	14.96

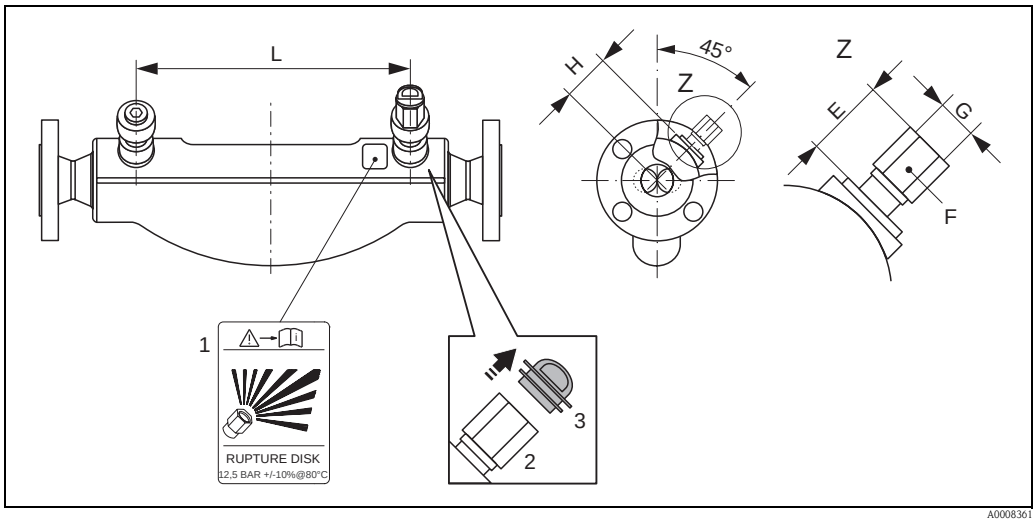
Rupture disk

Sensor housings with integrated rupture disks are optionally available.

Warning!
- Make sure that the function and operation of the rupture disk is not impeded through the installation. Triggering overpressure in the housing as stated on the indication label. Take adequate precautions to ensure that no damage occurs, and risk to human life is ruled out, if the rupture disk is triggered.
  Rupture disk: Burst pressure 10 to 15 bar (145 to 217 psi).
- Please note that the housing can no longer assume a secondary containment function if a rupture disk is used.
- It is not permitted to open the connections or remove the rupture disk.

Caution!
- Rupture disks can not be combined with separately available heating jacket.
- The existing connection nozzles are not designed for a rinse or pressure monitoring function.

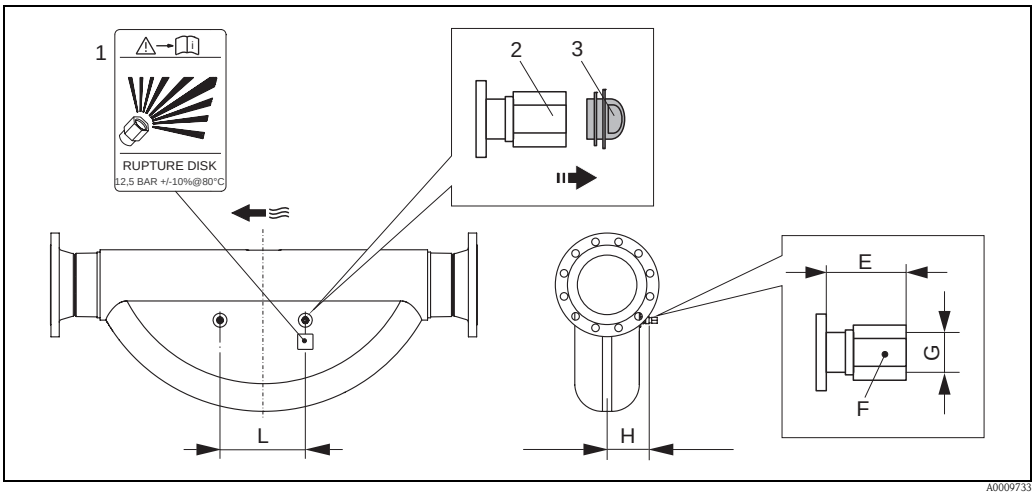
Note!
- Before commissioning, please remove the transport protection of the rupture disk.
- Please note the indication labels.



DN 8 to DN 150 (3/8" to 6")

1 Indication label for the rupture disk
2 ½" NPT internal screw thread with 1" width across flat
3 Transport protection

DN		E		F	G	H		L	
[mm]	[inch]	[mm]	[inch]			[mm]	[inch]	[mm]	[inch]
8	3/8"	ca. 42	ca. 1.65	AF 1"	½"-NPT	62	2.44	216	8.50
15	½"	ca. 42	ca. 1.65	AF 1"	½"-NPT	62	2.44	220	8.66
25	1"	ca. 42	ca. 1.65	AF 1"	½"-NPT	62	2.44	260	10.24
40	1½"	ca. 42	ca. 1.65	AF 1"	½"-NPT	67	2.64	310	12.20
50	2"	ca. 42	ca. 1.65	AF 1"	½"-NPT	79	3.11	452	17.78
80	3"	ca. 42	ca. 1.65	AF 1"	½"-NPT	101	3.98	560	22.0
100	4"	ca. 42	ca. 1.65	AF 1"	½"-NPT	120	4.72	684	27.0
150	6"	ca. 42	ca. 1.65	AF 1"	½"-NPT	141	5.55	880	34.6



DN 250 (10")

1 Indication label for the rupture disk
2 ½" NPT internal screw thread with 1" width across flat
3 Transport protection

DN		E		F	G	H		L	
[mm]	[inch]	[mm]	[inch]			[mm]	[inch]	[mm]	[inch]
250	10"	ca. 42	ca. 1.65	AF 1"	½"-NPT	182	7.17	380	14.96

Weight

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

Weight information in SI units

DN [mm]	8	15	25	40	50	80	100	150	250 [1]
Compact version	11	12	14	19	30	55	96	154	400
High-temperature compact version	–	–	14.7	–	30.7	55.7	–	–	–
Compact version Ex d	20	21	23	28	39	64	105	163	409
Remote version	9	10	12	17	28	53	94	152	398
High-temperature remote version	–	–	13.5	–	29.5	54.5	–	–	–

[1] With 10" according to ASME B16.5 Cl 300 flanges
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"	4"	6"	10" [1]
Compact version	24	26	31	42	66	121	212	339	882
High-temperature compact version	–	–	32	–	68	123	–	–	–
Compact version Ex d	44	46	51	62	86	141	232	359	902
Remote version	20	22	26	37	62	117	207	335	877
High-temperature remote version	–	–	29	–	65	120	–	–	–

[1] With 10" according to ASME B16.5 Cl 300 flanges
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
- Stainless steel 1.4301/1.4307/304L

Connection housing, sensor (remote version)

- Stainless steel 1.4301/304 (standard)
- Powder coated die-cast aluminium
  (high-temperature version and 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)
  - Threaded hygienic connection:
    - DIN 11851
    - SMS 1145
    - ISO 2853
    - DIN 11864-1 Form A
  - Tri-Clamp (OD-Tubes)
  - VCO connections
- Alloy C-22 2.4602/N 06022
  Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / JIS B2220

High-temperature version

- Stainless steel 1.4404/316L
  Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / JIS B2220
- Alloy C-22 2.4602/N 06022
  Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / JIS B2220

Measuring tubes

- DN 8 to 100 (3/8" to 4"): Stainless steel 1.4539/904L; manifold: 1.4404/316L
- DN 150 (6"): Stainless steel 1.4404/316L
- DN 250 (10"): Stainless steel 1.4404/316L; manifold: CF3M
- DN 8 to 150 (3/8" to 6"): Alloy C-22 2.4602/N 06022

High-temperature version

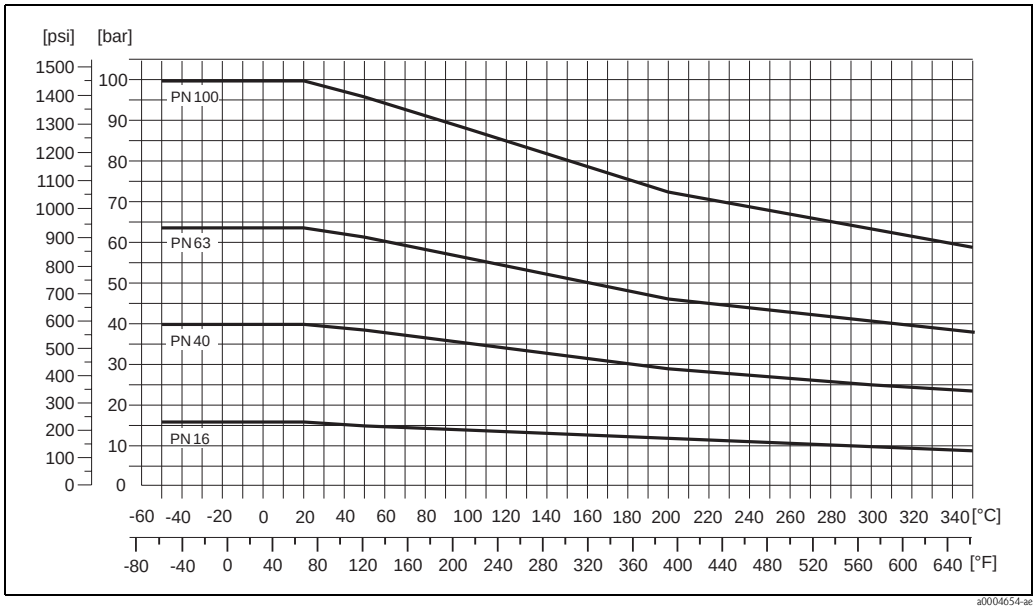
DN 25, 50, 80: Alloy C-22 2.4602/N 06022

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)

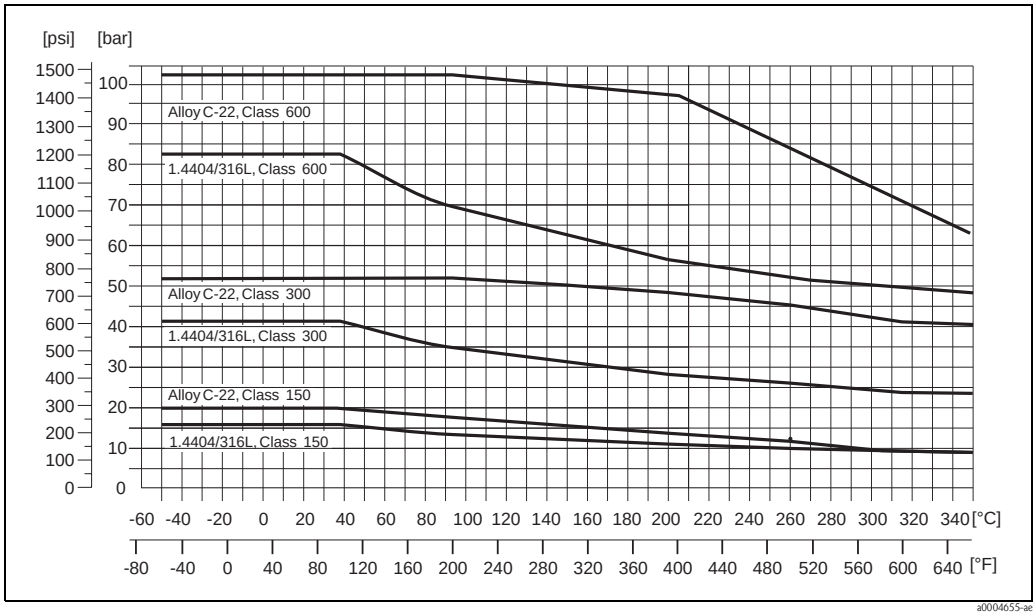
Flange material: 1.4404/316L, Alloy C-22



The values for the temperature range from +200 °C to +350 °C (+392 °F to +662 °F) are exclusively valid for the high-temperature version.

Flange connection according to ASME B16.5

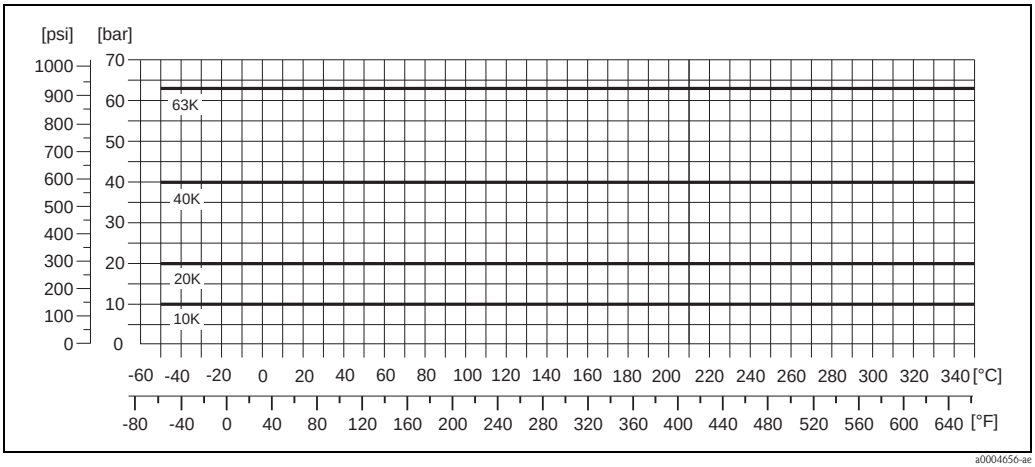
Flange material: 1.4404/316L, Alloy C-22



The values for the temperature range from +200 °C to +350 °C (+392 °F to +662 °F) are exclusively valid for high-temperature version.

Flange connection to JIS B2220

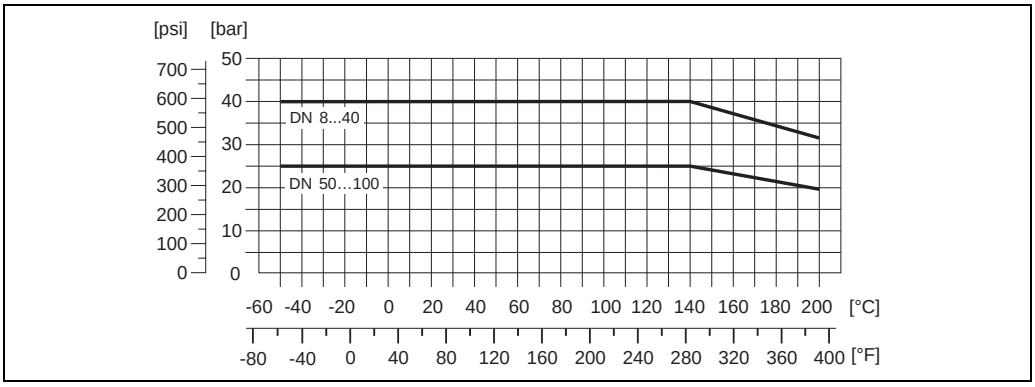
Flange material: 1.4404/316L, Alloy C-22



The values for the temperature range from +200 °C to +350 °C (+392 °F to +662 °F) are exclusively valid for high-temperature version.

Threaded hygienic connection to DIN 11851 / SMS 1145

Connection material: 1.4404/316L

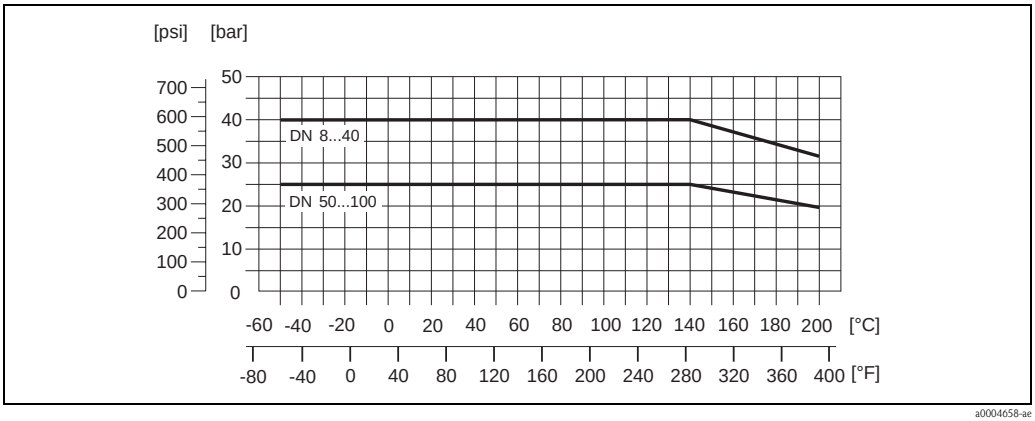


Tri-Clamp process connection

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.

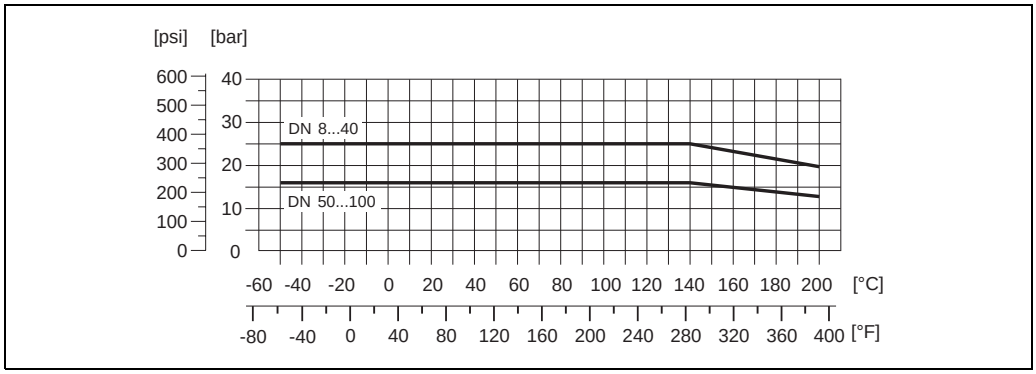
Threaded hygienic connection to DIN 11864-1 Form A

Connection material: 1.4404/316L



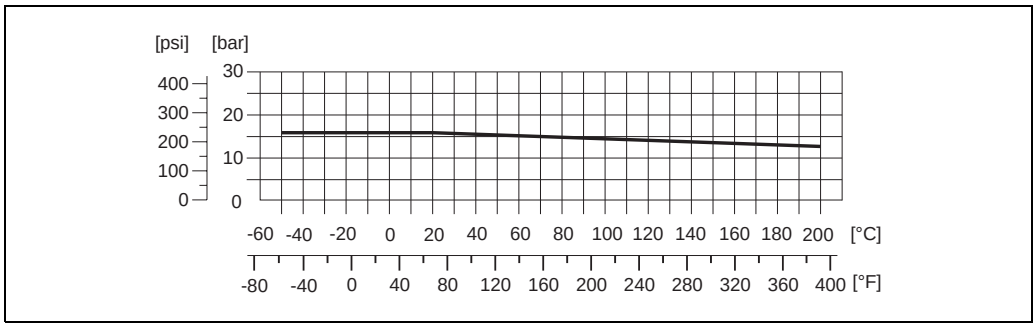
Flange connection to DIN 11864-2 Form A (flat flange with groove)

Flange material: 1.4404/316L



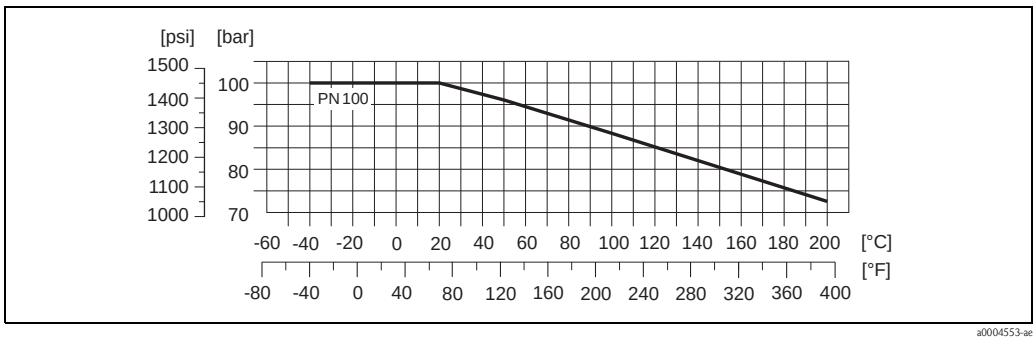
Threaded hygienic connection to ISO 2853

Connection material: 1.4404/316L



VCO process connection

Connection material: 1.4404/316L



Process connections

- Flanges according to EN 1092-1 (DIN 2501), according to ASME B16.5, JIS B2220, VCO connections
- 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)

Human interface

Display elements

- 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

- Local operation with three optical sensors (−, +, E)
- Application specific Quick Setup menus for straightforward commissioning

Language groups

Language groups available for operation in different countries:

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

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

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
- EHEDG tested

MODBUS RS485 certification

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

- 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

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).

Optionally flowmeters in accordance to the guidelines AD 2000 are available on request.

Measuring Instruments Directive

Measuring Instruments Directive 2004/22/EG (MID)

Annex MI-002 (gas meter)

The measuring device is approved as gas meter for use under legal control (in commercial transactions) acc. the European Measuring Instruments Directive, Annex MI-002 (DE-08-MI002-PTB014).

Annex MI-005 (liquids other than water)

- 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
- NMi, The Netherlands
- METAS, Switzerland
- BEV, Austria
- NTEP, USA
- MC, Canada

Information on custody transfer measurement → 📄 22

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			
			For liquids other than water			High pressure gas
Promass	[mm]	[inch]	Mass	Volume	Density	(CNG) Mass
F	8 to 250	3/8" to 10"	YES	YES	YES	NO

MID approval, Annex MI-002 (gas meter)

The device is qualified to OIML R137/D11.

Sensor	DN		MID Type Examination Certificate MI-002 (Europe)		
			Fuel gases up to 100 bar (1450 psi)		
Promass	[mm]	[inch]	Mass	Volume	Density
F	8 to 250	3/8" to 10"	YES	YES*	NO

* at pure gases only (invariable gas density)

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)		
			Liquids other than water		
Promass	[mm]	[inch]	Mass	Volume	Density
F	8 to 250	3/8" to 10"	YES	YES	YES

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		
			Liquids other than water		High-pressure gas
Promass	[mm]	[inch]	Mass	Volume	(CNG) Mass
F	15 to 150	½" to 6"	YES	YES	NO

MC approval

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

Sensor	DN		MC approval	
			Liquids other than water	
Promass	[mm]	[inch]	Mass	Volume
F	8 to 150	3/8" to 6"	YES	YES

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 84M (TI104D)
- 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

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