Technical Information
TI052D/06/en
50098278

Coriolis Mass Flow Measuring System
PROline promass 80/83 H, I

The single-tube system with fit-and-forget design: Easy to clean – hygienic – minimal shear stress on fluids – chemically resistant materials

Features and benefits

- Balanced single-tube system
- High vibration immunity
- Nominal diameters DN 8...50
- "Fit and forget" installation
- Compact design, occupying very little space
- Measurement is independent of fluid properties
- Hygienic design in accordance with the latest directives: 3A authorization and EHEDG-tested (Promass I)
- Guaranteed product quality, suitable for CIP/SIP cleaning
- Robust field housing (aluminium or stainless steel), IP 67 protection
- IP 67 remote field housing version
- Promass 83 with Touch Control: Operation without opening the housing
- Additional software packs:
  – for batching applications
  – for concentration measurement
  – for advanced diagnostics
- Quick Setup menus for straightforward commissioning in the field
- Multifunctional: Simultaneous measurement of flow (mass flow, volume flow), density and temperature.
- Interfaces for integration into all major process control systems:
  – HART interface as standard
  – Promass 80: PROFIBUS-PA
  – Promass 83: PROFIBUS-DP/-PA, FOUNDATION Fieldbus
- Application in safety related systems with requirements for functional safety up to SIL 2
- Ex approvals: ATEX, FM, CSA
- High accuracy (liquids):
  Promass 80: ±0.20%
  Promass 83: ±0.15%

Application

Suitable for applications which require minimal shear stress to the fluid, low pressure loss or chemically resistant materials.

Application examples:

- Yoghourt with fruit pieces
- Syrup/molasses
- Chocolate with nuts
- Blood plasma (sterile)
- Cosmetics
- Liquefied gases
- Cleaning agents and solvents
- Paints
- Corrosive acids

Endress+Hauser
The Power of Know How

Function and system design

Measuring principle

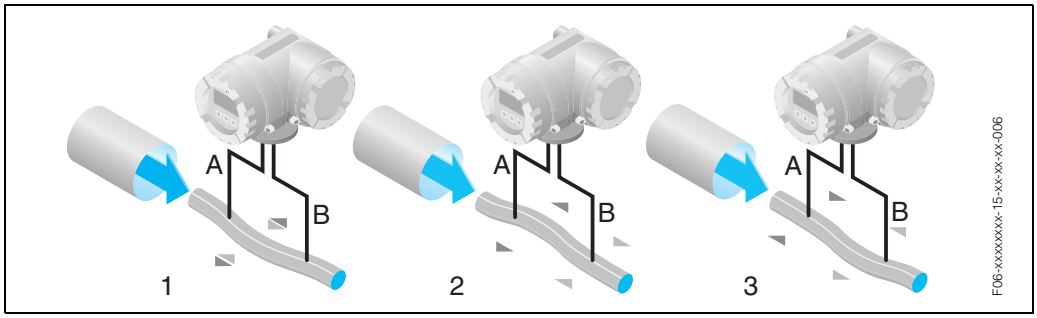
The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present when both translational and rotational movements are superimposed.

$$\vec{F}_C = 2 \cdot \Delta m \, (\vec{v} \cdot \vec{\omega})$$

$\vec{F}_C$ = Coriolis force
Δm = moved mass
$\vec{\omega}$ = angular velocity
$\vec{v}$ = radial velocity in the rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass Δm, its velocity $\vec{v}$ in the system, and thus on the mass flow. Instead of a constant angular velocity $\vec{\omega}$ the Promass sensor uses oscillation. The measuring tube contains flowing fluid and oscillates. The Coriolis forces produced at the measuring tube cause a phase shift in the tube oscillations (see illustration):

- At zero flow, in other words when the fluid is at a standstill, the oscillations registered at points A and B are in phase, in other words there is no phase difference (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tube (2) and acceleration at the outlet (3).



The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet.

In the case of the Promass I, the system balance required for accurate measurement is achieved by exciting an eccentric pendulum mass in such a way that its oscillations are antiphase. This patented TMB™-System (Torsion Mode Balanced System) ensures correct measurement even under changing process and ambient conditions.

For Promass H, system balance for an accurate measurement is ensured by a balancing weight running parallel to the measuring tube. The balancing weight is oscillated in antiphase to the measuring tube creating a balanced system. This patented ITB™-System (Intrinsic Tube Balance) provide balance and stability for an accurate measurement over a wide range of process and ambient conditions.

Consequently, the Promass H and Promass I are just as easy to install as the tried-and-tested two-tube systems. No special supports or brackets are required in front of or behind the sensor.

The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement

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

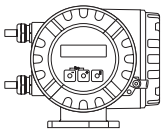
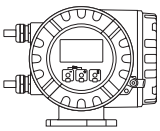
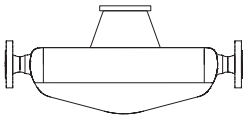
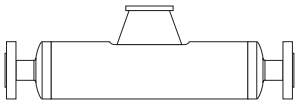
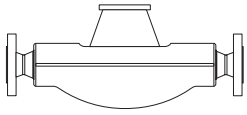
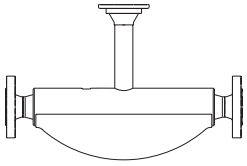
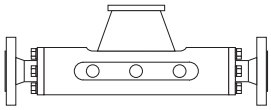
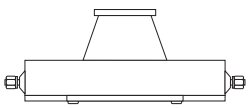
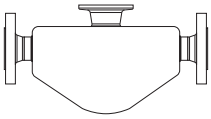
Temperature measurement

The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output.

Measuring system

The measuring system consists of a transmitter and a sensor.
Two versions are available:
- Compact version: transmitter and sensor form a single mechanical unit.
- Remote version: transmitter and sensor are installed separately.

- Transmitter Promass 80/83
- Sensor Promass H/I
- Sensor Promass F/M/A/E (see separate documentation)

Transmitter		
Promass 80 	• Two-line liquid-crystal display • Operation with push buttons • Quick Setup • Mass flow, volume flow, density and temperature measurement	
Promass 83 	• Four-line liquid-crystal display • Operation with “Touch control” • Application-specific Quick Setup • Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. fluid concentrations)	
Sensor		
H 	• Single bent tube. Low pressure loss and chemically resistant material • “Fit-and-forget” • Nominal diameters DN 8...50 • Tube material: zirconium	Documentation No. TI 052D/06/en
I 	• Straight single-tube instrument. Minimal shear stress on fluid, hygienic design, low pressure loss. • “Fit-and-forget”: No special supports required for installation. • Nominal diameters DN 8...50 • Tube material: titanium	Documentation No. TI 052D/06/en
F 	• Universal sensor for fluid temperatures up to 200 °C. • Nominal diameters DN 8...150 • Tube material: stainless steel or Alloy C-22	Documentation No. TI 053D/06/en
F (High-temperature) 	• Universal high-temperature sensor for fluid temperatures up to 350 °C. • Nominal diameters DN 25, 50, 80 • Tube material: Alloy C-22	Documentation No. TI 053D/06/en
M 	• Robust sensor for extreme process pressures, high requirements for the secondary containment and fluid temperatures up to 150 °C • Nominal diameters DN 8...80 • Tube material: titanium	Documentation No. TI 053D/06/en
A 	• Single-tube system for highly accurate measurement of very small flows • Nominal diameters DN 1...4 • Tube material: stainless steel or Alloy C-22	Documentation No. TI 054D/06/en
E 	• General purpose sensor, ideal replacement for volumetric flowmeters. • Nominal diameters DN 8...50 • Tube material: stainless steel	Documentation No. TI 061D/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

Measuring ranges for liquids:

DN	Range of full scale values (liquids) $\dot{m}_{min(F)} ... \dot{m}_{max(F)}$
8	0...2000 kg/h
15	0...6500 kg/h
15 *	0...18000 kg/h
25	0...18000 kg/h
25 *	0...45000 kg/h
40	0...45000 kg/h
40 *	0...70000 kg/h
50	0...70000 kg/h
* DN 15, 25, 40 "FB" = Full bore versions of Promass I	

Measuring ranges for gases (not for Promass H):
The full scale values depend on the density of the gas. Use the formula below to calculate the full scale values:

$$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \frac{\rho_{(G)}}{160\ kg/m^3}$$

$\dot{m}_{max(G)}$ = 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] under process conditions

Calculation example for gas:
- Sensor type: Promass I, DN 50
- Gas: air with a density of 60.3 kg/m^3 (at 20 °C and 50 bar)
- Max. full scale value (liquid): 70000 kg/h

Max. possible full scale value:

$$\dot{m}_{max(G)} = \frac{\dot{m}_{max(F)} \cdot \rho_{(G)}}{160\ kg/m^3} = \frac{70000\ kg/h \cdot 60.3\ kg/m^3}{160\ kg/m^3} = 26400\ kg/h$$

Recommended measuring ranges:
See Page 17 ("Limiting flow")

Operable flow range

Greater than 1000 :1. Flow rates above the preset full scale value do not overload the amplifier, i.e. the totalizer values are registered correctly.

Input signal

Status input (auxiliary input):
U = 3...30 V DC, R_i = 5 kΩ, galvanically isolated.
Configurable for: totalizer(s) reset, positive zero return, error-message reset, zero point adjustment.

Current input (Promass 83 only):
Active/passive selectable, galvanically isolated, resolution: 2 µA
active: 4...20 mA, $R_i \leq 150\ \Omega$, U_{out} = 24 V DC, short-circuit-proof
passive: 0/4...20 mA, $R_i \leq 150\ \Omega$, U_{max} = 30 V DC

Output

Output signal

Promass 80

Current output:
Active/passive selectable, galvanically isolated, time constant selectable (0.05...100 s), full scale value selectable, temperature coefficient: typ. 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; Operating voltage V_S 18...30 V DC, $R_L \leq 700$ Ω

Pulse/frequency output:
Passive, open collector, 30 V DC, 250 mA, galvanically isolated.
- Frequency output: full scale frequency 2...1000 Hz (f_{max} = 1250 Hz), on/off ratio 1:1, pulse width max. 10 s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width adjustable (0.5...2000 ms)

PROFIBUS-PA interface:
- PROFIBUS-PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Current consumption: 11 mA
- FDE (Fault Disconnection Electronic): 0 mA
- Data transmission rate, supported baudrate: 31.25 kBit/s
- Signal encoding: Manchester II
- Function blocks: 4 x Analog Input, 1 x Totalizer
- Output data: Mass flow, Volume flow, Density, Temperature, Totalizer
- Input data: Empty pipe detection (ON/OFF), Zero point adjustment, Measuring mode, Control totalizer
- Bus address adjustable via DIP-switches at the measuring device

Promass 83

Current output:
Active/passive selectable, galvanically isolated, time constant selectable (0.05...100 s), full scale value selectable, temperature coefficient: typ. 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; Operating voltage V_S 18...30 V DC, $R_L \leq 700$ Ω

Pulse/frequency output:
active/passive selectable, galvanically isolated
- active: 24 V DC, 25 mA (max. 250 mA during 20 ms), R_L > 100 Ω
- passive: open collector, 30 V DC, 250 mA

- Frequency output: full scale frequency 2...10000 Hz (f_{max} = 12500 Hz), on/off ratio 1:1, pulse width max. 10 s
- Pulse output: pulse value and pulse polarity selectable, max. pulse width adjustable (0.05...2000 ms), above a frequency of 1 / (2 x pulse width) the on/off ratio is 1:1

PROFIBUS-DP interface:
- PROFIBUS-DP/-PA in accordance with EN 50170 Volume 2, IEC 61158-2, galvanically isolated
- Data transmission rate, supported baudrat: 9.6 kBaud...12 MBaud
- Current consumption: 11 mA
- Permissible supply voltage: 9...32 V
- Signal encoding: NRZ-Code
- Function blocks: 6 x Analog Input, 3 x Totalizer
- Output data: Mass flow, Volume flow, Corrected volumen flow, Density, Reference density, Temperature, Totalizer 1...3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Control totalizer
- Bus address adjustable via DIP-switches at the measuring device
- Automatic data transmission rate recognition

PROFIBUS-PA interface:
- PROFIBUS-PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Current consumption: 11 mA
- FDE (Fault Disconnection Electronic): 0 mA
- Data transmission rate, supported baudrate: 31.25 kBit/s
- Signal encoding: Manchester II
- Function blocks: 6 x Analog Input, 3 x Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Standard Density, Temperature, Totalizer 1...3
- Input data: Empty pipe detection (ON/OFF), Zero point adjustment, Measuring mode, Control totalizer
- Bus address adjustable via DIP-switches at the measuring device

FOUNDATION Fieldbus interface:
- FOUNDATION Fieldbus H1, IEC 61158-2, galvanically isolated
- Data transmission rate, supported baudrate: 31.25 kBit/s
- Current consumption: 12 mA
- Permissible supply voltage: 9...32 V
- FDE (Fault Disconnection Electronic): 0 mA
- Signal encoding: Manchester II
- Function blocks: 7 x Analog Input, 1 x Digital Output, 1 x PID
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Standard Density, Temperature, Totalizer 1...3
- Input data: Empty pipe detection (ON/OFF), Zero point adjustment, Measuring mode, Reset totalizer
- Link Master function (LAS) is supported

Signal on alarm

- Current output → failsafe mode selectable (e.g. in accordance with NAMUR Recommendation NE 43)
- Pulse/frequency output → failsafe mode selectable
- Status output (Promass 80) → "non-conductive" by fault or power supply failure
- Relay output (Promass 83) → "de-energised" by fault or power supply failure

Load

see "Output signal"

Switching output

Status output (Promass 80):
Open collector, max. 30 V DC / 250 mA, galvanically isolated.
Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.

Relay output (Promass 83):
Normally closed (NC or break) or normally open (NO or make) contacts available
(default: relay 1 = NO, relay 2 = NC),
max. 30 V / 0.5 A AC; 60 V / 0.1 A DC, galvanically isolated.
Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values.

Low flow cut off

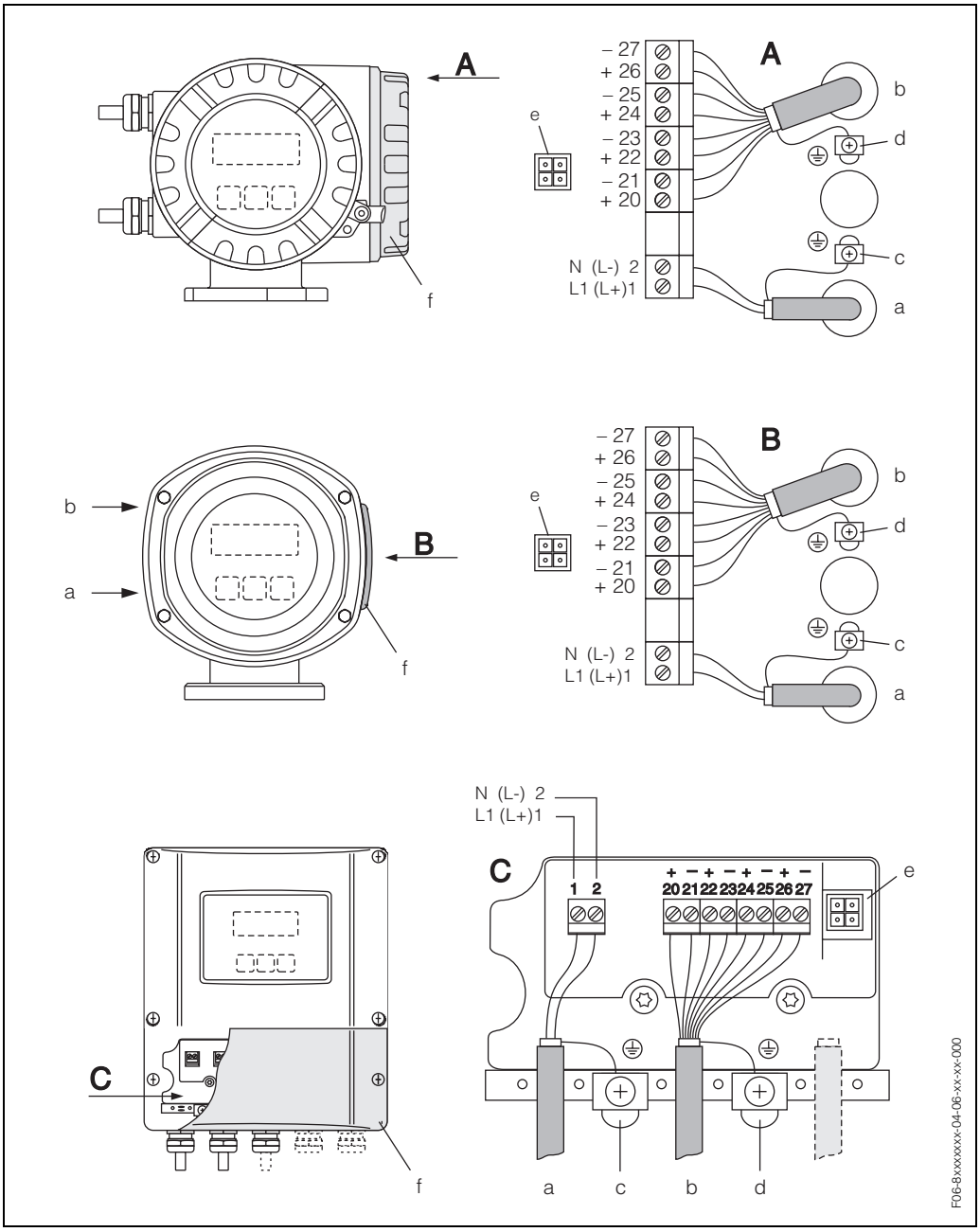
Switch points for low flow cut off are selectable

Galvanic isolation

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

Power supply

Electrical connection
Measuring unit

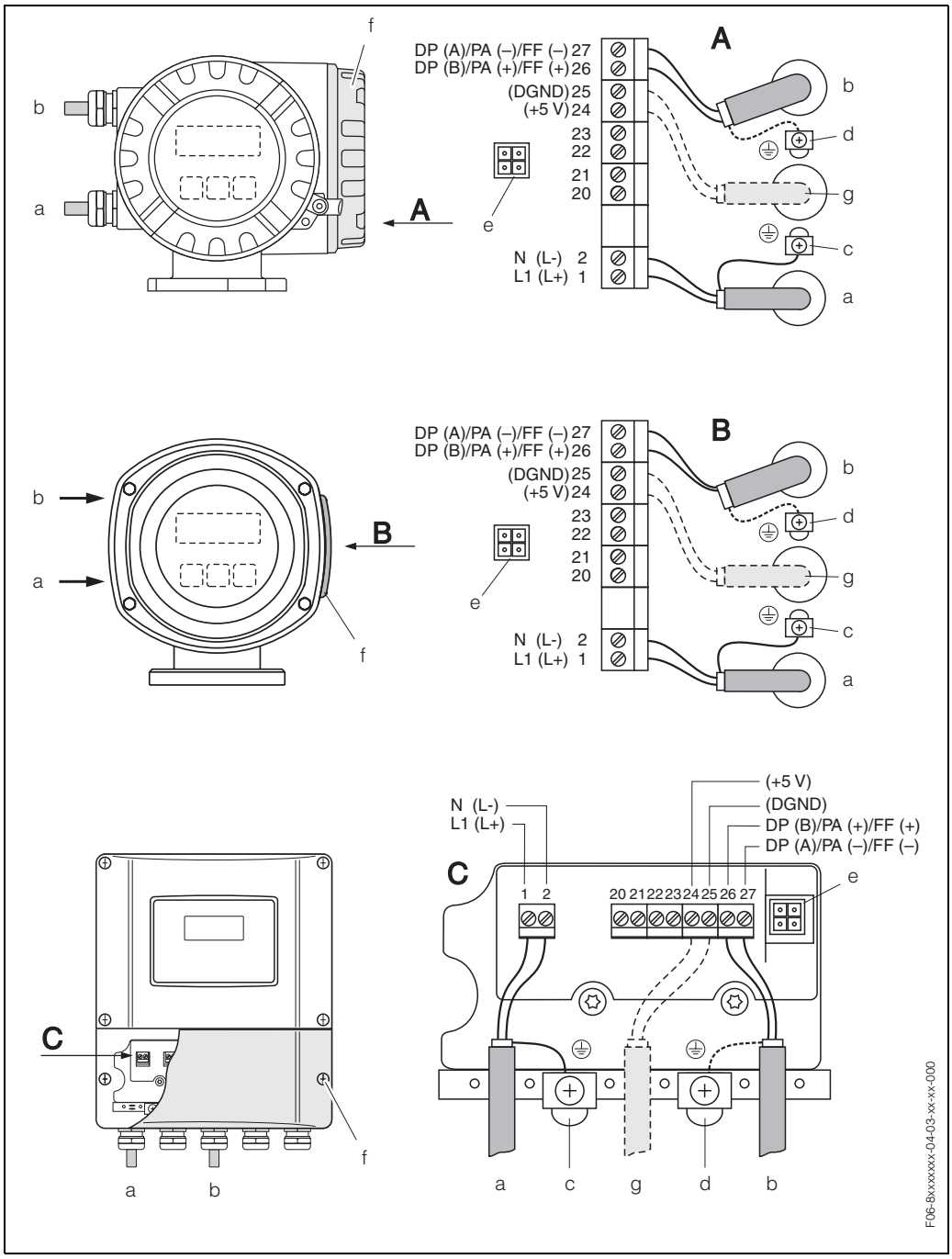


Connecting the transmitter, cable cross-section: max. 2.5 mm²

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 Nos. 20–27 → see Page 9
c Ground terminal for protective conductor
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 Measuring unit (bus communication)



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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 Fieldbus cable:
Terminal No. 26: DP (B) / PA (+) / FF (+) (with reverse polarity protection)
Terminal No. 27: DP (A) / PA (–) / FF (–) (with reverse polarity protection)
DP (A) = RxD/TxD-N; DP (B) = RxD/TxD-P

c Ground terminal for protective conductor

d Ground terminal for Fieldbus cable

e Service connector for connecting service interface FXA 193 (FieldCheck, FieldTool)

f Cover of the connection compartment

g Cabel for external termination (only PROFIBUS):
Terminal No. 24: +5 V
Terminal No. 25: DGND

Terminal assignment, Promass 80

Order variant	Terminal Nos. (inputs/outputs) 20 – 21	22 – 23	24 – 25	26 – 27
80***-**********A	–	–	Frequency output	Current output HART
80***-**********D	Status input	Status output	Frequency output	Current output HART
80***-**********H	–	–	–	PROFIBUS-PA
80***-**********S	–	–	Frequency output Ex i, passive	Current output Ex i active, HART
80***-**********T	–	–	Frequency output Ex i, passive	Current output Ex i passive, HART
80***-**********8	Status input	Frequency output	Current output 2	Current output 1 HART

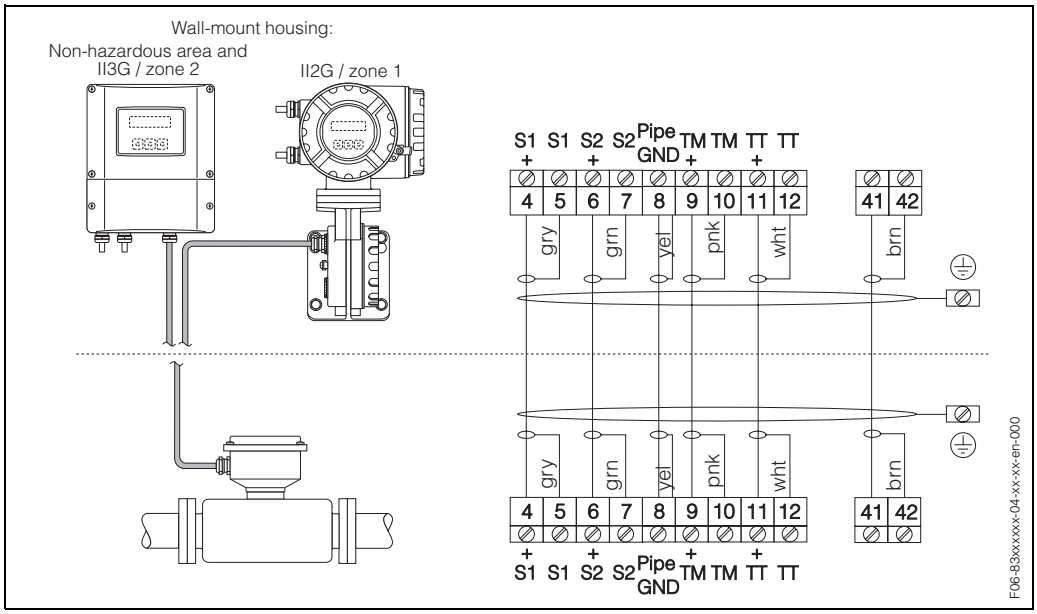
Terminal assignment, Promass 83

The inputs and outputs on the communication board can be either permanently assigned (fixed) or variable (flexible), depending on the version ordered (see table). Replacements for modules which are defective or which have to be replaced can be ordered as accessories.

Order variant	Terminal Nos. (inputs/outputs) 20 – 21	22 – 23	24 – 25	26 – 27
Fixed communication boards (permanent assignment)				
83***-**********A	–	–	Frequency output	Current output HART
83***-**********B	Relay output	Relay output	Frequency output	Current output HART
83***-**********F	–	–	–	PROFIBUS-PA Ex i
83***-**********G	–	–	–	FOUNDATION Field-bus, Ex i
83***-**********H	–	–	–	PROFIBUS-PA
83***-**********J	–	–	–	PROFIBUS-DP
83***-**********K	–	–	–	FOUNDATION Fieldbus
83***-**********R	–	–	Current output 2 Ex i aktiv	Current output 1 Ex i aktiv, HART
83***-**********S	–	–	Frequency output Ex i, passive	Current output Ex i active, HART
83***-**********T	–	–	Frequency output Ex i, passive	Current output Ex i passive, HART
83***-**********U	–	–	Current output 2 Ex i passiv	Current output 1 Ex i passiv, HART
Flexible communication boards				
83***-**********C	Relay output 2	Relay output 1	Frequency output	Current output HART
83***-**********D	Status input	Relay output	Frequency output	Current output HART
83***-**********E	Status input	Relay output	Current output 2	Current output 1 HART
83***-**********L	Status input	Relay output 2	Relay output 1	Current output HART
83***-**********M	Status input	Frequency out-put 2	Frequency out-put 1	Current output HART
83***-**********W	Relay output	Current output 3	Current output 2	Current output 1 HART

Order variant	Terminal Nos. (inputs/outputs)			
	20 – 21	22 – 23	24 – 25	26 – 27
83***-**********0	Status input	Current output 3	Current output 2	Current output 1 HART
83***-**********2	Relay output	Current output 2	Frequency output	Current output 1 HART
83***-**********3	Current input	Relay output	Current output 2	Current output 1 HART
83***-**********4	Current input	Relay output	Frequency output	Current output HART
83***-**********5	Status input	Current input	Frequency output	Current output HART
83***-**********6	Status input	Current input	Current output 2	Current output 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

Potential equalisation

No measures necessary.

Cable entries

Power-supply and signal cables (inputs/outputs):
- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, G 1/2"

Connecting cable for remote version:
- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, PG 13.5 (5...15 mm), 1/2" NPT, G 1/2"

Cable specifications Remote version

- 6 x 0.38 mm^2 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 NE21/43.

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™ (Promass 83 only) retain the measuring-system data in the event of a power supply failure
- S-DAT™: exchangeable data storage chip with sensor specific data: nominal diameter, serial number, calibration factor, zero point, etc.

Performance characteristics

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.
The additional measured error at the current output is typically ±5 µA.

Mass flow (liquid)
Promass 80 H, I: ±0.20% ± [(zero point stability / measured value) x 100]% o.r.
Promass 83 H, I: ±0.15% ± [(zero point stability / measured value) x 100]% o.r.

Mass flow (gas)
Promass 80/83 I: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.

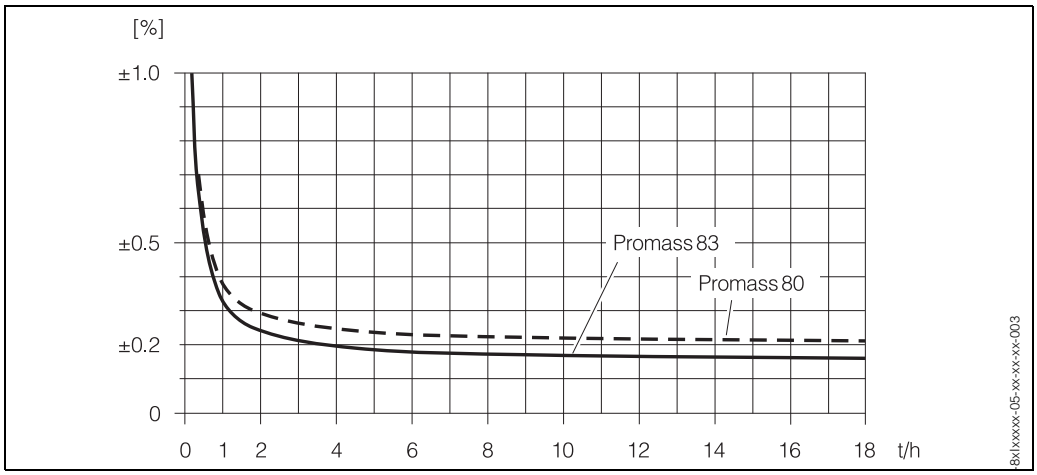
Volume flow (liquid)
Promass 80/83 H, I: ±0.50% ± [(zero point stability / measured value) x 100]% o.r.

o.r. = of reading

DN	Maximum full scale value [kg/h] or [l/h]	Zero point stability Promass H [kg/h] or [l/h]	Zero point stability Promass I [kg/h] or [l/h]
8	2000	0.20	0.20
15	6500	0.65	0.65
15 [1)]	18000	–	1.8
25	18000	1.8	1.8
25 [1)]	45000	–	4.5
40	45000	4.5	4.5
40 [1)]	70000	–	7.0
50	70000	7.0	7.0
[1)] DN 15, 25, 40 “FB” = Full bore versions of Promass I			

Calculation example (mass flow, liquid):
Given: Promass 83 I / DN 25, measured flow = 8000 kg/h
Max. measured error: ±0.15% ± [(zero point stability / measured value) x 100]% o.r.

Max. measured error → $\pm 0.15\% \pm \frac{1.8\ kg/h}{8000\ kg/h} \cdot 100\% = \pm 0.17\%$



Maximum measured error in % of reading (example: Promass 80/83 I / DN 25)

Density (liquid)
Promass H:
- Field density calibration or under reference operating conditions: ±0.001 g/cc (1 g/cc = 1 kg/l)
- Special density calibration (optional), calibration range: 0.8...1.8 g/cc, 5...80 °C: ±0.002 g/cc
- Standard calibration: ±0.02 g/cc

Promass I:
- Field density calibration or under reference operating conditions: ±0.002 g/cc (1 g/cc = 1 kg/l)
- Special density calibration (optional), calibration range: 0.8...1.8 g/cc, 5...80 °C: ±0.004 g/cc
- Standard calibration: ±0.02 g/cc

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

Repeatability

Flow measurement
- Promass H, I:
  Mass flow (liquid): ±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
- Promass I:
  Mass flow (gas): ±0.25% ± [1/2 x (zero point stability / measured value) x 100]% o.r.
- Promass H, I:
  Volume flow (liquid): ±0.20% ± [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 83 I / DN 25, measured flow = 3.6 t/h = 3600 kg/h
Repeatability: ±0.05% ± [1/2 x (zero point stability / measured value) x 100]% o.r.

Repeatability → $\pm 0.05\% \pm 1/2 \cdot \frac{1.8\ kg/h}{8000\ kg/h} \cdot 100\% = \pm 0.061\%$

Density measurement (liquid)
Promass I: ±0.001 g/cc (1 g/cc = 1 kg/l)
Promass H: ±0.0005 g/cc (1 g/cc = 1 kg/l)

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 Promass H, I 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 H % o.r. / bar	Promass I % o.r. / bar
8	–0.017	0.006
15	–0.021	0.004
15 [1)]	–	0.006
25	–0.013	0.006
25 [1)]	–	No influence
40	–0.018	No influence
40 [1)]	–	0.006
50	–0.020	0.006

[1)] DN 15, 25, 40 “FB” = Full bore versions of Promass I
o.r. = of reading

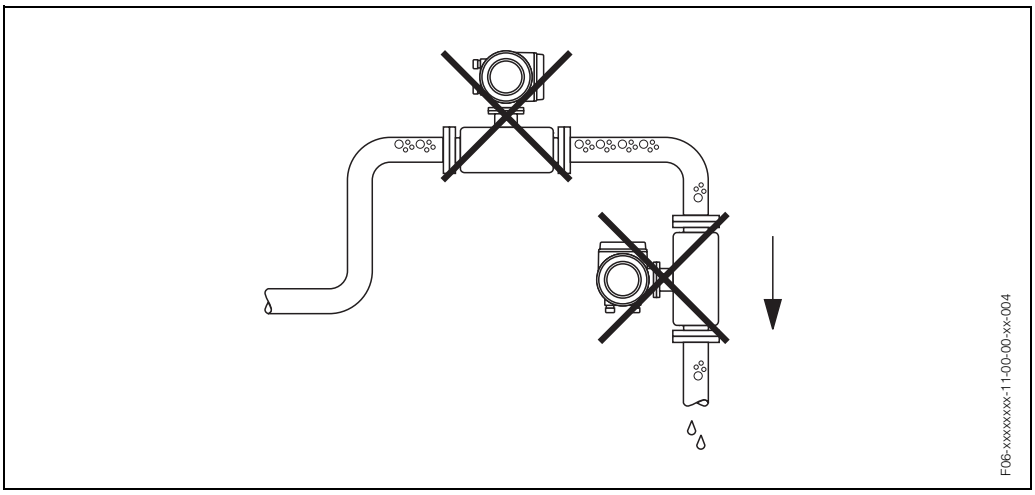
Operating conditions (installation)

Installation instructions

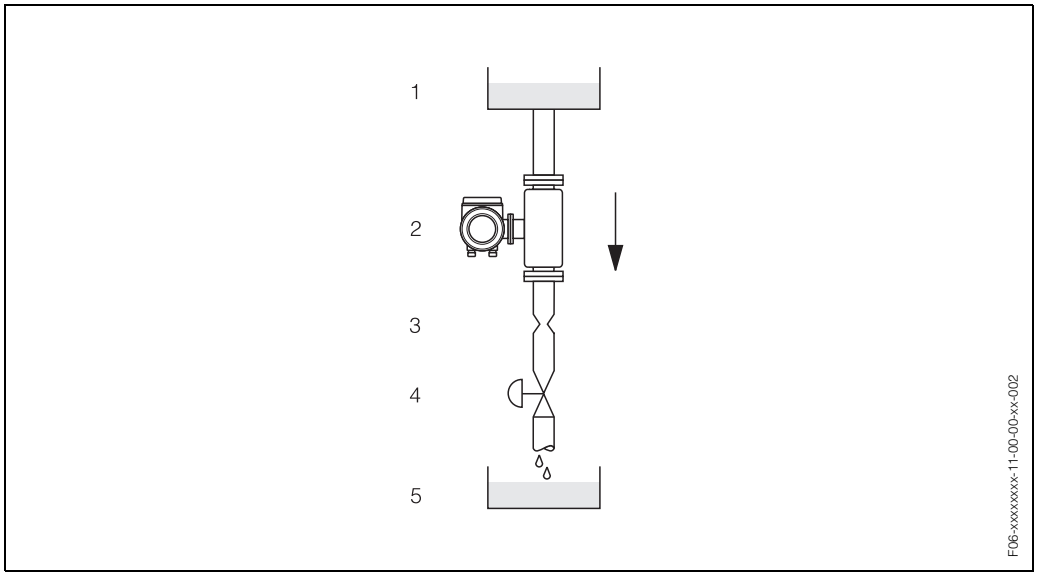
Note the following points:
- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument, for example the secondary containment.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system 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.

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 in a run.
- Directly upstream from a free pipe outlet in a vertical pipeline.



Notwithstanding the above, the installation proposal below permits installation in a vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.



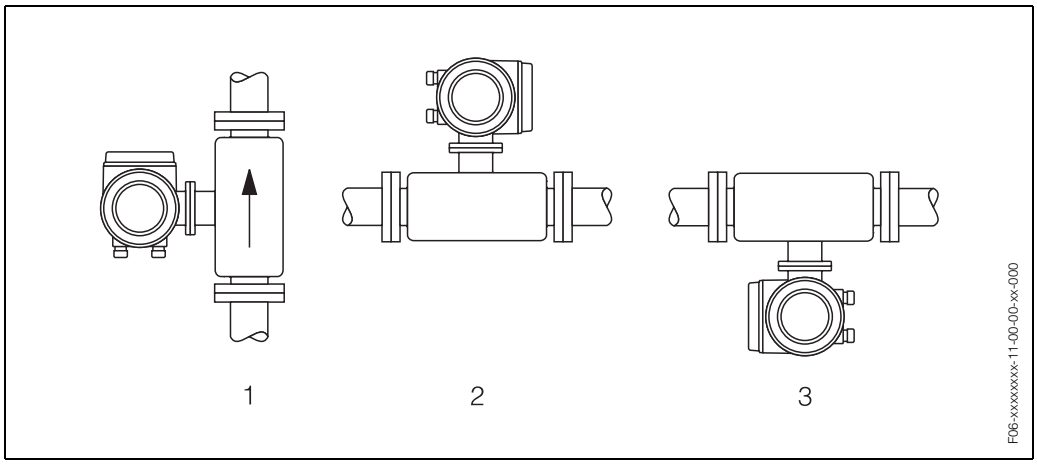
Installation in a vertical pipeline (e.g. for batching applications)
1 = Supply tank, 2 = Sensor, 3 = Orifice, pipe restrictions (see Table), 4 = Valve, 5 = Batching tank

Promass H, I / DN	8	15	15 [1)]	25	25 [1)]	40	40 [1)]	50
Ø orifice / pipe restriction	6 mm	10 mm	15 mm	14 mm	24 mm	22 mm	35 mm	28 mm
[1)] DN 15, 25, 40 “FB” = Full bore versions of Promass I								

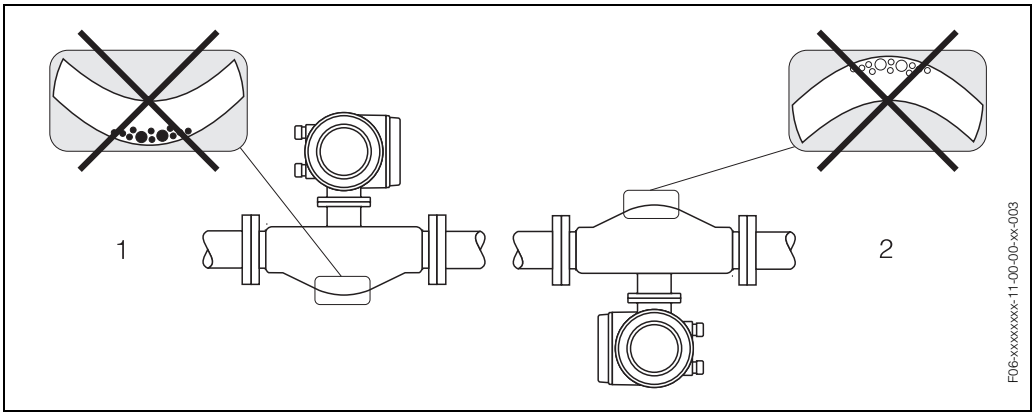
Orientation

Vertical
Recommended orientation with upward direction of flow (View 1). Entrained solids sink down. Gases rise away from the measuring-tube when fluid is not flowing. The measuring tubes can be completely drained and protected against solids build-up.

Horizontal
Promass H and Promass I can be installed in any orientation in a horizontal piping run (views 2, 3).



Special installation instructions for Promass H
The measuring tubes of Promass H are slightly curved. The position of the sensor, therefore, has to be matched to the fluid properties when the sensor is installed horizontally (see illustration).



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

Fluid temperature / orientation
In order to ensure that the maximum permissible ambient temperature for the transmitter (–20...+60 °C) is not exceeded, we recommend the following orientations (see Figure on Page 14):

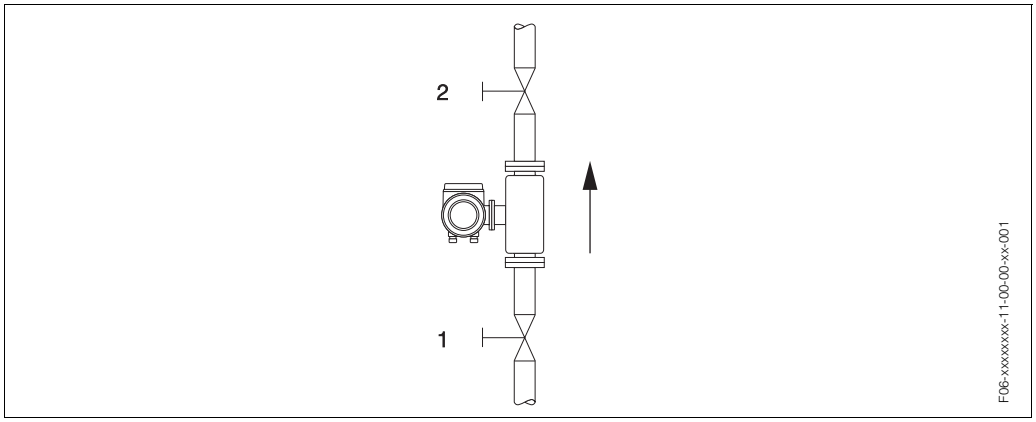
High fluid temperature
Vertical piping: installation in accordance with View 1
Horizontal piping: installation in accordance with View 3

Low fluid temperature
Vertical piping: installation in accordance with View 1
Horizontal piping: installation in accordance with View 2

Zero point adjustment
Promass generally does not require zero point adjustment!

Zero point adjustment is only required 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 pressure or very high viscosity of the fluid).

Zero point adjustment is performed with the measuring tubes completely filled and “zero flow”. 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



Tracing, thermal insulation
Some fluids require suitable measures to avoid heat transfer at the sensor. A wide range of materials can be used to provide the required thermal insulation. Heating can be electric, e.g. with heating elements, or by means of hot-water or steam pipes made of copper.
Special heating jackets are available for all sensors (except Promass H); these jackets can be ordered as accessories from Endress+Hauser.

Caution:
Risk of electronics overheating! Make sure that the connector between sensor and transmitter as well as 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 illustration on Page 15).

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 risk of partial 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 1 g, 10...150 Hz, following IEC 68-2-6

Electromagnetic compatibility (EMC)
To EN 61326 and NAMUR recommendation NE 21

Operating conditions (process)

Medium temperature range

Promass H
Sensor: –50...+200 °C

Promass I
Sensor: –50...+150 °C

Limiting medium pressure range (nominal pressure)

Promass H
- Flanges: DIN PN 40 / ANSI Cl 150, Cl 300 / JIS 10K, 20K
- Pressure range of secondary containment:
  DN 8...15: 25 bar or 375 psi
  DN 25...50: 16 bar or 250 psi

Promass I
- Flanges: DIN PN 40...100 / ANSI Cl 150, Cl 300, Cl 600 / JIS 10K, 20K, 40K, 63K
- Pressure range of secondary containment: 40 bar or 600 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 or detection.
Dimensions → Page 23, 33.

Limiting flow

See Page 4 (“Measuring range”)

Select nominal diameter by optimising between required flow range and permissible pressure loss. See Page 4 for a list of max. possible full scale values.
- 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 (see formula on Page 4)

Pressure loss

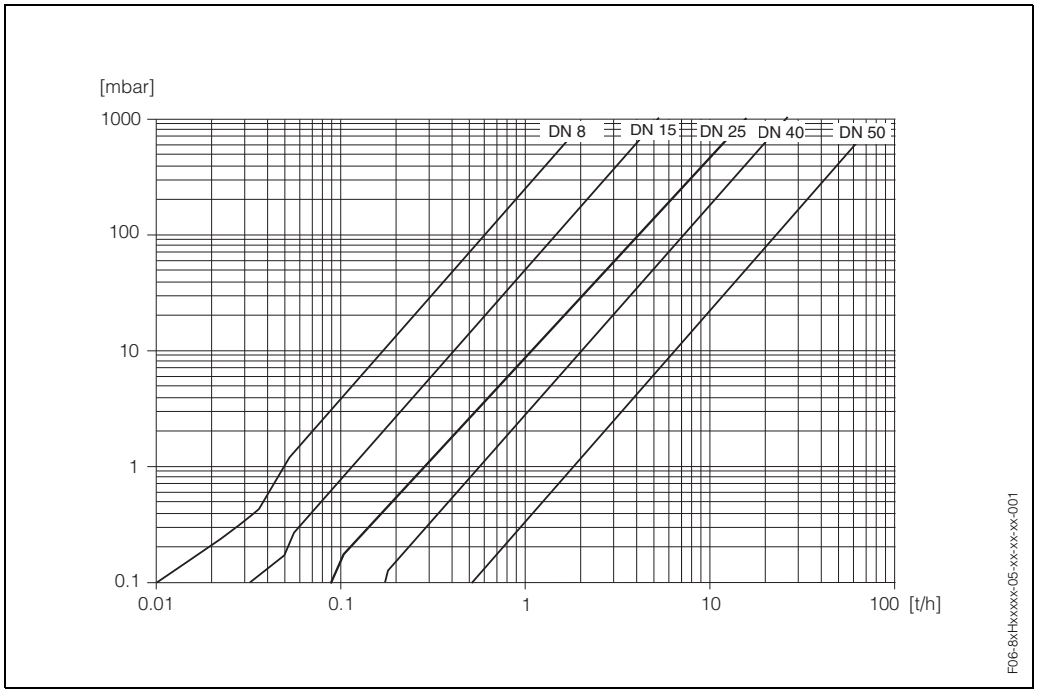
Pressure loss depends on the fluid properties and on the flow rate.
The following formula can be used to approximately calculate the pressure loss.

Reynolds number	$Re = \frac{4 \cdot \dot{m}}{\pi \cdot d \cdot \upsilon \cdot \rho}$
Re ≥ 2300 [1)]	$\Delta p = K \cdot \upsilon^{0.25} \cdot \dot{m}^{1.75} \cdot \rho^{-0.75} + \frac{K3 \cdot \dot{m}^2}{\rho}$
Re < 2300	$\Delta p = K1 \cdot \upsilon \cdot \dot{m} + \frac{K3 \cdot \dot{m}^2}{\rho}$
Δp = pressure loss [mbar] υ = 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...K3 = constants (depending on nominal diameter)

[1)] To compute the pressure loss for gases, always use the formula for Re ≥ 2300.

Pressure loss coefficient for Promass H

DN	d [m]	K	K1	K3
8	$8.51 \cdot 10^{-3}$	$8.04 \cdot 10^{6}$	$3.28 \cdot 10^{7}$	$1.15 \cdot 10^{6}$
15	$12.00 \cdot 10^{-3}$	$1.81 \cdot 10^{6}$	$9.99 \cdot 10^{6}$	$1.87 \cdot 10^{5}$
25	$17.60 \cdot 10^{-3}$	$3.67 \cdot 10^{5}$	$2.76 \cdot 10^{6}$	$4.99 \cdot 10^{4}$
40	$25.50 \cdot 10^{-3}$	$8.75 \cdot 10^{4}$	$8.67 \cdot 10^{5}$	$1.22 \cdot 10^{4}$
50	$40.50 \cdot 10^{-3}$	$1.35 \cdot 10^{4}$	$1.72 \cdot 10^{5}$	$1.20 \cdot 10^{3}$
Pressure loss data includes interface between measuring tube and piping				

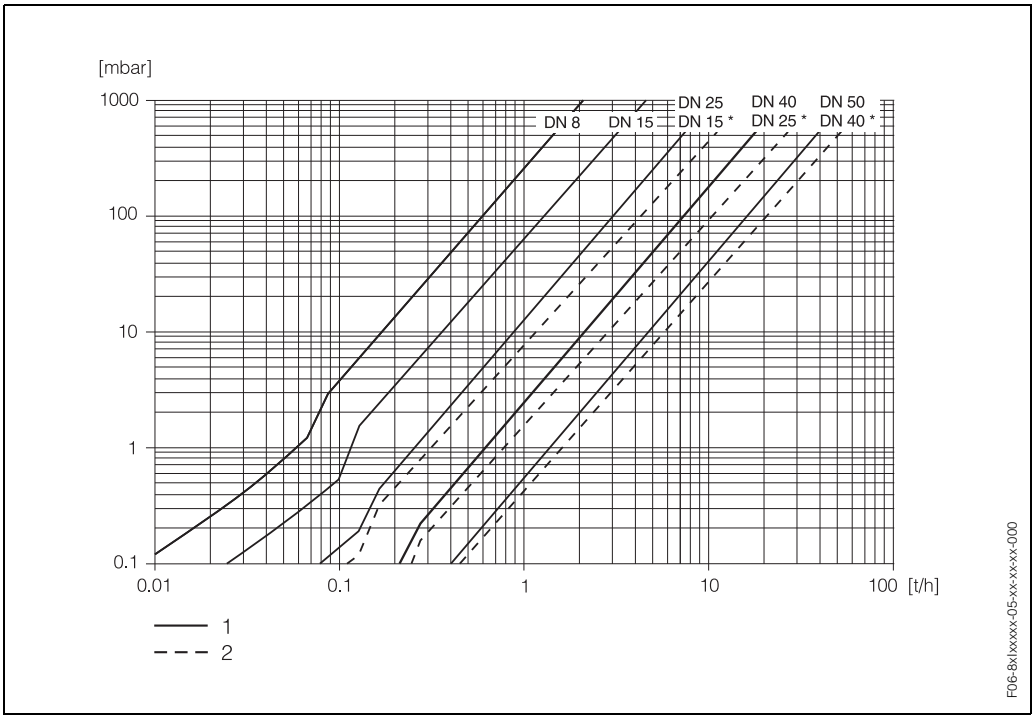


Pressure loss diagram with water

Pressure loss coefficient for Promass I

DN	d [m]	K	K1	K3
8	$8.55 \cdot 10^{-3}$	$8.1 \cdot 10^{6}$	$3.9 \cdot 10^{7}$	$129.95 \cdot 10^{4}$
15	$11.38 \cdot 10^{-3}$	$2.3 \cdot 10^{6}$	$1.3 \cdot 10^{7}$	$23.33 \cdot 10^{4}$
15 [1)]	$17.07 \cdot 10^{-3}$	$4.1 \cdot 10^{5}$	$3.3 \cdot 10^{6}$	$0.01 \cdot 10^{4}$
25	$17.07 \cdot 10^{-3}$	$4.1 \cdot 10^{5}$	$3.3 \cdot 10^{6}$	$5.89 \cdot 10^{4}$
25 [1)]	$25.60 \cdot 10^{-3}$	$7.8 \cdot 10^{4}$	$8.5 \cdot 10^{5}$	$0.11 \cdot 10^{4}$
40	$25.60 \cdot 10^{-3}$	$7.8 \cdot 10^{4}$	$8.5 \cdot 10^{5}$	$1.19 \cdot 10^{4}$
40 [1)]	$35.62 \cdot 10^{-3}$	$1.3 \cdot 10^{4}$	$2.0 \cdot 10^{5}$	$0.08 \cdot 10^{4}$
50	$35.62 \cdot 10^{-3}$	$1.3 \cdot 10^{4}$	$2.0 \cdot 10^{5}$	$0.25 \cdot 10^{4}$

Pressure loss data inclusive interface measuring tube / pipe run
[1)] DN 15, 25, 40 “FB” = Full bore versions of Promass I



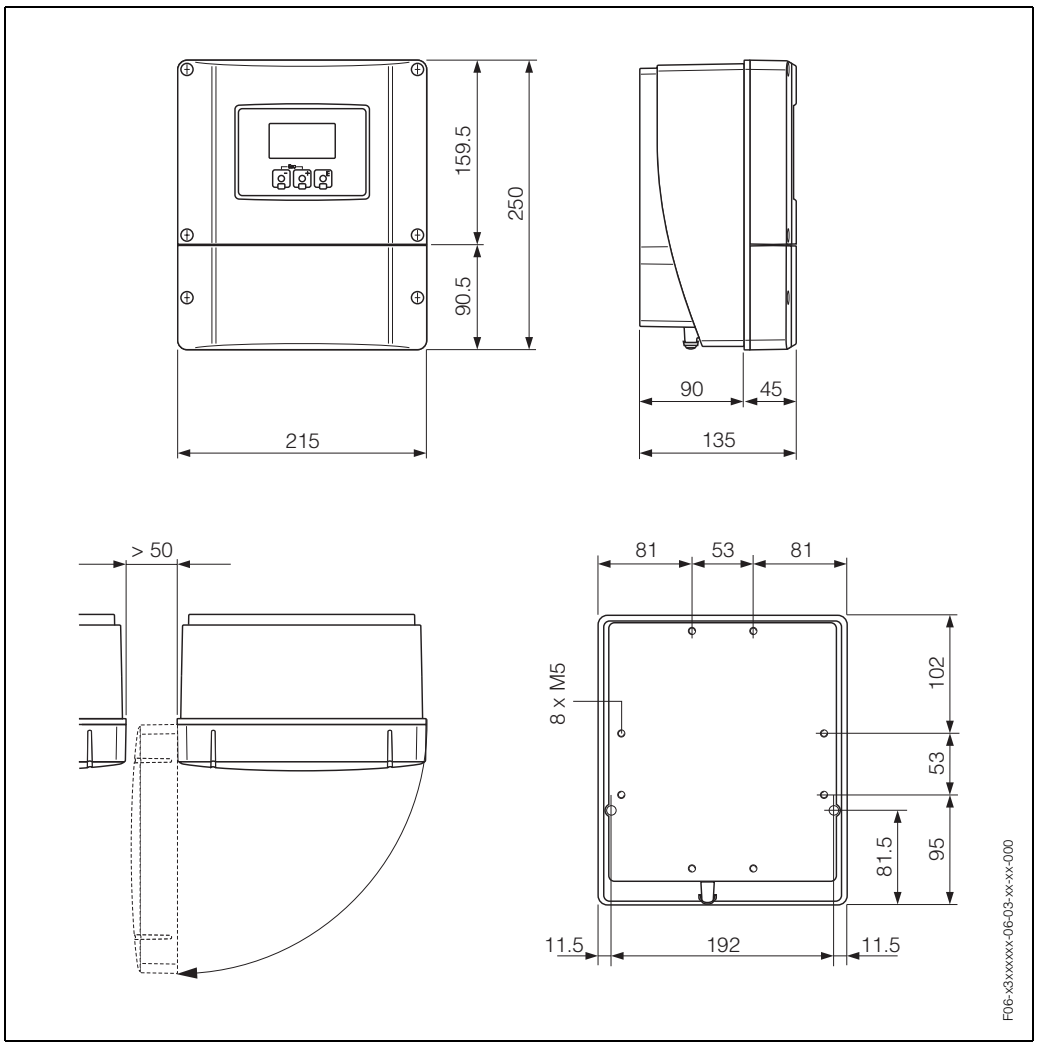
Pressure loss diagram with water

1 Standard versions
2 Full bore versions (*)

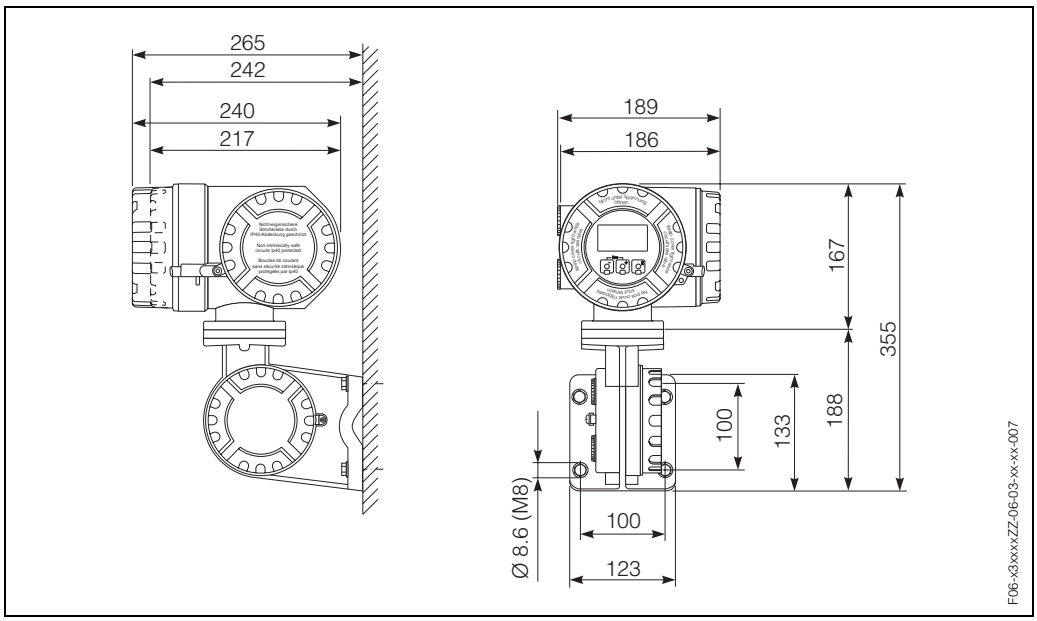
Mechanical construction

Design / dimensions

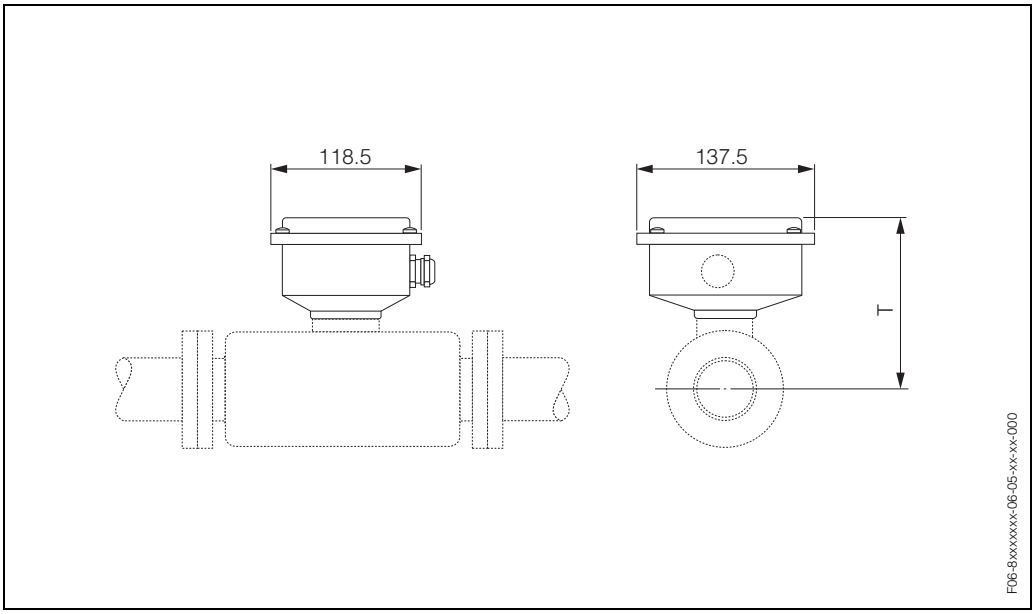
Dimensions: remote field housing (non hazardous area and II3G / zone 2)



Dimensions: remote field housing (II2G / zone 1)

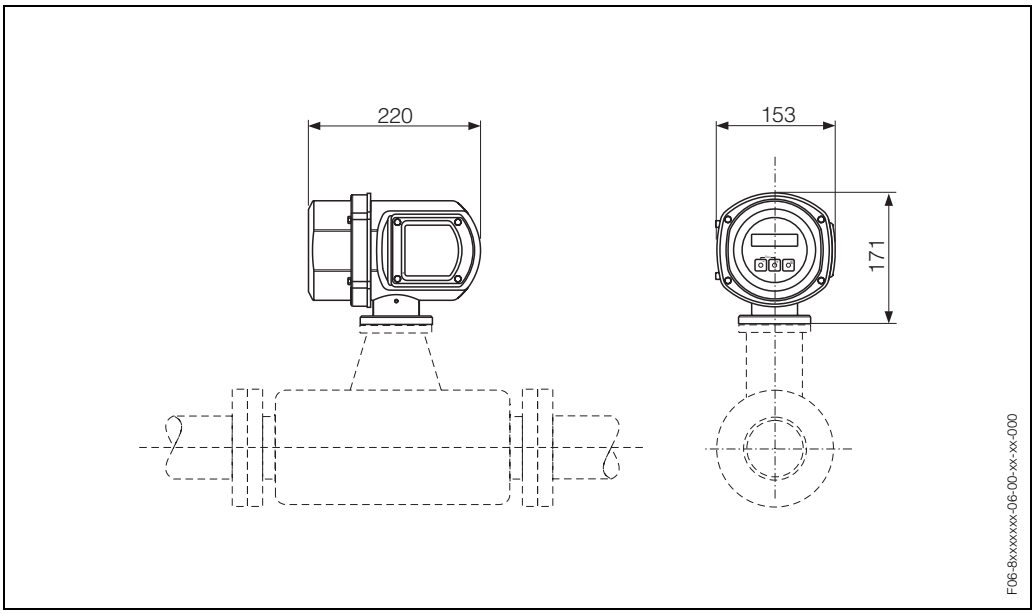


Dimensions: remote version



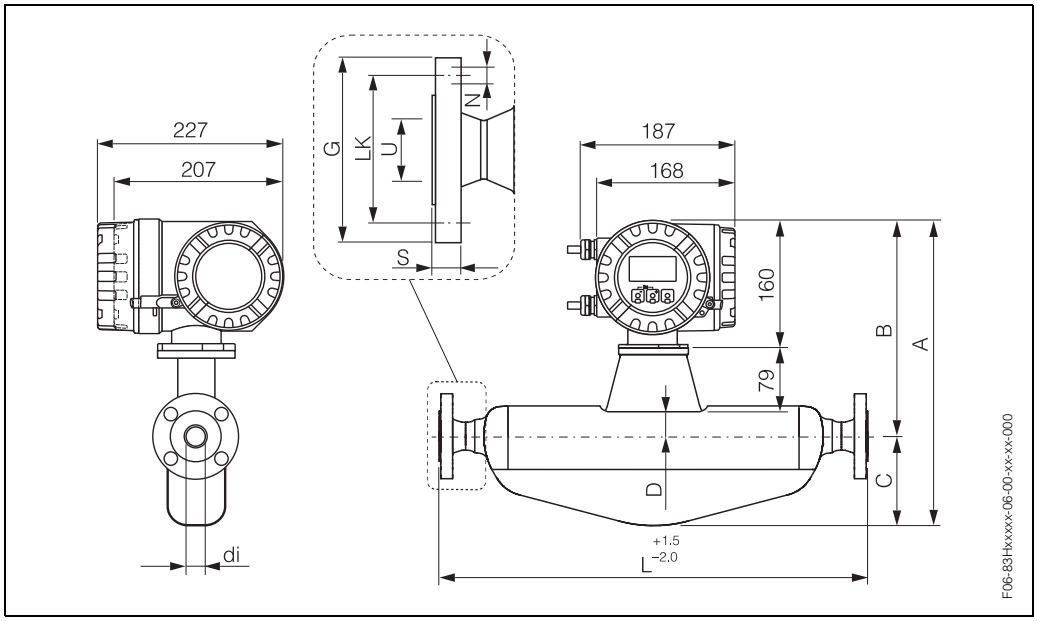
T = dimension B in the compact version (with corresponding nominal diameter) minus 153 mm

Dimensions: stainless steel field housing



Dimensions: stainless steel field housing

Dimensions Promass H: flange connections EN (DIN), ANSI, JIS



Flange EN 1092-1 (DIN 2501) / PN 40: 1.4301/304, parts in contact with medium zirconium 702
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 1.6...3.2 µm

DN	A	B	C	D	G	L	N	S	LK	U	di
8 [1]	384	280	104	41	95	336	4 x Ø14	20	65	17.30	8.51
15	385	280	105	41	95	440	4 x Ø14	20	65	17.30	12.00
25	401	280	121	41	115	580	4 x Ø14	19	85	28.50	17.60
40	475	304	171	65	150	794	4 x Ø18	21.5	110	43.10	25.50
50	556	315	241	76	165	1071	4 x Ø18	23.5	125	54.50	40.50

[1] DN 8 with DN 15 flanges as standard

Flange ANSI B16.5 / Cl 150: 1.4301/304, parts in contact with medium zirconium 702
Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	D	G	L	N	S	LK	U	di
8 [1]	3/8"	384	280	104	41	88.9	336	4 x Ø15.7	12.8	60.5	15.70	8.51
15	1/2"	385	280	105	41	88.9	440	4 x Ø15.7	12.8	60.5	15.70	12.00
25	1"	401	280	121	41	108.0	580	4 x Ø15.7	15.1	79.2	26.70	17.60
40	1 1/2"	475	304	171	65	127.0	794	4 x Ø15.7	17.5	98.6	40.90	25.50
50	2"	556	315	241	76	152.4	1071	4 x Ø19.1	23.6	120.7	52.60	40.50

[1] DN 8 with DN 15 flanges as standard

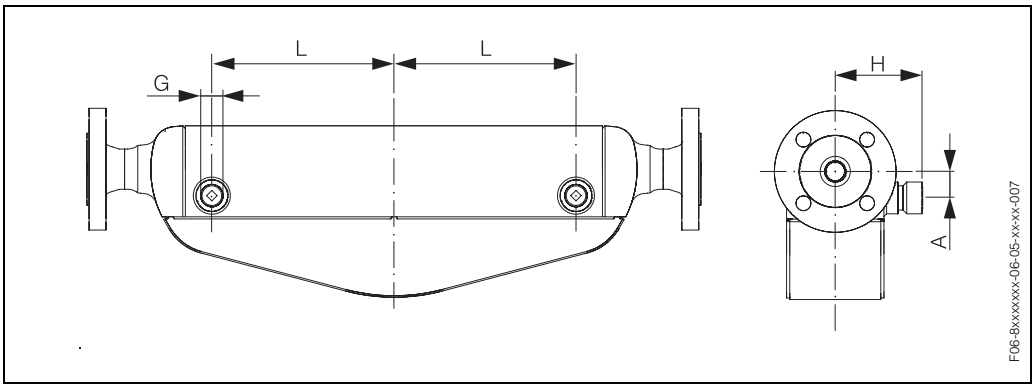
Flange ANSI B16.5 / Cl 300: 1.4301/304, parts in contact with medium zirconium 702
Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	D	G	L	N	S	LK	U	di
8 [1]	3/8"	384	280	104	41	95.2	336	4 x Ø15.7	14.2	66.5	15.70	8.51
15	1/2"	385	280	105	41	95.2	440	4 x Ø15.7	14.2	66.5	15.70	12.00
25	1"	401	280	121	41	124.0	580	4 x Ø19.1	17.5	88.9	26.70	17.60
40	1 1/2"	475	304	171	65	155.4	794	4 x Ø22.3	20.6	114.3	40.90	25.50
50	2"	556	315	241	76	165.1	1071	8 x Ø19.1	23.6	127	52.60	40.50

[1] DN 8 with DN 15 flanges as standard

Flange JIS B2238 / 20K: 1.4301/304, parts in contact with medium zirconium 702 Surface roughness (flange): Ra 3.2...6.3 µm											
DN	A	B	C	D	G	L	N	S	LK	U	di
8 [1)]	384	280	104	41	95	336	4 x Ø15	14	70	15.00	8.51
15	385	280	105	41	95	440	4 x Ø15	14	70	15.00	12.00
25	401	280	121	41	125	580	4 x Ø19	16	90	25.00	17.60
40	475	304	171	65	140	794	4 x Ø19	18	105	40.00	25.50
50	556	315	241	76	165	1071	8 x Ø19	22	120	50.00	40.50
[1)] DN 8 with DN 15 flanges as standard											

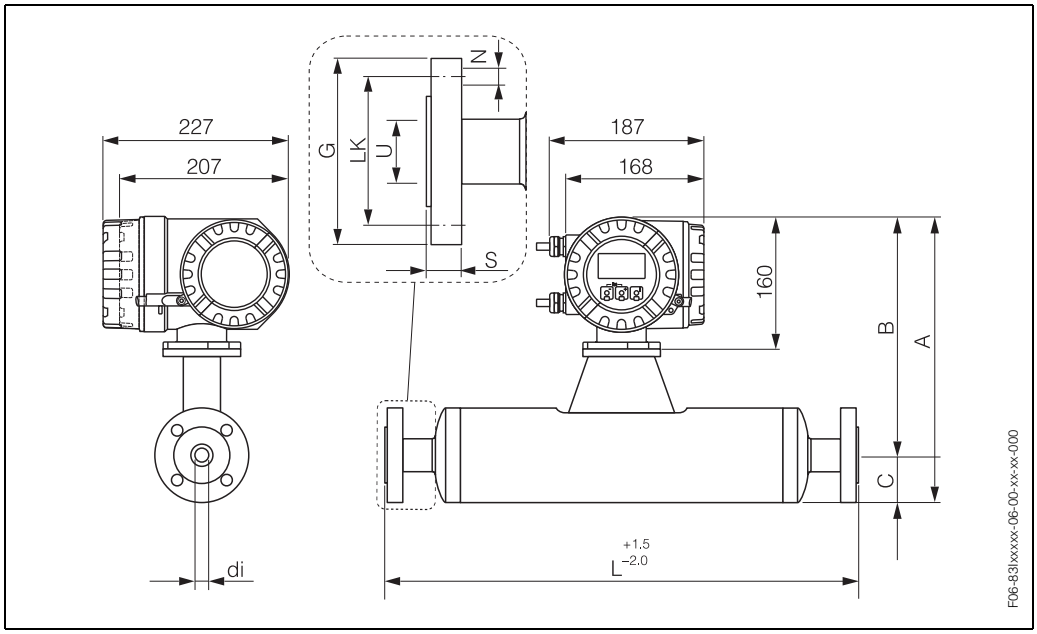
Dimensions Promass H: purge connections / secondary containment monitoring



DN	L	H	A	G
8	55	82	25	1/2" NPT
15	102	82	25	1/2" NPT
25	172	82	25	1/2" NPT
40	263	102	45	1/2" NPT
50	381.5	119.5	58	1/2" NPT

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.

Dimensions Promass I: flange connections EN (DIN), ANSI, JIS



Flange EN 1092-1 (DIN 2501) / PN 40: 1.4301/304, parts in contact with medium titanium grade 9 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 [1]	350	291	59	95	402	4 x Ø14	20	65	17.30	8.55
15	350	291	59	95	438	4 x Ø14	20	65	17.30	11.38
15 [2]	350	291	59	95	572	4 x Ø14	19	65	17.07	17.07
25	350	291	59	115	578	4 x Ø14	23	85	28.50	17.07
25 [2]	377	305	72	115	700	4 x Ø14	22	85	25.60	25.60
40	377	305	72	150	708	4 x Ø18	26	110	43.10	25.60
40 [2]	406	320	86	150	819	4 x Ø18	24	110	35.62	35.62
50	406	320	86	165	827	4 x Ø18	28	125	54.50	35.62
[1] DN 8 with DN 15 flanges as standard [2] DN 15, 25, 40 “FB” = Full bore versions of Promass I										

Flange EN 1092-1 (DIN 2501) / PN 64: 1.4301/304, parts in contact with medium titanium grade 9 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	406	320	86	180	832	4 x Ø22	34	135	54.5	35.62

Flange EN 1092-1(DIN 2501) / PN 100: 1.4301/304, parts in contact with medium titanium grade 9 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 [1]	350	291	59	105	402	4 x Ø14	25	75	17.30	8.55
15	350	291	59	105	438	4 x Ø14	25	75	17.30	11.38
15 [2]	350	291	59	105	578	4 x Ø14	26	75	17.07	17.07
25	350	291	59	140	578	4 x Ø18	29	100	28.50	17.07
25 [2]	377	305	72	140	706	4 x Ø18	31	100	25.60	25.60
40	377	305	72	170	708	4 x Ø22	32	125	42.50	25.60
40 [2]	406	320	86	170	825	4 x Ø22	33	125	35.62	35.62
50	406	320	86	195	832	4 x Ø26	36	145	53.90	35.62
[1] DN 8 with DN 15 flanges as standard [2] DN 15, 25, 40 “FB” = Full bore versions of Promass I										

Flange ANSI B16.5 / Cl 150: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8 [1]	3/8"	350	291	59	88.9	402	4 x Ø15.7	20	60.5	15.70	8.55
15	1/2"	350	291	59	88.9	438	4 x Ø15.7	20	60.5	15.70	11.38
15 [2]	1/2"	350	291	59	88.9	572	4 x Ø15.7	19	60.5	17.07	17.07
25	1"	350	291	59	108.0	578	4 x Ø15.7	23	79.2	26.70	17.07
25 [2]	1"	377	305	72	108.0	700	4 x Ø15.7	22	79.2	25.60	25.60
40	1 1/2"	377	305	72	127.0	708	4 x Ø15.7	26	98.6	40.90	25.60
40 [2]	1 1/2"	406	320	86	127.0	819	4 x Ø15.7	24	98.6	35.62	35.62
50	2"	406	320	86	152.4	827	4 x Ø19.1	28	120.7	52.60	35.62

[1] DN 8 with DN 15 flanges as standard
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange ANSI B16.5 / Cl 300: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8 [1]	3/8"	350	291	59	95.3	402	4 x Ø15.7	20	66.5	15.70	8.55
15	1/2"	350	291	59	95.3	438	4 x Ø15.7	20	66.5	15.70	11.38
15 [2]	1/2"	350	291	59	95.3	572	4 x Ø15.7	19	66.5	17.07	17.07
25	1"	350	291	59	124.0	578	4 x Ø19.1	23	88.9	26.70	17.07
25 [2]	1"	377	305	72	124.0	700	4 x Ø19.1	22	88.9	25.60	25.60
40	1 1/2"	377	305	72	155.4	708	4 x Ø22.4	26	114.3	40.90	25.60
40 [2]	1 1/2"	406	320	86	155.4	819	4 x Ø22.4	24	114.3	35.62	35.62
50	2"	406	320	86	165.1	827	8 x Ø19.1	28	127.0	52.60	35.62

[1] DN 8 with DN 15 flanges as standard
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange ANSI B16.5 / Cl 600: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN		A	B	C	G	L	N	S	LK	U	di
8 [1]	3/8"	350	291	59	95.3	402	4 x Ø15.7	20	66.5	13.80	8.55
15	1/2"	350	291	59	95.3	438	4 x Ø15.7	20	66.5	13.80	11.38
15 [2]	1/2"	350	291	59	95.3	578	4 x Ø15.7	22	66.5	17.07	17.07
25	1"	350	291	59	124.0	578	4 x Ø19.1	23	88.9	24.40	17.07
25 [2]	1"	377	305	72	124.0	706	4 x Ø19.1	25	88.9	25.60	25.60
40	1 1/2"	377	305	72	155.4	708	4 x Ø22.4	28	114.3	38.10	25.60
40 [2]	1 1/2"	406	320	86	155.4	825	4 x Ø22.4	29	114.3	35.62	35.62
50	2"	406	320	86	165.1	832	8 x Ø19.1	33	127.0	49.30	35.62

[1] DN 8 with DN 15 flanges as standard
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange JIS B2238 / 10K: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
50	406	320	86	155	827	4 x Ø19	28	120	50	35.62

Flange JIS B2238 / 20K: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
8 [1]	350	291	59	95	402	4 x Ø15	20	70	15.00	8.55
15	350	291	59	95	438	4 x Ø15	20	70	15.00	11.38
15 [2]	350	291	59	95	572	4 x Ø15	19	70	17.07	17.07
25	350	291	59	125	578	4 x Ø19	23	90	25.00	17.07
25 [2]	377	305	72	125	700	4 x Ø19	22	90	25.60	25.60
40	377	305	72	140	708	4 x Ø19	26	105	40.00	25.60
40 [2]	406	320	86	140	819	4 x Ø19	24	105	35.62	35.62
50	406	320	86	155	827	8 x Ø19	28	120	50.00	35.62

[1] DN 8 with DN 15 flanges as standard
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange JIS B2238 / 40K: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
8 [1]	350	291	59	115	402	4 x Ø19	25	80	15.00	8.55
15	350	291	59	115	438	4 x Ø19	25	80	15.00	11.38
15 [2]	350	291	59	115	578	4 x Ø19	26	80	17.07	17.07
25	350	291	59	130	578	4 x Ø19	27	95	25.00	17.07
25 [2]	377	305	72	130	706	4 x Ø19	29	95	25.60	25.60
40	377	305	72	160	708	4 x Ø23	30	120	38.00	25.60
40 [2]	406	320	86	160	825	4 x Ø23	31	120	35.62	35.62
50	406	320	86	165	827	8 x Ø19	32	130	50.00	35.62

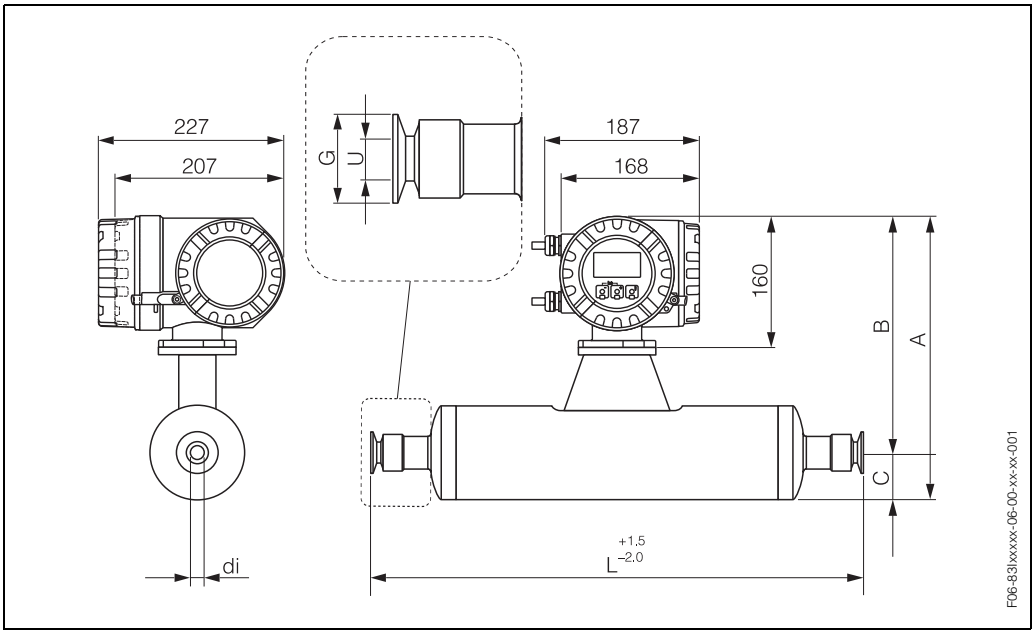
[1] DN 8 with DN 15 flanges as standard
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Flange JIS B2238 / 63K: 1.4301/304, parts in contact with medium titanium grade 9
Surface roughness (flange): Ra 3.2...6.3 µm

DN	A	B	C	G	L	N	S	LK	U	di
8 [1]	350	291	59	120	402	4 x Ø19	28	85	12.00	8.55
15	350	291	59	120	438	4 x Ø19	28	85	12.80	11.38
15 [2]	350	291	59	120	578	4 x Ø19	29	85	17.07	17.07
25	350	291	59	140	578	4 x Ø23	30	100	22.00	17.07
25 [2]	377	305	72	140	706	4 x Ø23	32	100	25.60	25.60
40	377	305	72	175	708	4 x Ø25	36	130	35.00	25.60
40 [2]	406	320	86	175	825	4 x Ø25	37	130	35.62	35.62
50	406	320	86	185	832	8 x Ø23	40	145	48.00	35.62

[1] DN 8 with DN 15 flanges as standard
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Dimensions Promass I: Tri-Clamp connections



Tri-Clamp / 3A-version[1]: titanium grade 2								
DN	Clamp	A	B	C	G	L	U	di
8	1"	350	291	59	50.4	427	22.1	8.55
15	1"	350	291	59	50.4	463	22.1	11.38
15 [2]	see 3/4" Tri-Clamp connection							
25	1"	350	291	59	50.4	603	22.1	17.07
25 [2]	1"	377	305	72	50.4	730	22.1	25.60
40	1 1/2"	377	305	72	50.4	731	34.8	25.60
40 [2]	1 1/2"	406	320	86	50.4	849	34.8	35.62
50	2"	406	320	86	63.9	850	47.5	35.62

[1] 3A-version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
[2] DN 15, 25, 40 "FB" = Full bore versions of Promass I

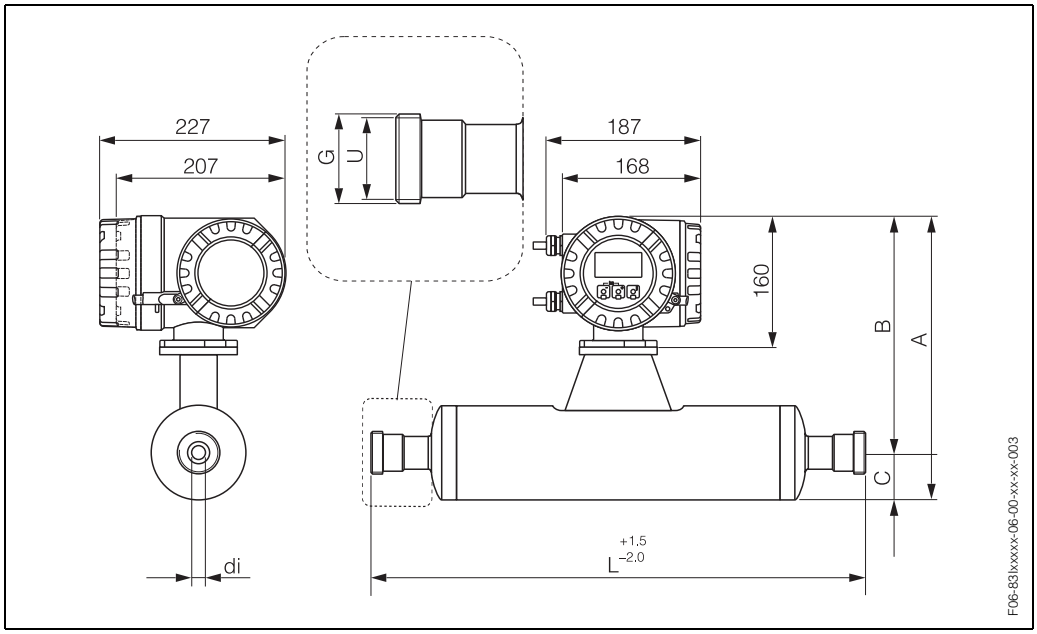
1/2" Tri-Clamp / 3A-version[1]: titanium grade 2								
DN	Clamp	A	B	C	G	L	U	di
8	1/2"	350	291	59	25.0	426	9.5	8.55
15	1/2"	350	291	59	25.0	462	9.5	11.38

[1] 3A-version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)

3/4" Tri-Clamp / 3A-version[1]: titanium grade 2								
DN	Clamp	A	B	C	G	L	U	di
8	3/4"	350	291	59	25.0	426	16.0	8.55
15	3/4"	350	291	59	25.0	462	16.0	11.38
15 [2]	3/4"	350	291	59	25.0	602	16.0	17.07

[1] 3A-version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
[2] DN 15 "FB" = Full bore versions of Promass I

Dimensions Promass I: DIN 11851 connections (hygienic coupling)



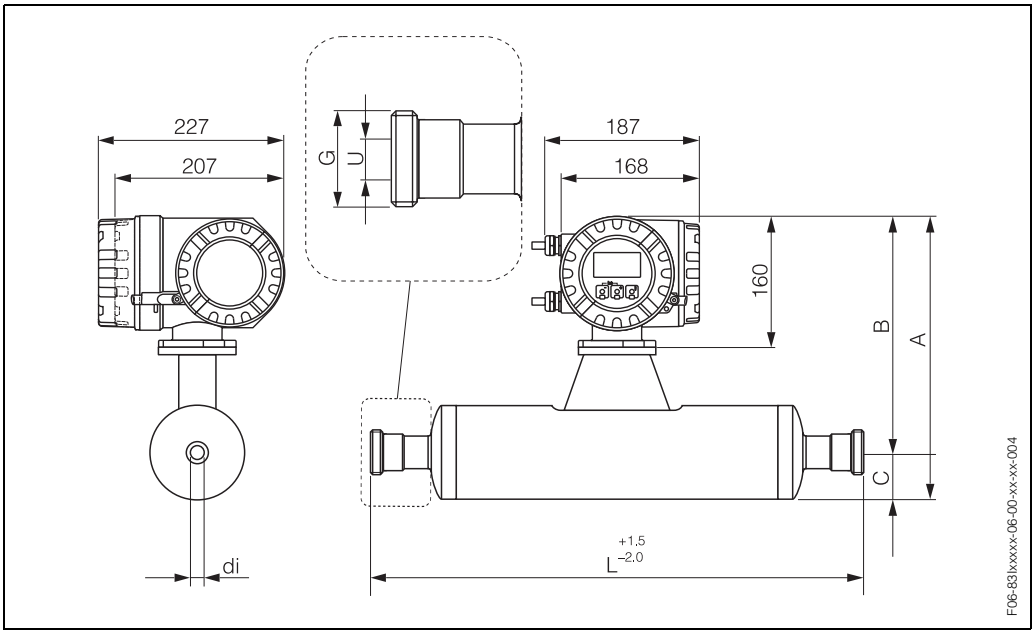
Hygienic coupling DIN 11851 / 3A-version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	Rd 34 x 1/8"	427	16	8.55
15	350	291	59	Rd 34 x 1/8"	463	16	11.38
15 [2]	350	291	59	Rd 34 x 1/8"	602	16	17.07
25	350	291	59	Rd 52 x 1/6"	603	26	17.07
25 [2]	377	305	72	Rd 52 x 1/6"	736	26	25.60
40	377	305	72	Rd 65 x 1/6"	731	38	25.60
40 [2]	406	320	86	Rd 65 x 1/6"	855	38	35.62
50	406	320	86	Rd 78 x 1/6"	856	50	35.62

[1] 3A-version (Ra ≤ 0.8 µm/150 grit)
[2] DN 15, 25, 40 "FB" = Full bore versions of Promass I

Hygienic coupling DIN 11851 Rd 28 x 1/8" / 3A-version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	Rd 28 x 1/8"	426	10	8.55
15	350	291	59	Rd 28 x 1/8"	462	10	11.38

[1] 3A-version (Ra ≤ 0.8 µm/150 grit)

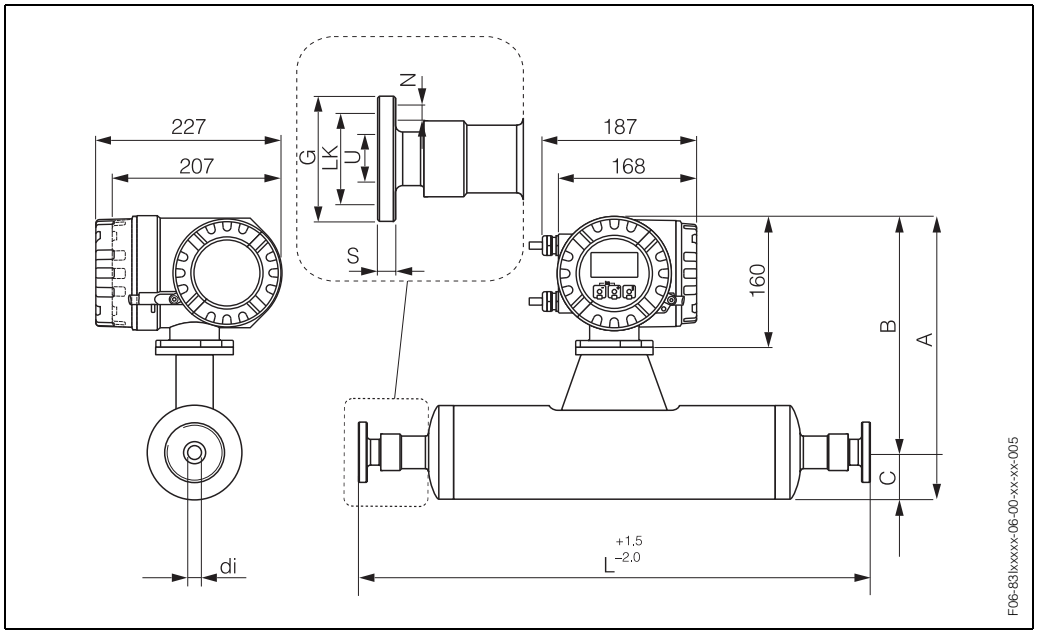
Dimensions Promass I: DIN 11864-1 Form A connections (couplings)



Couplings DIN 11864-1 Form A / 3A-version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8 [2]	350	291	59	Rd 28 x 1/8"	428	10	8.55
15	350	291	59	Rd 34 x 1/8"	463	16	11.38
15 [3]	350	291	59	Rd 34 x 1/8"	602	16	17.07
25	350	291	59	Rd 52 x 1/6"	603	26	17.07
25 [3]	377	305	72	Rd 52 x 1/6"	734	26	25.60
40	377	305	72	Rd 65 x 1/6"	731	38	25.60
40 [3]	406	320	86	Rd 65 x 1/6"	855	38	35.62
50	406	320	86	Rd 78 x 1/6"	856	50	35.62

[1] 3A-version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
[2] DN 8 with DN 10 coupling adapters
[3] DN 15, 25, 40 “FB” = Full bore versions of Promass I

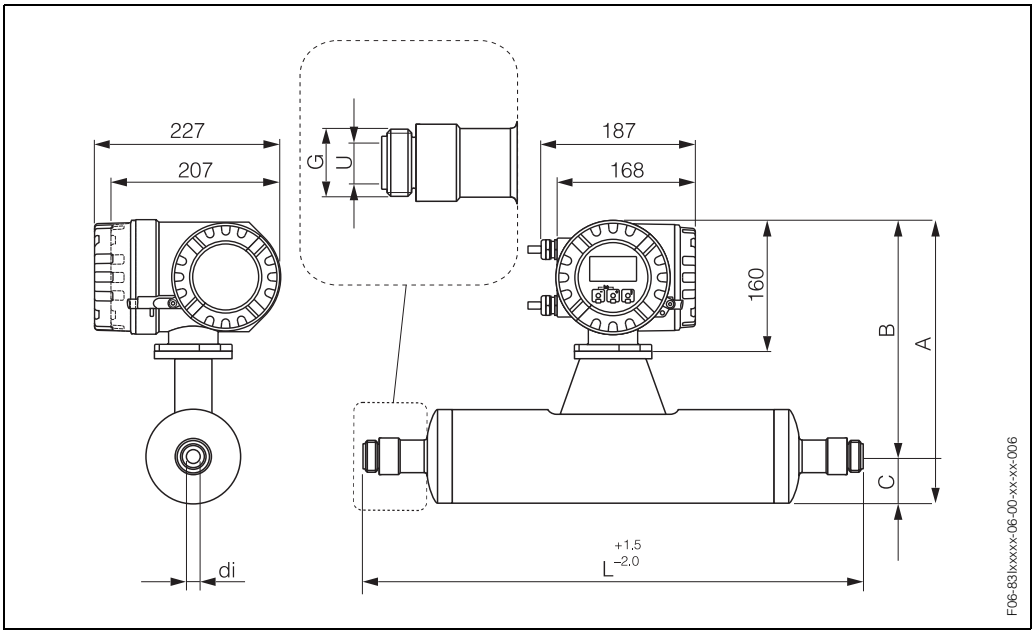
Dimensions Promass I: flange connection DIN 11864-2 Form A (flat flange)



Flange DIN 11864-2 Form A (flat flange) / 3A-version [1]: titanium grade 2										
DN	A	B	C	G	L	N	S	LK	U	di
8 [2]	350	291	59	54	449	4 x Ø9	10	37	10	8.55
15	350	291	59	59	485	4 x Ø9	10	42	16	11.38
25	350	291	59	70	625	4 x Ø9	10	53	26	17.07
40	377	305	72	82	753	4 x Ø9	10	65	38	25.60
50	406	320	86	94	874	4 x Ø9	10	77	50	35.62

[1] 3A-version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
[2] DN 8 with DN 10 flanges

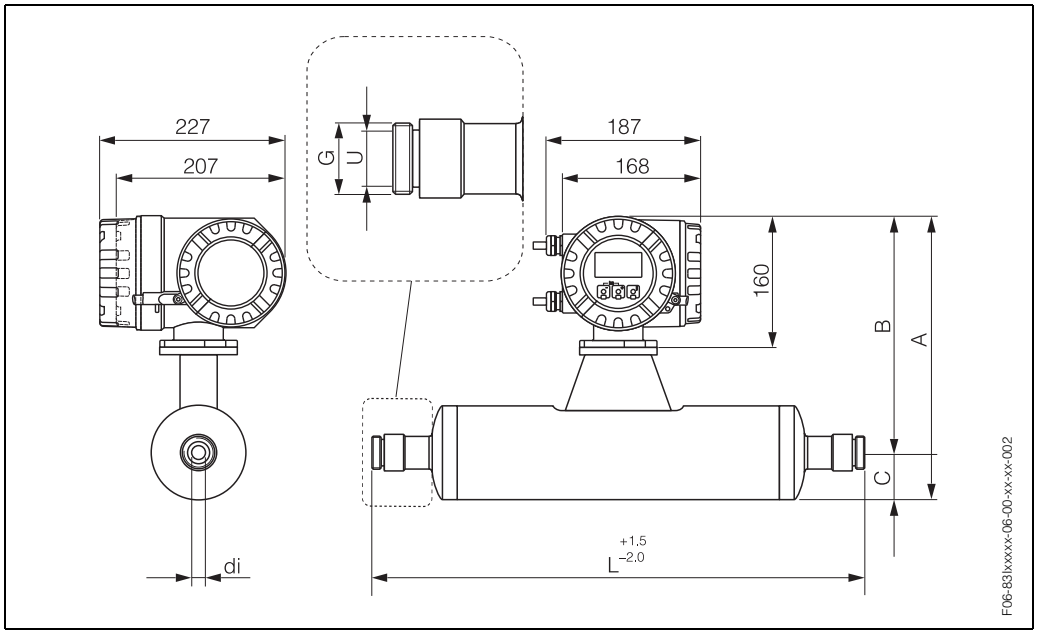
Dimensions Promass I: ISO 2853 connections (couplings)



Coupling ISO 2853 / 3A-version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8 [2]	350	291	59	37.13	435	22.6	8.55
15	350	291	59	37.13	471	22.6	11.38
15 [3]	350	291	59	37.13	610	22.6	17.07
25 [3]	377	305	72	37.13	744	22.6	25.60
40	377	305	72	50.65	737	35.6	25.60
40 [3]	406	320	86	50.65	859	35.6	35.62
50	406	320	86	64.16	856	48.6	35.62

[1] 3A-version (Ra ≤ 0.8 µm/150 grit. Option: Ra ≤ 0.4 µm/240 grit)
[2] DN 8 with DN 15 coupling adapters as standard
[3] DN 15, 25, 40 “FB” = Full bore versions of Promass I

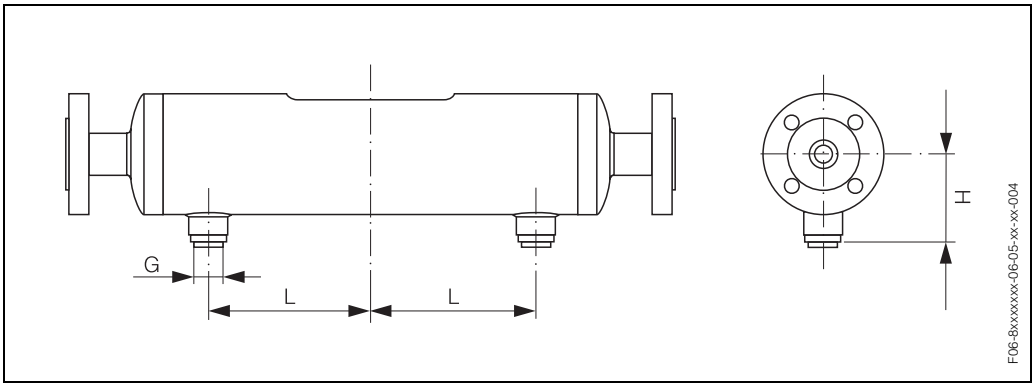
Dimensions Promass I: SMS 1145 connections (hygienic coupling)



Hygienic coupling SMS 1145 / 3A-version [1]: titanium grade 2							
DN	A	B	C	G	L	U	di
8	350	291	59	Rd 40 x 1/6"	427	22.5	8.55
15	350	291	59	Rd 40 x 1/6"	463	22.5	11.38
25	350	291	59	Rd 40 x 1/6"	603	22.5	17.07
25 [2]	377	305	72	Rd 40 x 1/6"	736	22.5	25.60
40	377	305	72	Rd 60 x 1/6"	738	35.5	25.60
40 [2]	406	320	86	Rd 60 x 1/6"	857	35.5	35.62
50	406	320	86	Rd 70 x 1/6"	858	48.5	35.62

[1] 3A-version (Ra ≤ 0.8 µm/150 grit)
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Dimensions Promass I: purge connections / secondary containment monitoring



DN	L	H	G
8 [2]	61	78.15	1/2" NPT
15	79	78.15	1/2" NPT
15 [1]	79	78.15	1/2" NPT
25	148	78.15	1/2" NPT
25 [1]	148	78.15	1/2" NPT
40	196	90.85	1/2" NPT
40 [1]	196	90.85	1/2" NPT
50	244	105.25	1/2" NPT

[1] DN 15, 25, 40 “FB” = Full bore versions of Promass I
[2] DN 8 with DN 15 flanges as standard

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.

Weight

- Compact version: see table below
- Remote version
  - Sensor: weight of compact version minus 2 kg
  - Remote field housing: 5 kg

Promass H / DN	**8**	**15**	**25**	**40**	**50**
Weight[1] in [kg]	12	13	19	36	69
[1] The weights in the table are those of the compact version.					

Promass I / DN	**8**	**15**	**15** [2]	**25**	**25** [2]	**40**	**40** [2]	**50**
Weight[1] in [kg]	12	15	20	20	41	41	67	67

[1] The weights in the table are those of the compact version.
[2] DN 15, 25, 40 “FB” = Full bore versions of Promass I

Materials

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:
- Acid- and alkali-resistant outer surface; stainless steel 1.4301/304

Connection housing, sensor (remote version):
- Stainless steel 1.4301/304

Measuring tubes
- Promass H: zirconium 702/R 60702
- Promass I: titanium grade 9

Process connections, Promass H:
- Flanges EN (DIN) / ANSI / JIS → 1.4301/304, parts in contact with medium zirconium 702

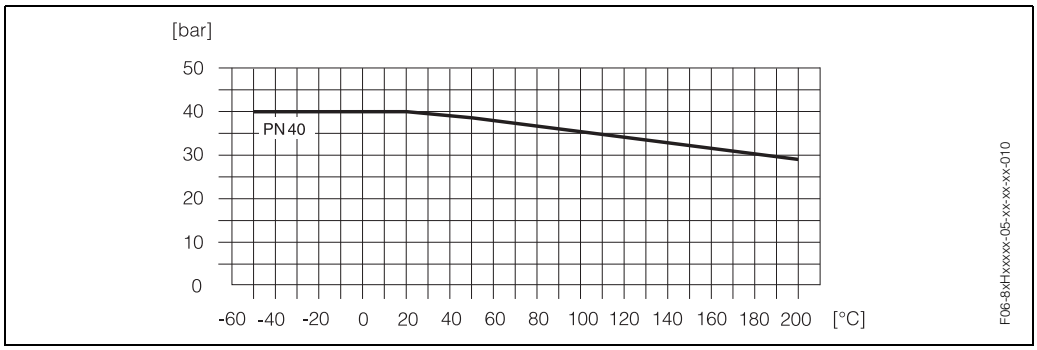
Process connections, Promass I:
- Flanges EN (DIN) / ANSI / JIS → 1.4301/304, parts in contact with medium titanium grade 9
- Flange EN (DIN) 11864-2 (flat flange) → titanium grade 2
- Hygienic coupling DIN 11851 / SMS 1145 → titanium grade 2
- Couplings ISO 2853 / DIN 11864-1 → titanium grade 2
- Tri-Clamp → titanium grade 2

Seals:
Welded process connections without internal seals

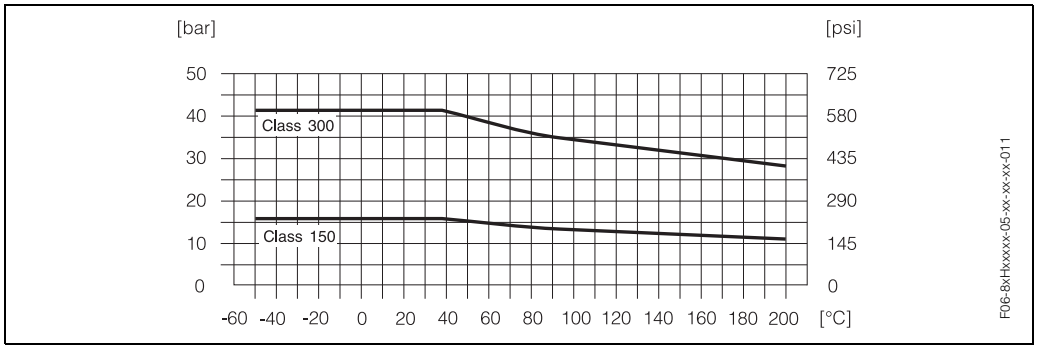
Material load diagram

Promass H

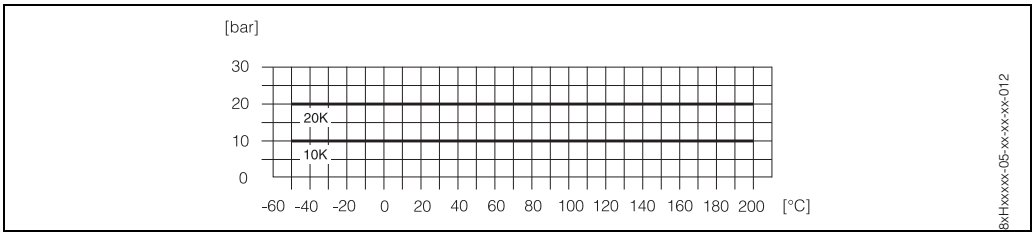
Flange connection to EN 1092-1 (DIN 2501)
Flange material: 1.4301/304
Parts in contact with medium: zirconium 702



Flange connection to ANSI B16.5
Flange material: 1.4301/304
Parts in contact with medium: zirconium 702

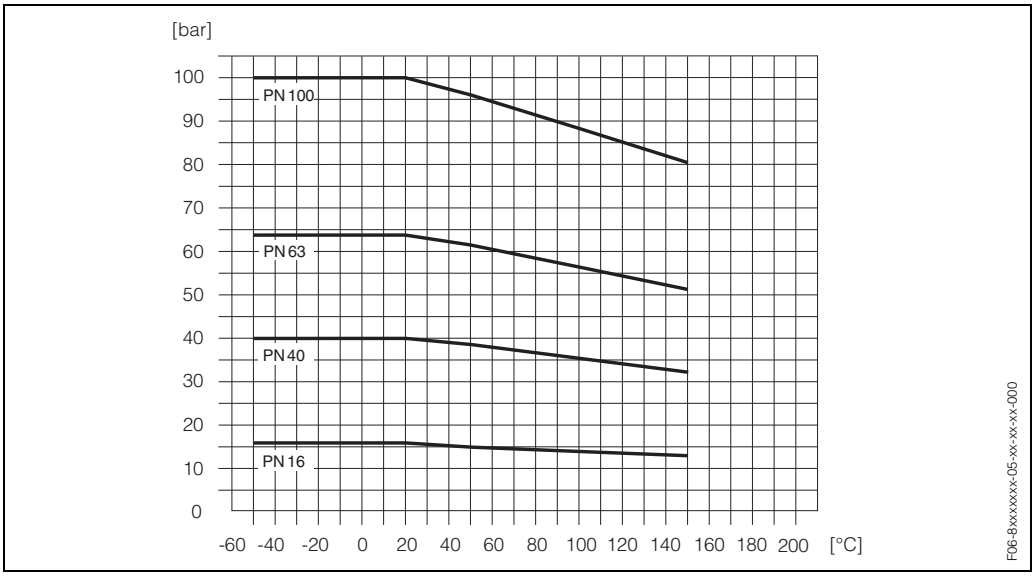


Flange connection to JIS B2238
Flange material: 1.4301/304
Parts in contact with medium: zirconium 702

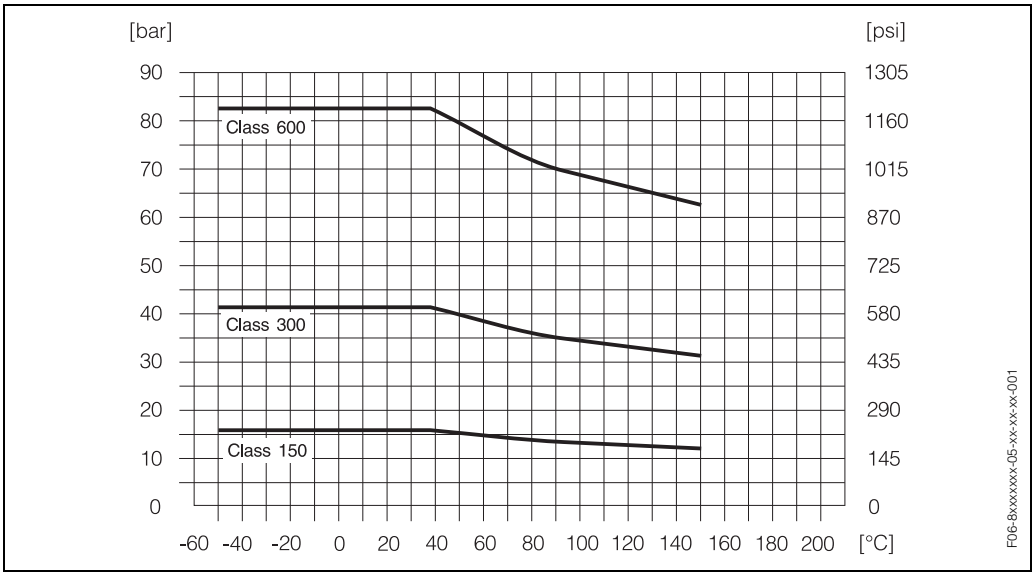


Promass I

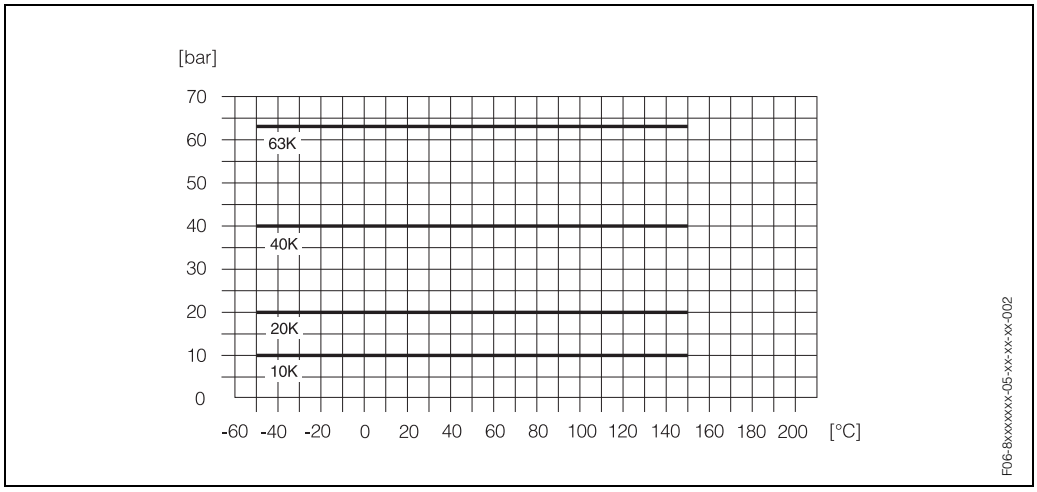
Flange connection to EN 1092-1 (DIN 2501)
Flange material: 1.4301/304
Parts in contact with medium: titanium grade 9



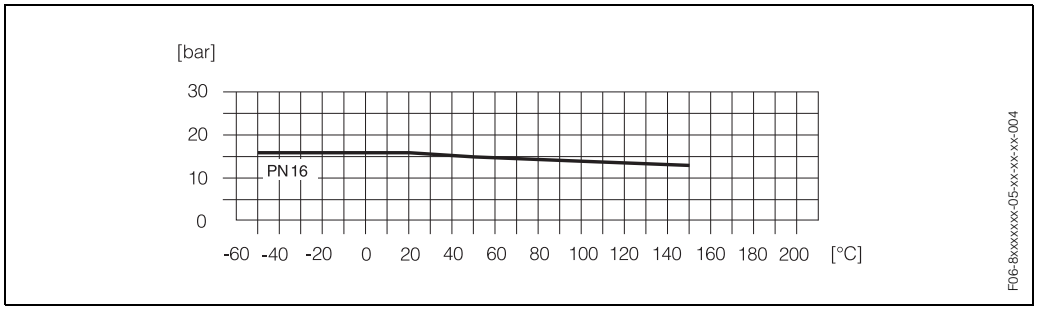
Flange connection to ANSI B16.5
Flange material: 1.4301/304
Parts in contact with medium: titanium grade 9



Flange connection to JIS B2238
Flange material: 1.4301/304
Parts in contact with medium: titanium grade 9

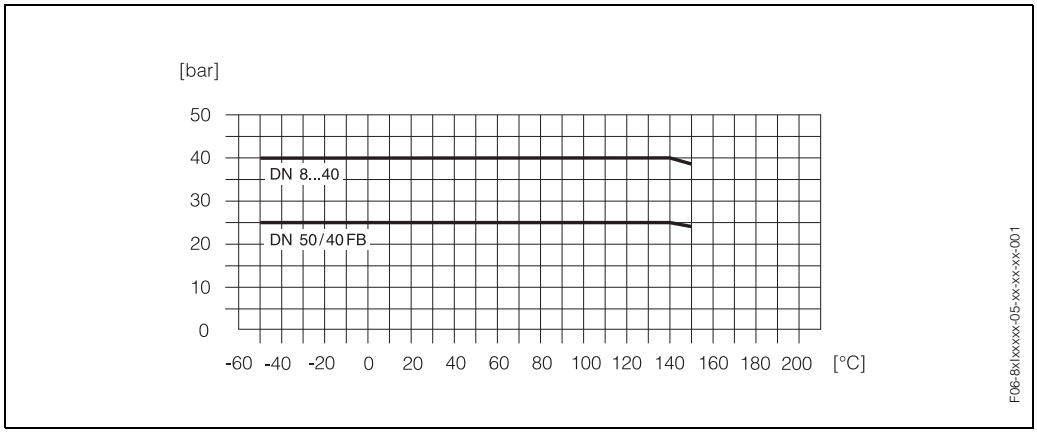


Hygienic coupling to DIN 11851 / SMS 1145
Connection material: titanium grade 2

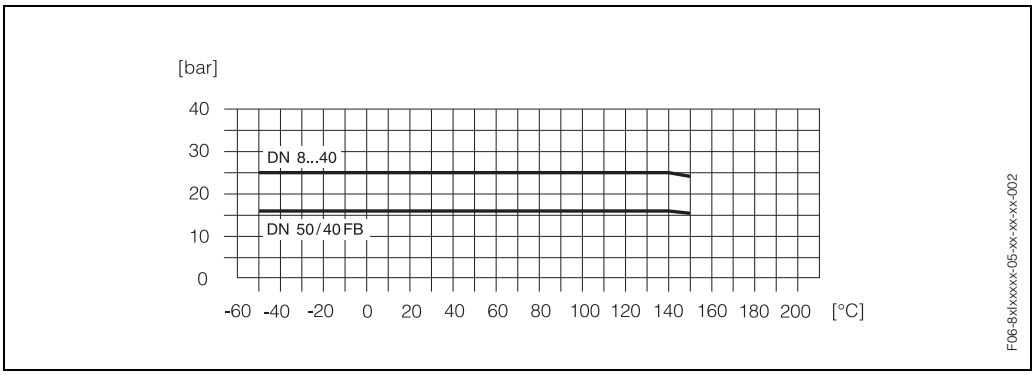


Tri-Clamp process connection
The load limit is defined exclusively by the material properties of the outer clamp used.
This clamp is not included in the scope of delivery.

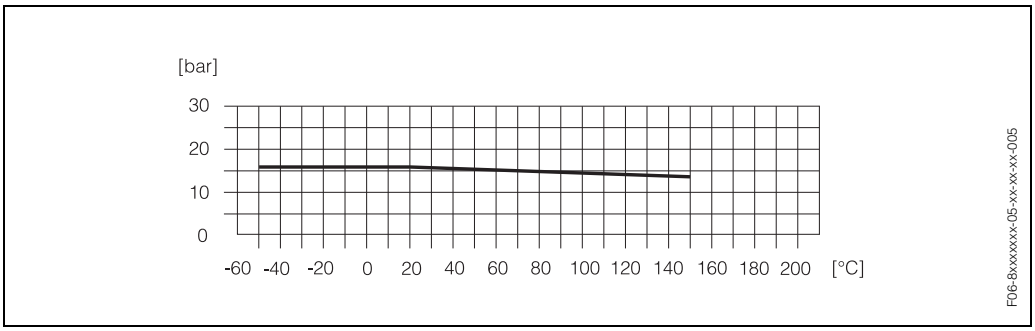
Coupling to DIN 11864-1
Connection material: titanium grade 2



Flange connection to DIN 11864-2 Form A (flat flange)
Connection material: titanium grade 2



Coupling to ISO 2853
Connection material: titanium grade 2



Process connection

Promass H (welded process connections):
- Flanges EN 1092-1 (DIN 2501), ANSI B16.5, JIS B2238

Promass I (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 to DIN 11864-2 Form A (flat flange)

Human interface

Display elements

- Liquid-crystal display: backlit, two lines (Promass 80) or four lines (Promass 83) with 16 characters per line
- Selectable display of different measured values and status variables
- At ambient temperatures below –20 °C the readability of the display may be impaired.

Operating elements

Unified control concept for both types of transmitter:

Promass 80:
- Local operation with three keys (–, +, E)
- Quick Setup menus for straightforward commissioning

Promass 83:
- Local operation with three optical keys (–, +, E)
- Application specific Quick Setup menus for straightforward commissioning

Language group

Language groups for operation in different countries:
- Western Europe and America:
  English, German, Spanish, Italian, French, Dutch and Portuguese
- Northern/eastern Europe:
  English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
- Southern/eastern Asia:
  English, Japanese and Indonesian

Remote operation

Promass 80:
Remote operation via HART, PROFIBUS-PA

Promass 83:
Remote operation via HART, PROFIBUS-DP/-PA, FOUNDATION Fieldbus

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 authorization and EHEDG-tested

Pressure measuring device approval

Devices with a nominal diameter smaller than or equal to DN 25 correspond to Article 3 (3) of the EC Directive 97/23/EC (Pressure Equipment Directive). For larger nominal diameters, certified flowmeters to Category III are optionally also available if necessary (depends on fluid and operating pressure). All devices are applicable for all fluids and instable gases on principle and have been designed and manufactured in accordance to sound engineering practice.

Functional safety

SIL 2:
accordance IEC 61508/IEC 61511-1 (FDIS)
4...20 mA output according to the following order code:

Promass 80***–**********A
Promass 80***–**********D
Promass 83***–**********A
Promass 83***–**********B

Certification PROFIBUS-DP/-PA

The flowmeter has successfully passed all test procedures and is certified and registered by the PNO (PROFIBUS User Organisation). The device thus meets all the requirements of the specifications following:
- Certified according to PROFIBUS-PA profile version 3.0 (device certification number available on request)
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification FOUNDATION Fieldbus

The flowmeter has successfully passed all test procedures and is certified and registered by the Fieldbus FOUNDATION. The device thus meets all the requirements of the specifications following:
- Certified according to FOUNDATION Fieldbus Specification
- The device meets all the specifications of the FOUNDATION Fieldbus-H1
- Interoperability Test Kit (ITK), revision status 4.0 (device certification no. available on request): The device can also be operated with certified devices of other manufacturers
- Physical Layer Conformance Test of the Fieldbus FOUNDATION

Other standards, 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 (IEC 1326):
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.

Ordering information

The E+H 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 E+H service organisation can provide detailed information on request.

Documentation

- ❑ System Information Promass (SI 032D/06/en)
- ❑ Technical Information Promass 80/83 A (TI 054D/06/en)
- ❑ Technical Information Promass 80/83 F, M (TI 053D/06/en)
- ❑ Technical Information Promass 80/83 E (TI 061D/06/en)
- ❑ Operating Instructions Promass 80 (BA 057D/06/en)
- ❑ Description of Device Functions Promass 80 (BA 058D/06/en)
- ❑ Operating Instructions Promass 80 PROFIBUS-PA (BA 072D/06/en)
- ❑ Description of Device Functions Promass 80 PROFIBUS-PA (BA 073D/06/en)
- ❑ Operating Instructions Promass 83 (BA 059D/06/en)
- ❑ Description of Device Functions Promass 83 (BA 060D/06/en)
- ❑ Operating Instructions Promass 83 PROFIBUS-DP/-PA (BA 063D/06/en)
- ❑ Description of Device Functions Promass 83 PROFIBUSDP/-PA (BA 064D/06/en)
- ❑ Operating Instructions Promass 83 FOUNDATION Fieldbus (BA 065D/06/en)
- ❑ Description of Device Functions Promass 83 FOUNDATION Fieldbus (BA 066D/06/en)
- ❑ Supplementary documentation on Ex-ratings: ATEX, FM, CSA
- ❑ Functional safety manual Promass 80/83 (SD077D/06/en)

Subject to modification

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