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

Technical Information

Proline Promass 84F, 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)
- Fluid temperatures up to +200 °C
- Process pressures up to 350 bar
- Mass flow measurement up to 2200 t/h

Approvals for custody transfer:
- PTB, NMi

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

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

Connection to process control system:
- HART

Relevant safety aspects:
- Secondary containment (up to 100 bar), Pressure Equipment Directive

Features and 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
- Efficient protection against forces from piping thanks to robust construction
- Easy installation without taking inlet and outlet runs into account

TI067D/06/en
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Endress+Hauser
People for Process Automation

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Function and system design

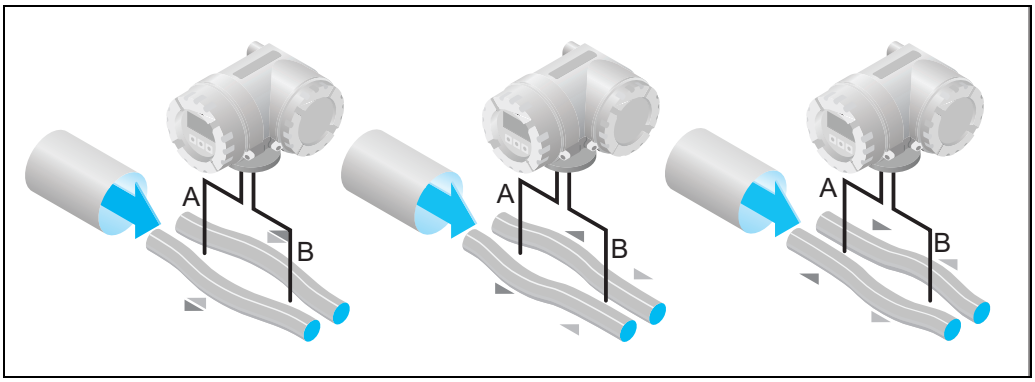
Measuring principle

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.

In the Promass F and M sensors, two parallel measuring tubes containing flowing fluid oscillate in antiphase, acting like a tuning fork. 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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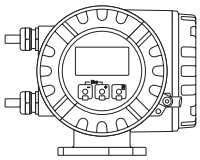
The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet.
System balance is ensured by the antiphase oscillation of the two measuring tubes. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

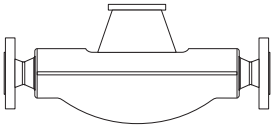
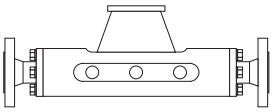
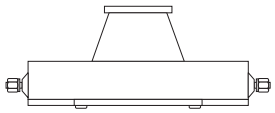
Density measurement
The measuring tubes are continuously excited at their resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tubes and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency 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  F06-x3xxxxxx-03-06-00-xx-000	■ 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  F06-8xFxxxxx-03-05-00-xx-000	■ Universal sensor for fluid temperatures up to 200 °C ■ Nominal diameters DN 8...250 ■ Measuring tubes made of stainless steel or Alloy C-22	Documentation No. TI067D/06/en
M  F06-8xMxxxxx-03-05-00-xx-000	■ Robust sensor for extreme process pressures, high secondary containment requirements and fluid temperatures up to 150 °C ■ Nominal diameters DN 8...80 ■ Tube material: titanium	Documentation No. TI067D/06/en
A  F06-8xAxxxxx-03-05-00-xx-000	■ Single-tube system for highly accurate measurement of very small flows ■ Nominal diameters DN 2...4 ■ Measuring tube made of stainless steel or Alloy C-22	Documentation No. TI068D/06/en

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 (Promass F, M):

DN	Range for full scale values (liquids) $\dot{m}_{min(F)}...\dot{m}_{max(F)}$
8	0...2000 kg/h
15	0...6500 kg/h
25	0...18000 kg/h
40	0...45000 kg/h
50	0...70000 kg/h
80	0...180000 kg/h
100 (only Promass F)	0...350000 kg/h
150 (only Promass F)	0...800000 kg/h
250 (only Promass F)	0...2200000 kg/h

Measuring ranges for gases

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

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

$\dot{m}_{max(G)}$ = 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/m^3] for process conditions
x = 160 (Promass F DN 8...100, M); x = 250 (Promass F DN 150...250)

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/m^3 (at 20 °C and 50 bar)
- Measuring range: 70000 kg/h
- x = 160 (for Promass F DN 50)

Max. possible full scale value:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} / x$ [kg/m^3] = 70000 kg/h ·60.3 kg/m^3 ÷ 160 kg/m^3 = 26400 kg/h

Recommended full scale values

See → Page 19 ff. (“Limiting flow”)

Measuring range in custody transfer mode

Measuring ranges for liquids in mass flow (Promass F, M):

DN	Range for mass flow (liquids) $Q_{min\ [kg/min]}...Q_{max\ [kg/min]}$	Smallest measured quantity [kg]
8	1.5...30	0.5
15	5...100	2
25	15...300	5
40	35...700	20
50	50...1000	50
80	150...3000	100
100 (only Promass F)	200...4500	200
150 (only Promass F)	350...12000	500
250 (only Promass F)	1500...35000	1000

Measuring ranges for liquids in volume flow (also LPG) (Promass F, M):

DN Promass F	DN Promass M	Range for volume flow (liquids) (with P = 1 kg/dm³) $Q_{min\ [l/min]}...Q_{max\ [l/min]}$	Smallest measured quantity [l]
8	8*	1.5...30	0.5
15	15*	5...100	2
25	25*	15...300	5
40	40*	35...700	20
50	50*	50...1000	50
80	80	150...3000	100
100		200...4500	200
150		350...12000	500
250		1500...35000	1000
* NMi approval only			

Measuring ranges for high pressure fuel gases CNG (Promass M):

DN	Range for mass flow (liquids) $Q_{min\ [kg/min]}...Q_{max\ [kg/min]}$	Smallest measured quantity [kg]	Maximum pressure [bar]
8	0.1...10	0.2	160 / 350*
15	0.3...40	0.5	160 / 350*
25	1.0...100	2.0	160 / 350*
* High pressure version			

Operable flow range

Over 20 : 1 for verified device

Input signal

Status input (auxiliary input):

U = 3...30 V DC, R_i = 5 kΩ, galvanically isolated.
Configurable for: totalizer reset, positive zero return, error message reset, start zero point adjustment

Output

Output signal

Current output:

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

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

Pulse / frequency output:

For custody transfer measurement, two pulse outputs can be operated, phase-shifted 90°.

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

- Frequency output: full scale frequency 2...10000 Hz (f_{max} = 12500 Hz), on/off ratio 1:1, pulse width max. 2 s. For phase-shifted double pulse max. 5000 Hz.
- Pulse output: pulse value and pulse polarity selectable, pulse width configurable (0.05…2000 ms)

Signal on alarm

Current output:
Failsafe mode selectable (for example, according to NAMUR recommendation NE 43)

Pulse / frequency output:
Failsafe mode selectable

Status output:
De-energised by fault or power supply failure

Load

See "Output signal"

Low flow cut off

Switch points for low flow cut off are selectable.

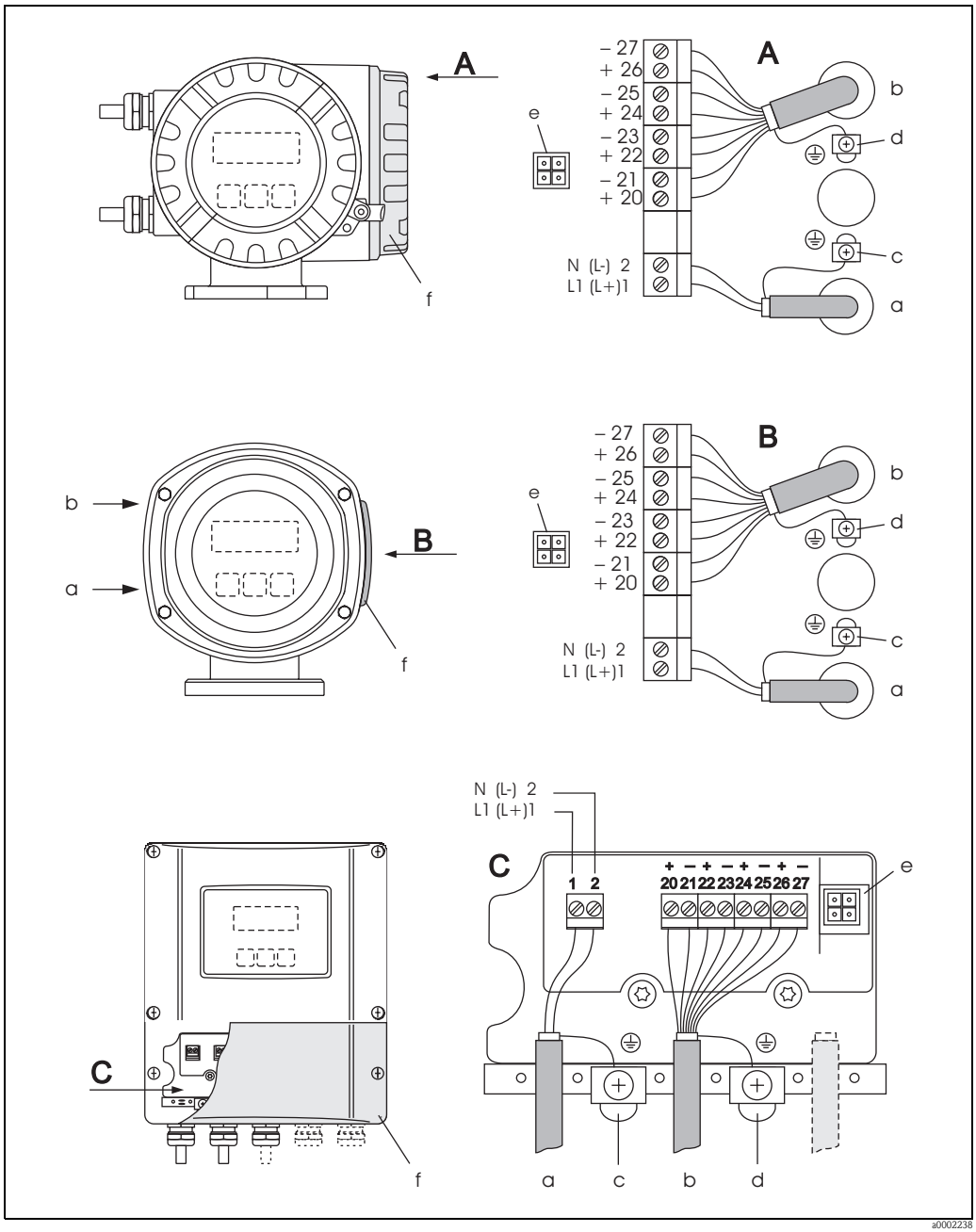
Nominal diameter	Low flow cutoff / factory settings (v ~ 0.04 m/s)	
[mm]	SI units [kg/h]	US units [lb/min]
8	8.00	0.300
15	26.00	1.000
25	72.00	2.600
40	180.00	6.600
50	300.00	11.000
80	720.00	26.000
100	1200.00	44.000
150	2600.00	95.000
250	7200.00	260.000

Galvanic isolation

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

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...260 V AC, 20...55 V AC,16...62 V DC
Terminal No. 1: L1 for AC, L+ for DC
Terminal No. 2: N for AC, L- for DC
b Signal cable: Terminals No. 20–27 → Page 9
c Ground terminal for protective earth
d Ground terminal for signal cable shield
e Service connector for connecting service interface FXA 193 (FieldCheck, FieldTool)
f Cover of the connection compartment

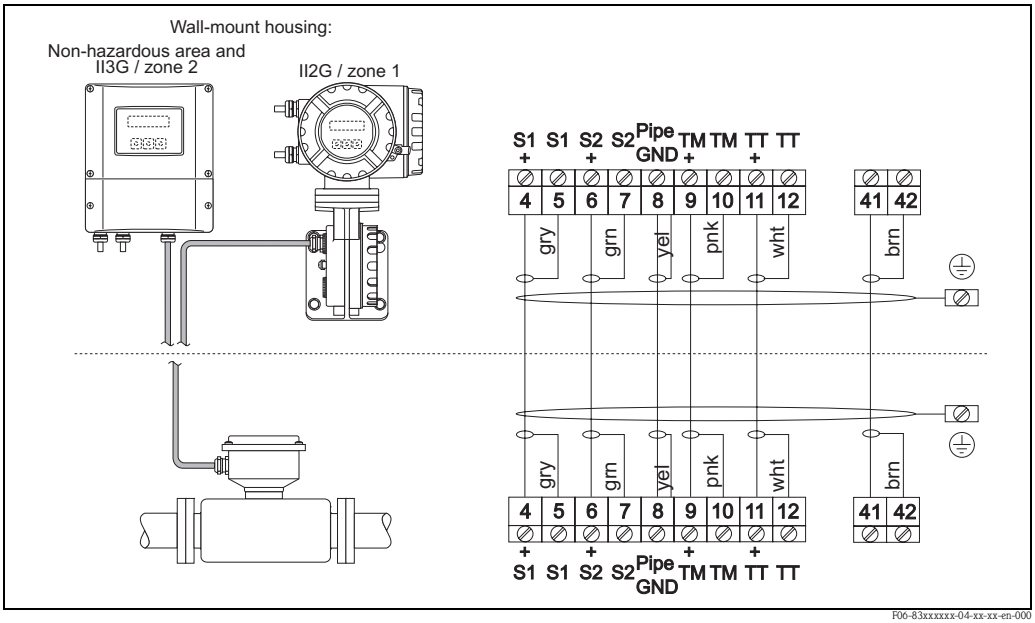
Electrical connection, terminal assignment

Promass 84

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 (-)
84***-**********M	Status input	Frequency output 2	Frequency output 1	Current output HART

Electrical connection Remote version



Supply voltage

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

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.

Cable entry

Power supply and signal cables (inputs/outputs):
- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, 1/2" NPT, G 1/2"

Connecting cable for remote version:
- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, 1/2" NPT, G 1/2"

Cable specifications, remote version

- 6 x 0.38 mm² PVC cable with common shield and individually shielded cores
- Conductor resistance: ≤ 50 Ω/km
- Capacitance core/shield: ≤ 420 pF/m
- Cable length: max. 20 m
- Permanent operating temperature: max. +105 °C

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 EN 61326/A1, 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 HistoROM T-DAT saves measuring system data if power supply fails.
- HistoROM/S-DAT: exchangeable data storage chip which stores the data of the sensor (nominal diameter, serial number, calibration factor, zero point, etc.)
- See Note on Page 9 (switching on the power supply in custody transfer mode)

Potential equalisation

No measures necessary.
Exception: explosion protected equipment must be included in the potential equalization.

Performance characteristics

Note!
The accuracy solely refers to the measuring device suitable for custody transfer measurement and not to the measuring system.

Reference operating conditions

Error limits following ISO/DIS 11631:
- 20...30 °C; 2...4 bar
- Calibration systems as per national norms
- Zero point calibrated under operating conditions
- Field density calibrated (or special density calibration)

Maximum measured error

The following values refer to the pulse/frequency output. Deviation at the current output is typically ±5 µA.

Mass flow (liquid):

±0.10% ± [(zero point stability / measured value) x 100]% o.r.

Mass flow (gas):

Promass F:

±0.35% ± [(zero point stability / measured value) x 100]% o.r.

Promass M:

±0.50% ± [(zero point stability / measured value) x 100]% o.r.

Volume flow (liquid)

Promass F:

±0.15% ± [(zero point stability / measured value) x 100]% o.r.

Promass M:

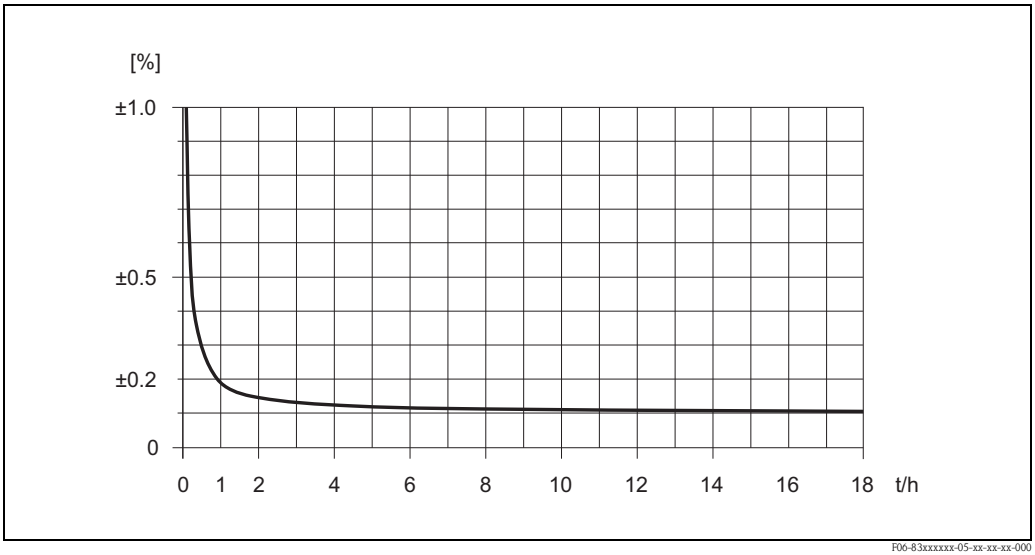
±0.25% ± [(zero point stability / measured value) x 100]% o.r.

o.r. = of reading

Zero point stability (Promass F, M):

DN	Max. full scale value [kg/h] or [l/h]	Zero point stability	
		Promass F [kg/h] or [l/h]	Promass M [kg/h] or [l/h]
8	2000	0.060	0.100
15	6500	0.200	0.325
25	18000	0.540	0.90
40	45000	2.25	2.25
50	70000	3.50	3.50
80	180000	9.00	9.00
100	350000	14.00	–
150	800000	32.00	–
250	2200000	88.00	–

Sample calculation



Maximum measured error in % of reading (example: Promass 84 F / DN 25)

Calculation example (mass flow, liquid):
Given: Promass 84 F / DN 25, measured value flow = 8000 kg/h
Max. measured error: ±0.10% ± [(zero point stability / measured value) x 100]% o.r.
Maximum measured error → ±0.10% ±0.54 kg/h ÷ 8000 kg/h · 100% = ±0.107%

Density (liquid)

Standard calibration
(1g/cc = 1 kg/l):

Promass F

±0.01 g/cc

Promass M

±0.02 g/cc

Special density calibration (optional), not for high temperature version

Promass F

±0.001 g/cc

Promass M

±0.002 g/cc

After field density calibration or under reference conditions:

Promass F

±0.0005 g/cc

Promass M

±0.0010 g/cc

Temperature

Promass F, M:

±0.5 °C ±0.005 x T (T = fluid temperature in °C)

Repeatability

Mass flow (liquid):

±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

Mass flow (gas):

±0.25% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

Volume flow (liquid):

Promass F:

±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

Promass M:

±0.10% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

o.r. = of reading
Zero point stability: see “Max. measured error”

Calculation example (mass flow, liquid):
Given: Promass 84 F / DN 25, measured value flow = 8000 kg/h
Repeatability: ±0.05% ± [(1/2 x zero point stability / measured value) x 100]% o.r.
Repeatability → ±0.05% ±1/2 · 0.54 kg/h ÷ 8000 kg/h · 100% = ±0.053%

Density measurement (liquid)

Promass F:

±0.00025 g/cc (1 g/cc = 1 kg/l)

Promass M:

±0.0005 g/cc

Temperature measurement

±0.25 °C ±0.0025 x T (T = fluid temperature in °C)

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.

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 [% o.r./bar]	Promass M [% o.r./bar]	Promass M / (high pressure) [% o.r./bar]
8	No influence	0.009	0.006
15	No influence	0.008	0.005
25	No influence	0.009	0.003
40	-0.003	0.005	-
50	-0.008	No influence	-
80	-0.009	No influence	–
100	-0.012	–	–
150	-0.009	–	–
250	-0.009	–	–
o.r. = of reading			

Operating conditions: Installation

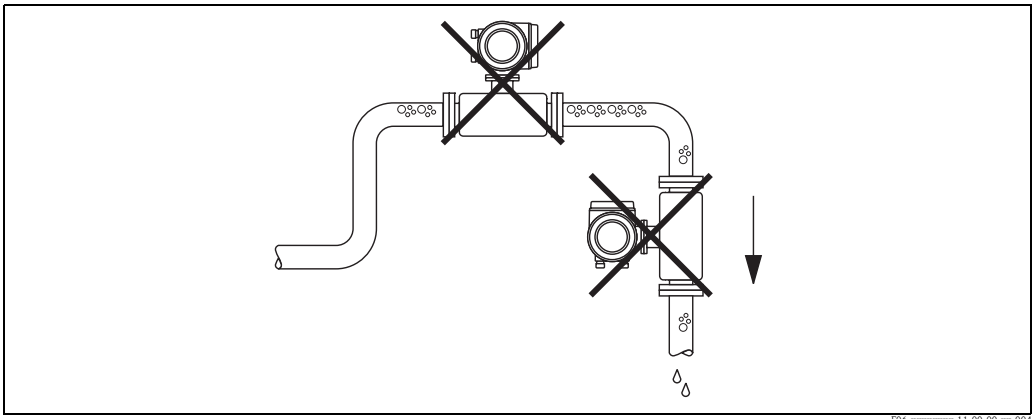
Installation instructions

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.

Note!
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.

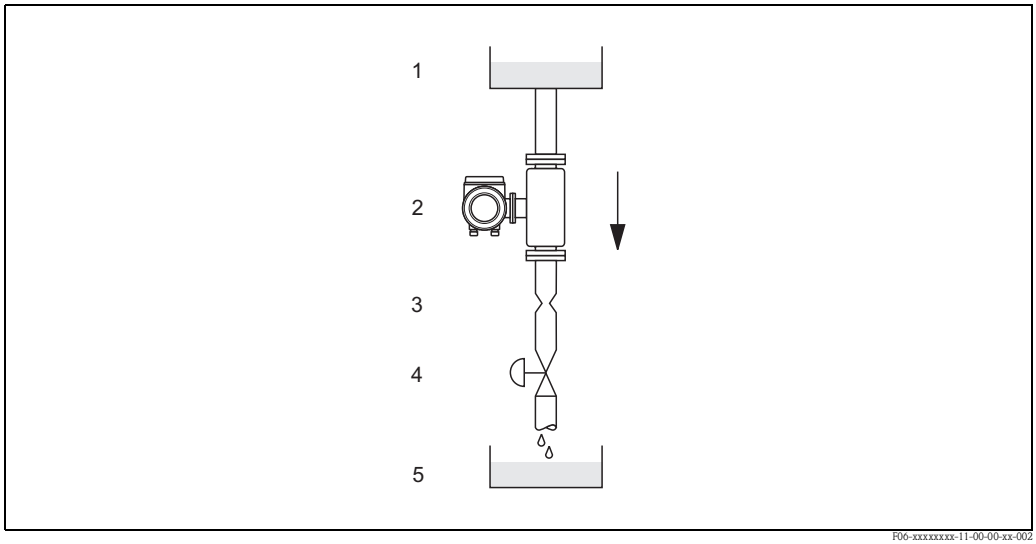
Mounting location

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 vertical pipe (e.g. for batching applications)

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

DN	8	15	25	40	50	80	100[1)]	150[1)]	250[1)]
∅ Orifice plate, pipe restriction	6 mm	10 mm	14 mm	22 mm	28 mm	50 mm	65 mm	90 mm	150 mm
1) only Promass F									

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).

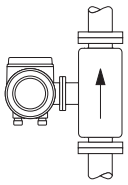
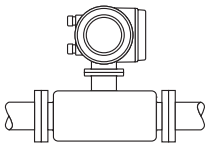
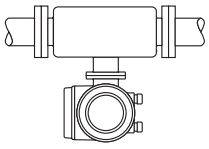
Vertical

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

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! see Page 16

In order to ensure that the maximum permissible ambient temperature for the transmitter (–20...+60 °C, optional –40...+60 °C) is not exceeded, we recommend the following orientations:

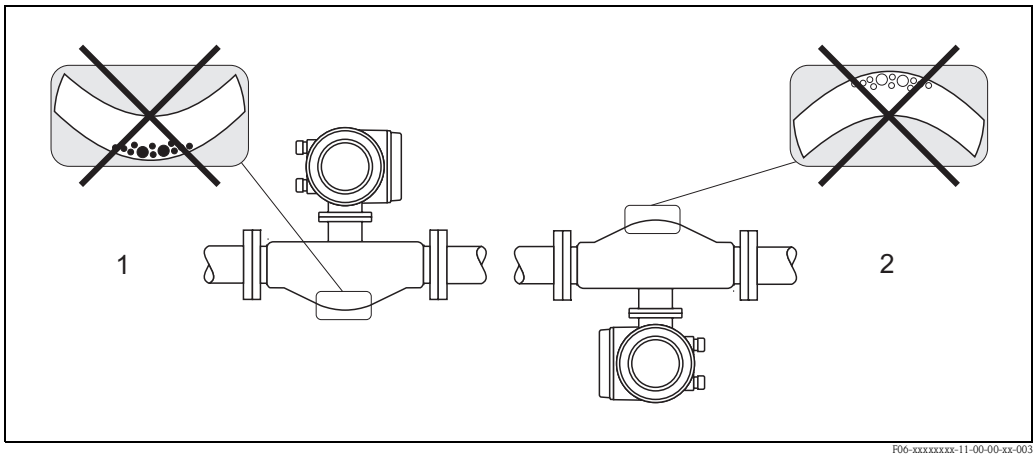
	Promass F, M Standard, compact	**Promass F, M Standard, remote**
Fig. V: Vertical orientation  F06-xxxxxxxx-11-00-00-xx-008	✔✔ ① ②	✔✔ ① ②
Fig. H1: Horizontal orientation Transmitter head up  F06-xxxxxxxx-11-00-00-xx-009	✔✔ ①	✔✔ ①
Fig. H2: Horizontal orientation Transmitter head down  F06-xxxxxxxx-11-00-00-xx-010	✔✔ ②	✔✔ ②
✔✔ = Recommended orientation ✔ = Orientation recommended in certain situations ✘ = Impermissible orientation		

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

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

Special installation instructions for Promass F

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



Promass F, 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.

Caution!
- Risk of electronics overheating! Consequently, make sure that the adapter between the sensor and transmitter and the connection housing of the remote version always remain free of insulating material. Note that a certain orientation might be required, depending on the fluid temperature see Page 15.
- 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 screened (except for Promass M).
  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
- Information on permissible temperature ranges → Page 18

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

Thermal insulation

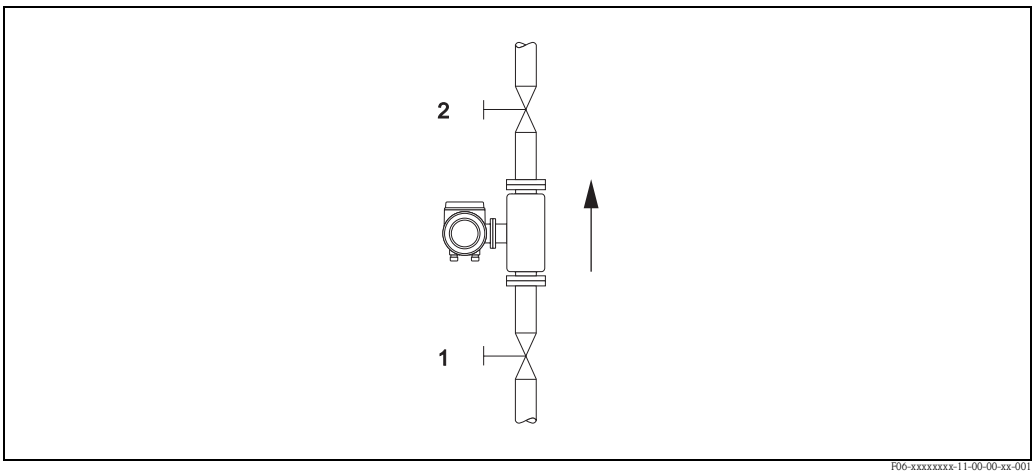
Some fluids require suitable measures to avoid loss of heat at the sensor. A wide range of materials can be used to provide the required thermal insulation.

Zero point adjustment

All Promass measuring devices are calibrated with state-of-the-art technology. The zero point determined in this way is imprinted on the nameplate. Calibration takes place under reference operating conditions.
→ Page 10 ff.
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).

Note the following before you perform a zero point adjustment:
- A zero point adjustment can be performed only with fluids that contain no gas or solid contents.
- Zero point adjustment is performed with the measuring tubes completely filled and at zero flow (v = 0 m/s). This can be achieved, for example, with shut-off valves upstream and/or downstream of the sensor or by using existing valves and gates.
  – Normal operation → valves 1 and 2 open
  – Zero point adjustment *with* pump pressure → Valve 1 open / valve 2 closed
  – Zero point adjustment *without* pump pressure → Valve 1 closed / valve 2 open



Zero point adjustment and shut-off valves

Inlet and outlet runs

There are no installation requirements regarding inlet and outlet runs.

Length of connecting cable

Max. 20 meters (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

Standard: –20...+60 °C (sensor, transmitter)
Optional: –40...+60 °C (sensor, transmitter)

Note!
- Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- At ambient temperatures below –20 °C the readability of the display may be impaired.

Storage temperature

–40...+80 °C (preferably +20 °C)

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 2 g, 10...150 Hz, following IEC 68-2-6

Electromagnetic compatibility (EMC)

To EN 61326/A1 and NAMUR recommendation NE 21

Operating conditions: Process

Medium temperature range

Sensor

Promass F:

–50...+200 °C

Promass M:

–50...+150 °C

Seals:

Promass F:

No internal seals

Promass M:

Viton –15...+200 °C; EPDM –40...+160 °C; silicon –60...+200 °C; Kalrez –20...+275 °C;
FEP sheathed (not for gas applications): –60...+200 °C

Medium pressure range (nominal pressure)

Flanges:

Promass F:
DIN PN 16...100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K

Promass M:
DIN PN 40...100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K

Promass M (high pressure version):

Measuring tubes, connector, couplings: max. 350 bar

Note!
Material load diagrams for the process connections can be found on → Page 55 ff.

Pressure ranges of secondary containment:

Promass F:

DN 8...50: 40 bar or 600 psi; DN 80: 25 bar or 375 psi;
DN 100...150: 16 bar or 250 psi; DN 250: 10 bar or 150 psi

Promass M:

100 bar or 1500 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

Limiting flow

See “Measuring range” section. → Page 63 ff.

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...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).
- 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 → Page 5 ff.

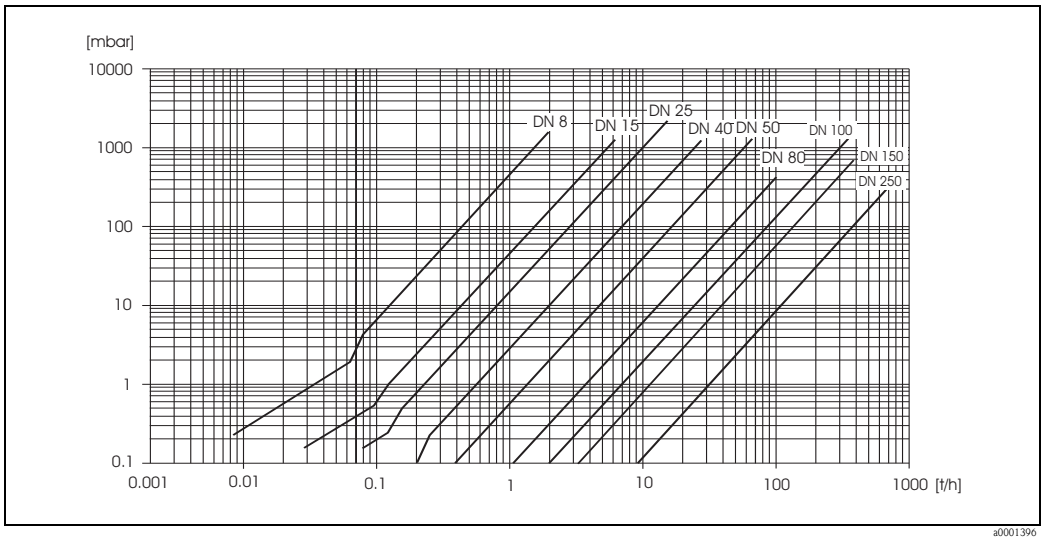
Pressure loss

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	$Re = \frac{2 \cdot \dot{m}}{\pi \cdot d \cdot \upsilon \cdot \rho}$ F06-83xxxxxx-19-xx-xx-xx-000
$Re \geq 2300$ [1)]	$\Delta p = K \cdot \upsilon^{0.25} \cdot \dot{m}^{1.85} \cdot \rho^{-0.86}$ F06-83xxxxxx-19-xx-xx-xx-001
$Re < 2300$	$\Delta p = K1 \cdot \upsilon \cdot \dot{m} + \frac{K2 \cdot \upsilon^{0.25} \cdot \dot{m}^2}{\rho}$ F06-83xxxxxx-19-xx-xx-xx-002
Δp = pressure loss [mbar] ν = kinematic viscosity [m2/s] $\dot{m}$ = mass flow [kg/s]	ρ = fluid density [kg/m3] d = inside diameter of measuring tubes [m] K...K2 = constants (depending on nominal diameter)
1) To compute the pressure loss for gases, always use the formula for $Re \geq 2300$.	

Pressure loss coefficient for Promass F

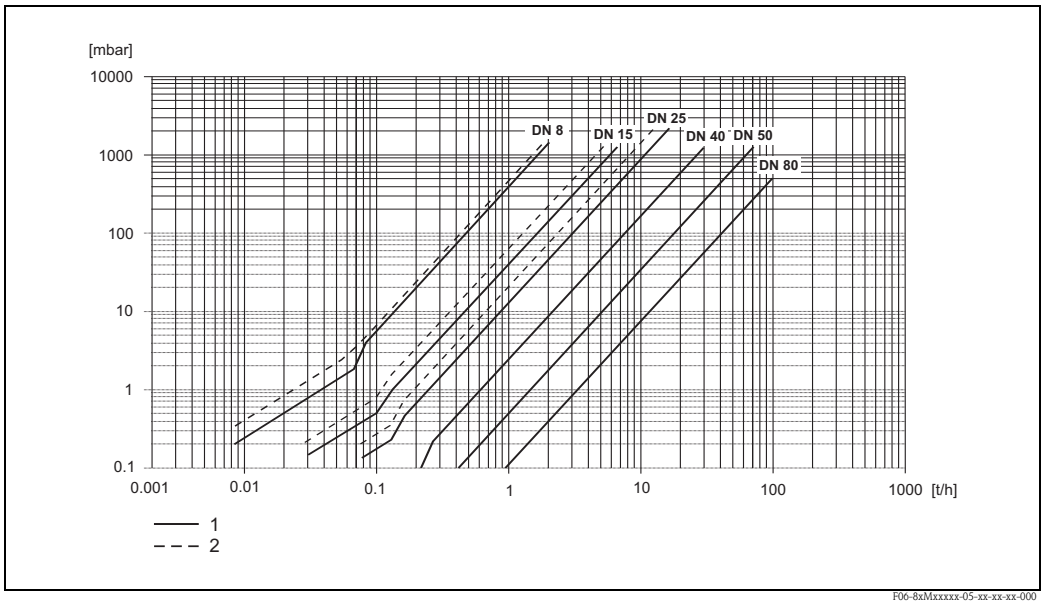
DN	d[m]	K	K1	K2
8	$5.35 \cdot 10^{-3}$	$5.70 \cdot 10^{7}$	$9.60 \cdot 10^{7}$	$1.90 \cdot 10^{7}$
15	$8.30 \cdot 10^{-3}$	$5.80 \cdot 10^{6}$	$1.90 \cdot 10^{7}$	$10.60 \cdot 10^{5}$
25	$12.00 \cdot 10^{-3}$	$1.90 \cdot 10^{6}$	$6.40 \cdot 10^{6}$	$4.50 \cdot 10^{5}$
40	$17.60 \cdot 10^{-3}$	$3.50 \cdot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



Pressure loss diagram for water

Pressure loss coefficient for Promass M

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



Pressure loss diagram for water

1 Promass M
2 Promass M (high pressure version)

Custody transfer measurement

Promass 84 is a flowmeter suitable for custody transfer measurement for liquids (other than water) and for fuel gases under high pressure (> 100 bar).

Custody transfer variables

- Mass flow
- Volume flow
- Density

Suitability for custody transfer measurement, approval by the Standards Authorities, repeated calibration due to legal metrology controls

- All Promass 84 flowmeters are verified on site using reference measurements. Only once it has been approved on site by the 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 Standards Authorities may be used for invoicing in applications subject to legal metrology controls.

- The owner-operator of a verified Promass 84 measuring system is obliged to carry out repeat calibration on the unit in accordance with the regulations of the authority.
- In contrast to mechanical counters, mass flowmeters which have been verified by the Standards Authorities may be operated continuously at $Q_{100\%} = Q_{max}$ in accordance with the approval certificate.
- A preliminary examination does not have to be performed as the verification certificate (approval) is available.

Approval for custody transfer

The requirements of the following test centres are taken into consideration:

- **PTB**, Germany; (www.eichamt.de)
- **NMi**, The Netherlands; (www.nmi.nl)
- **METAS**, Switzerland; (www.metas.ch)
- **BEV**, Austria; (www.eichamt.at)

Special features of working in the custody transfer mode

- In the custody transfer mode, the flow may only be measured and totalized in one direction of flow (forward).
- In the custody transfer mode, error messages that occur during operation must be confirmed and reset. The error messages can also be reset by means of the status input.

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.

Definition of terms

Terms used in the subject area “Suitability for custody transfer measurement for liquids other than water”

■ Verify	Inspection of a measuring system to determine the measured error from the "true" value with subsequent system sealing. Verification can only be carried out on site by the authority for legal metrology controls responsible.
■ Suitable for custody transfer measurement	A measuring system or a part of the system, for example counters or accessory equipment, has the (type) “approval for national verification” of a (national) approval centre.
■ Verified	The measuring system has been inspected and sealed on site by a representative of the authority for legal metrology controls. This must be arranged by the facility's owner-operator.
■ Repair	Upon request, the authority responsible can give companies that repair verified measuring devices (repairers) the authority to mark repaired devices (repairer mark) if they have the equipment necessary for repair and adjustment and have properly trained specialist staff. Endress+Hauser is authorised to carry out repair work on verified measuring devices.

■ Adjust	Adjustment on site (zero point, density) under operating conditions. Is performed by the facility's owner-operator.
■ Calibrate	Determine and save correction values for the individual measuring instrument to get as close as possible to the "real" value with the measured value.
■ Smallest measured quantity	Smallest measured variable for which the measuring system/the measuring device is approved.
■ Quantity convertor	Unit for automatically converting the measured value determined to another variable (pressure, temperature, density, etc.) or non-volatile saved conversion values for the fluid.
■ Measured error	(Also known as limit of permissible error, error limit or inaccuracy). Relative measurement error, derived from the quotient (measured value – "true" measured value) / "true" measured value in per cent.
■ Measuring system	Measuring device that includes the counter and all the ancillary equipment and additional devices.
■ Reapproval	Verified measuring devices can be reapproved if they observe the applicable limits of error in legal metrology and meet any other requirements which applied when they were initially verified. The authority responsible provides you with information as to how long the verification is valid.
■ Q_{min}	Minimum flow as of which the counter must observe the error limits.
■ Q_{max}	Maximum flow of the counter while observing the error limits.
■ Stamp points	To be provided on all parts of the measuring system which cannot otherwise be protected against any alteration (=falsification) to measured value determination and processing. Lead stamping is preferably used but adhesive seals are also permitted. They may only be affixed by an authorised party, namely authority for legal metrology controls or service team with field service mark.
■ Preliminary examination, Standards Authority	Early examination on a test bench where the medium corresponds to the material to be measured later both in terms of density and viscosity.
■ Counter	Device for measuring, saving and displaying the variables subject to mandatory verification (mass, volume, density, etc.)
■ Additional devices	Equipment that does not have a direct effect on the measurement but which is needed to ensure correct measuring or make it easier (e.g. gas display units, filters, pumps, etc.)
■ Ancillary equipment	Equipment used for direct further processing of the measurement result (e.g. printers, quantity convertors, price calculators, pre-set devices, etc.)

Verification process

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 Standards Authorities come to inspect and approve the system. This includes:

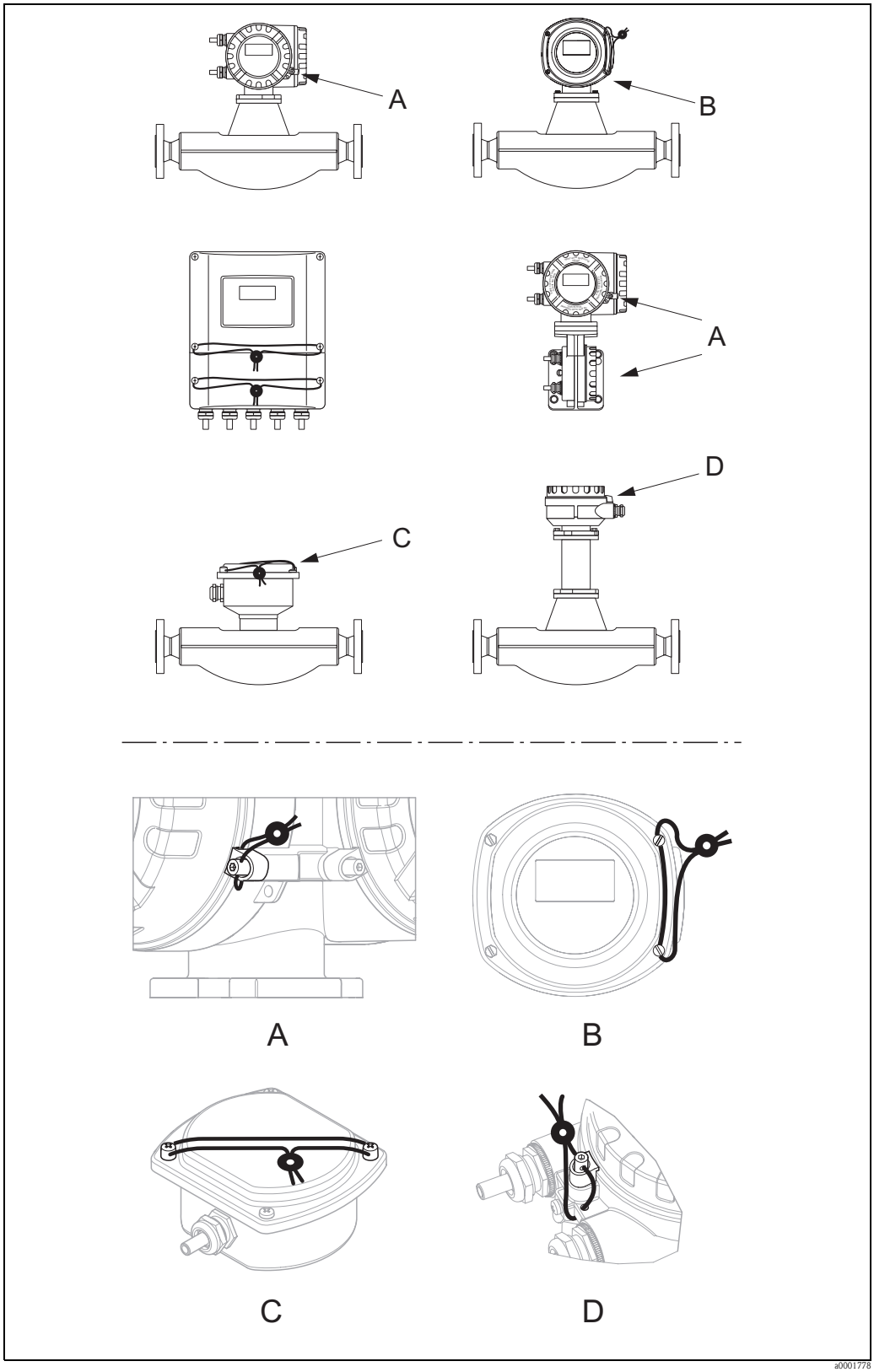
- Scales or container with a reading unit with a load or volumetric capacity that corresponds to the operation of the system at Q_{max} for one minute. The resolution of the scales display or the reading unit must be at least 0.1 % of the minimum measured quantity.
- Unit for removing the medium being 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 x 1 minute at Q_{min},
  plus 3 x 1 minute at ½ Q_{max},
  plus 3 x 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.

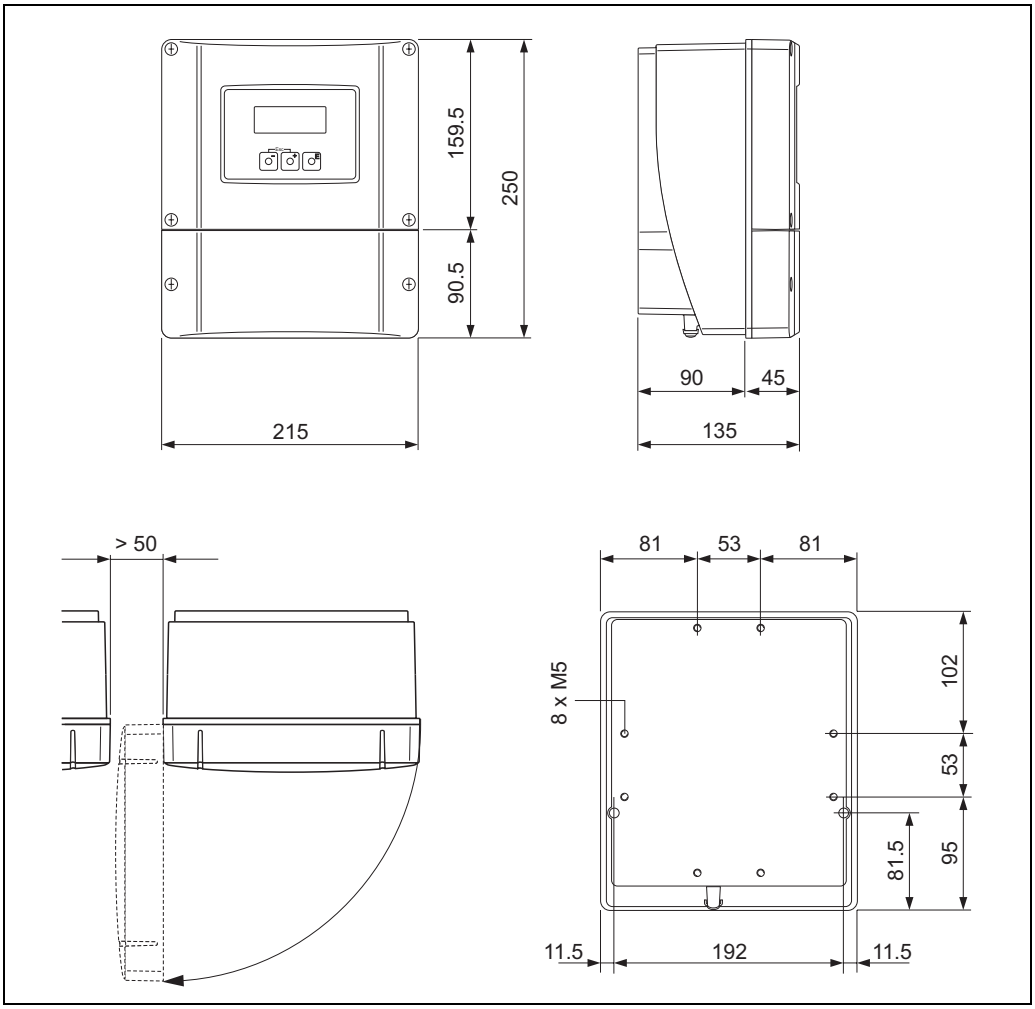
Disabling custody transfer mode

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

Mechanical construction

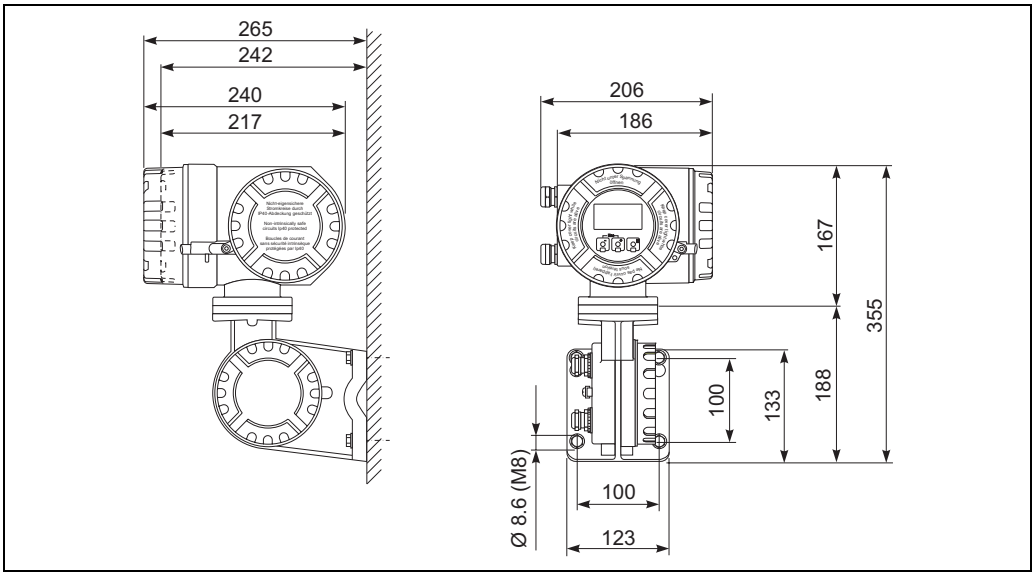
Design / dimensions

Dimensions: Wall-mount housing (non hazardous area and II3G / zone 2)



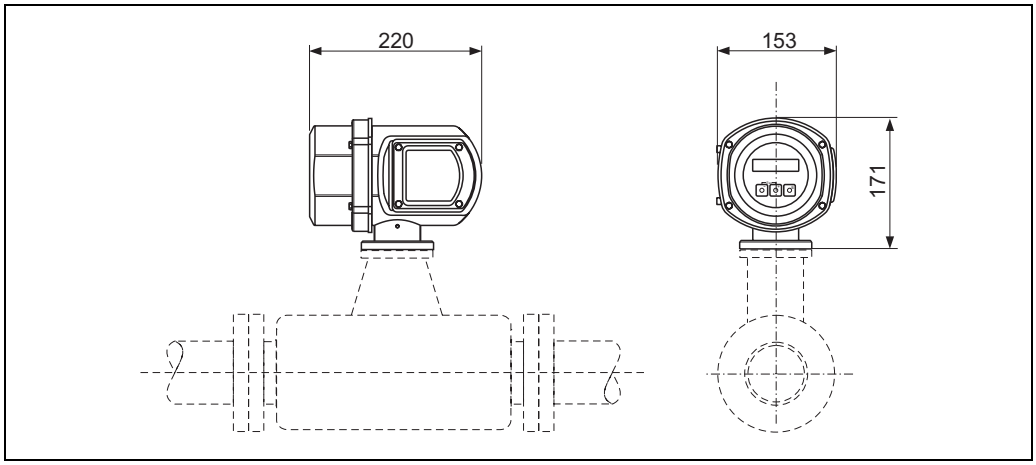
a0001150

Dimensions: Remote field housing (II2G / zone 1)



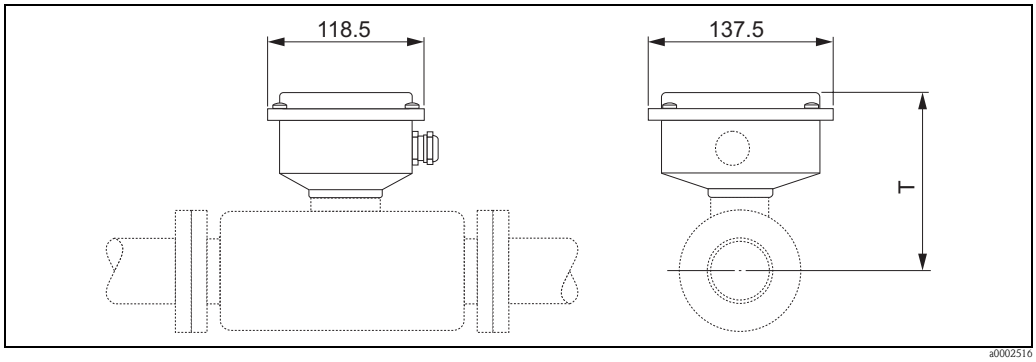
a0002128

Dimensions: stainless steel field housing



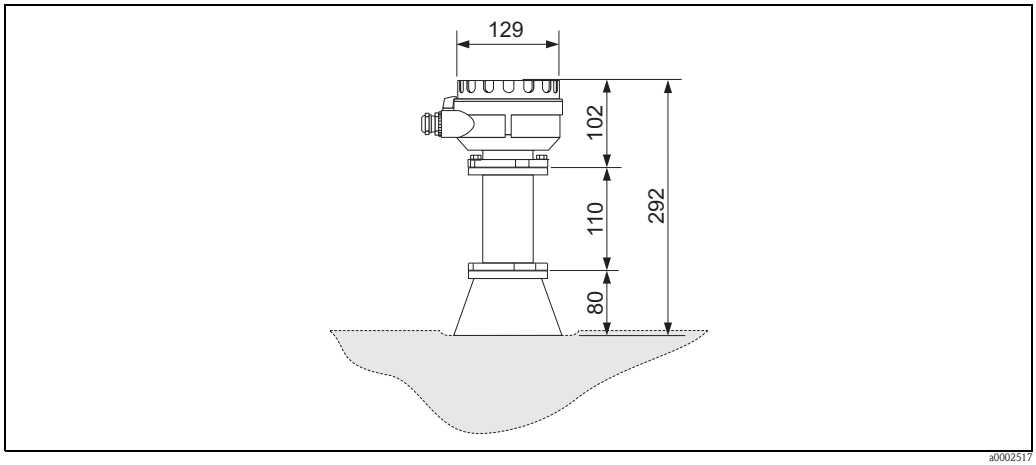
Dimensions: stainless steel field housing

Dimensions: Remote version



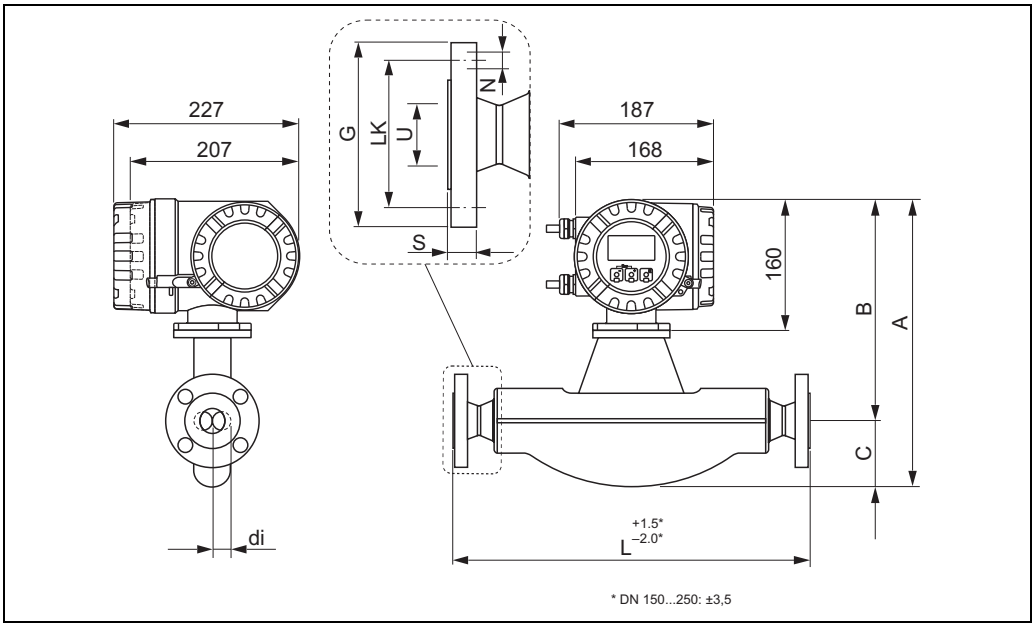
T = dimension B in the compact version (with corresponding nominal diameter) minus 153 mm

Dimensions: Remote version for heating



Dimensions of sensor connection housing, remote version for heating ("long-necked" version)

Dimensions, Promass F: Flange connections EN (DIN), ANSI, JIS



Flange 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 6.3...12.5 µm

DN	A	B	C	G	L	N	S	LK	U	di
100	571	324	247	220	1128	8 x Ø18	20	180	107.1	51.20
150	740	362	378	285	1330	8 x Ø22	22	240	159.3	68.90
250[2]	938	390	548	405	1780	12 x Ø26	26	355	260.4	102.26

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

Flange 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 6.3...12.5 µm

DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	95	370	4 x Ø14	16	65	17.3	5.35
15	341	266	75	95	404	4 x Ø14	16	65	17.3	8.30
25	341	266	75	115	440	4 x Ø14	18	85	28.5	12.00
40	376	271	105	150	550	4 x Ø18	18	110	43.1	17.60
50	424	283	141	165	715	4 x Ø18	20	125	54.5	26.00
80	505	305	200	200	840	8 x Ø18	24	160	82.5	40.50
100	571	324	247	235	1128	8 x Ø22	24	190	107.1	51.20
150	740	362	378	300	1370	8 x Ø26	28	250	159.3	68.90
250[2]	938	390	548	450	1850	12 x Ø33	38	385	258.8	102.26

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

Flange 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 6.3...12.5 mm

DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	115	440	4 x Ø14	18	85	28.5	5.35
15	341	266	75	115	440	4 x Ø14	18	85	28.5	8.30

Flange 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 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
150	938	390	548	285	1980	8 x Ø22	22	240	159.3	102.26
200	938	390	548	340	1940	12 x Ø22	24	295	207.3	102.26
300	938	390	548	460	1940	12 x Ø26	28	410	309.7	102.26

Flange 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 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
150	938	390	548	300	1980	8 x Ø26	28	250	159.3	102.26
200	938	390	548	375	1940	12 x Ø30	34	320	206.5	102.26
300	938	390	548	515	1940	16 x Ø33	42	450	307.9	102.26

Flange 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 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
50	424	283	141	180	724	4 x Ø22	26	135	54.5	26.00
80	505	305	200	215	875	8 x Ø22	28	170	81.7	40.50
100	571	324	247	250	1128	8 x Ø26	30	200	106.3	51.20
150	740	362	378	345	1410	8 x Ø33	36	280	157.1	68.90
250[2]	938	390	548	470	1890	12 x Ø36	46	400	255.4	102.26

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

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 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	105	400	4 x Ø14	20	75	17.3	5.35
15	341	266	75	105	420	4 x Ø14	20	75	17.3	8.30
25	341	266	75	140	470	4 x Ø18	24	100	28.5	12.00
40	376	271	105	170	590	4 x Ø22	26	125	42.5	17.60
50	424	283	141	195	740	4 x Ø26	28	145	53.9	26.00
80	505	305	200	230	885	8 x Ø26	32	180	80.9	40.50
100	571	324	247	265	1128	8 x Ø30	36	210	104.3	51.20
150	740	362	378	355	1450	12 x Ø33	44	290	154.0	68.90

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

Flange ANSI B16.5 / Cl 150:1.4404/316L, Alloy C-22

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	341	266	75	88.9	370	4 x Ø15.7	11.2	60.5	15.7	5.35
15	1/2"	341	266	75	88.9	404	4 x Ø15.7	11.2	60.5	15.7	8.30
25	1"	341	266	75	108.0	440	4 x Ø15.7	14.2	79.2	26.7	12.00
40	1 1/2"	376	271	105	127.0	550	4 x Ø15.7	17.5	98.6	40.9	17.60
50	2"	424	283	141	152.4	715	4 x Ø19.1	19.1	120.7	52.6	26.00
80	3"	505	305	200	190.5	840	4 x Ø19.1	23.9	152.4	78.0	40.50
100	4"	571	324	247	228.6	1128	8 x Ø19.1	23.9	190.5	102.4	51.20
150	6"	740	362	378	279.4	1398	8 x Ø22.4	25.4	241.3	154.2	68.90
250[1]	10"	938	390	548	406.4	1836.8	12 x Ø25.4	30.2	362	254.5	102.26

[1] Not available in Alloy

Flange ANSI B16.5 / Cl 300:1.4404/316L, Alloy C-22

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	341	266	75	95.2	370	4 x Ø15.7	14.2	66.5	15.7	5.35
15	1/2"	341	266	75	95.2	404	4 x Ø15.7	14.2	66.5	15.7	8.30
25	1"	341	266	75	123.9	440	4 x Ø19	17.5	88.9	26.7	12.00
40	1 1/2"	376	271	105	155.4	550	4 x Ø22.3	20.6	114.3	40.9	17.60
50	2"	424	283	141	165.1	715	8 x Ø19	22.3	127.0	52.6	26.00
80	3"	505	305	200	209.5	840	8 x Ø22.3	28.4	168.1	78.0	40.50
100	4"	571	324	247	254.0	1128	8 x Ø22.3	31.7	200.1	102.4	51.20
150	6"	740	362	378	317.5	1417	12 x Ø22.3	36.5	269.7	154.2	68.90
250[1]	10"	938	390	548	444.5	1868.2	16 x Ø28.4	47.4	387.3	254.5	102.26

[1] Not available in Alloy

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

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	341	266	75	95.3	400	4 x Ø15.7	20.6	66.5	13.9	5.35
15	1/2"	341	266	75	95.3	420	4 x Ø15.7	20.6	66.5	13.9	8.30
25	1"	341	266	75	124.0	490	4 x Ø19.1	23.9	88.9	24.3	12.00
40	1 1/2"	376	271	105	155.4	600	4 x Ø22.4	28.7	114.3	38.1	17.60
50	2"	424	283	141	165.1	742	8 x Ø19.1	31.8	127.0	49.2	26.00
80	3"	505	305	200	209.6	900	8 x Ø22.4	38.2	168.1	73.7	40.50
100	4"	571	324	247	273.1	1158	8 x Ø25.4	48.4	215.9	97.3	51.20
150	6"	740	362	378	355.6	1467	16xØ28.4	47.8	292.1	154.2	68.90
250[1)]	10"	938	390	548	508.0	1951.2	16 X Ø35.1	69.9	431.8	254.5	102.26

[1)] Not available in Alloy

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

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
150	6"	938	390	548	279.4	1980	8 x Ø22.4	25.4	241.3	154.2	102.26
200	8"	938	390	548	342.9	1940	8 x Ø22.4	28.4	298.5	202.7	102.26
300	12"	938	390	548	482.6	1940	12 x Ø25.4	31.8	431.8	304.80	102.26

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

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
150	6"	938	390	548	317.5	1980	12 x Ø22.4	36.5	269.7	154.2	102.26
200	8"	938	390	548	381.0	1940	12 x Ø25.4	41.1	330.2	202.7	102.26
300	12"	938	390	548	520.7	1940	16 x Ø31.7	50.8	450.8	304.80	102.26

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

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
150	6"	938	390	548	355.6	1980	12 x Ø28.4	54.2	292.1	154.2	102.26
200	8"	938	390	548	419.1	1940	12 x Ø31.8	62.0	349.3	202.7	102.26

Flange JIS B2238 / 10K:1.4404/316L, Alloy C-22

Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
50	424	283	141	155	715	4 x Ø19	16	120	50	26.00
80	505	305	200	185	832	8 x Ø19	18	150	80	40.50
100	571	324	247	210	1128	8 x Ø19	18	175	100	51.20
150	740	362	378	280	1354	8 x Ø23	22	240	150	68.90
250[1)]	938	390	548	400	1780	12 x Ø25	24	355	250	102.26

[1)] Not available in Alloy

Flange JIS B2238 / 20K:1.4404/316L, Alloy C-22

Surface roughness (flange):
Ra 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	95	370	4 x Ø15	14	70	15	5.35
15	341	266	75	95	404	4 x Ø15	14	70	15	8.30
25	341	266	75	125	440	4 x Ø19	16	90	25	12.00
40	376	271	105	140	550	4 x Ø19	18	105	40	17.60
50	424	283	141	155	715	8 x Ø19	18	120	50	26.00
80	505	305	200	200	832	8 x Ø23	22	160	80	40.50
100	571	324	241	225	1128	8 x Ø23	24	185	100	51.20
150	740	362	378	305	1386	12 x Ø25	28	260	150	68.90
250[1)]	938	390	548	430	1850	12 x Ø27	34	380	250	102.26

[1)] Not available in Alloy

Flange JIS B2238 / 40K:1.4404/316L, Alloy C-22

Surface roughness (flange):
Ra 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	115	400	4 x Ø19	20	80	15	5.35
15	341	266	75	115	425	4 x Ø19	20	80	15	8.30
25	341	266	75	130	485	4 x Ø19	22	95	25	12.00
40	376	271	105	160	600	4 x Ø23	24	120	38	17.60
50	424	283	141	165	760	8 x Ø19	26	130	50	26.00
80	505	305	200	210	890	8 x Ø23	32	170	75	40.50
100	571	324	241	250	1168	8 x Ø25	36	205	100	51.20
150	740	362	378	355	1498	12 x Ø33	44	295	150	68.90

Flange JIS B2238 / 63K:1.4404/316L, Alloy C-22

Surface roughness (flange):
Ra 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	120	420	4 x Ø19	23	85	12	5.35
15	341	266	75	120	440	4 x Ø19	23	85	12	8.30
25	341	266	75	140	494	4 x Ø23	27	100	22	12.00
40	376	271	105	175	620	4 x Ø25	32	130	35	17.60
50	424	283	141	185	775	8 x Ø23	34	145	48	26.00
80	505	305	200	230	915	8 x Ø25	40	185	73	40.50
100	571	324	247	270	1168	8 x Ø27	44	220	98	51.20
150	740	362	378	365	1528	12 x Ø33	54	305	146	68.90

Flange JIS extension/reduction / 10K:1.4404/316L, Alloy C-22

Only for nominal diameter DN 250 (on request)
Surface roughness (flange):
Ra 1.6...3.2 mm

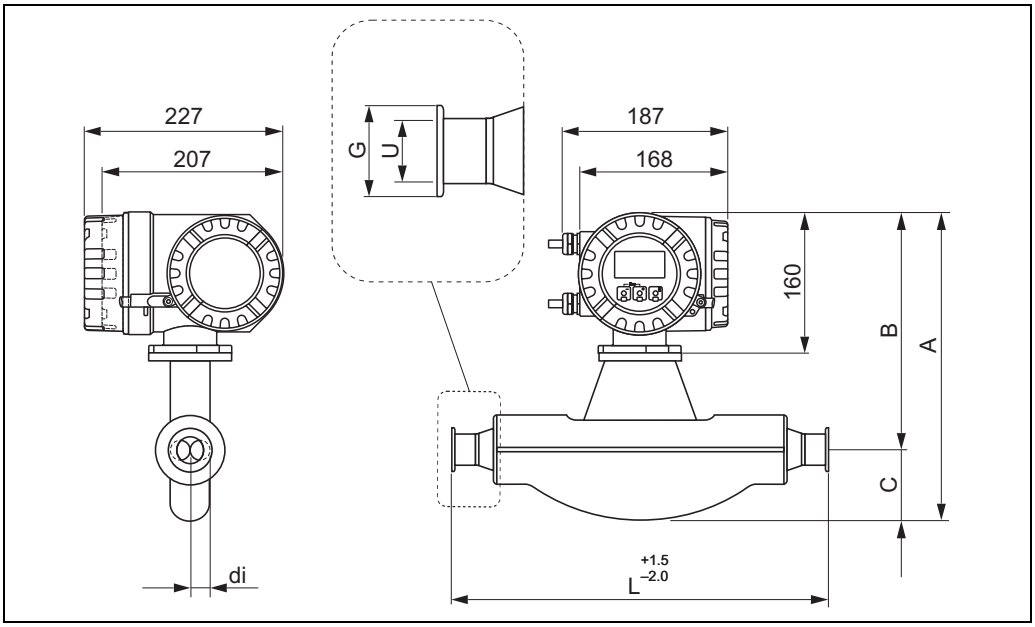
DN	A	B	C	G	L	N	S	LK	U	di
150	938	390	548	280	1980	8 x Ø23	22	240	150	102.26
200	938	390	548	330	1940	12 x Ø23	22	290	200	102.26
300	938	390	548	445	1940	16 x Ø25	24	400	300	102.26

Flange JIS extension/reduction / 20K:1.4404/316L, Alloy C-22

Only for nominal diameter DN 250 (on request)
Surface roughness (flange):
Ra 1.6...3.2 mm

DN	A	B	C	G	L	N	S	LK	U	di
150	938	390	548	305	1980	12 x Ø25	28	260	150	102.26
200	938	390	548	350	1940	12 x Ø25	30	305	200	102.26
300	938	390	548	480	1940	16 x Ø27	36	430	300	102.26

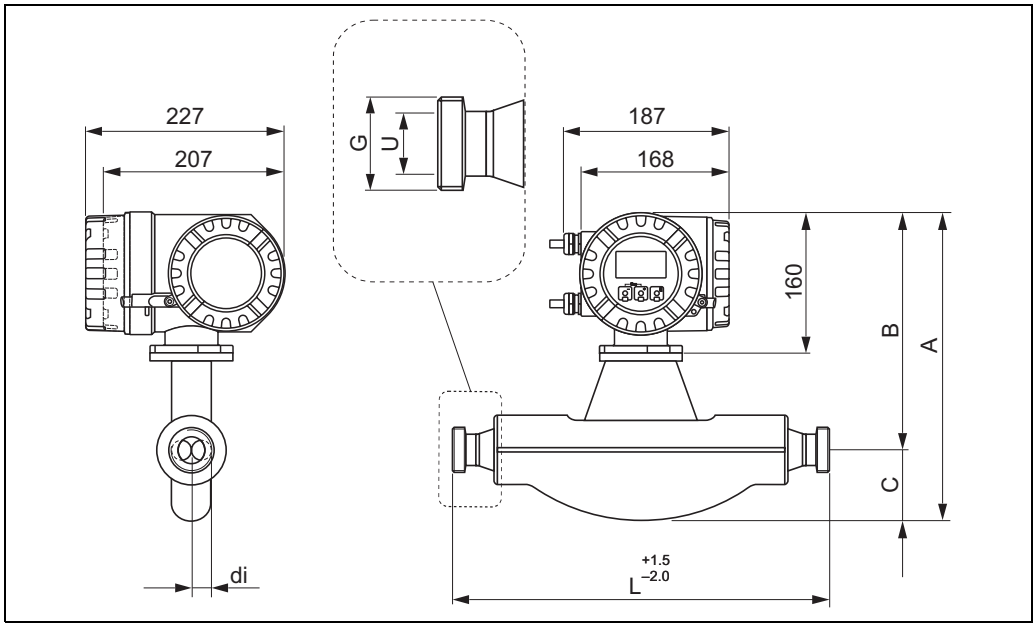
Dimensions, Promass F: Tri-Clamp connections



Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1"	341	266	75	50.4	367	22.1	5.35
15	1"	341	266	75	50.4	398	22.1	8.30
25	1"	341	266	75	50.4	434	22.1	12.00
40	1 1/2"	376	271	105	50.4	560	34.8	17.60
50	2"	424	283	141	63.9	720	47.5	26.00
80	3"	505	305	200	90.9	900	72.9	40.50
100	4"	571	324	247	118.9	1128	97.4	51.20
3A version available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)								

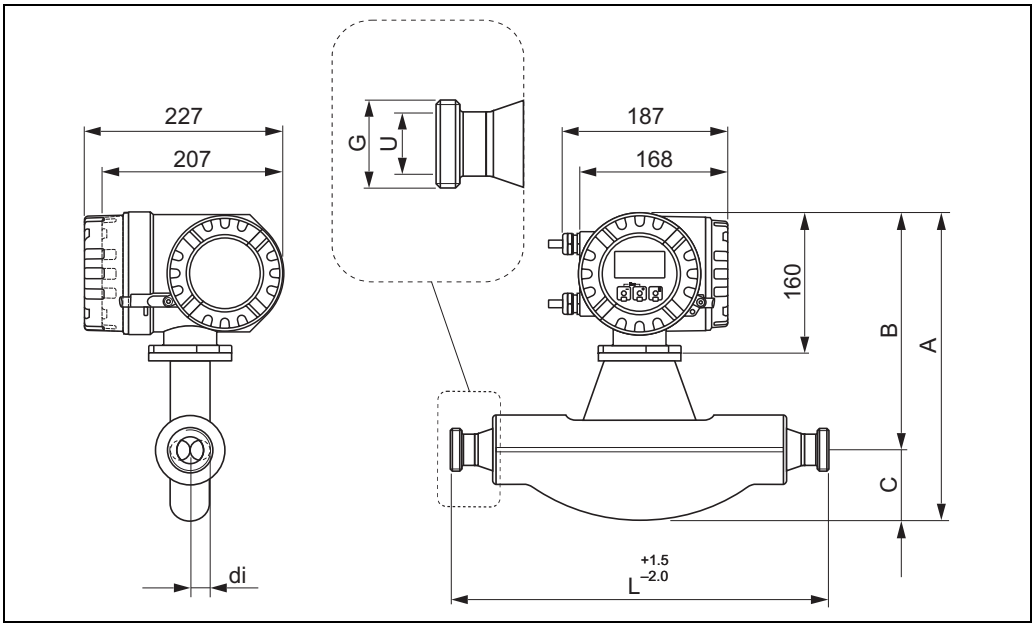
1/2" Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1/2"	341	266	75	25.0	367	9.5	5.35
15	1/2"	341	266	75	25.0	398	9.5	8.30
3A version available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)								

Dimensions, Promass F: DIN 11851 connections (hygienic coupling)



Hygienic coupling DIN 11851: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	Rd 34 x 1/8"	367	16	5.35
15	341	266	75	Rd 34 x 1/8"	398	16	8.30
25	341	266	75	Rd 52 x 1/6"	434	26	12.00
40	376	271	105	Rd 65 x 1/6"	560	38	17.60
50	424	283	141	Rd 78 x 1/6"	720	50	26.00
80	505	305	200	Rd 110 x 1/4"	900	81	40.50
100	571	324	247	Rd 130 x 1/4"	1128	100	51.20
3A version available (Ra ≤ 0.8 µm/150 grit.)							

Dimensions, Promass F: DIN 11864-1 Form A connections (couplings)



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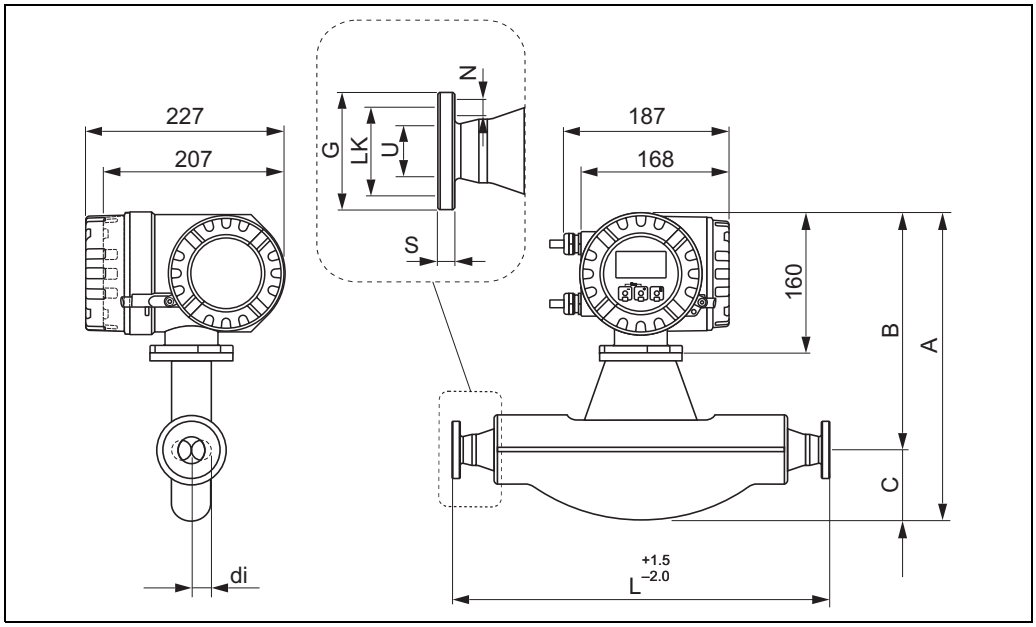
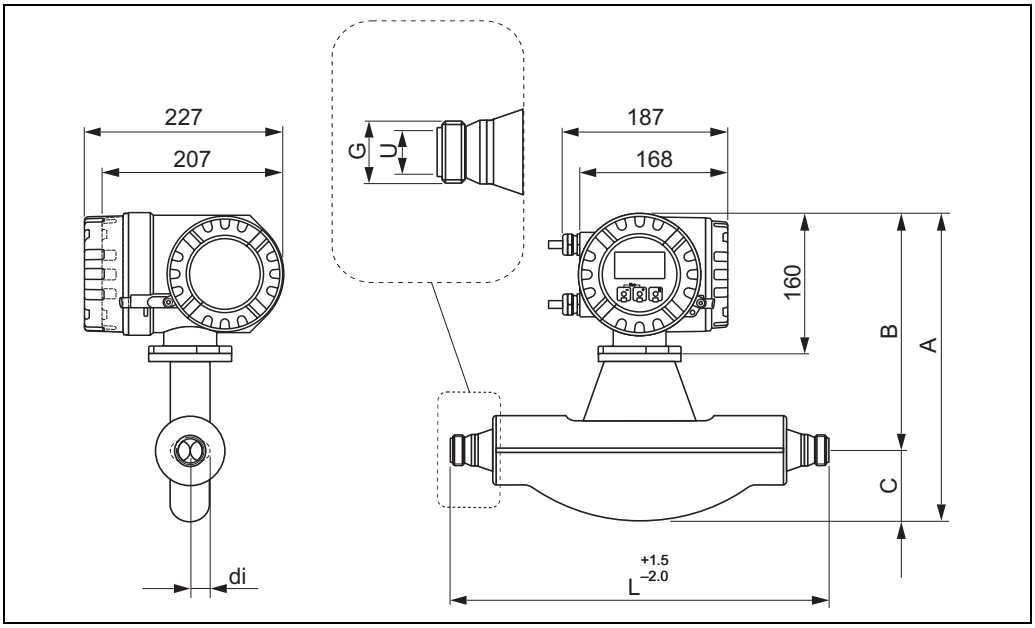
Coupling DIN 11864-1 Form A: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	Rd 28x 1/8"	367	10	5.35
15	341	266	75	Rd 34 x 1/8"	398	16	8.30
25	341	266	75	Rd 52 x 1/6"	434	26	12.00
40	376	271	105	Rd 65 x 1/6"	560	38	17.60
50	424	283	141	Rd 78 x 1/6"	720	50	26.00
80	505	305	200	Rd 110 x 1/4"	900	81	40.50
100	571	324	247	Rd 130 x 1/4"	1128	100	51.20
3A version available (Ra ≤ 0.8 µm/150 grit.)							

Dimensions, Promass F: Flange connections DIN 11864-2 Form A (flat flange)



Flange DIN 11864-2 Form A (flat flange): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
8	341	266	75	54	387	4 x Ø9	10	37	10	5.35
15	341	266	75	59	418	4 x Ø9	10	42	16	8.30
25	341	266	75	70	454	4 x Ø9	10	53	26	12.00
40	376	271	105	82	560	4 x Ø9	10	65	38	17.60
50	424	283	141	94	720	4 x Ø9	10	77	50	26.00
80	505	305	200	133	900	8 x Ø11	12	112	81	40.50
100	571	324	247	159	1128	8 x Ø11	14	137	100	51.20
3A version available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)										

Dimensions, Promass F: ISO 2853 connections (couplings)



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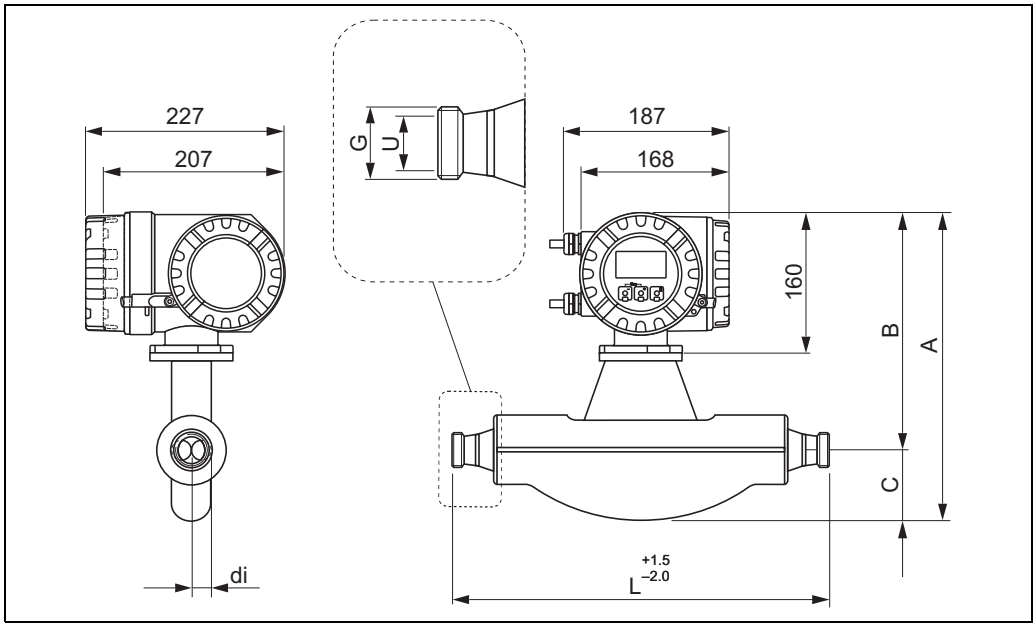
Coupling ISO 2853: 1.4404/316L							
DN	A	B	C	G [1)]	L	N	di
8	341	266	75	37.13	367	22.6	5.35
15	341	266	75	37.13	398	22.6	8.30
25	341	266	75	37.13	434	22.6	12.00
40	376	271	105	52.68	560	35.6	17.60
50	424	283	141	64.16	720	48.6	26.00
80	505	305	200	91.19	900	72.9	40.50
100	571	324	247	118.21	1128	97.6	51.20

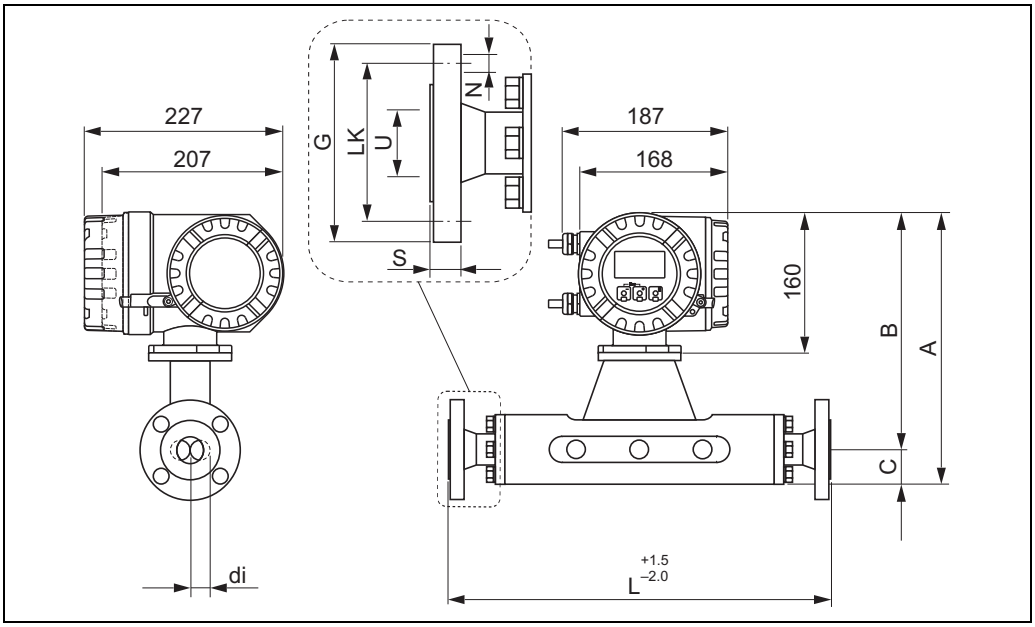
[1)] Max. thread diameter to ISO 2853 Annex A
3A version available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)

Dimensions, Promass F: SMS 1145 connections (hygienic coupling)



Hygienic coupling SMS 1145: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	341	266	75	37.13	367	22.6	5.35
15	341	266	75	37.13	398	22.6	8.30
25	341	266	75	37.13	434	22.6	12.00
40	376	271	105	52.68	560	35.6	17.60
50	424	283	141	64.16	720	48.6	26.00
80	505	305	200	91.19	900	72.9	40.50
100	571	324	247	118.21	1128	97.6	51.20
3A version available (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)							

Dimensions, Promass M: Flange connections EN (DIN), ANSI, JIS



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Flange EN 1092-1 (DIN 2501) / PN 16: PVDF										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø14	16	65	16.1	5.53
15	305	268	37	95	404	4 x Ø14	16	65	16.1	8.55
25	312	272	40	115	440	4 x Ø14	18	85	28.5	11.38
40	332	283	49	150	550	4 x Ø18	18	110	43.1	17.07
50	351	293	58	165	715	4 x Ø18	20	125	54.5	25.60

Flange 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 6.3...12.5 µm										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø14	16	65	17.3	5.53
15	305	268	37	95	404	4 x Ø14	16	65	17.3	8.55
25	312	272	40	115	440	4 x Ø14	18	85	28.5	11.38
40	332	283	49	150	550	4 x Ø18	18	110	43.1	17.07
50	351	293	58	165	715	4 x Ø18	20	125	54.5	25.60
80	385	309	76	200	840	8 x Ø18	24	160	82.5	38.46
[1] Flange with groove to EN 1092-1 Form D (DIN 2512N) available										

Flange 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 6.3...12.5 mm										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	115	440	4 x Ø14	18	85	28.5	5.53
15	305	268	37	115	440	4 x Ø14	18	85	28.5	8.55

Flange 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 1.6...3.2 µm

DN	A	B	C	G	L	N	S	LK	U	di
50	351	293	58	180	724	4 x Ø22	26	135	54.5	25.60
80	385	309	76	215	875	8 x Ø22	28	170	81.7	38.46

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

Flange 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 1.6...3.2 µm

DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	400	4 x Ø14	20	65	17.3	5.53
15	305	268	37	95	420	4 x Ø14	20	65	17.3	8.55
25	312	272	40	115	470	4 x Ø14	24	85	28.5	11.38
40	332	283	49	150	590	4 x Ø18	26	110	43.1	17.07
50	351	293	58	165	740	4 x Ø18	28	125	54.5	25.60
80	385	309	76	230	885	8 x Ø26	32	180	80.9	38.46

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

Flange ANSI B16.5 / Cl 150: 1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	88.9	370	4 x Ø15.7	11.2	60.5	15.7	5.53
15	1/2"	305	268	37	88.9	404	4 x Ø15.7	11.2	60.5	15.7	8.55
25	1"	312	272	40	108.0	440	4 x Ø15.7	14.2	79.2	26.7	11.38
40	1 1/2"	332	283	49	127.0	550	4 x Ø15.7	17.5	98.6	40.9	17.07
50	2"	351	293	58	152.4	715	4 x Ø19.1	19.1	120.7	52.6	25.60
80	3"	385	309	76	190.5	840	4 x Ø19.1	23.9	152.4	78.0	38.46

Flange ANSI B16.5 / Cl 150: PVDF

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	88.9	370	4 x Ø15.7	16	60.5	15.7	5.53
15	1/2"	305	268	37	88.9	404	4 x Ø15.7	16	60.5	15.7	8.55
25	1"	312	272	40	108.0	440	4 x Ø15.7	18	79.2	26.7	11.38
40	1 1/2"	332	283	49	127.0	550	4 x Ø15.7	21	98.6	40.9	17.07
50	2"	351	293	58	152.4	715	4 x Ø19.1	28	120.7	52.6	25.60

Flange ANSI B16.5 / Cl 300:1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	95.2	370	4 x Ø15.7	14.2	66.5	15.7	5.53
15	1/2"	305	268	37	95.2	404	4 x Ø15.7	14.2	66.5	15.7	8.55
25	1"	312	272	40	123.9	440	4 x Ø19.0	17.5	88.9	26.7	11.38
40	1 1/2"	332	283	49	155.4	550	4 x Ø22.3	20.6	114.3	40.9	17.07
50	2"	351	293	58	165.1	715	8 x Ø19.0	22.3	127.0	52.6	25.60
80	3"	385	309	76	209.5	840	8 x Ø22.3	28.4	168.1	78.0	38.46

Flange ANSI B16.5 / Cl 600:1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8	3/8"	301	266	35	95.3	400	4 x Ø15.7	20.6	66.5	13.8	5.53
15	1/2"	305	268	37	95.3	420	4 x Ø15.7	20.6	66.5	13.8	8.55
25	1"	312	272	40	124.0	490	4 x Ø19.1	23.6	88.9	24.4	11.38
40	1 1/2"	332	283	49	155.4	600	4 x Ø22.4	28.7	114.3	38.1	17.07
50	2"	351	293	58	165.1	742	8 x Ø19.1	31.8	127.0	49.3	25.60
80	3"	385	309	76	209.6	900	8 x Ø22.4	38.2	168.1	73.7	38.46

Flange JIS B2238 / 10K:1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
50	351	293	49.25	155	715	4 x Ø19	16	120	50	25.60
80	385	309	58	185	832	8 x Ø19	18	150	80	38.46

Flange JIS B2238 / 10K:1.4404/316L, PVDF

DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø15	16	70	15	5.53
15	305	268	37	95	404	4 x Ø15	16	70	15	8.55
25	312	272	40	125	440	4 x Ø19	18	90	25	11.38
40	332	283	49	140	550	4 x Ø19	21	105	40	17.07
50	351	293	58	155	715	4 x Ø19	22	120	50	25.60

Flange JIS B2238 / 20K:1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	95	370	4 x Ø15	16	70	15	5.53
15	305	268	37	95	404	4 x Ø15	16	70	15	8.55
25	312	272	40	125	440	4 x Ø19	18	90	25	11.38
40	332	283	49	140	550	4 x Ø19	21	105	40	17.07
50	351	293	58	155	715	4 x Ø19	22	120	50	25.60
80	385	309	76	200	832	8 x Ø23	22	160	80	38.46

Flange JIS B2238 / 40K:1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

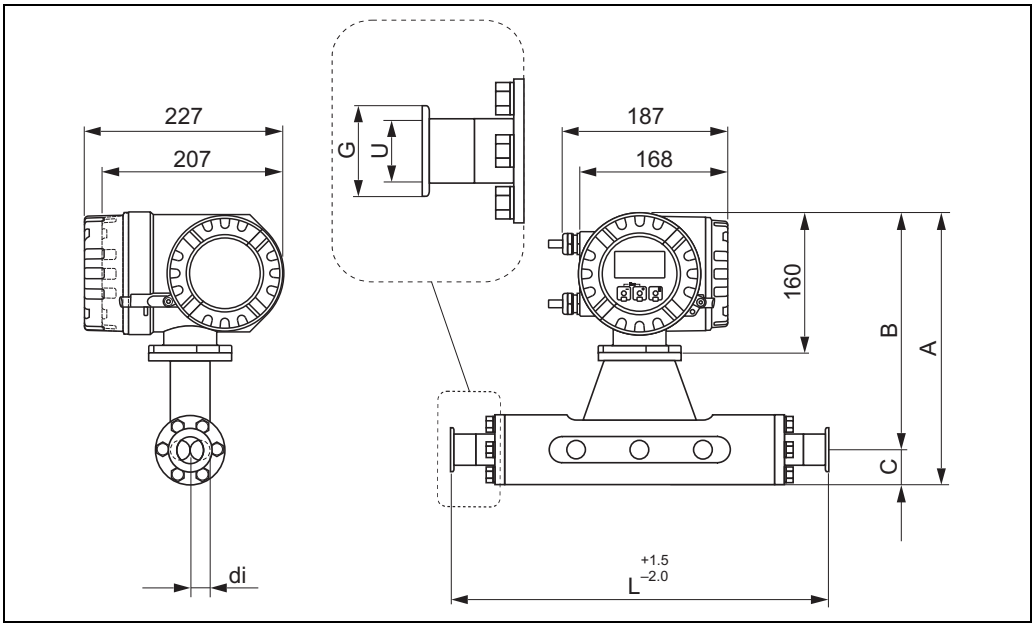
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	115	400	4 x Ø19	20	80	15	5.53
15	305	268	37	115	425	4 x Ø19	20	80	15	8.55
25	312	272	40	130	485	4 x Ø19	22	95	25	11.38
40	332	283	49	160	600	4 x Ø23	24	120	38	17.07
50	351	293	58	165	760	8 x Ø19	26	130	50	25.60
80	385	309	76	210	890	8 x Ø23	32	170	75	38.46

Flange JIS B2238 / 63K:1.4404/316L, titanium

Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	120	420	4 x Ø19	23	85	12	5.53
15	305	268	37	120	440	4 x Ø19	23	85	12	8.55
25	312	272	40	140	494	4 x Ø23	27	100	22	11.38
40	332	283	49	175	620	4 x Ø25	32	130	35	17.07
50	351	293	58	185	775	8 x Ø23	34	145	48	25.60
80	385	309	76	230	915	8 x Ø25	40	185	73	38.46

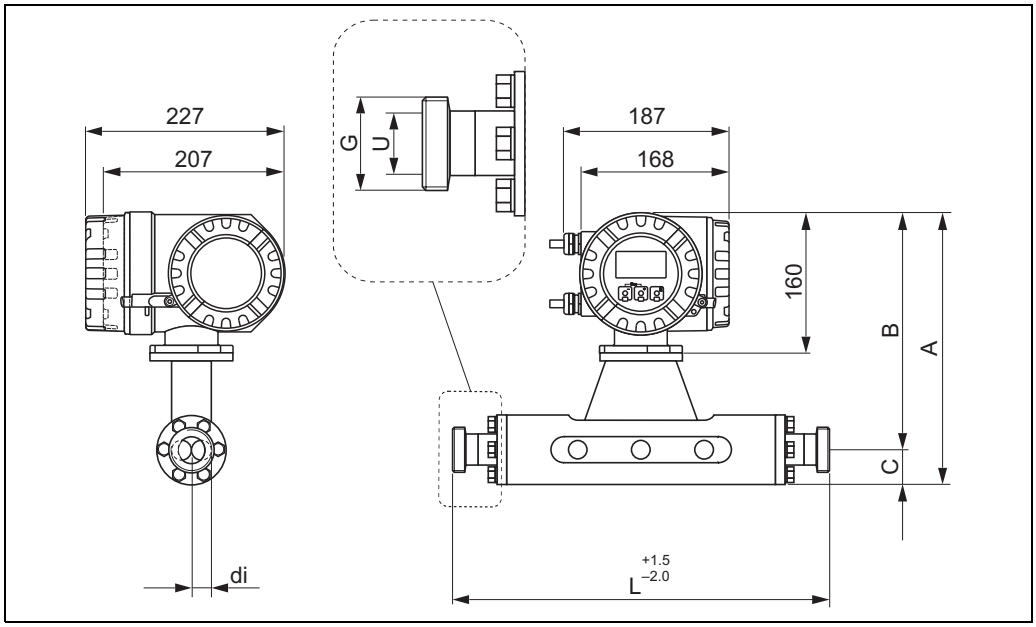
Dimensions, Promass M: Tri-Clamp connections



Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1"	301	266	35	50.4	367	22.1	5.53
15	1"	305	268	37	50.4	398	22.1	8.55
25	1"	312	272	40	50.4	434	22.1	11.38
40	1 1/2"	332	283	49	50.4	560	34.8	17.07
50	2"	351	293	58	63.9	720	47.5	25.60
80	3"	385	309	76	90.9	801	72.9	38.46
3A version available (Ra ≤ 0.8 µm/150 grit)								

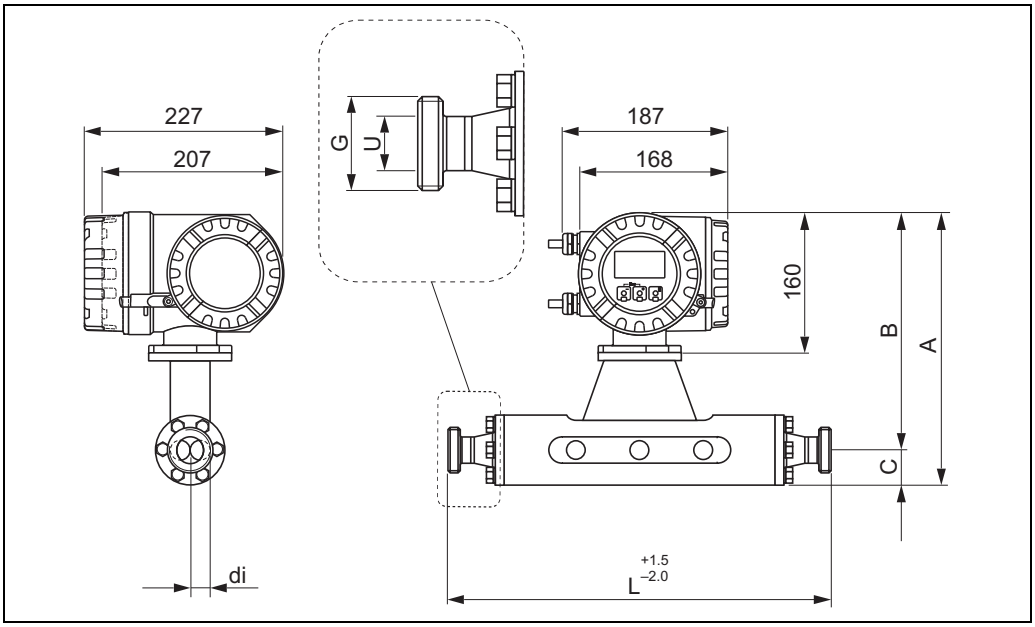
1/2" Tri-Clamp: 1.4404/316L								
DN	Clamp	A	B	C	G	L	U	di
8	1/2"	301	266	35	25.0	367	9.5	5.53
15	1/2"	305	268	37	25.0	398	9.5	8.55
3A version available (Ra ≤ 0.8 µm/150 grit)								

Dimensions, Promass M: DIN 11851 connections (Hygienic coupling)



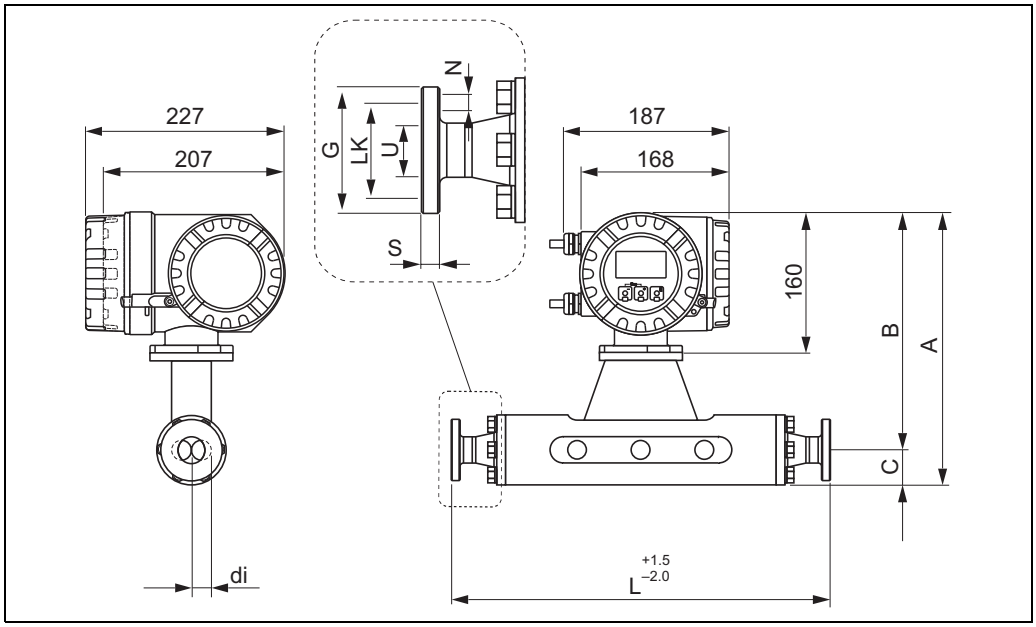
Hygienic coupling DIN 11851: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	Rd 34 x 1/8"	367	16	5.53
15	305	268	37	Rd 34 x 1/8"	398	16	8.55
25	312	272	40	Rd 52 x 1/6"	434	26	11.38
40	332	283	49	Rd 65 x 1/6"	560	38	17.07
50	351	293	58	Rd 78 x 1/6"	720	50	25.60
80	385	309	76	Rd 110 x 1/4"	815	81	38.46
3A version available (Ra ≤ 0.8 µm/150 grit.)							

Dimensions, Promass M: DIN 11864-1 Form A connections (couplings)



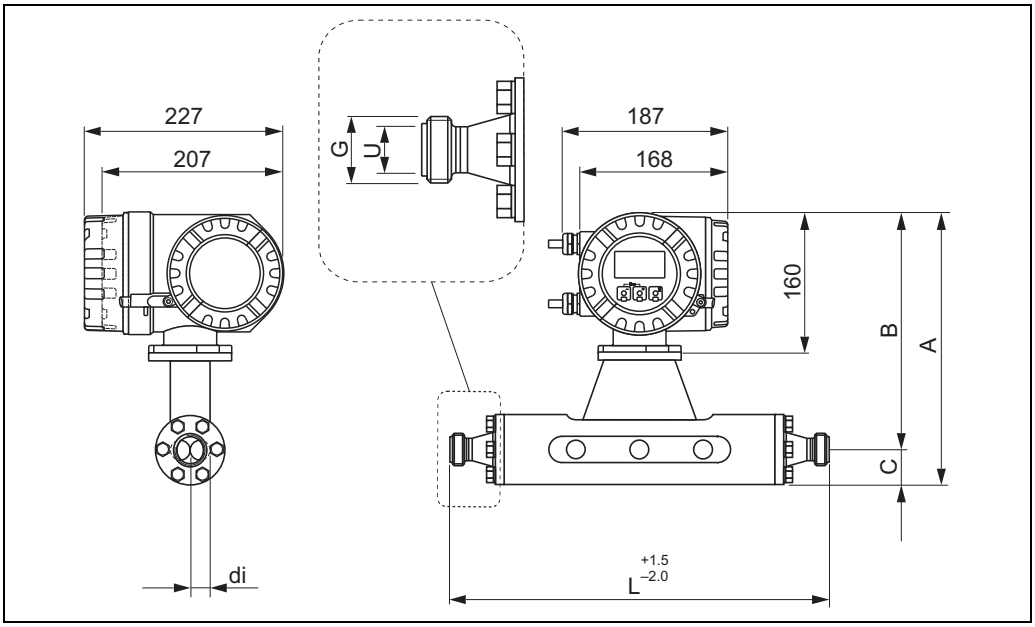
Coupling DIN 11864-1 Form A: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	Rd 28x 1/8"	367	10	5.53
15	305	268	37	Rd 34 x 1/8"	398	16	8.55
25	312	272	40	Rd 52 x 1/6"	434	26	11.38
40	332	283	49	Rd 65 x 1/6"	560	38	17.07
50	351	293	58	Rd 78 x 1/6"	720	50	25.60
80	385	309	76	Rd 110 x 1/4"	815	81	38.46
3A version available (Ra ≤ 0.8 µm/150 grit.)							

Dimensions, Promass M: Flange connections DIN 11864-2 Form A (flat flange)



Flange DIN 11864-2 Form A (flat flange): 1.4404/316L										
DN	A	B	C	G	L	N	S	LK	U	di
8	301	266	35	54	367	4 x Ø9	10	37	10	5.53
15	305	268	37	59	398	4 x Ø9	10	42	16	8.55
25	312	272	40	70	434	4 x Ø9	10	53	26	11.38
40	332	283	49	82	560	4 x Ø9	10	65	38	17.07
50	351	293	58	94	720	4 x Ø9	10	77	50	25.60
80	385	309	76	133	815	8 x Ø11	12	112	81	38.46
3A version available (Ra ≤ 0.8 µm/150 grit)										

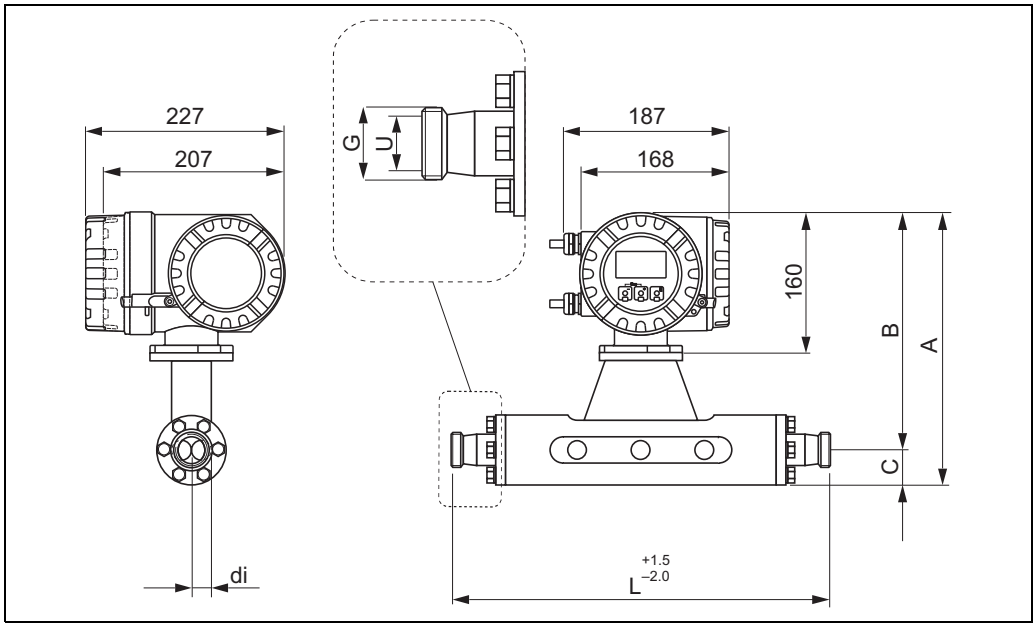
Dimensions, Promass M: ISO 2853 connections (couplings)



Coupling ISO 2853: 1.4404/316L							
DN	A	B	C	G [1]	L	N	di
8	301	266	35	37.13	367	22.6	5.53
15	305	268	37	37.13	398	22.6	8.55
25	312	272	40	37.13	434	22.6	11.38
40	332	283	49	52.68	560	35.6	17.07
50	351	293	58	64.16	720	48.6	25.60
80	385	309	76	91.19	815	72.9	38.46

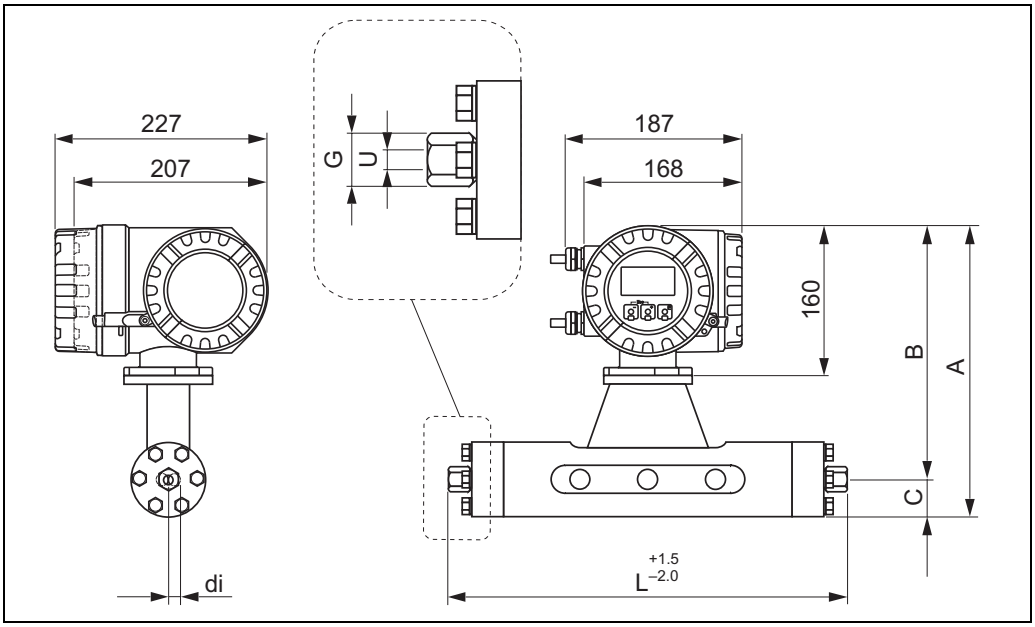
[1] Max. thread diameter to ISO 2853 Annex A
3A version available (Ra ≤ 0.8 µm/150 grit)

Dimensions, Promass M: SMS 1145 connections (hygienic coupling)



Hygienic coupling SMS 1145: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	Rd 40 x 1/6"	367	22.5	5.53
15	305	268	37	Rd 40 x 1/6"	398	22.5	8.55
25	312	272	40	Rd 40 x 1/6"	434	22.5	11.38
40	332	283	49	Rd 40 x 1/6"	560	35.5	17.07
50	351	293	58	Rd 70 x 1/6"	720	48.5	25.60
80	385	309	76	Rd 98 x 1/6"	792	72.0	38.46
3A version available (Ra ≤ 0.8 µm/150 grit)							

Dimensions, Promass M (high pressure): NPT 1/2", NPT 3/8" and G 3/8" connections

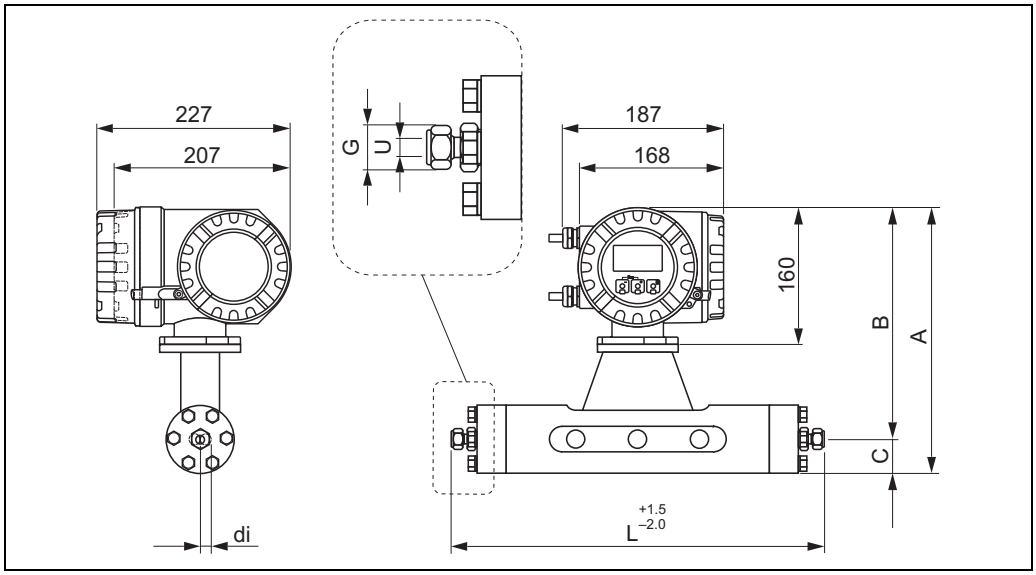


1/2" NPT: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 1 1/16"	370	10.2	4.93
15	305	268	37	SW 1 1/16"	400	10.2	7.75
25	312	272	40	SW 1 1/16"	444	10.2	10.20

3/8" NPT: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 1 5/16"	355.8	10.2	4.93
15	305	268	37	SW 1 5/16"	385.8	10.2	7.75
25	312	272	40	SW 1 5/16"	429.8	10.2	10.20

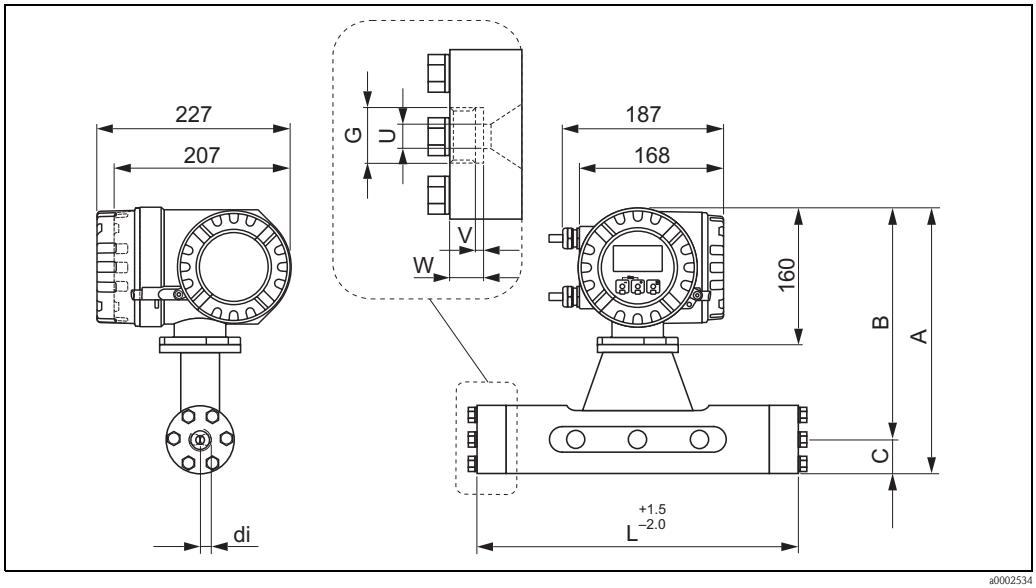
G 3/8": 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	SW 24	355.8	10.2	4.93
15	305	268	37	SW 24	385.8	10.2	7.75
25	312	272	40	SW 24	429.8	10.2	10.20

Dimensions, Promass M (high pressure): 1/2" SWAGELOK connection



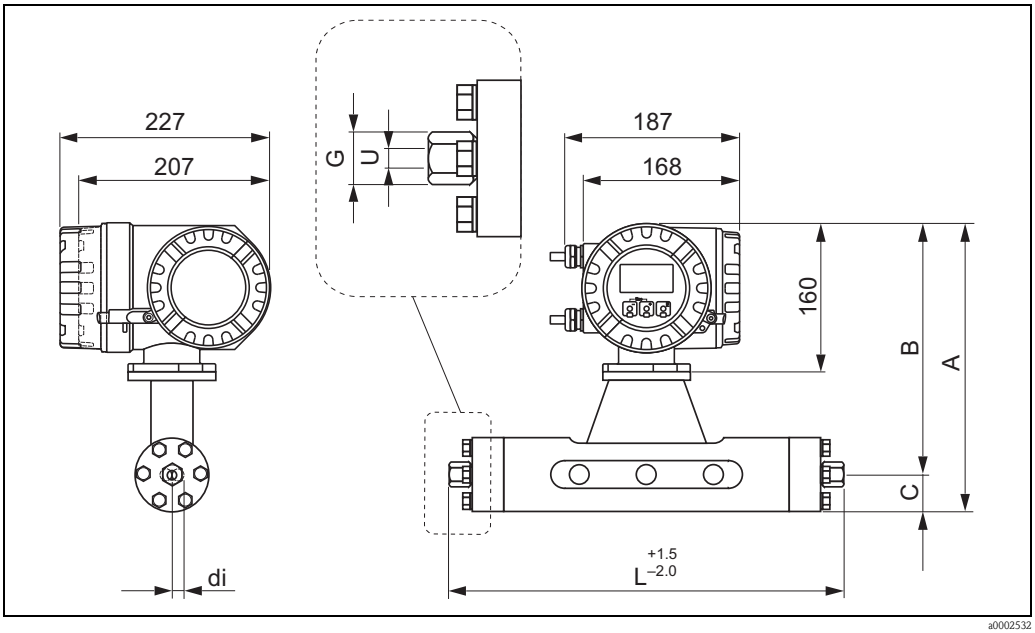
1/2" SWAGELOK: 1.4404/316L							
DN	A	B	C	G	L	U	di
8	301	266	35	7/8"	366.4	10.2	4.93
15	305	268	37	7/8"	396.4	10.2	7.75
25	312	272	40	7/8"	440.4	10.2	10.20

Dimensions, Promass M (high pressure): Connector with internal thread 7/8-14UNF



Internal thread 7/8-14-UNF: 1.4404/316L									
DN	A	B	C	G	L	U	V	W	di
8	301	266	35	7/8-14UNF	304	10.2	3	14	4.93
15	305	268	37	7/8-14UNF	334	10.2	3	14	7.75
25	312	272	40	7/8-14UNF	378	10.2	3	14	10.20

Dimensions, Promass M: Without process connections



DN	L	J	K	M	$b_{max.}$	$b_{min.}$
8	256	27	54	6 x M 8	12	10
8[1)]	256	27	54	6 x M 8	12	10
15	286	35	56	6 x M 8	12	10
15[1)]	286	35	56	6 x M 8	12	10
25	310	40	62	6 x M 8	12	10
25[1)]	310	40	62	6 x M 8	12	10
40	410	53	80	8 x M 10	15	13
50	544	73	94	8 x M 10	15	13
80	644	102	128	12 x M 12	18	15

[1)] High pressure version; permissible thread: A4 - 80; lubricant: Molykote P37

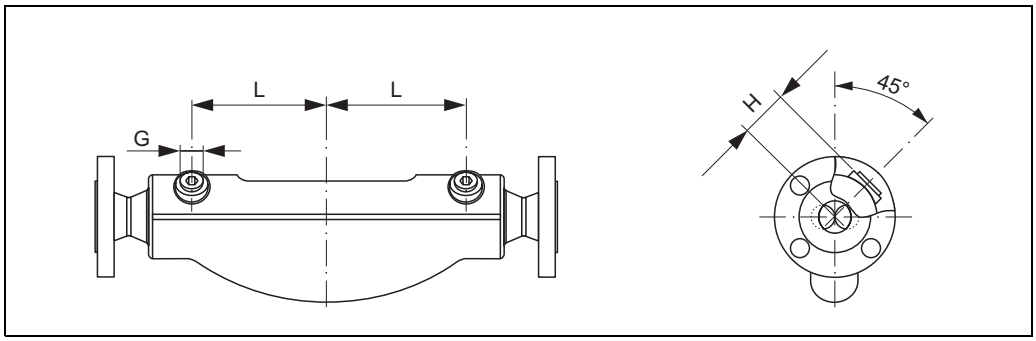
	Tightening torque	**Lubricated thread**	**O-ring**	
DN	Nm	yes/no	Thickness	Inside Ø
8	30.0	no	2.62	21.89
8[1)]	19.3	yes	2.62	21.89
15	30.0	no	2.62	29.82
15[1)]	19.3	yes	2.62	29.82
25	30.0	no	2.62	34.60
25[1)]	19.3	yes	2.62	34.60
40	60.0	no	2.62	47.30
50	60.0	yes	2.62	67.95
80	100.0	yes	3.53	94.84

[1)] High pressure version; permissible thread: A4 - 80; lubricant: Molykote P37

Purge connections / pressure vessel monitoring

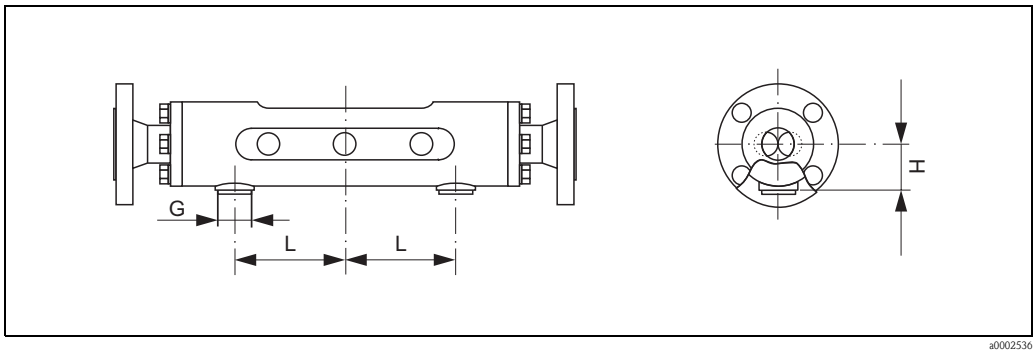
Caution!
The secondary containment is filled with dry nitrogen (N2). Do not open the purge connections unless the containment can be filled immediately with a dry inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar.

Dimensions, Promass F:



DN	L	H	G
8	108	62	1/2" NPT
15	110	62	1/2" NPT
25	130	62	1/2" NPT
40	155	67	1/2" NPT
50	226	79	1/2" NPT
80	280	101	1/2" NPT
100	342	115	1/2" NPT
150	440	121	1/2" NPT

Promass M dimensions:



DN	L	H	G
8	85	44.0	1/2" NPT
15	100	46.5	1/2" NPT
25	110	50.0	1/2" NPT
40	155	59.0	1/2" NPT
50	210	67.5	1/2" NPT
80	210	81.5	1/2" NPT

Weight

- Compact version: see table below
- Remote version
  - Sensor: see table below
  - Wall-mount housing: 5 kg

Promass F / DN	8	15	25	40	50	80	100	150	250*
Compact version	11	12	14	19	30	55	96	154	400
Remote version	9	10	12	17	28	53	94	152	398
* With 10" ANSI Cl 300 flanges									

Promass M / DN	8	15	25	40	50	80
Compact version	11	12	15	24	41	67
Remote version	9	10	13	22	39	65

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

Material

Transmitter housing:

- Compact housing: stainless steel 1.4301/304
- Compact housing: powder coated die-cast aluminium
- Wall-mount housing: powder coated die-cast aluminium
- Remote field housing: powder-coated die-cast aluminium

Sensor housing / containment:

Promass F:

Acid- and alkali-resistant outer surface
DN 8...50: stainless steel 1.4301/304
DN 80...250: stainless steel 1.4301/304 and 1.4308/304L

Promass M:

Acid- and alkali-resistant outer surface
DN 8...50: steel, chemically nickel-plated
DN 80: stainless steel

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

Promass F:

- Flanges EN 1092-1 (DIN 2501) / ANSI B16.5 / JIS B2238 → stainless steel 1.4404/316L
- Flanges EN 1092-1 (DIN 2501) / ANSI B16.5 / JIS B2238 → Alloy C-22 2.4602/N 06022
- Flange DIN 11864-2 Form A (flat flange) → stainless steel 1.4404/316L
- Hygienic coupling DIN 11851 / SMS 1145 → stainless steel 1.4404/316L
- Couplings ISO 2853 / DIN 11864-1 → stainless steel 1.4404/316L
- Tri-Clamp (OD-tubes) → stainless steel 1.4404/316L

Promass M:

- Flanges EN 1092-1 (DIN 2501) / ANSI B16.5 / JIS B2238 → stainless steel 1.4404/316L, titanium grade 2
- Flange DIN 11864-2 Form A (flat flange) → stainless steel 1.4404/316L
- PVDF connection to DIN / ANSI / JIS
- Hygienic coupling DIN 11851 / SMS 1145 → stainless steel 1.4404/316L
- Couplings ISO 2853 / DIN 11864-1 → stainless steel 1.4404/316L
- Tri-Clamp (OD-tubes) → stainless steel 1.4404/316L

Promass M (high pressure version):

- Connector → stainless steel 1.4404/316L
- Couplings → stainless steel 1.4401/316

Measuring tube(s):

Promass F:

- DN 8...100: stainless steel 1.4539/904L
- DN 150: stainless steel 1.4404/316L
- DN 250: stainless steel 1.4404/316L; manifold: CF3M
- DN 8...150: Alloy C-22 2.4602/N 06022

Promass M:

- DN 8...50: titanium grade
- DN 80: titanium grade 2

Promass M (high pressure version):

- Titanium grade 9

Seals:

Promass F:

Welded process connections without internal seals

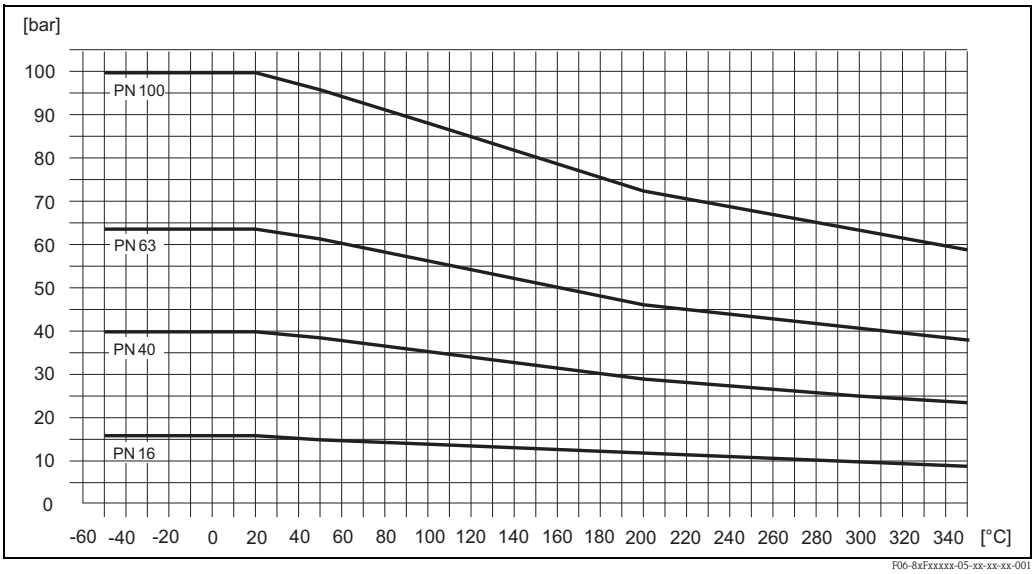
Promass M:

Viton, EPDM, silicon, Kalrez, FEP sheathing (not for gas applications)

Material load curves

Promass F: Flange connection to EN 1092-1 (DIN 2501)

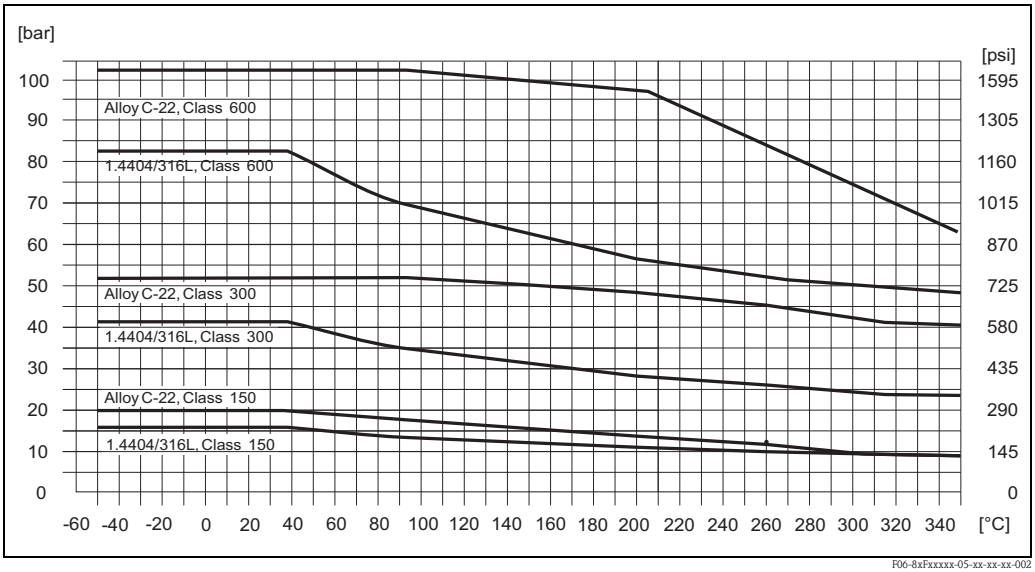
Flange material: 1.4404/316L, Alloy C-22



The values for the temperature range from 200 °C to 350 °C are exclusively valid for the high-temperature version. (The high-temperature version is not available for Promass 84)

Promass F: Flange connection to ANSI B16.5

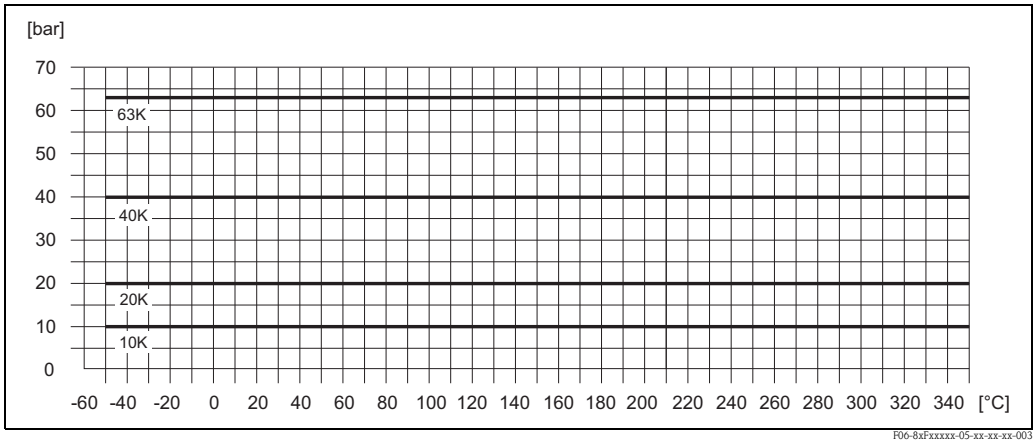
Flange material: 1.4404/316L, Alloy C-22



The values for the temperature range from 200 °C to 350 °C are exclusively valid for the high-temperature version. (The high-temperature version is not available for Promass 84)

Promass F: Flange connection to JIS B2238

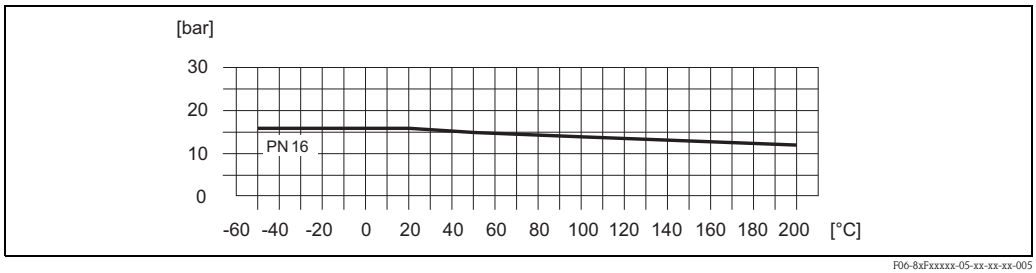
Flange material: 1.4404/316L, Alloy C-22



The values for the temperature range from 200 °C to 350 °C are exclusively valid for the high-temperature version. (The high-temperature version is not available for Promass 84)

Promass F: Hygienic coupling to DIN 11851 / SMS 1145

Connection material: 1.4404/316L

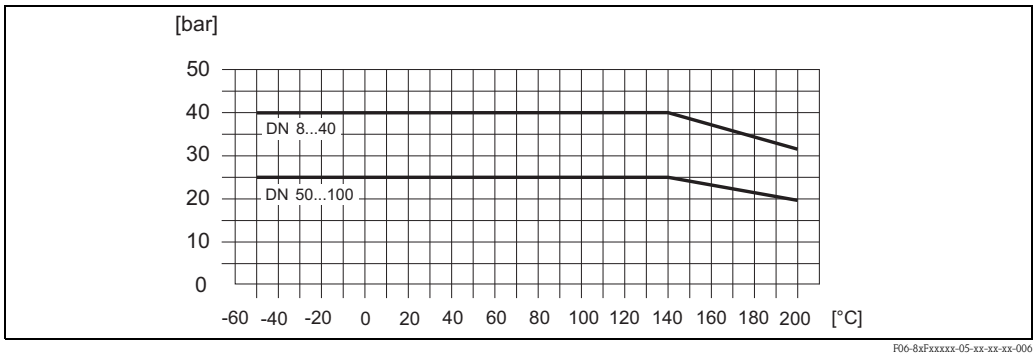


Promass F: Tri-Clamp process connection

The load limit is defined exclusively by the material properties of the outer clamp used. This clamp is not included in the scope of delivery.

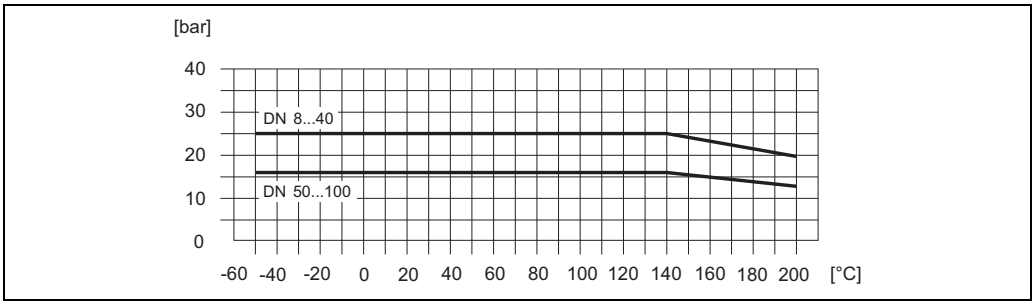
Promass F: Coupling to DIN 11864-1

Connection material: 1.4404/316L



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

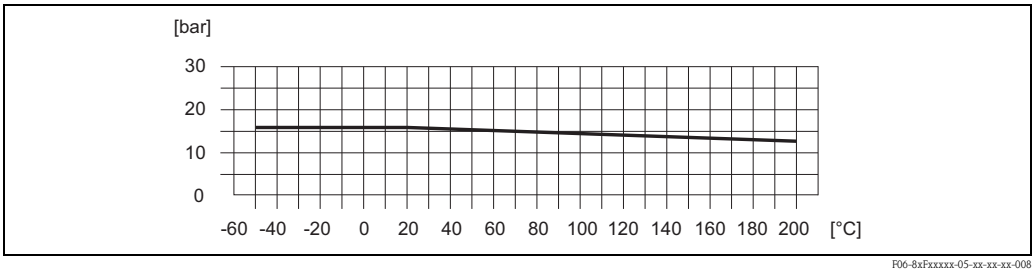
Flange material: 1.4404/316L



F06-8xFxxxxx-05-xx-xx-xx-007

Promass F: Coupling to ISO 2853

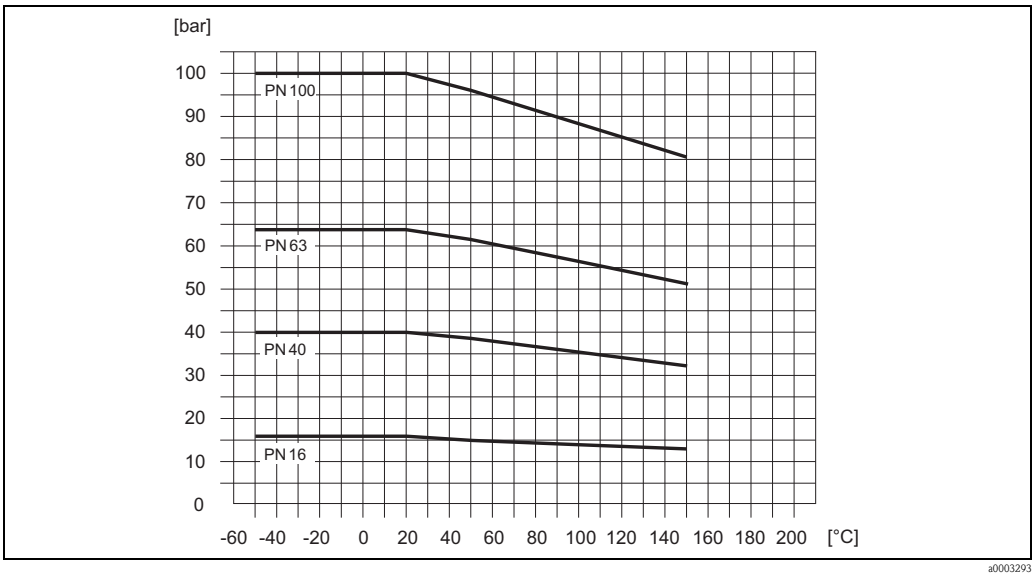
Connection material: 1.4404/316L



F06-8xFxxxxx-05-xx-xx-xx-008

Promass M: Flange connection to DIN 2501

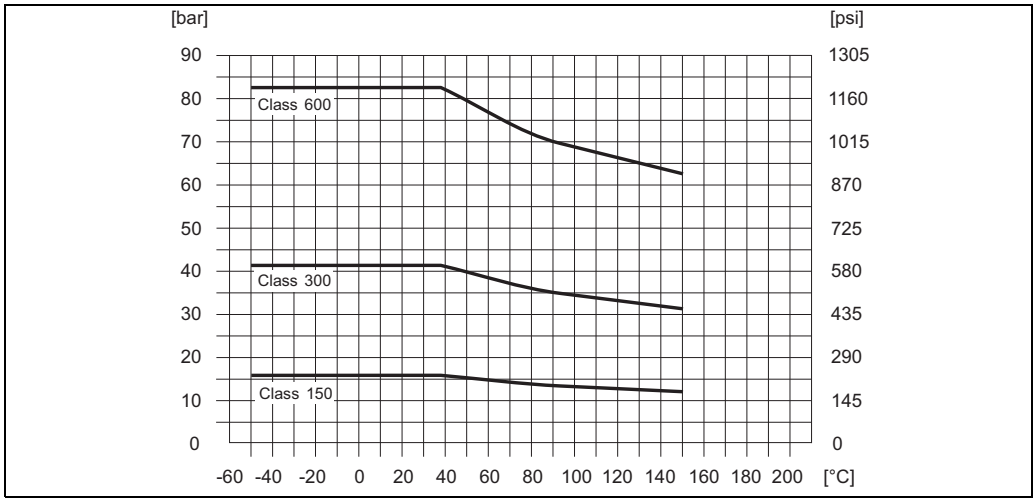
Flange material: 1.4404/316L, titanium grade 2



a0003293

Promass M: Flange connection to ANSI B16.5

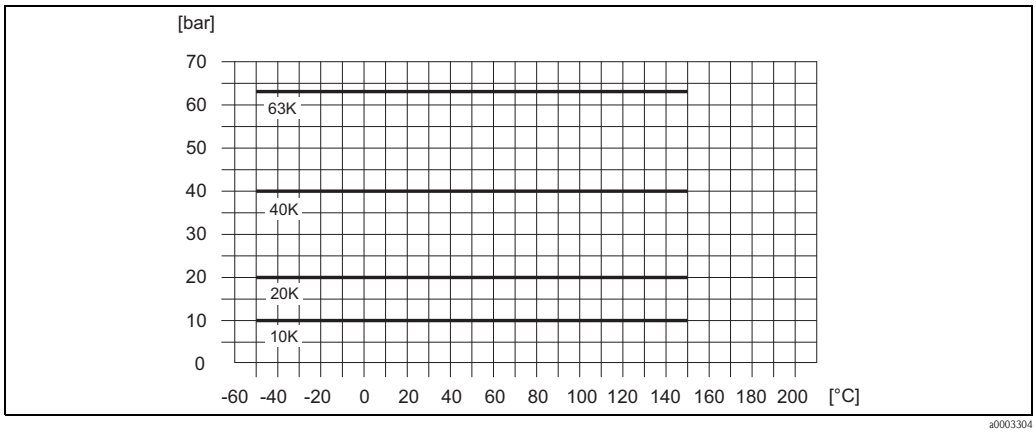
Flange material: 1.4404/316L, titanium grade 2



a0003297

Promass M: Flange connection to JIS B2238

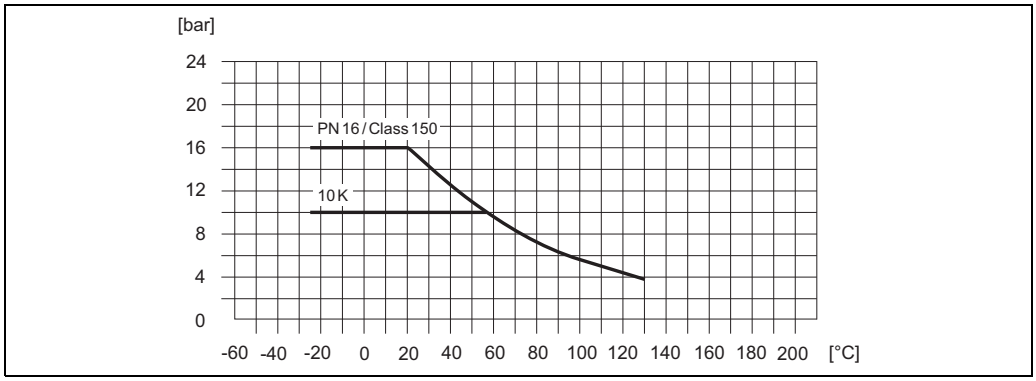
Flange material: 1.4404/316L, titanium grade 2



a0003304

Promass M: PVDF flange connection (to DIN 2501, ANSI B16.5, JIS B2238)

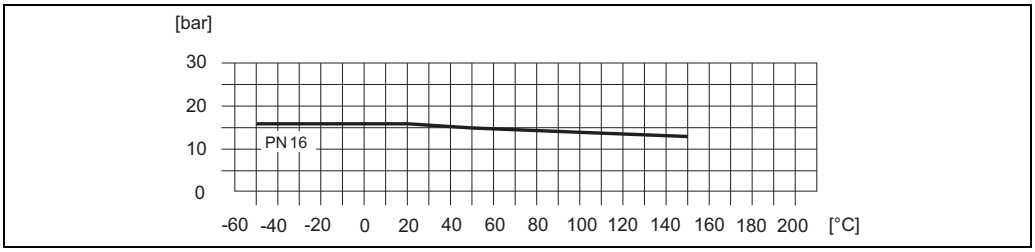
Flange material: PVDF



F06-8xMxxxxx-05-xx-xx-xx-001

Promass M: Hygienic coupling to DIN 11851 / SMS 1145

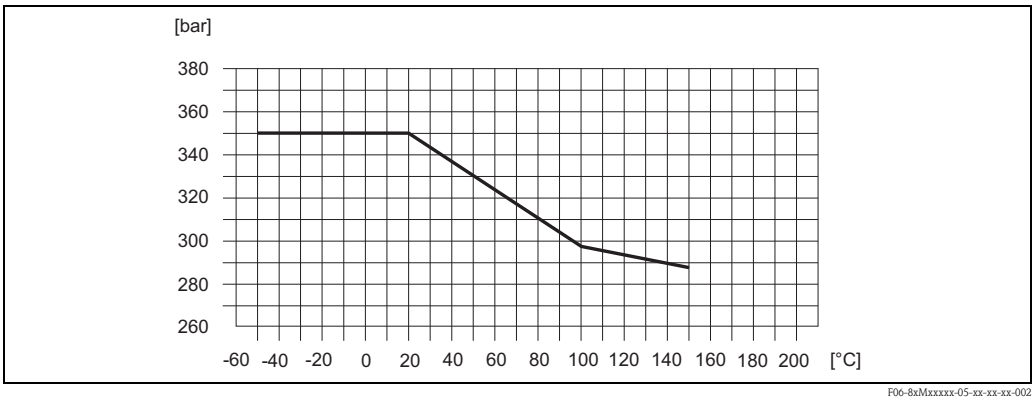
Connection material: 1.4404/316L



a0003305

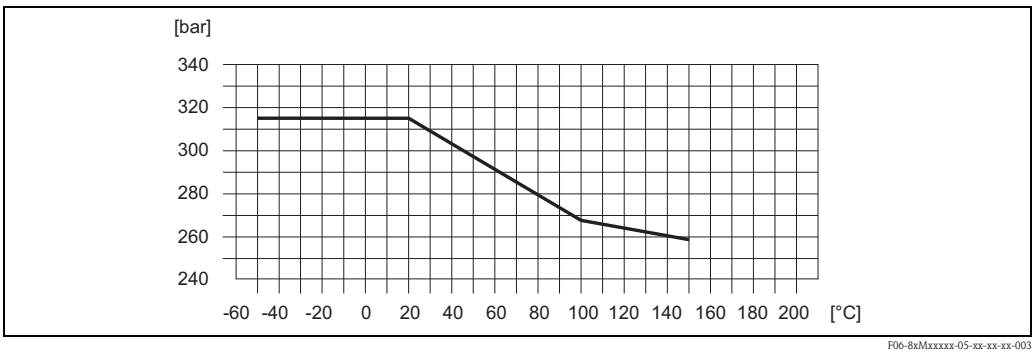
Promass M: Process connections for high pressure version

Connector material: 1.4404/316L
Material of thread connections (G 3/8", VCO with 1/2" SWAGELOK, NPT 3/8"): 14401/316



F06-8xMxxxxx-05-xx-xx-xx-002

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



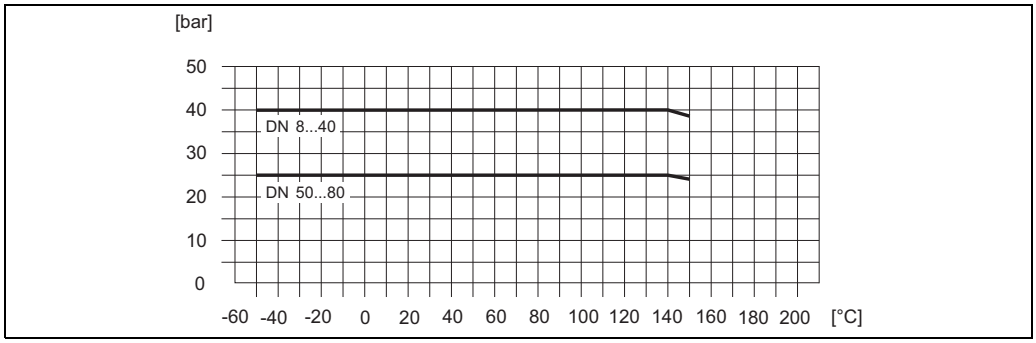
F06-8xMxxxxx-05-xx-xx-xx-003

Promass M: Tri-Clamp process connection

The load limit is defined exclusively by the material properties of the outer clamp used. This clamp is not included in the scope of delivery.

Promass M: Coupling to DIN 11864-1

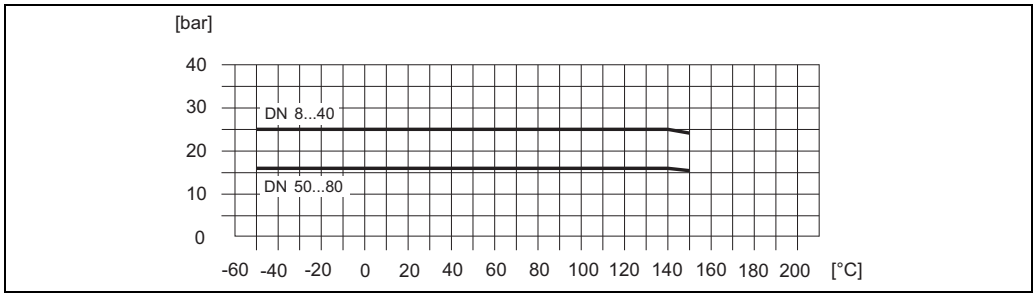
Connection material: 1.4404/316L



F06-8xMxxxxx-05-xx-xx-xx-004

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

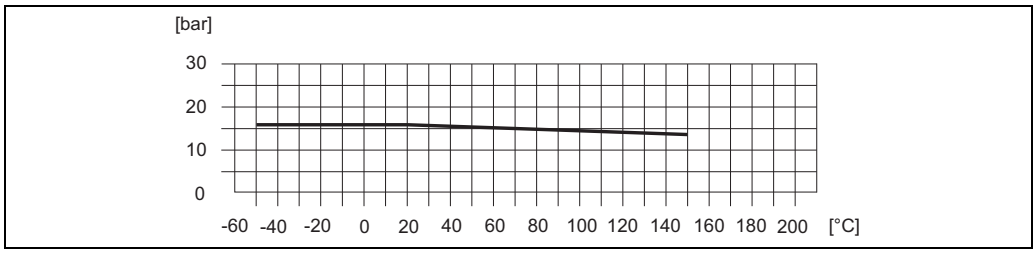
Flange material: 1.4404/316L



F06-8xMxxxxx-05-xx-xx-xx-005

Promass M: Coupling to ISO 2853

Connection material: 1.4404/316L



a0003308

Process connections

Promass F (welded process connections):
- Flanges EN 1092-1 (DIN 2501), ANSI B16.5, JIS B2238
- Sanitary connections: Tri-Clamp, couplings (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1), flange DIN 11864-2 Form A (flat flange)

Promass M (threaded process connections):
- Flanges EN 1092-1 (DIN 2501), ANSI B16.5, JIS B2238
- Sanitary connections: Tri-Clamp, couplings (DIN 11851, SMS 1145, ISO 2853, DIN 11864-1), flange DIN 11864-2 Form A (flat flange)

Promass M (high pressure version):
- Thread connections: G 3/8", 1/2" NPT, 3/8" NPT and 1/2" SWAGELOK couplings; connector with 7/8-14UNF internal thread

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 the readability of the display may be impaired.

Unified control concept for both types of transmitter:

- 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 "ToF Tool – Fieldtool Package."

Remote operation

Operation via HART

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.

Ex approval

Information about currently available Ex versions (ATEX, FM, CSA) can be supplied by your E+H Sales Centre on request. All explosion protection data are given in a separate documentation which is available upon request.

Sanitary compatibility

3A approval

Other standards and guidelines

EN 60529:
Degrees of protection by housing (IP code)

EN 61010
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.

EN 61326/A1 (IEC 1326)
"Emission in accordance with requirements for Class A". Electromagnetic compatibility (EMC- requirements)

NAMUR NE 21:
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.

NAMUR NE 43:
Standardisation of the signal level for the breakdown information of digital transmitters with analogue 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).

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).
The requirements of the following test centres are taken into consideration:

- PTB, Germany
- NMi, The Netherlands
- Other approvals are in preparation.
  The Endress+Hauser service organisation can provide detailed information.

Information on custody transfer measurement see Page 22 ("Custody Transfer Measurement" Section)

Suitability for custody transfer measurement

PTB and NMi approval for determining the mass and volume of liquids, other than water, and of fuel gases. The device is qualified to OIML R117, DIN 19217.

Promass	DN	PTB approval			
		For liquids other than water			For high-pressure gas (CNG)
		Mass counter	Volume counter	Density measuring unit	Mass counter
F	8...250	YES	YES	YES	NO
M	8...50	YES	NO	NO	NO
M	80	YES	YES	YES	NO
M*	8...25	NO	NO	NO	YES
M* (high pressure)	8...25	NO	NO	NO	YES
* For CNG applications					

Promass	DN	NMi approval	
		For liquids other than water as	
		Mass counter	Volume counter
F	8...250	YES	YES
M	8..80	YES	YES
M*	8...25	NO	NO
M* (high pressure)	8...25	NO	NO
* For CNG applications			

Ordering information

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

Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor.
The Endress+Hauser service organisation can provide detailed information on the order codes of your choice.

Documentation

- ❑ System Information Promass (SI 032D/06/en)
- ❑ Technical Information Promass 84F, 84M (TI067D/06/en)
- ❑ Technical Information Promass 84A (TI068D/06/en)
- ❑ Operating Instructions Promass 84 (BA109D/06/en)
- ❑ Description of Device Functions Promass 84 (BA110D/06/en)
- ❑ Supplementary documentation on Ex-ratings: ATEX, FM, CSA

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