Technical Information
Proline Promass 84X
Coriolis flowmeter

The highest capacity four-tube flowmeter with transmitter for custody transfer

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- For highest flow rates and outstanding performance in on/offshore oil & gas applications

Device properties
- Nominal diameter: DN 300 to 400 (12 to 16")
- Four-tube system with low pressure drop
- Complete exterior design made of 1.4404 (316L)
- 4-line backlit display with touch control
- Device in compact or remote version
- Phase-shifted pulse, HART, Modbus RS485

Your benefits

- Increased profit – single installation point providing premium accuracy for large quantities
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in/outlet run needs
- Quality – designed for custody transfer; featuring worldwide recognized metrological approvals
- Flexible data transfer options– numerous communication
- Automatic recovery of data for servicing

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People for Process Automation

Table of contents

Function and system design

Measuring principle

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

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

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

The measuring tubes through which the measured material flows are brought into oscillation. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):
- At zero flow, in other words when the fluid is at a standstill, the two tubes oscillate in phase (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).

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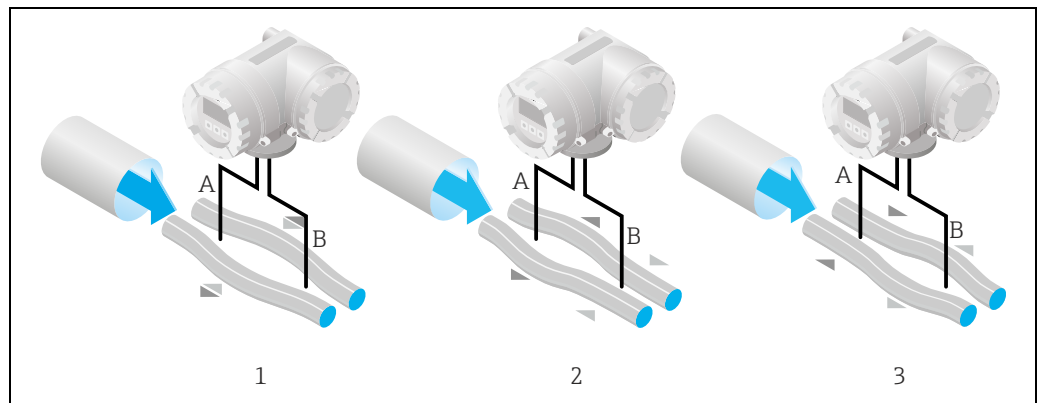
The phase difference (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet.
System balance is ensured by the antiphase oscillation of the two measuring tubes. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement
The measuring tubes are continuously excited at their resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tubes and fluid) results in a corresponding, automatic adjustment in the oscillation frequency. Resonance frequency is thus a function of fluid density. The microprocessor utilizes 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.

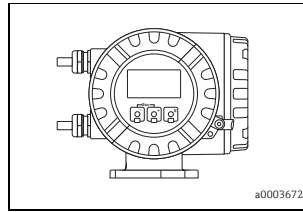| Measuring system	The measuring system consists of a transmitter and a sensor. Two versions are available:

- Compact version: transmitter and sensor form a mechanical unit
- Remote version: transmitter and sensor are mounted physically separate from one another

Transmitter Promass 84

	• 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 Promass X
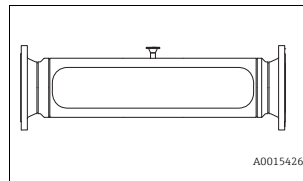
	• Universal sensor for fluid temperatures up to +180 °C (+356 °F).
	• Nominal diameter DN 350 (14").
	• Material:
	  – Sensor: Stainless Steel 1.4404 (316L)
	  – Measuring tube: Stainless Steel 1.4404 (316/316L)
	  – Process connections: Stainless Steel 1.4404 (316/316L)

Input

Measured variable	• Mass flow (proportional to the phase difference between two sensors mounted on the measuring tube to register a phase shift in the oscillation) • Fluid density (proportional to resonance frequency of the measuring tube) • Fluid temperature (measured with temperature sensors)

Measuring range	**Measuring ranges for liquids**

DN		Range for full scale values (liquids) $\dot{m}_{min(F)}$ to $\dot{m}_{max(F)}$	
[mm]	[in]	[t/h]	[tn. sh./h]
350	14	0 to 4100	0 to 4520

Measuring ranges for gases

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

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

$\dot{m}_{max(G)}$ = max. full scale value for gas [kg/h (lb/min)]
$\dot{m}_{max(F)}$ = max. full scale value for liquid [kg/h (lb/min)]
$\rho_{(G)}$ = gas density in [kg/m³ (lb/ft³)] under process conditions
x = Coefficient for Promass X DN 350 (14"): x = 200

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

Calculation example for gas:

- Sensor type: Promass X, DN 350
- Gas: air with a density of 60.3 kg/m³ (at 20 °C and 50 bar)
- Measuring range (liquid): 70000 kg/h
- x = 200

Max. possible full scale value:
$\dot{m}_{max(G)} = \dot{m}_{max(F)} \cdot \rho_{(G)} \div x \ [kg/m^3] = 70000 \ kg/h \cdot 60.3 \ kg/m^3 \div 200 \ kg/m^3 = 21105 \ kg/h$

Recommended measuring ranges:

See information in the "Limiting flow" Section →

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.

Measuring range in custody transfer mode	The following are example data for MI-005 Evaluation Certificate (liquids other than water).

Measuring ranges for liquids in mass flow

DN		Mass flow (liquids) Q_{min} to Q_{max}		Smallest measured quantity	
[mm]	[in]	[t/h]	[tn. sh./h]	[kg]	[lbs]
350	14	137 to 3500	152 to 3850	1000	2210

Measuring ranges for liquids in volume flow

DN		Volume flow Q_{min} to Q_{max}		Smallest measured quantity	
[mm]	[in]	[m³/h]	[gal/h]	[l]	[gal]
350	14	137 to 3500	36500 to 924600	1000	264

Note!
For information about the other approvals →see corresponding certificate.

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

U = 3 to 30 V DC, R_i = 5 kΩ, galvanically isolated.
Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment start, batching start/stop (optional), totalizer reset for batching (optional).

Status input (auxiliary input) with Modbus RS485

U = 3 to 30 V DC, R_i = 3 kΩ, galvanically isolated.
Switch level: ±3 to ±30 V DC, independent of polarity.
Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment start.

Current input

Active/passive selectable, galvanically isolated, resolution: 2 µA
- Active: 4 to 20 mA, R_L < 700 Ω, U_{out} = 24 V DC, short-circuit proof
- Passive: 0/4 to 20 mA, R_i = 150 Ω, U_{max} = 30 V DC

Output

Output signal	**Current output**

Active/passive selectable, galvanically isolated, time constant selectable (0.05 to 100 s), full scale value selectable, temperature coefficient: typically 0.005% o.r./°C, resolution: 0.5 µA (o.r. = of reading)
- Active: 0/4 to 20 mA, R_L < 700 Ω (for HART: R_L ≥ 250 Ω)
- Passive: 4 to 20 mA; supply voltage U_S 18 to 30 V DC; R_i ≥ 150 Ω

Pulse/frequency output

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

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

Modbus interface

- Modbus device type: slave
- Address range: 1 to 247
- Supported function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Physical interface: RS485 in accordance with EIA/TIA-485 standard
- Supported baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Transmission mode: RTU or ASCII
- Response times:
  Direct data access = typically 25 to 50 ms
  Auto-scan buffer (data range) = typically 3 to 5 ms
- Possible output combinations → 🖹 6

Signal on alarm	**Current output** Failsafe mode selectable (e.g. in accordance with NAMUR Recommendation NE 43) **Pulse/frequency output** Failsafe mode selectable **Relay output** Dead in the event of a fault or if the power supply fails
Load	see "Output signal"
Low flow cutoff	Switch points for low flow are selectable.
Galvanic isolation	All circuits for inputs, outputs, and power supply are galvanically isolated from each other.
Switching output	**Relay output** • max. 30 V / 0.5 A AC; 60 V / 0.1 A DC • galvanically isolated • Normally closed (NC or break) or normally open (NO or make) contacts available (factory setting: relay 1 = NO, relay 2 = NC)

Power supply

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

Order characteristic for "inputs/outsputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (−)	22 (+) / 23 (−)	24 (+) / 25 (−)	26 (+) / 27 (−)
Fixed communication boards (permanent assignment)				
S	–	–	Pulse/freq. output Ex i, passive	Current output Ex i active, HART
T	–	–	Pulse/freq. output Ex i, passive	Current output Ex i passive, HART
Flexible communication boards				
D	Status input	Relay output	Pulse/frequency output	Current output HART
M	Status input	Pulse/frequency output 2	Pulse/frequency output 1	Current output HART
N	Current output	Pulse/frequency output	Status input	Modbus RS485

Order characteristic for "inputs/outsputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (−)	22 (+) / 23 (−)	24 (+) / 25 (−)	26 (+) / 27 (−)
Q	–	–	Status input	Modbus RS485
1	Relay output	Pulse/frequency output 2	Pulse/frequency output 1	Current output HART
2	Relay output	Current output 2	Pulse/frequency output	Current output 1 HART
7	Relay output 2	Relay output 1	Status input	Modbus RS485

Supply voltage   85 to 260 V AC, 45 to 65 Hz
20 to 55 V AC, 45 to 65 Hz
16 to 62 V DC

Power consumption   AC: <15 VA (including sensor)
DC: <15 W (including sensor)

Switch-on current:
- Max. 13.5 A (<50 ms) at 24 V DC
- Max. 3 A (<5 ms) at 260 V AC

Power supply failure   Lasting min. 1 power cycle:
- EEPROM and T-DAT save the measuring system data if the power supply fails.
- HistoROM/S-DAT: exchangeable data storage chip with sensor specific data (nominal diameter, serial number, calibration factor, zero point, etc.)

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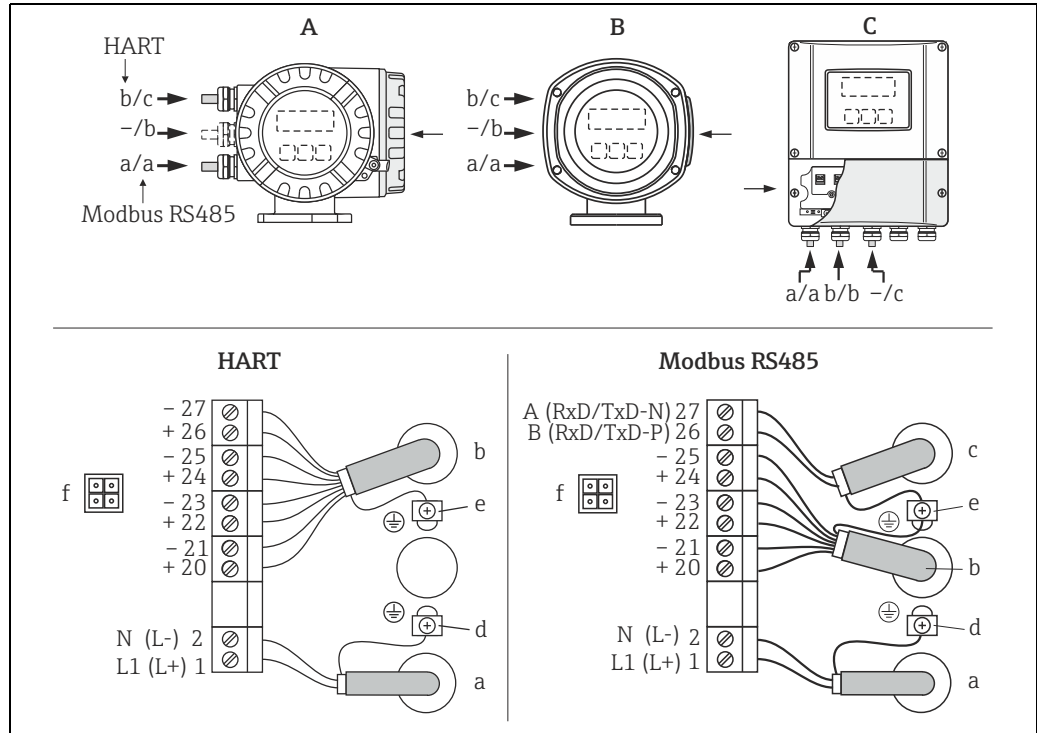
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Connecting the transmitter, cable cross-section: max. 2.5 mm²

A   View A (field housing)
B   View B (stainless steel field housing)
C   View C (wall-mount housing)

a   Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC
      – Terminal No. 1: L1 for AC, L+ for DC
      – Terminal No 2: N for AC, L- for DC
b   Signal cable: Terminal assignment → 🖺 6
c   Fieldbus cable: Terminal assignment → 🖺 6
d   Ground terminal for protective earth
e   Ground terminal for Signal cable/RS485 cable
f   Service connector for connecting service interface FXA 193 with Proline adapter cable (Fieldcheck, FieldCare)

Electrical connection Remote version
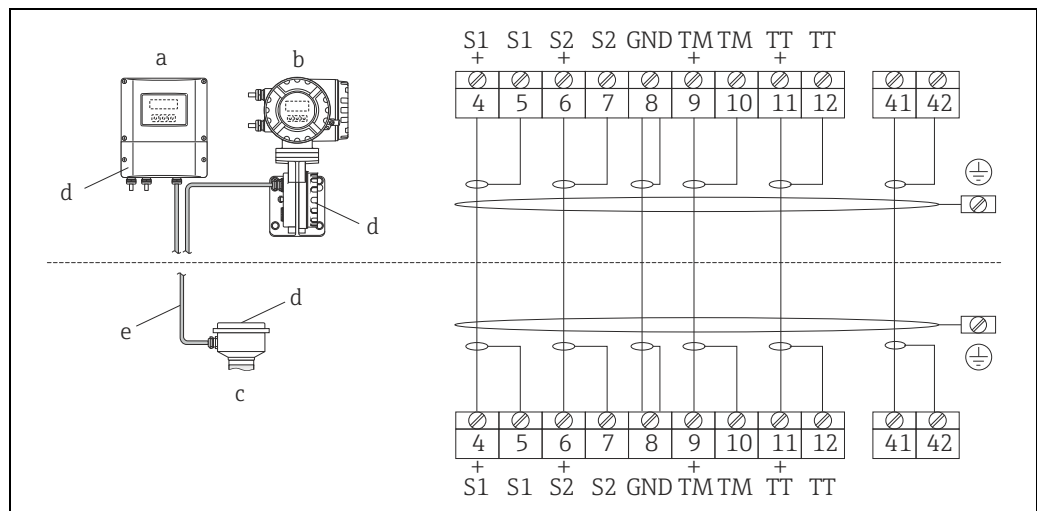
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Connecting the remote version

a   Wall-mount housing: non-hazardous area and ATEX II3G / zone 2 → see separate "Ex documentation"
b   Wall-mount housing: ATEX II2G / Zone 1 /FM/CSA → see separate "Ex documentation"
c   Connection housing sensor
d   Cover for connection compartment or connection housing
e   Connecting cable

Terminal No.: 4/5 = gray; 6/7 = green; 8 = yellow; 9/10 = pink; 1¹⁄₁₂ = white; 41/42 = brown

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Potential equalization	No special measures for potential equalization are required. For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.
Cable entries	*Power-supply and signal cables (inputs/outputs):* • Cable entry M20 × 1.5 (8 to 12 mm / 0.31" to 0.47") • Thread for cable entries, ½" NPT, G ½" *Connecting cable for remote version:* • Cable entry M20 × 1.5 (8 to 12 mm / 0.31" to 0.47") • Thread for cable entries, ½" NPT, G ½"
Remote version cable specification	• 6 × 0.38 mm² (PVC cable with common shield and individually shielded cores • Conductor resistance: ≤ 50 Ω/km (≤0.015 Ω/ft) • Capacitance: core/shield: ≤ 420 pF/m (≤128 pF/ft) • Cable length: max. 20 m (65 ft) • Permanent operating temperature: max. +105 ℃ (+221 ℉) 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.

Performance characteristics

Reference operating conditions	• Error limits following ISO/DIN 11631 • Water, typically +15 to +45 ℃ (+59 to +113 ℉); 2 to 6 bar (29 to 87 psi) • Data according to calibration protocol • Accuracy based on accredited calibration rigs according to ISO 17025 To obtain measured errors, use the Applicator sizing tool *Applicator*: → 🖹 32.

Maximum measured error	o.r. = of reading; 1 g/cm³ = 1 kg/l; T = fluid temperature
	
	Base accuracy
	
	Mass and volume flow (liquids)
	
	• ±0.05% o.r. (PremiumCal, for mass flow)
	• ±0.10% o.r.
	
	Mass flow (gases)
	
	±0.35%
	
	Density (liquids)
	
	• Reference conditions: ±0.0005 g/cm³
	• Field density calibration: ±0.0005 g/cm³
	  (valid after a field density calibration under process conditions)
	• Standard density calibration: ±0.01 g/cm³
	  (valid over the entire measuring range and density range → 🖹 15)
	• Special density calibration: ±0.001 g/cm³
	  (optional, valid range: +5 to +80 ℃ (+41 to +176 ℉) and 0.0 to 2.0 g/cm³)
	
	Temperature
	
	±0.5 ℃ ± 0.005 · T ℃ (±1 ℉ ± 0.003 · (T - 32) ℉)
	
	Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
350	14	137	5.03

Flow values

Flow values as turndown parameter.

SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
350	4100000	410000	205000	82000	41000	8200

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[in]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
14	150700	15070	7535	3014	1507	301.4

Accuracy of outputs

o.r. = of reading; o.f.s. = of full scale value

The output accuracy must be factored into the measured error if analog outputs are used, but can be ignored for fieldbus outputs (e.g. Modbus RS485, EtherNet/IP).

Current output

Accuracy: Max. ±0.05 % o.f.s. or ±5 µA

Pulse/frequency output

Genauigkeit: Max. ±50 % ppm o.r.

Repeatability	o.r. = of reading; 1 g/cm^3= 1 kg/l; T = fluid temperature Design fundamentals → 🕮 11. **Base repeatability** **Mass flow and volume flow (liquids)** • ±0.025% o.r. (PremiumCal, for mass flow) • ±0.05% o.r. **Mass flow (gases):** ±0.25% o.r. **Density (liquids)** ±0.00025 g/cm^3 **Temperature** ±0.25 ℃ ± 0.0025 · T ℃ (±0.45 ℉ ± 0.0015 · (T − 32) ℉)
Response time	• The response time depends on the configuration (damping). • Response time in the event of erratic changes in the measured variable (only mass flow): after 100 ms 95 % of the full scale value.
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/℃ (±0.0001% of the full scale value / ℉).

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		
[mm]	[in]	[% o.r./bar]
350	14	-0.009

Design fundamentals

o.r. = of reading
BaseAccu = base accuracy in % o.r.
BaseRepeat = base repeatability in % o.r.
MeasValue = measured value (in flow units consistent with the zero point stability value → 🕮 9)
ZeroPoint = zero point stability

Calculation of the maximum measured error depending on flowrate

Flowrate (in flow units consistent with the zero point stability value → 🕮 9)	Maximum measured error in % o.r.
$\geq \dfrac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ A0021332	$\pm\, \text{BaseAccu}$ A0021339
$< \dfrac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ A002133	$\pm\, \dfrac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021334

Calculation of the repeatability depending on flowrate

Flowrate (in flow units consistent with the zero point stability value → 🕮 9)	Repeatability in % o.r.
$\geq \dfrac{\frac{1}{2} \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021335	$\pm\, \text{BaseRepeat}$ A0021340
$< \dfrac{\frac{1}{2} \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ A0021336	$\pm\, \frac{1}{2} \cdot \dfrac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ A0021337

Example for maximum measured error
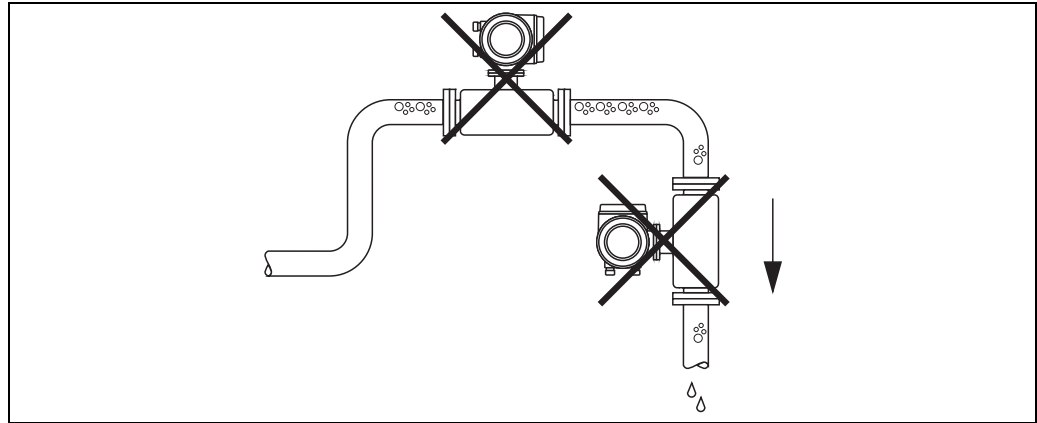

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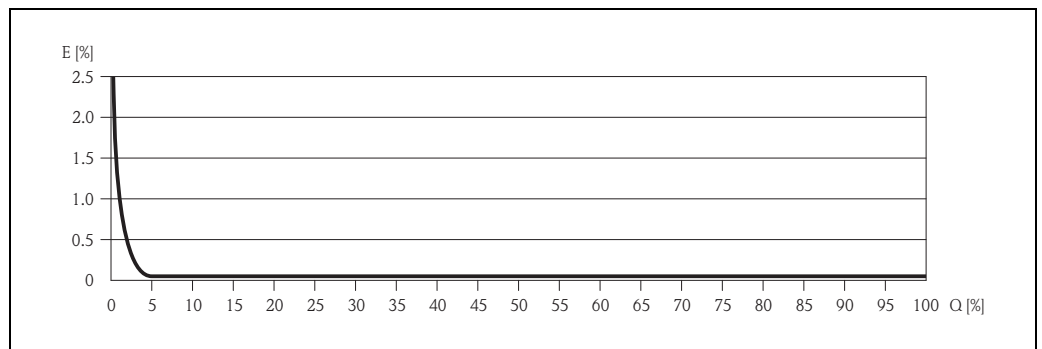
E = Error: Maximum measured error as % o.r.

Q = Flow rate as %

Installation

Mounting location

Entrained air or gas bubbles in the measuring tube can result in an increase in measuring errors. **Avoid** the following mounting locations in the pipe:
- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream from a free pipe outlet in a vertical pipeline

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Notwithstanding the above, the installation proposal below permits installation in an open vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.
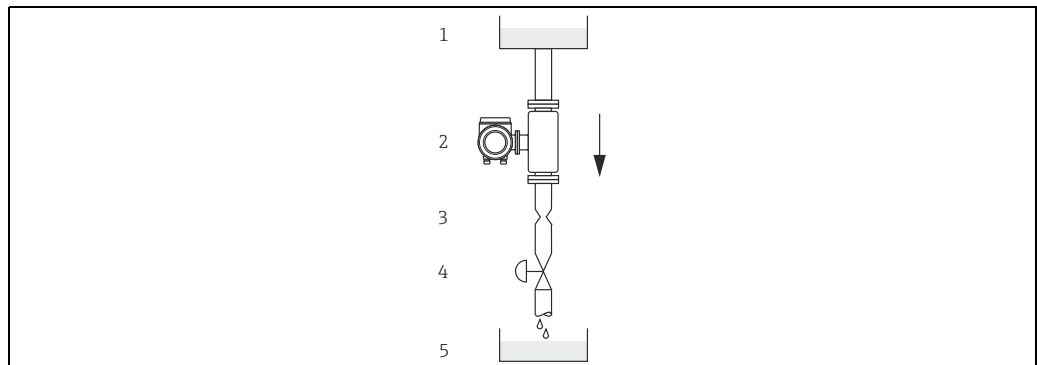
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Installation in a down pipe (e.g. for batching applications)

1 = Supply tank, 2 = Sensor, 3 = Orifice plate, pipe restriction (see table on following page), 4 = Valve, 5 = Batching tank

DN		Ø Orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
350	14	210	8.27

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).
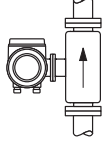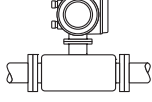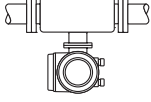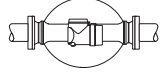
Orientation	Vertical	Horizontal, Transmitter head up	Horizontal, Transmitter head down	Horizontal, Transmitter head to the side
	Fig. V a0004572	*Fig. H1* a0004576	*Fig. H2* a0004580	*Fig. H3* A0015824
Compact version	✔✔	✔✔	✔✔	✔ [1]
Remote version	✔✔	✔✔	✔✔	✔ [1]

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

[1] = When using a bent measuring tube and horizontal installation, the position of the sensor has to be matched to the fluid properties:
- Conditionally for fluids with entrained solids. Risk of solids accumulating!
- Conditionally for outgassing fluids. Risk of air accumulating!

Vertical (Fig. V)

Recommended orientation with upward direction of flow (Fig. 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 (Fig. H1, H2)

The measuring tubes must be horizontal and beside each other. When installation is correct the transmitter housing is above or below the pipe (Fig. H1, H2).

Installation instructions

Note the following points:
- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument, for example the secondary containment.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations.
- No special precautions need to be taken for fittings which create turbulence (valves, elbows, T-pieces, etc.), as long as no cavitation occurs.
- For mechanical reasons and to protect the pipe, support is recommended for heavy sensors.

Inlet and outlet runs

There are no installation requirements regarding inlet and outlet runs.

Length of connecting cable

max. 20 m (65 ft), remote version

Special mounting instructions

Rupture disk

Make sure that the function and operation of the rupture disk is not impeded through the installation of the device. The position of the rupture disk is indicated on a sticker beside it. For additional information that is relevant to the process (→ 🕮 16).

The existing connecting nozzles are not designed for a rinse or pressure monitoring function.
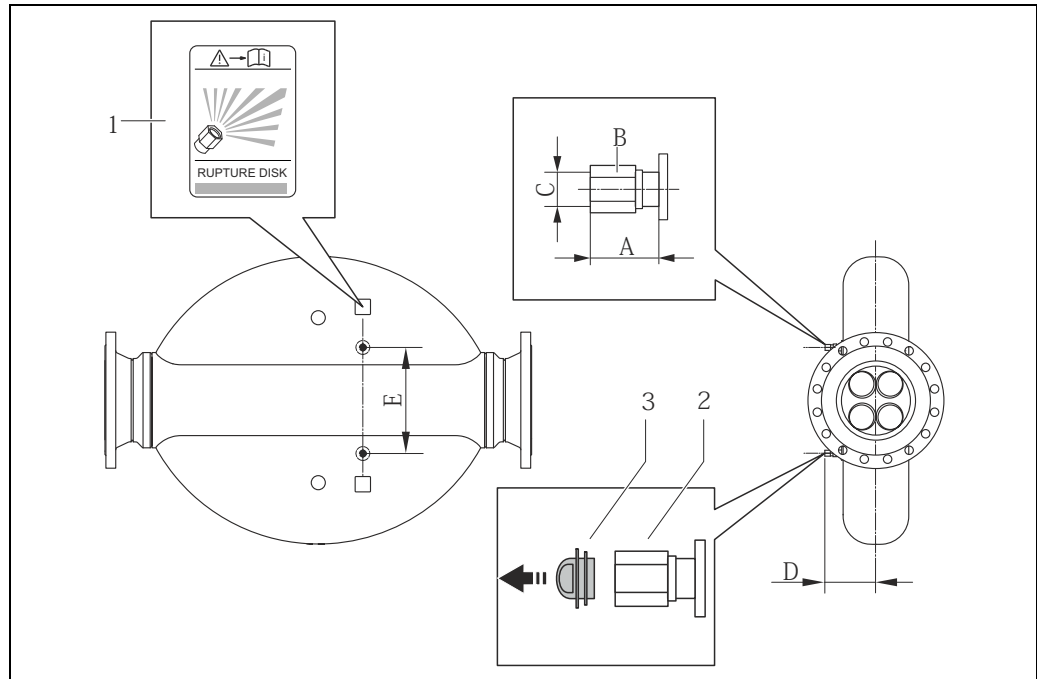
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1   *Indication label for the rupture disk*

2   *½" NPT internal screw thread with 1" width across flat*

3   *Transport protection*

DN		A		B	C	D		E	
[mm]	[in]	[mm]	[in]			[mm]	[in]	[mm]	[in]
350	14	approx. 42	approx. 1.65	SW 1"	1/2" NPT	approx. 220	approx. 8.66	547	21.53

Zero point adjustment

All measuring devices are calibrated to state-of-the-art technology. Calibration takes place under reference operating conditions → ▤ 9. Consequently, the zero point adjustment is generally not necessary.

Experience shows that the zero point adjustment is advisable only in special cases:
• To achieve highest measuring accuracy also with small flow rates
• Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

Environment

Ambient temperature range	Sensor and transmitter • Standard: −20 to +60 °C (−4 to +140 °F) • Optional: −40 to +60 °C (−40 to +140 °F) ✎ Note! • Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions. • At ambient temperatures below −20 °C (−4 °F) the readability of the display may be impaired.
Storage temperature	−40 to +80 °C (−40 to +175 °F), preferably +20 °C (+68 °F)
Degree of protection	Standard: IP 67 (NEMA 4X) for transmitter and sensor

Shock resistance	In accordance with IEC 60068-2-31

Vibration resistance	Acceleration up to 1 g, 10 to 150 Hz, following IEC 60068-2-6

Electromagnetic compatibility (EMC)	To IEC/EN 61326 and NAMUR Recommendation NE 21

Process

Medium temperature range	**Sensor**
	−50 to +180 °C (−58 to +356 °F)

Fluid density range	0 to 5000 kg/m^3 (0 to 312 lb/ft^3)

Medium pressure range (nominal pressure)	**Flanges**

• according to DIN PN 10 to 100
• according to ASME B16.5 Cl 150, Cl 300, Cl 600

Secondary containment pressure rating

The sensor housing is filled with dry nitrogen and protects the electronics and mechanics inside.

Pressure rating according to ASME BPVC

DN		Secondary containment rating (designed with a safety factor ≥ 4)		Burst pressure of secondary containment	
[mm]	[in]	[bar]	[psi]	[bar]	[psi]
350	14	6	87	28	415

✎ Note!
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 as standard. 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 gas detection (dimensions → 🕮 28).

Do not open the purge connections unless the containment can be filled immediately with a dry inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar (72.5 psi).

If a device equipped with purge connections is connected to the purge system, the maximum pressure rating is defined by the purge system itself or the device, whichever is lower.
If the device is equipped with a rupture disk, the maximum pressure rating is defined by the rupture disk properties (→ 🕮 16).

Pressure-temperature ratings

⚠️ Warning!
The following pressure-temperature ratings refer to the entire sensor and not just the process conection.

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

Flange material: 1.4404 (F316/F316L)
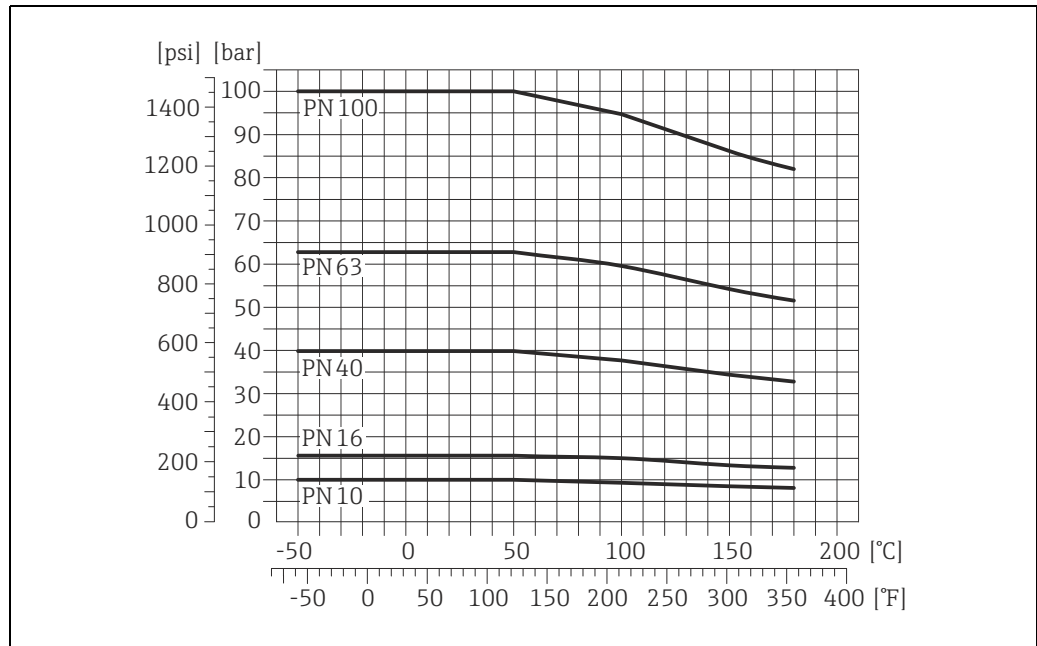
A0021035-EN

Flange connection according to ASME B16.5

Flange material: 1.4404 (F316/F316L)

A0021179-EN

Rupture disk

To increase the level of safety, a device version with a rupture disk with a triggering pressure of 5.5 to 6.5 bar (80 to 94 psi) can be used. Special mounting instructions: (→ 🖺 13).

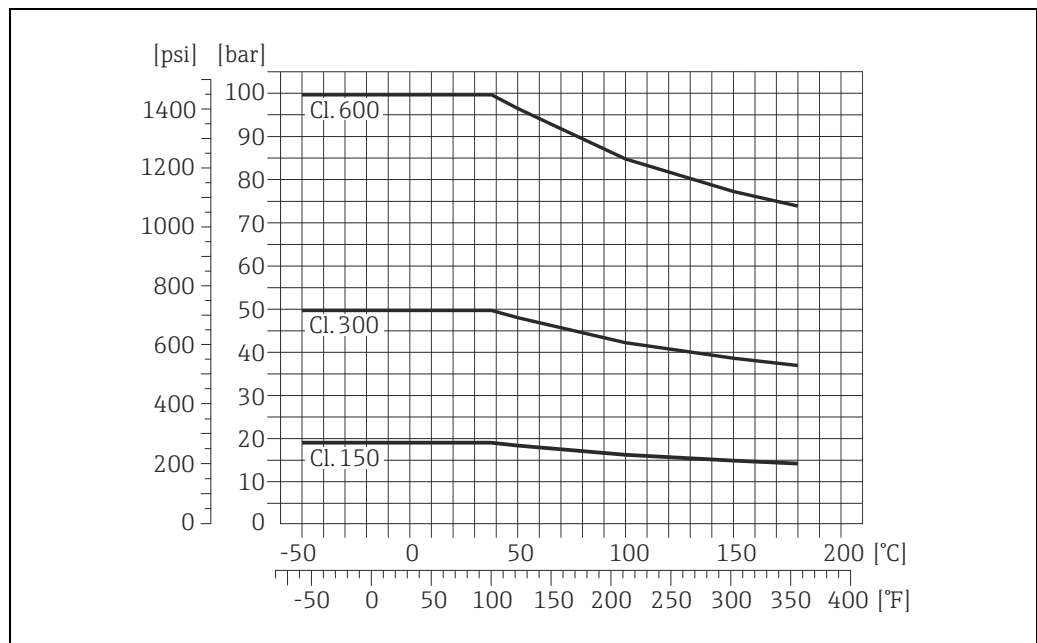|	
Limiting flow	See information in the "Measuring range" Section → 🖺 4
	Select nominal diameter by optimizing between required flow range and permissible pressure loss. An overview of max. possible full scale values can be found in the "Measuring range" Section.
	• The minimum recommended full scale value is approx. 1/20 of the max. full scale value.
	• In most applications, 20 to 50% of the maximum full scale value can be considered ideal.
	• Select a lower full scale value for abrasive substances such as fluids with entrained solids (flow velocity <1 m/s (<3 ft/s)).
	• For gas measurement the following rules apply:
	– Flow velocity in the measuring tubes should not be more than half the sonic velocity (0.5 Mach).
	– The maximum mass flow depends on the density of the gas: formula → 🖺 4
Pressure loss	To calculate the pressure loss, use the *Applicator* sizing tool (→ 🖺 31).
System pressure	It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.
	In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapor pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.
	For this reason, the following mounting locations are preferred:
	• Downstream from pumps (no risk of partial vacuum)
	• At the lowest point in a vertical pipe
Heating	Some fluids require suitable measures to avoid loss of heat at the sensor. Heating can be electric, e.g. with heated elements, or by means of hot water or steam pipes made of copper or heating jackets.

Caution!
- Risk of electronics overheating! Make sure that the maximum permissible ambient temperature for the transmitter is not exceeded. Consequently, make sure that the adapter between sensor and transmitter and the connection housing of the remote version always remain free of insulating material. Note that a certain orientation might be required, depending on the fluid temperature → 🖺 13.
- When using electrical heat tracing whose heat is regulated using phase control or by pulse packs, it cannot be ruled out that the measured values are influenced by magnetic fields which may occur, (i.e. at values greater than those permitted by the EC standard (Sinus 30 A/m)). In such cases, the sensor must be magnetically shielded.
  The secondary containment can be shielded with tin plates or electric sheets without privileged direction (e.g. V330-35A) with the following properties:
  – Relative magnetic permeability $\mu_r \geq 300$
  – Plate thickness $d \geq 0.35$ mm ($d \geq 0.01"$)
- Information on permissible temperature ranges → 🖺 15
- Especially under critical climatic conditions it has to be ensured that the temperature difference between environment and measured medium does not exceed 100K. Suitable measures, such as heating or thermal insulation, are to be taken.

Custody transfer measurement

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

Custody transfer variables
- Mass flow
- Volume flow
- Density

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

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

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

Approval for custody transfer

The requirements of the following legal metrology authorities are taken into consideration:
- **PTB**, Germany; (www.eichamt.de)
- **NMi**, Netherlands; (www.nmi.nl)
- **METAS**, Switzerland; (www.metas.ch)
- **BEV**, Austria; (www.bev.gv.at)
- **NTEP**, USA; (www.ncwm.net)
- **MC**, Canada; (www.ic.gc.ca)

Switching on the power supply in custody transfer mode

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

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

Verification (Example)

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

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

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

Setting up custody transfer mode

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

Stamp points
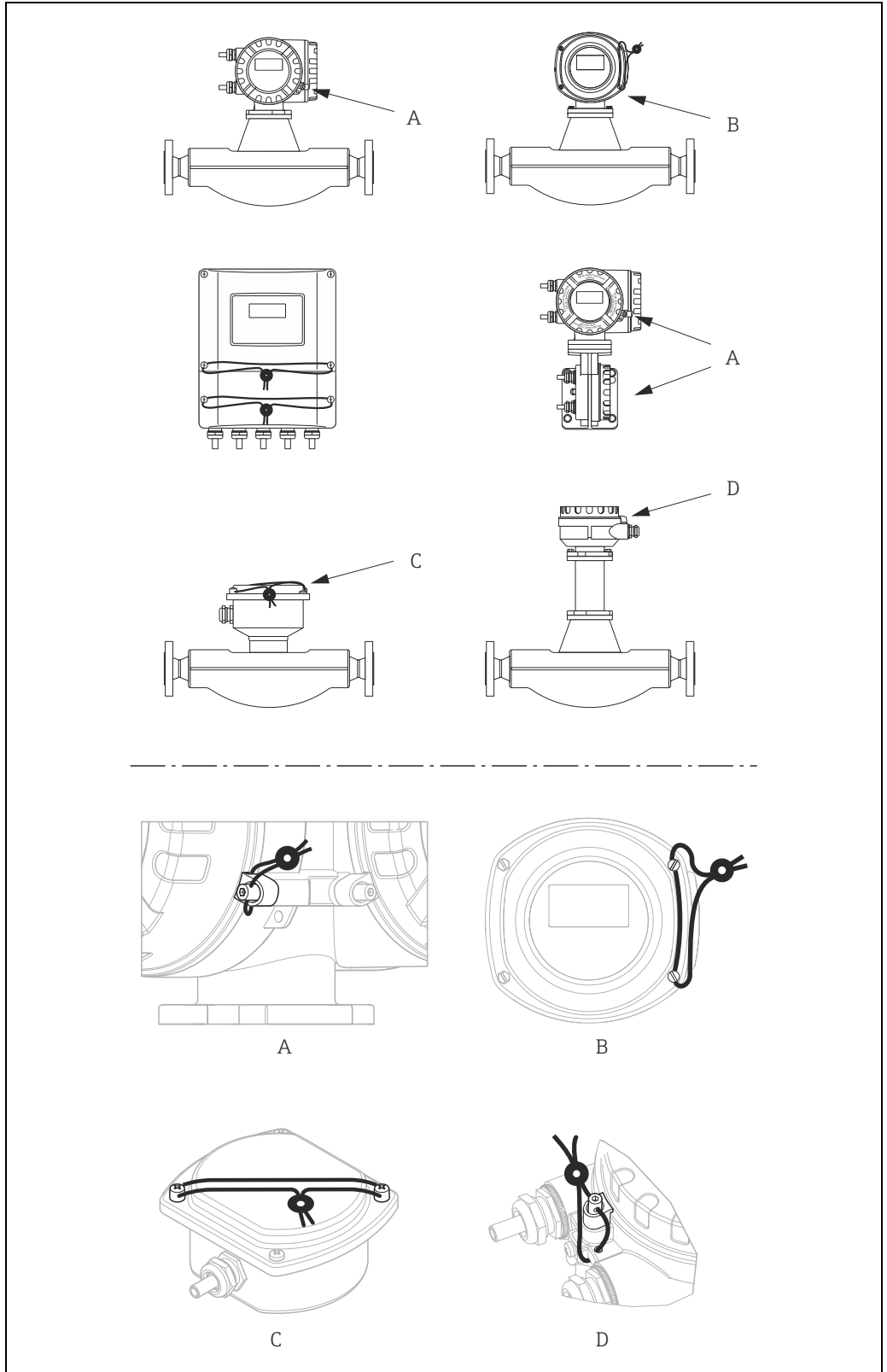
Examples of how to seal the various device versions.

Disabling custody transfer mode

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

Mechanical construction

Design, dimensions

Dimensions	
Field housing compact version, powder-coated die-cast aluminum and stainless steel	→ 🖺 21
Transmitter remote version, connection housing (II2G/Zone 1)	→ 🖺 22
Transmitter remote version, wall-mount housing (non Ex-zone and II3G/Zone 2)	→ 🖺 23
Sensor remote version, connection housing	→ 🖺 24
Process connections in SI units	
Flange connections EN (DIN)	→ 🖺 25
Flange connections ASME B16.5	→ 🖺 26
Process connections in US units	
Flange connections ASME B16.5	→ 🖺 27
Purge connections / secondary containment monitoring	→ 🖺 28

Field housing compact version, powder-coated die-cast aluminum and stainless steel
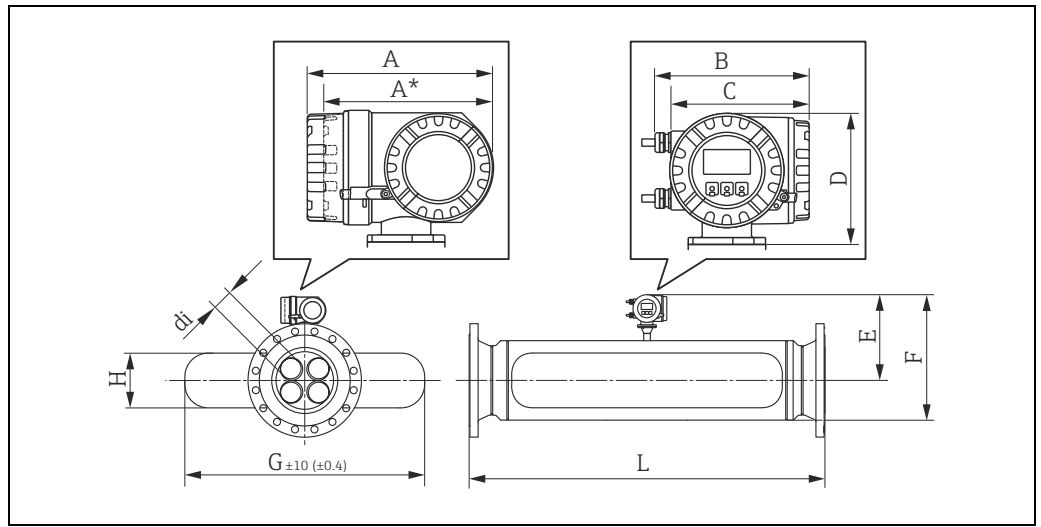
Dimension unit in mm (in)

Dimensions in SI units and US units for powder-coated die-cast aluminum

DN	A	A*	B	C	D	E	F	G	H	L	di
350	227	207	187	168	160	445	585	1230	280	1)	102,26

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

DN	A	A*	B	C	D	E	F	G	H	L	di
14"	8.94	8.15	7.68	6.61	6.30	17.52	23.03	48.42	11.02	1)	4.03

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

Dimensions in SI units and US units for stainless steel (II2G/Zone 1)

DN	A	A*	B	C	D	E	F	G	H	L	di
350	240	217	206	186	178	448	585	1230	280	1)	102,26

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

DN	A	A*	B	C	D	E	F	G	H	L	di
14"	8.94	8.15	7.68	6.61	6.30	17.52	23.03	48.42	11.02	1)	4.03

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

✎ Note!
Dimensions for remote version II2G/Zone 1 → 🖹 22

Transmitter remote version, connection housing (II2G/Zone 1)
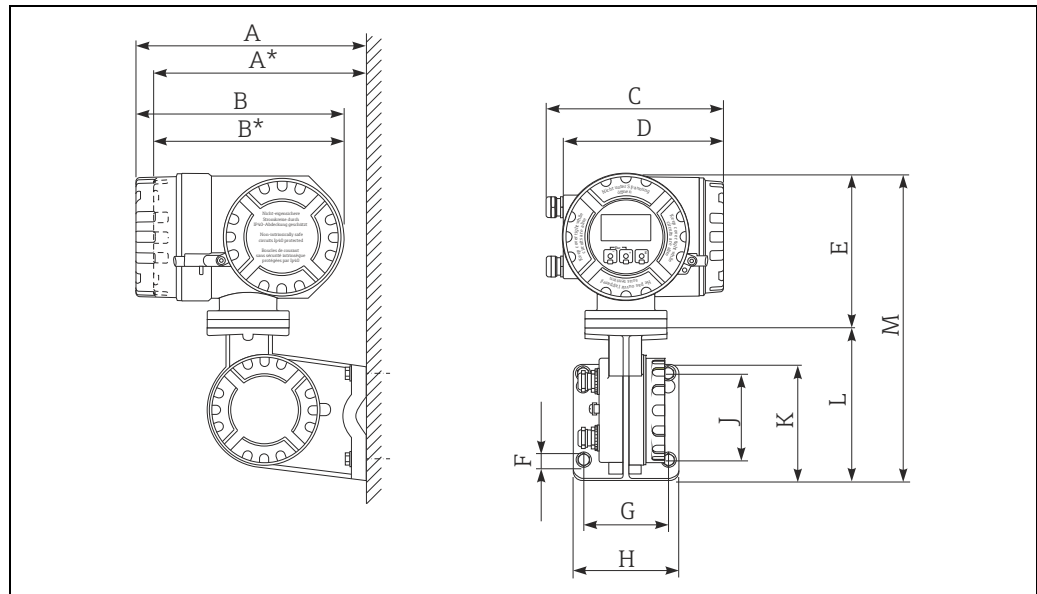
a0002128

Dimensions in SI units

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

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

Dimensions in US units

A	A*	B	B*	C	D	E	F Ø	G	H	J	K	L	M
10.4	9.53	9.45	8.54	8.11	7.32	7.01	0,34 (M8)	3.94	5.12	3.94	5.67	6.69	13.7

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

Transmitter remote version, wall-mount housing (non Ex-zone and II3G/Zone 2)
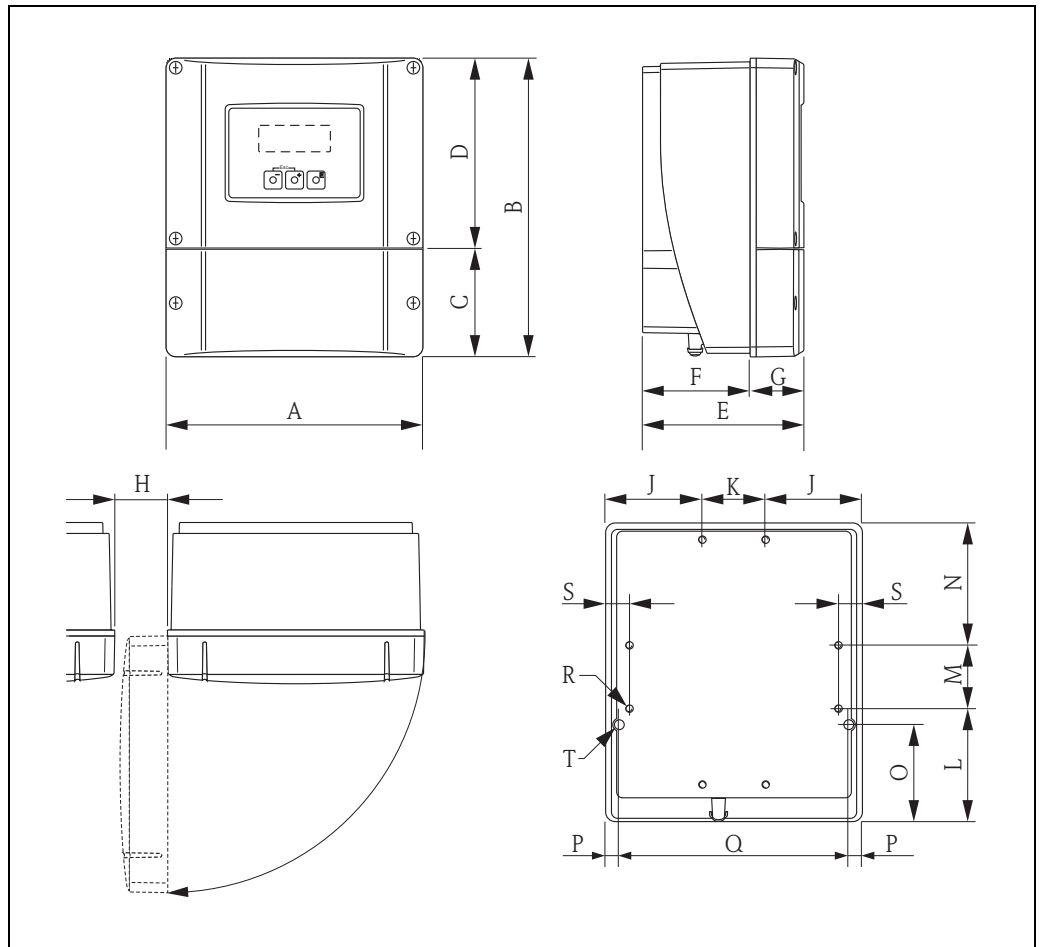
a0001150

Dimensions in SI units

A	B	C	D	E	F	G	H	J	K
215	250	90.5	159.5	135	90	45	>50	81	53
L	M	N	O	P	Q	R	S	T [1]	
95	53	102	81.5	11.5	192	8 × M5	20	2 × Ø6.5	

[1] Fixing bolt for wall assembly: M6 (screw head max. 10.5 mm)
All dimensions in [mm]

Dimensions in US units

A	B	C	D	E	F	G	H	J	K
8.46	9.84	3.56	6.27	5.31	3.54	1.77	>1.97	3.18	2.08
L	M	N	O	P	Q	R	S	T [1]	
3.74	2.08	4.01	3.20	0.45	7.55	8 × M5	0.79	2 × Ø0.26	

[1] Fixing bolt for wall assembly: M6 (screw head max. 0.41 inch)
All dimensions in [in]

Sensor remote version, connection housing
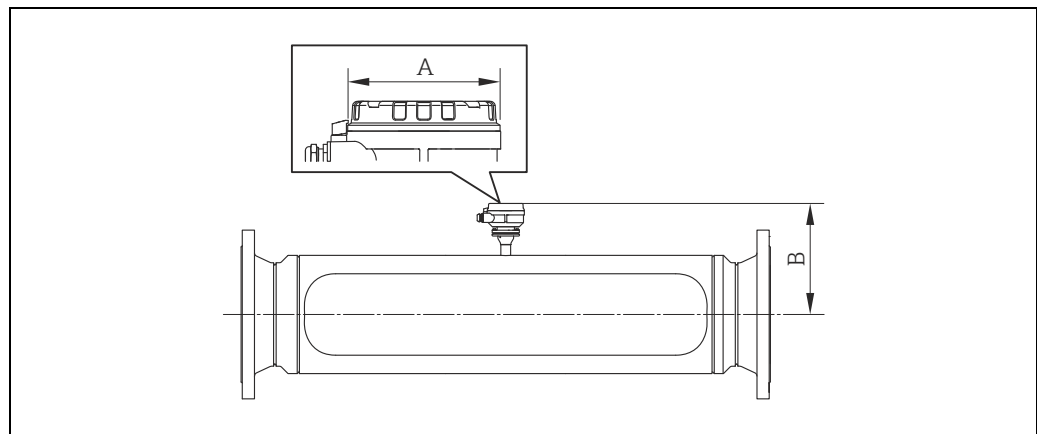
A0015436

Dimensions in SI units

DN	A	B
350	129	389

All dimensions in [mm]

Dimensions in US units

DN	A	B
14"	5.08	15.31

All dimensions in [in]

Process connections in SI units

Flange connections EN (DIN), ASME B16.5

A0015431
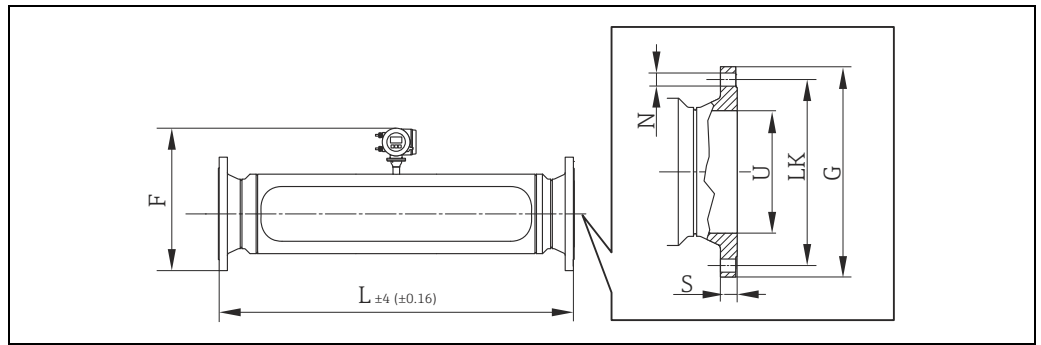
Dimension unit in mm (in)

Flange connections EN (DIN)

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) / PN 10: 1.4404 (F316/F316L)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm							
DN	F	L	G	N	S	LK	U
300	665.8	1707	445	12 x Ø22	26	400	309.7
350	695.8	1707	505	16 x Ø22	26	460	341.4
400	725.8	1716	565	16 x Ø26	26	515	392.2

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) / PN 16: 1.4404 (F316/F316L)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm							
DN	F	L	G	N	S	LK	U
300	673.3	1727	460	12 x Ø26	28	410	309.7
350	703.3	1734	520	16 x Ø26	30	470	339.6
400	733.3	1741	580	16 x Ø30	32	525	390.4

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) / PN 40: 1.4404 (F316/F316L)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm							
DN	F	L	G	N	S	LK	U
300	700.8	1800	515	16 x Ø33	42	450	307.9
350	733.3	1818	580	16 x Ø36	46	510	338.0
400	733.3	1836	660	16 x Ø39	50	585	384.4

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) / PN 63: 1.4404 (F316/F316L)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm							
DN	F	L	G	N	S	LK	U
300	708.3	1844	530	16 x Ø36	52	460	301.9
350	743.3	1863	600	16 x Ø39	56	525	330.6
400	778.3	1880	670	16 x Ø42	60	585	378.0

All dimensions in [mm]

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) / PN 100: 1.4404 (F316/F316L)							
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 μm							
DN	F	L	G	N	S	LK	U
300	735.8	1901	585	16 x Ø42	68	500	295.5
350	770.8	1936	655	16 x Ø48	74	560	323.6
400	800.8	1936	715	16 x Ø48	82.2	620	364.9

All dimensions in [mm]

Flange connections ASME B16.5

Flange according to ASME B16.5 / Cl 150: 1.4404 (F316/F316L)								
Surface roughness (flange): Ra 3.2 to 6.3 μm								
DN		F	L	G	N	S	LK	U
300	12"	684.6	1794	482.6	12 x Ø25.4	32.2	431.8	304.8
350	14"	710.0	1820	533.4	16 x Ø28.4	35.5	476.3	336.5
400	16"	741.8	1820	596.9	16 x Ø28.4	37.0	539.8	387.3

All dimensions in [mm]

Flange according to ASME B16.5 / Cl 300: 1.4404 (F316/F316L)								
Surface roughness (flange): Ra 3.2 to 6.3 μm								
DN		F	L	G	N	S	LK	U
300	12"	703.7	1826	520.7	16 x Ø31.8	51.3	450.9	304.8
350	14"	735.4	1852	584.2	16 x Ø31.8	54.4	514.4	336.5
400	16"	767.2	1858	647.7	16 x Ø35.1	57.6	571.5	387.3

All dimensions in [mm]

Flange according to ASME B16.5 / Cl 600: 1.4404 (F316/F316L)								
Surface roughness (flange): Ra 3.2 to 6.3 μm								
DN		F	L	G	N	S	LK	U
300	12"	722.7	1875	558.8	20 x Ø35.1	73.7	489.0	288.8
350	14"	745.0	1891	603.3	20 x Ø38.1	77.0	527.1	317.5
400	16"	786.2	1912	685.8	20 x Ø41.1	83.2	603.3	363.3

All dimensions in [mm]

Process connections in US units
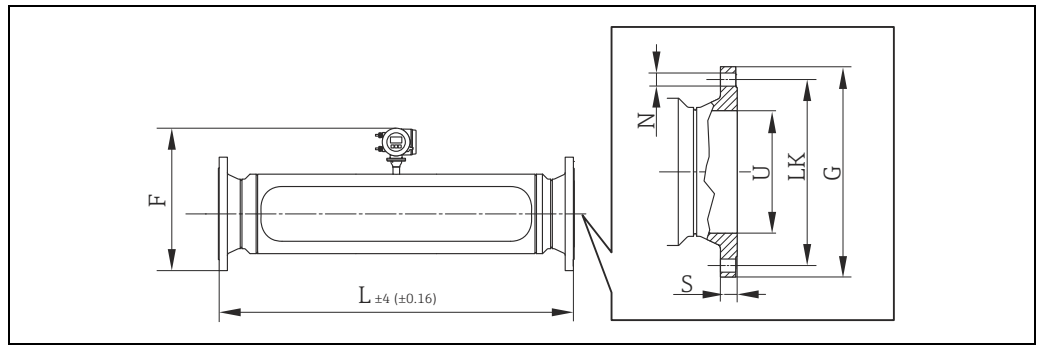
Flange connections ASME B16.5

Dimension unit in mm (in)

Flange according to ASME B16.5 / Cl 150: 1.4404 (F316/F316L)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	F	L	G	N	S	LK	U
12"	26.95	70.63	19.00	12 x Ø1.00	1.27	17.00	12.00
14"	27.95	71.65	21.00	16 x Ø1.12	1.40	18.75	13.25
16"	29.20	71.65	23.50	16 x Ø1.12	1.46	21.25	15.25

All dimensions in [in]

Flange according to ASME B16.5 / Cl 300: 1.4404 (F316/F316L)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	F	L	G	N	S	LK	U
12"	27.70	71.89	20.50	16 x Ø1.25	2.02	17.75	12.00
14"	28.95	72.91	23.00	16 x Ø1.25	2.14	20.25	13.25
16"	30.20	73.15	25.50	16 x Ø1.38	2.27	22.50	15.25

All dimensions in [in]

Flange according to ASME B16.5 / Cl 600: 1.4404 (F316/F316L)							
Surface roughness (flange): Ra 3.2 to 6.3 µm							
DN	F	L	G	N	S	LK	U
12"	28.45	73.82	22.00	20 x Ø1.38	2.90	19.25	11.37
14"	29.33	74.45	23.75	20 x Ø1.50	3.03	20.75	12.50
16"	30.95	75.28	27.00	20 x Ø1.62	3.28	23.75	14.30

All dimensions in [in]

Purge connections / secondary containment monitoring
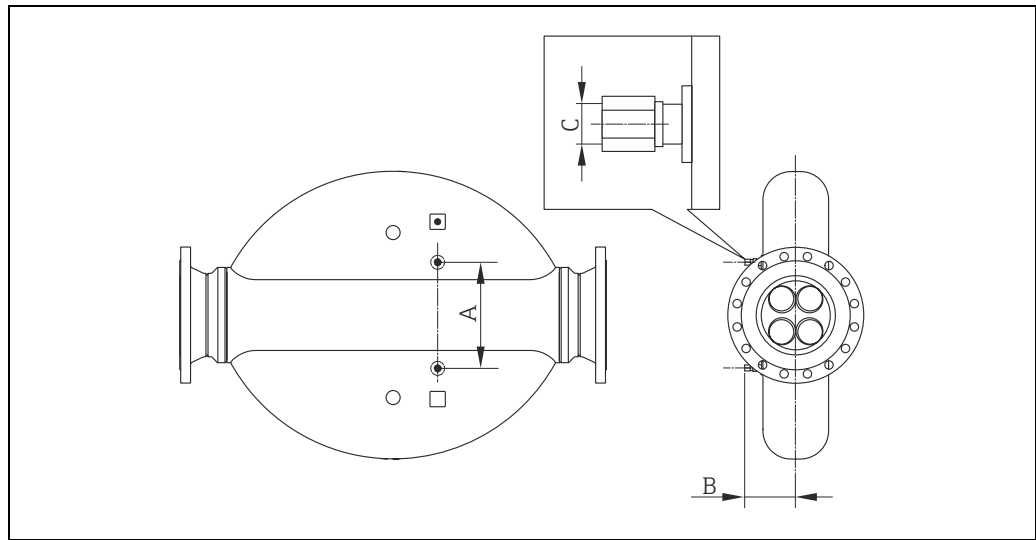
A0015430

DN		A		B		C
[mm]	[in]	[mm]	[in]	[mm]	[in]	
350	14	547	21.53	182	7.17	1/2" NPT

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

	[kg]	[lbs]
Compact version	555	1224
Compact version Ex d	564	1244
Remote version	553	1219

[1] with 12" Cl 150 flanges according to ASME B16.5

Material

Transmitter housing

Compact version
- Stainless steel housing Ex d: stainless steel 1.4404/CF3M
- Powder coated die-cast aluminum
- Window material: Glass

Remote version
- Remote field housing: powder coated die-cast aluminum
- Wall-mount housing: powder coated die-cast aluminum
- Window material: Glass

Sensor housing / containment

- Acid and alkali-resistant outer surface
- Stainless Steel 1.4404 (316L)

Connection housing, sensor (remote version)

- Powder coated die-cast aluminum

Process connections

1.4404 (F316/F316L)

Measuring tubes

Stainless Steel 1.4404 (316/316L)

Process connections	• Flanges according to EN 1092-1 (DIN 2501) • Flanges according to ASME B16.5

Operability

Local operation	**Display elements** • Liquid-crystal display: backlit and four lines with 16 characters per line • Selectable display of different measured values and status variables • At ambient temperatures below −20 °C (−4 °F) the readability of the display may be impaired. **Operating elements** • Local operation with three optical keys (⊟ ⊞ Ⓔ) • Application-specific Quick Setup menus for straightforward commissioning
Language group	Language groups available for operation in different countries: • Western Europe and America (WEA): English, German, Spanish, Italian, French, Dutch and Portuguese • Eastern Europe/Scandinavia (EES): English, Russian, Polish, Norwegian, Finnish, Swedish and Czech • South and Eastern Asia (SEA): English, Japanese, Indonesian • China (CN): English, Chinese The language group is changed using the "FieldCare" operating program.
Remote operation	Remote operation via HART, Modbus RS485

Certificates and approvals

CE mark	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick symbol	The measuring system complies with the EMC requirements of the "Australian Communications and Media Authority (ACMA)"
Ex approval	Information about currently available Ex versions (ATEX, FM, CSA, IECEx, NEPSI) can be supplied by your Endress+Hauser Sales Center on request. All explosion protection data are contained in separate explosion protection documentation which you can order if required.
Modbus certification	The measuring device meets all the requirements of the Modbus/TCP conformity and integration test and has the "Modbus/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "Modbus/TCP Conformance Test Laboratory" of the University of Michigan.

Pressure equipment directive	The measuring devices can be ordered with or without PED (Pressure Equipment Directive). If a device with PED is required, this must be ordered explicitly.

- With the identification PED/G1/III on the sensor nameplate, Endress+Hauser confirms conformity with the "Basic safety requirements" of Appendix I of the Pressure Equipment Directive 97/23/EC.
- Devices with this identification (with PED) are suitable for the following types of fluid:
  - Fluids of Group 1 and 2 with a steam pressure of greater than, or smaller and equal to 0.5 bar (7.3 psi)
  - Unstable gases
- Devices without this identification (without PED) are designed and manufactured according to good engineering practice. They correspond to the requirements of Art. 3, Section 3 of the Pressure Equipment Directive 97/23/EC. Their application is illustrated in Diagrams 6 to 9 in Appendix II of the Pressure Equipment Directive 97/23/EC.

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

Measuring Instruments Directive

Measuring Instruments Directive 2004/22/EG (MID)

Annex MI-002 (gas meter)

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

Annex MI-005 (liquids other than water)

- This flowmeter which is a suitable component in measuring systems subject to legal metrology controls in accordance with Annex MI-005 of the European Measuring Instruments Directive 2004/22/EC (MID)
  Note: According to the Measuring Instruments Directive, however, only the complete measuring system is licensable, covered by an EC type-examination certificate and bears conformity marking.
- This flowmeter is qualified to OIML R117-1 and has an MID Evaluation Certificate (1) which confirms compliance with the essential requirements of the Measuring Instruments Directive. The Evaluation Certificate results from the WELMEC (cooperation between the legal metrology services of the member states of the European Union and EFTA) towards voluntary modular approval for measuring systems in accordance with Annex MI-005 (measuring systems for the continuous and dynamic measurement of quantities of liquids other than water) of the Measuring Instruments Directive 2004/22/EC.

Approval for custody transfer

Promass 84 is a flowmeter suitable for custody transfer measurement for liquids (other than water) and for fuel gases. The requirements of the following test centres are taken into consideration:
- PTB, Germany
- NMi, The Netherlands
- METAS, Switzerland
- BEV, Austria
- NTEP, USA
- MC, Canada

Information on custody transfer measurement → 📖 18

Suitability for custody transfer measurement

MID approval, Annex MI-002 (gas meter)

The device is qualified to OIML R137/D11.

Sensor	DN		MID Type Examination Certificate MI-002 (Europe)		
			Fuel gases up to 100 bar (1450 psi)		
Promass	[mm]	[in]	Mass	Volume	Density
X	350	14	YES	*	NO

* at pure gases only (invariable gas density)

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

The device is qualified to OIML R117-1.

Sensor	DN		OIML R117-1/MID Evaluation Certificate (Europe)		
			Liquids other than water		
Promass	[mm]	[in]	Mass	Volume	Density
X	350	14	YES	YES	YES

Other standards and guidelines	• EN 60529
	  Degrees of protection by housing (IP code)
	
	• IEC/EN 60068-2-6
	  Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal)
	
	• IEC/EN 60068-2-31
	  Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices
	
	• EN 61010-1
	  Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures
	
	• IEC/EN 61326
	  "Emission in accordance with Class A requirements". Electromagnetic compatibility (EMC requirements)
	
	• NAMUR NE 21
	  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
	
	• NAMUR NE 43
	  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal
	
	• NAMUR NE 53
	  Software of field devices and signal-processing devices with digital electronics
	
	• NACE MR 103
	  Materials resistant to sulfide stress cracking in corrosive petroleum refining environments
	
	• NACE MR 0175/ISO 15156-1
	  Materials for use in H2S-containing Environments in Oil and Gas Production

Ordering Information

Detailed ordering information is available from the following sources:
• In the Product Configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
• From your Endress+Hauser Sales Center: www.endress.com/worldwide

✎ Note!
Product Configurator - the tool for individual product configuration
• Up-to-the-minute configuration data
• Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
• Automatic verification of exclusion criteria
• Automatic creation of the order code and its breakdown in PDF or Excel output format
• Ability to order directly in the Endress+Hauser Online Shop

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

For the Transmitter

Accessories	Description
Mounting set for transmitter	Mounting set for wall-mount housing (remote version). Suitable for: – Wall mounting – Pipe mounting – Installation in control panel Mounting set for aluminum field housing: Suitable for pipe mounting (3/4" to 3")

Communication-specific accessories

Accessories	Description
HART Communicator Field Xpert handheld terminal	Handheld terminal for remote parameterization and for obtaining measured values via the current output HART (4 to 20 mA). Contact your Endress +Hauser representative for more information.
Commubox FXA195 HART	The Commubox FXA195 connects intrinsically safe smart transmitters with the HART protocol with the USB port of a personal computer. This enables remote operation of the transmitter with operating software (e.g. FieldCare). Power is supplied to the Commubox via the USB port.

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: • Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections • Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: • Via the Internet: https://wapps.endress.com/applicator • On CD-ROM for local PC installation
W@M	Life cycle management for your plant. W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: • Via the Internet: www.endress.com/lifecyclemanagement • On CD-ROM for local PC installation
Fieldcheck	Tester/simulator for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.
FieldCare	FieldCare is Endress+Hauser's FDT-based plant asset management tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple but effective tool for monitoring devices. The Proline flowmeters are accessed via a service interface or via the service interface FXA193.
FXA193	Service interface from the measuring device to the PC for operation via FieldCare.

System components

Accessories	Description
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all the relevant process variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a DSD card or USB stick. Memograph M boasts a modular design, intuitive operation and a comprehensive security concept. The ReadWin® 2000 PC software is part of the standard package and is used for configuring, visualizing and archiving the data captured. The mathematics channels which are optionally available enable continuous monitoring of specific power consumption, boiler efficiency and other parameters which are important for efficient energy management.

Documentation

- Flow measuring technology (FA00005D)

- Operating Instructions/Description of Device Functions
  - Promass 84 HART (BA00109D/BA00110D)
  - Promass 84 Modbus (BA00129D/BA00130D)

- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, IECEx, NEPSI

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Modbus®
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