



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

# Proline Promass 830

## Coriolis Mass Flow Measuring System

The universal and multivariable flowmeter for liquids and gases



### Application

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

- Extremely accurate measurement of liquids and gases such as oils, lubricants, fuels, liquefied gases, solvents, and compressed gases
- Fluid temperatures up to +200 °C (+392°F)
- Process pressures up to 258.6 bar (3750 psi)
- Mass flow measurement up to 800 t/h (29400 lb/min)

Approvals for hazardous area:

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

Connection to all common process control systems:

- HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, MODBUS, EtherNet/IP

Relevant safety aspects:

- Secondary containment up to 16 bar (232 psi), Pressure Equipment Directive, AD 2000, SIL-2
- Purge connections or rupture disk

### Your benefits

The Promass measuring devices make it possible to simultaneously record several process variables (mass/density/temperature) for various process conditions during measuring operation.

The **Proline transmitter concept** comprises:

- Modular device and operating concept resulting in a higher degree of efficiency
- Software options for batching and concentration measurement for extended range of application
- Diagnostic ability and data back-up for increased process quality

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

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

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## Function and system design

### Measuring principle

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

$$F_C = 2 \cdot \Delta m (v \cdot \omega)$$

$F_C$  = Coriolis force

$\Delta m$  = moving mass

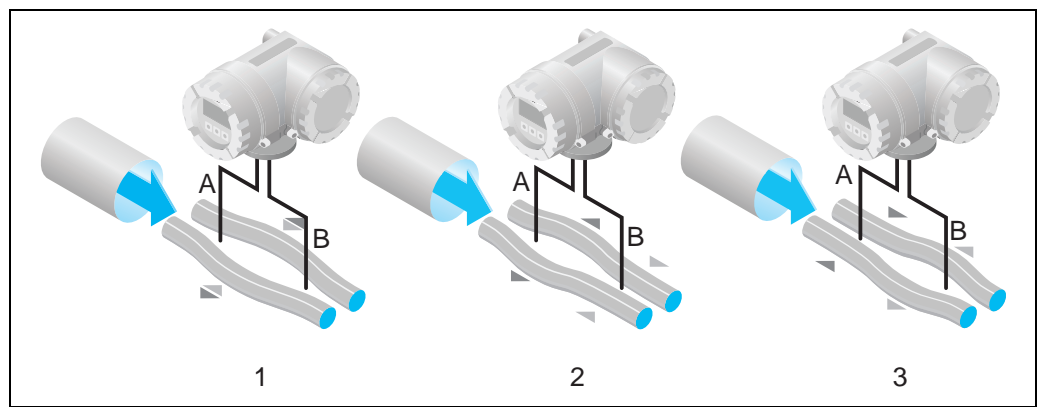
$\omega$  = rotational velocity

$v$  = velocity of the moving mass in a rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass  $\Delta m$ , its velocity  $v$  in the system, and thus on the mass flow. Instead of a constant angular velocity  $\omega$ , 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).



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

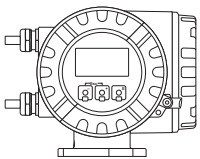
The temperature of the measuring tubes is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output.

**Measuring system**

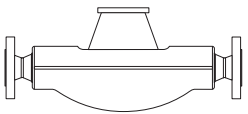
The measuring system consists of a transmitter and a sensor. Two versions are available:

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

**Transmitter**

<p><b>Promass 83</b></p>  <p style="text-align: right; font-size: small;">a0003672</p>	<ul style="list-style-type: none"> <li>■ Four-line liquid-crystal display</li> <li>■ Operation with "Touch control"</li> <li>■ Application-specific Quick Setup</li> <li>■ Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. fluid concentrations)</li> </ul>
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**Sensor Promass O**

 <p style="text-align: right; font-size: small;">a0003673</p>	<ul style="list-style-type: none"> <li>■ Universal sensor for fluid temperatures up to +200 °C (+392 °F).</li> <li>■ Nominal diameters DN 80 to 150 (3" to 6").</li> <li>■ Material: Stainless Steel <ul style="list-style-type: none"> <li>– 25Cr duplex EN 1.4410/ASTM UNS S32750 (superduplex)</li> <li>– EN1.4404/ASTM 316L</li> </ul> </li> </ul>
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**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]	[inch]	[kg/h]	[lb/min]
80	3	0 to 180000	0 to 6600
100	4	0 to 350000	0 to 12860
150	6	0 to 800000	0 to 29400

**Measuring ranges for gases**

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

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

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

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

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

DN		X
[mm]	[inch]	
80	3	110
100	4	130
150	6	200

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


*Calculation example for gas:*

- Sensor type: Promass O, DN 80
- Gas: air with a density of 60.3 kg/m<sup>3</sup> (at 20 °C and 50 bar)
- Measuring range (liquid): 180 000 kg/h
- x = 130 (for Promass O, DN 80)

Max. possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_{(G)} \div x \text{ [kg/m}^3\text{]} = 180\,000 \text{ kg/h} \cdot 60.3 \text{ kg/m}^3 \div 130 \text{ kg/m}^3 = 83\,500 \text{ kg/h}$$

*Recommended measuring ranges:*

See information in the "Limiting flow" Section →  18

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**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.

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**Input signal**

**Status input (auxiliary input)**

U = 3 to 30 V DC, R<sub>i</sub> = 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 PROFIBUS DP**

U = 3 to 30 V DC, R<sub>i</sub> = 3 kΩ, galvanically isolated.

Switch level: ±3 to ±30 V DC, independent of polarity.

Configurable for: 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<sub>i</sub> = 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<sub>L</sub> < 700 Ω, U<sub>out</sub> = 24 V DC, short-circuit proof
- Passive: 0/4 to 20 mA, R<sub>i</sub> = 150 Ω, U<sub>max</sub> = 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  $\mu$ A (o.r. = of reading)

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

#### Pulse/frequency output

active/passive selectable, galvanically isolated

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

#### PROFIBUS DP interface

- PROFIBUS DP in accordance with EN 50170 Volume 2
- Profile Version 3.0
- Data transmission rate: 9.6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Signal encoding: NRZ Code
- Function blocks: 6  $\times$  Analog Input, 3  $\times$  Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be configured via miniature switches or via the local display (optional)
- Available output combination  $\rightarrow$  9

#### PROFIBUS PA interface

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Data transmission rate:  
31.25 kBit/s
- Current consumption: 11 mA
- Permitted supply voltage: 9 to 32 V
- Bus connection with  
integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Signal encoding: Manchester II
- Function blocks: 6  $\times$  Analog Input, 3  $\times$  Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be configured via miniature switches or via the local display (optional)
- Available output combination  $\rightarrow$  9

#### 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  $\rightarrow$  9

**FOUNDATION Fieldbus interface**

- FOUNDATION Fieldbus H1, IEC 61158-2, galvanically isolated
- Data transmission rate: 31.25 kBit/s
- Current consumption: 12 mA
- Permitted supply voltage: 9 to 32 V
- Error current FDE (Fault Disconnection Electronic): 0 mA
- Bus connection with integrated reverse polarity protection
- Signal encoding: Manchester II
- ITK Version 5.01
- Function blocks:
  - 8 × Analog Input (Execution time: each 18 ms)
  - 1 × Digital Output (18 ms)
  - 1 × PID (25 ms)
  - 1 × Arithmetic (20 ms)
  - 1 × Input Selector (20 ms)
  - 1 × Signal Characterizer (20 ms)
  - 1 × Integrator (18 ms)
- Number of VCRs: 38
- Number of link objects in VFD: 40
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Reset totalizer
- Link Master (LM) function is supported

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**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

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**Load**

see "Output signal"

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**Low flow cutoff**

Switch points for low flow are selectable.

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**Galvanic isolation**

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

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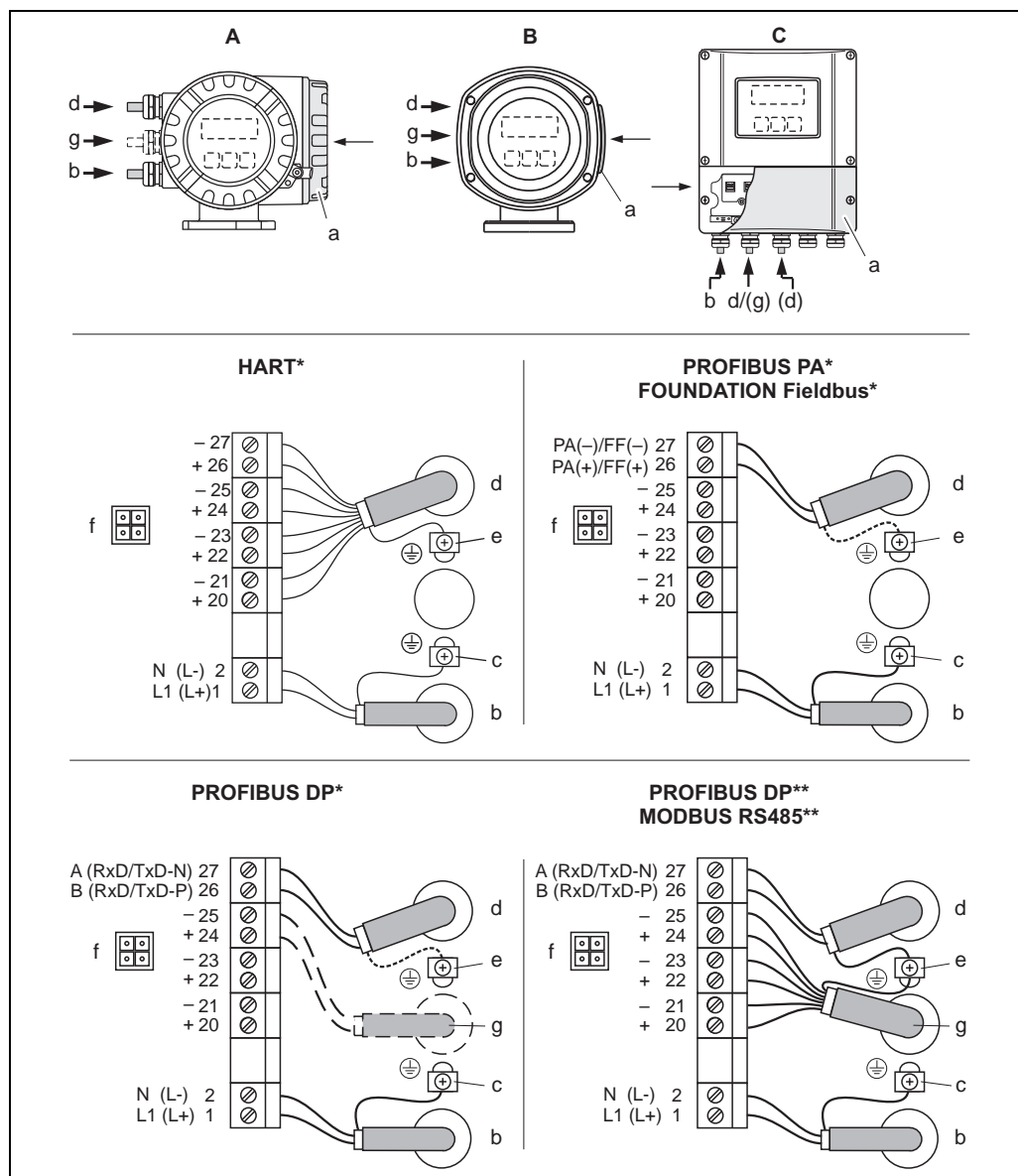
**Switching output**

**Relay output**

- max. 30 V / 0.5 A AC; 60 V / 0.1 A DC
- galvanically isolated
- Normally closed (NC or break) or normally open (NO or make) contacts available (factory setting: relay 1 = NO, relay 2 = NC)

## Power supply

Electrical connection  
Measuring unit



Connecting the transmitter, cable cross-section: max. 2.5 mm<sup>2</sup>

- A View A (field housing)  
B View B (Stainless Steel field housing)  
C View C (wall-mount housing)

\*) fixed communication board

\*\*) flexible communication board

a Connection compartment cover

b 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

c Ground terminal for protective ground

d Signal cable: see Terminal assignment → 9

Fieldbus cable:

Terminal No. 26: DP (B) / PA (+) / FF (+) / MODBUS RS485 (B) / (PA, FF: with reverse polarity protection)

Terminal No. 27: DP (A) / PA (-) / FF (-) / MODBUS RS485 (A) / (PA, FF: with reverse polarity protection)

e Ground terminal for signal cable shield / fieldbus cable / RS485 line

f Service adapter for connecting service interface FXA 193 (Fieldcheck, FieldCare)

g Signal cable: see Terminal assignment → 9

g Cable for external termination (only for PROFIBUS DP with permanent assignment communication board):

Terminal No. 24: +5 V

Terminal No. 25: DGND

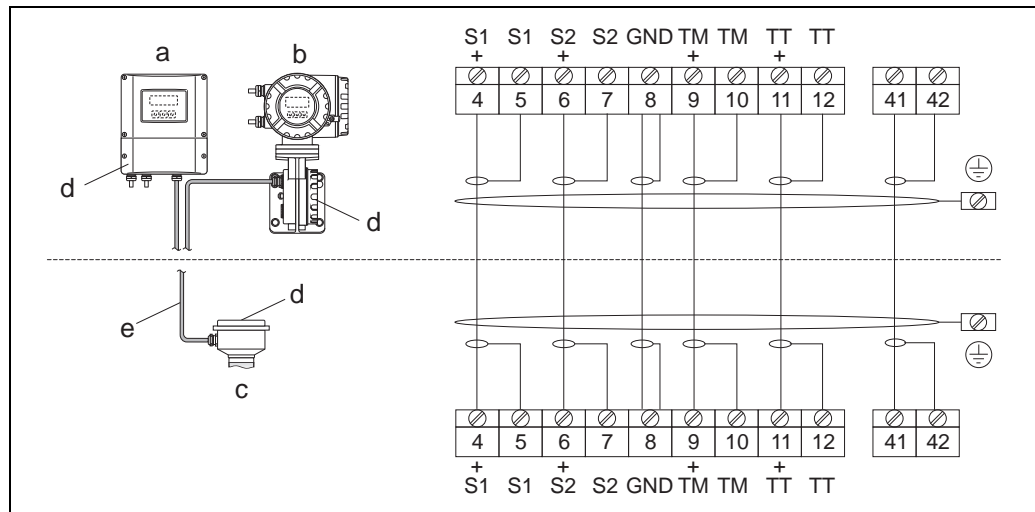


**Electrical connection,  
terminal assignment**

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/outputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
<i>Fixed communication boards (permanent assignment)</i>				
A	-	-	Frequency output	Current output, HART
B	Relay output	Relay output	Frequency output	Current output, HART
F	-	-	-	PROFIBUS PA, Ex i
G	-	-	-	FOUNDATION Fieldbus Ex i
H	-	-	-	PROFIBUS PA
J	-	-	+5V (ext. termination)	PROFIBUS DP
K	-	-	-	FOUNDATION Fieldbus
Q	-	-	Status input	MODBUS RS485
R	-	-	Current output 2 Ex i, active	Current output 1 Ex i active, HART
S	-	-	Frequency output Ex i, passive	Current output Ex i Active, HART
T	-	-	Frequency output Ex i, passive	Current output Ex i Passive, HART
U	-	-	Current output 2 Ex i, passive	Current output 1 Ex i passive, HART
<i>Flexible communication boards</i>				
C	Relay output 2	Relay output 1	Frequency output	Current output, HART
D	Status input	Relay output	Frequency output	Current output, HART
E	Status input	Relay output	Current output 2	Current output, HART
L	Status input	Relay output 2	Relay output 1	Current output, HART
M	Status input	Frequency output 2	Frequency output 1	Current output, HART
N	Current output	Frequency output	Status input	MODBUS RS485
P	Current output	Frequency output	Status input	PROFIBUS DP
V	Relay output 2	Relay output 1	Status input	PROFIBUS DP
W	Relay output	Current output 3	Current output 2	Current output 1, HART
0	Status input	Current output 3	Current output 2	Current output 1, HART
2	Relay output	Current output 2	Frequency output	Current output 1, HART
3	Current input	Relay output	Current output 2	Current output 1, HART
4	Current input	Relay output	Frequency output	Current output, HART
5	Status input	Current input	Frequency output	Current output, HART
6	Status input	Current input	Current output 2	Current output 1, HART
7	Relay output 2	Relay output 1	Status input	MODBUS RS485

## Electrical connection Remote version



### 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

## Supply voltage

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

## Cable entries

### Power-supply and signal cables (inputs/outputs):

- Cable entry M20 × 1.5 (8 to 12 mm / 0.31" to 0.47")
- Thread for cable entries, ½" NPT, G ½"

### Connecting cable for remote version:

- Cable entry M20 × 1.5 (8 to 12 mm / 0.31" to 0.47")
- Thread for cable entries, ½" NPT, G ½"

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**Remote version cable specification**

- $6 \times 0.38 \text{ mm}^2$  (PVC cable with common shield and individually shielded cores)
- Conductor resistance:  $\leq 50 \text{ } \Omega/\text{km}$  ( $\leq 0.015 \text{ } \Omega/\text{ft}$ )
- Capacitance: core/shield:  $\leq 420 \text{ pF/m}$  ( $\leq 128 \text{ pF/ft}$ )
- Cable length: max. 20 m (65 ft)
- Permanent operating temperature: max.  $+105 \text{ } ^\circ\text{C}$  ( $+221 \text{ } ^\circ\text{F}$ )

Operation in zones of severe electrical interference:

The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326/A1, and NAMUR recommendation NE 21/43.

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**Power consumption**

AC:  $<15 \text{ VA}$  (including sensor)

DC:  $<15 \text{ W}$  (including sensor)

*Switch-on current:*

- Max. 13.5 A ( $<50 \text{ ms}$ ) at 24 V DC
  - Max. 3 A ( $<5 \text{ ms}$ ) 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.)
- 

**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.

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## Performance characteristics

o.r. = of reading;  $1 \text{ g/cm}^3 = 1 \text{ kg/l}$ ; T = medium temperature

### Reference operating conditions

- Error limits following ISO/DIN 11631
- Water, typically +15 to +45 °C (+59 to +113 °F); 2 to 6 bar (29 to 87 psi)
- Data according to calibration protocol  $\pm 5 \text{ °C}$  ( $\pm 9 \text{ °F}$ ) and  $\pm 2 \text{ bar}$  ( $\pm 29 \text{ psi}$ )
- Accuracy based on accredited calibration rigs according to ISO 17025

### Maximum measured error

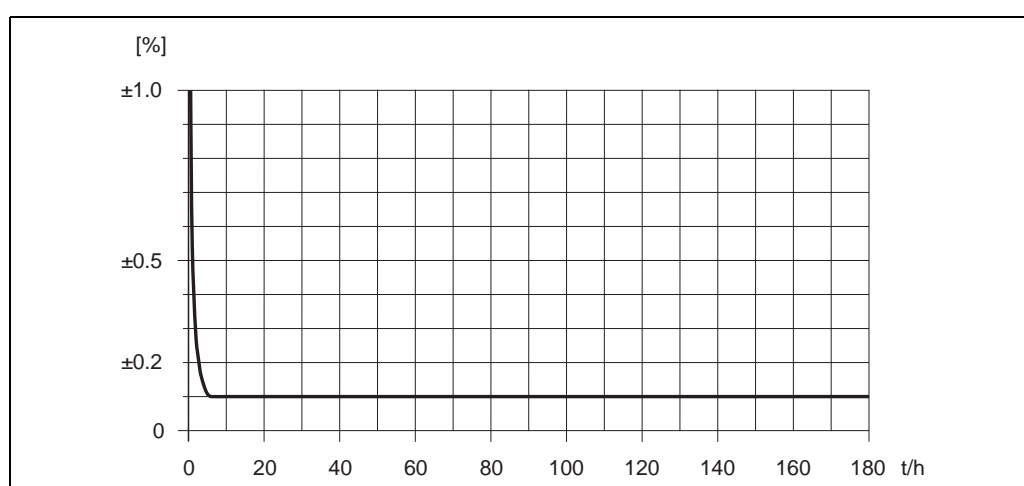
The following values refer to the pulse/frequency output.  
The additional measured error at the current output is typically  $\pm 5 \text{ }\mu\text{A}$ .  
Design fundamentals → [13](#).

- Mass flow and volume flow (liquids):
  - $\pm 0.05\%$  o.r. (PremiumCal, for mass flow)
  - $\pm 0.10\%$  o.r.
- Mass flow (gases):  $\pm 0.35\%$  o.r.
- Density (liquids)
  - Reference conditions:  $\pm 0.0005 \text{ g/cm}^3$
  - Field density calibration:  $\pm 0.0005 \text{ g/cm}^3$   
(valid after a field density calibration under process conditions)
  - Standard density calibration:  $\pm 0.01 \text{ g/cm}^3$   
(valid over the entire measuring range and density range → [17](#))
  - Special density calibration:  $\pm 0.001 \text{ g/cm}^3$   
(optional, valid range: +5 to +80 °C (+41 to +176 °F) and 0.0 to 2.0  $\text{g/cm}^3$ )
- Temperature:  $\pm 0.5 \text{ °C} \pm 0.005 \cdot T \text{ °C}$ ; ( $\pm 1 \text{ °F} \pm 0.003 \cdot (T - 32) \text{ °F}$ )

### Zero point stability

DN		Zero point stability	
[mm]	[inch]	[kg/h] or [l/h]	[lb/min]
80	3	9.00	0.330
100	4	14.00	0.514
150	6	32.00	1.17

### Example for max. measured error



Max. measured error in % o.r. (example: DN 80)

A0015774

Flow values (example: DN 80)

Design fundamentals → 13

Turn down	Flow		Max. measured error [% o.r.]
	[kg/h]	[lb/min]	
500 : 1	360	13.23	1.5
100 : 1	1800	66.15	0.3
25 : 1	7200	264.6	0.1
10 : 1	18000	661.5	0.1
2 : 1	90000	3307.5	0.1

**Repeatability**

Design fundamentals → 13.

- Mass flow and volume flow (liquids):  
±0.025% o.r. (PremiumCal, for mass flow)  
±0.05% o.r.
- Mass flow (gases): ±0.25% o.r.
- Density (liquids): ±0.00025 g/cc
- Temperature: ±0.25 °C ± 0.0025 · T °C; (±0.5 °F ± 0.0015 · (T - 32) °F)

**Influence of medium temperature**

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the Promass sensor is ±0.0002% of the full scale value/°C (±0.0001% of the full scale value / °F).

**Influence of medium pressure**

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

DN		[% o.r./bar]
[mm]	[inch]	
80	3	-0.0055
100	4	-0.0035
150	6	-0.002

**Design fundamentals**

Dependent on the flow:

- Flow ≥ Zero point stability ÷ (base accuracy ÷ 100)
  - Max. measured error: ±base accuracy in % o.r.
  - Repeatability: ± ½ · base accuracy in % o.r.
- Flow < Zero point stability ÷ (base accuracy ÷ 100)
  - Max. measured error: ± (zero point stability ÷ measured value) · 100% o.r.
  - Repeatability: ± ½ · (zero point stability ÷ measured value) · 100% o.r.

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

## Operating conditions: Installation

### Installation instructions

Note the following points:

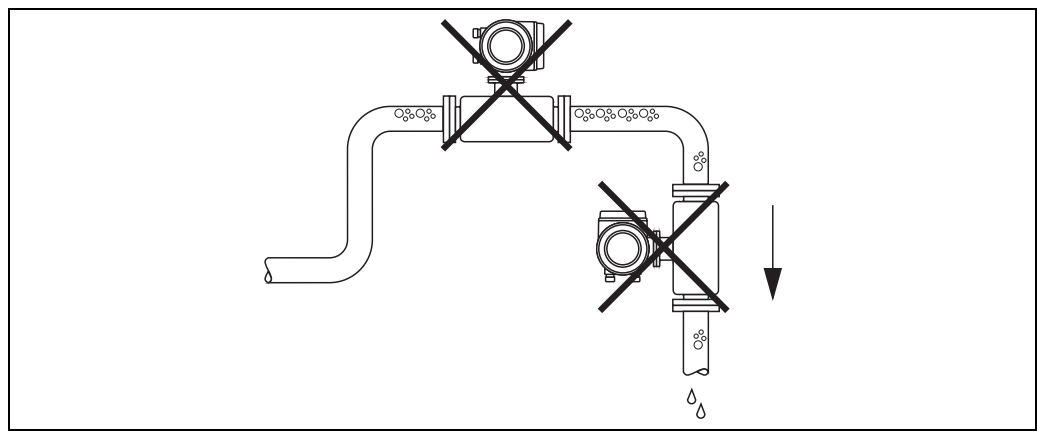
- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument, for example the secondary containment.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe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

### Mounting location

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

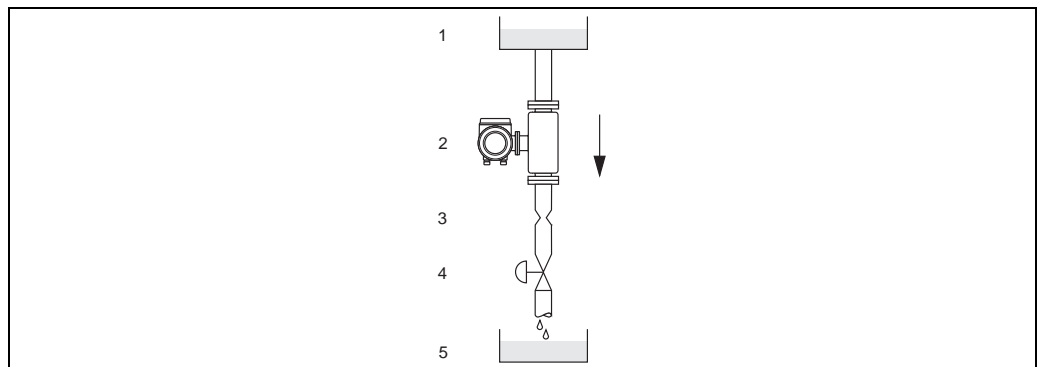
**Avoid** the following mounting locations in the pipe:

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



a0003605

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.



a0003597

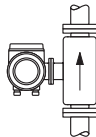
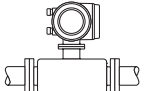
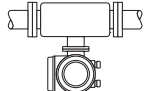
Installation in a down pipe (e.g. for batching applications)

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]	[inch]	mm	inch
80	3	50	2.00
100	4	65	2.60
150	6	90	3.54

**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
	 View V <span style="float: right;">a0004572</span>	 View H1 <span style="float: right;">a0004576</span>	 View H2 <span style="float: right;">a0004580</span>
Standard, Compact version	✓✓	✓✓	✓✓
Standard, Remote version	✓✓	✓✓	✓✓

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

*Vertical (View V)*

Recommended orientation with upward direction of flow (View V). When fluid is not flowing, entrained solids will sink down and gases will rise away from the measuring tube. The measuring tubes can be completely drained and protected against solids build-up.

*Horizontal (Views H1, H2)*

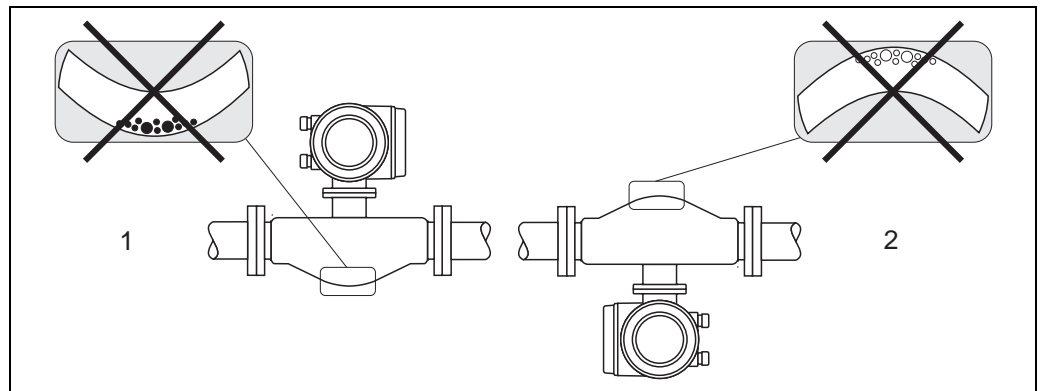
The measuring tubes must be horizontal and beside each other. When installation is correct the transmitter housing is above or below the pipe (Views H1, H2). Always avoid having the transmitter housing in the same horizontal plane as the pipe. Please note the special installation instructions → 15.

**Special installation instructions**



**Caution!**

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



*Horizontal installation*

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

## Heating

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



### Caution!

- Risk of electronics overheating! Make sure that the maximum permissible ambient temperature for the transmitter is not exceeded. Consequently, make sure that the adapter between sensor and transmitter and the connection housing of the remote version always remain free of insulating material. Note that a certain orientation might be required, depending on the fluid temperature → 15.

For fluid temperature of 150°C (302°F) or above the usage of the remote version with separate connection housing is recommended.

- 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 → 17

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

## Zero point adjustment

All devices are calibrated to state-of-the-art technology. The zero point determined in this way is imprinted on the nameplate of the device.

Calibration takes place under reference conditions. → 12

Promass therefore does **not** require zero point adjustment!

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

- To achieve highest measuring accuracy also with very low flow rates
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

---

### Inlet and outlet runs

There are no installation requirements regarding inlet and outlet runs.

---

### Length of connecting cable

max. 20 m (65 ft), remote version

---

### System pressure

It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.


In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the 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



## Operating conditions: Environment

<b>Ambient temperature range</b>	Sensor and transmitter <ul style="list-style-type: none"> <li>■ Standard: -20 to +60 °C (-4 to +140 °F)</li> <li>■ Optional: -40 to +60 °C (-40 to +140 °F)</li> </ul>
	 <p>Note!</p> <ul style="list-style-type: none"> <li>■ Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.</li> <li>■ At ambient temperatures below -20 °C (-4 °F) the readability of the display may be impaired.</li> </ul>
<b>Storage temperature</b>	-40 to +80 °C (-40 to +176 °F), preferably +20 °C (+68 °F)
<b>Degree of protection</b>	Standard: IP 67 (NEMA 4X) for transmitter and sensor
<b>Shock resistance</b>	In accordance with IEC 68-2-31
<b>Vibration resistance</b>	Acceleration up to 1 g, 10 to 150 Hz, following IEC 68-2-6
<b>Electromagnetic compatibility (EMC)</b>	To IEC/EN 61326 and NAMUR Recommendation NE 21

## Operating conditions: Process

<b>Medium temperature range</b>	<b>Sensor</b> -40 to +200 °C (-40 to +392 °F)
<b>Fluid density range</b>	0 to 5000 kg/m <sup>3</sup> (0 to 312 lb/cf)
<b>Medium pressure range (nominal pressure)</b>	<b>Flanges</b> <ul style="list-style-type: none"> <li>■ according to DIN PN 160, PN 250</li> <li>■ according to ASME B16.5 Cl 900, Cl 1500</li> </ul> <b>Pressure ranges of secondary containment</b> Type approved according to ASME BPVC: 16 bar (232 psi) The secondary containment is equipped with special pressure monitoring connections. 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 →  20).
<b>Rupture disk</b>	Further information →  32

**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

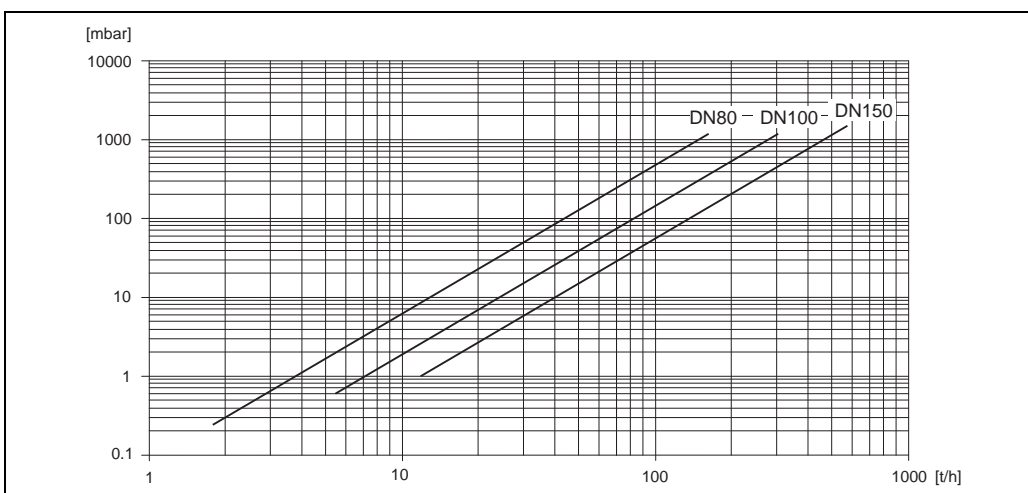
**Pressure loss**

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

Reynolds number	$Re = \frac{4 \cdot \dot{m}}{\pi \cdot d \cdot v \cdot \rho \cdot n}$ <div style="text-align: right; font-size: small;">A0015582</div>
Pressure loss	$\Delta p = (A_0 + A_1 \cdot Re^{A_2})^{1/A_3} \cdot \frac{1}{\rho} \cdot \left( \frac{2 \cdot \dot{m}}{5 \cdot \pi \cdot n \cdot d^2} \right)^2$ <div style="text-align: right; font-size: small;">A0015583</div>
Δp = pressure loss [mbar] v = kinematic viscosity [m <sup>2</sup> /s] ṁ = Mass flow [kg/s] ρ = fluid density [kg/m <sup>3</sup> ]	d = inside diameter of measuring tubes [m] A <sub>0</sub> to A <sub>3</sub> = constants (depending on nominal diameter) n = number of tubes

**Pressure loss coefficient**

DN		d [mm]	A <sub>0</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>
[mm]	[inch]					
80	3	38.5	0.72	4.28	-0.36	0.24
100	4	49.0	0.70	3.75	-0.35	0.22
150	6	66.1	0.75	2.81	-0.33	0.19



Pressure loss diagram for water

### **Pressure loss (US units)**

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

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

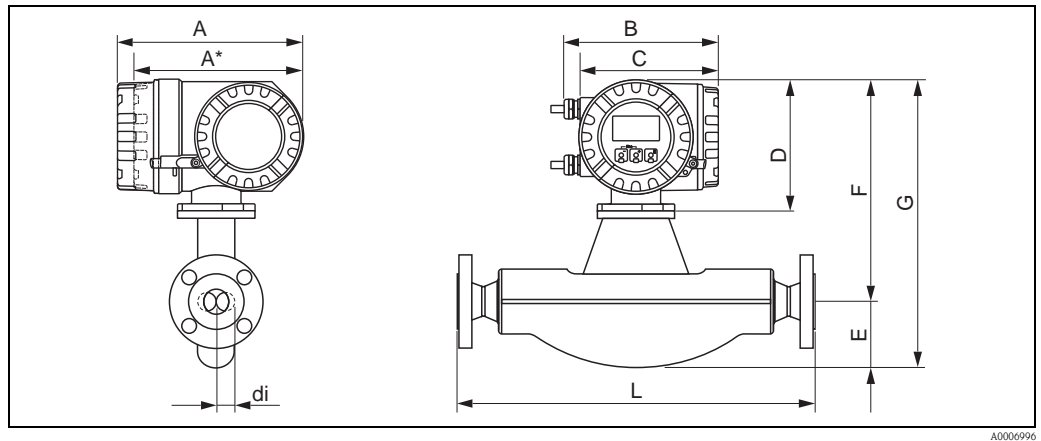
The Applicator runs on any IBM compatible PC with windows.

## Mechanical construction

### Design, dimensions

<b>Dimensions:</b>	
Field housing compact version, powder-coated die-cast aluminum	→ 21
Field housing compact version, powder-coated die-cast aluminum (II2G/Zone1)	→ 22
Transmitter compact version, stainless steel	→ 23
Transmitter remote version, connection housing (II2G/Zone 1)	→ 23
Transmitter remote version, wall-mount housing (non Ex-zone and II3G/Zone 2)	→ 24
Sensor remote version, connection housing	→ 25
Sensor remote version, connection housing with an extended neck	→ 26
<b>Process connections in SI units</b>	
Flange connections EN (DIN)	→ 27
Flange connections ASME B16.5	→ 28
<b>Process connection in US units</b>	
Process connections in US units	→ 29
<b>Purge connections / secondary containment monitoring</b>	→ 31
<b>Rupture disk</b>	→ 32

Field housing compact version, powder-coated die-cast aluminum



Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	L	di
80	227	207	187	168	160	200	305	505	1)	1)
100	227	207	187	168	160	254	324	578	1)	1)
150	227	207	187	168	160	378	362	740	1)	1)

\*Blind version (without display)

1) dependent on respective process connection

All dimensions in [mm];

Dimensions in US units

DN	A	A*	B	C	D	E	F	G	L	di
3"	8.94	8.15	7.68	6.61	6.30	7.87	12.0	19.9	1)	1)
4"	8.94	8.15	7.68	6.61	6.30	10.0	12.8	22.8	1)	1)
6"	8.94	8.15	7.68	6.61	6.30	14.9	14.3	29.1	1)	1)

\*Blind version (without display)

1) dependent on respective process connection

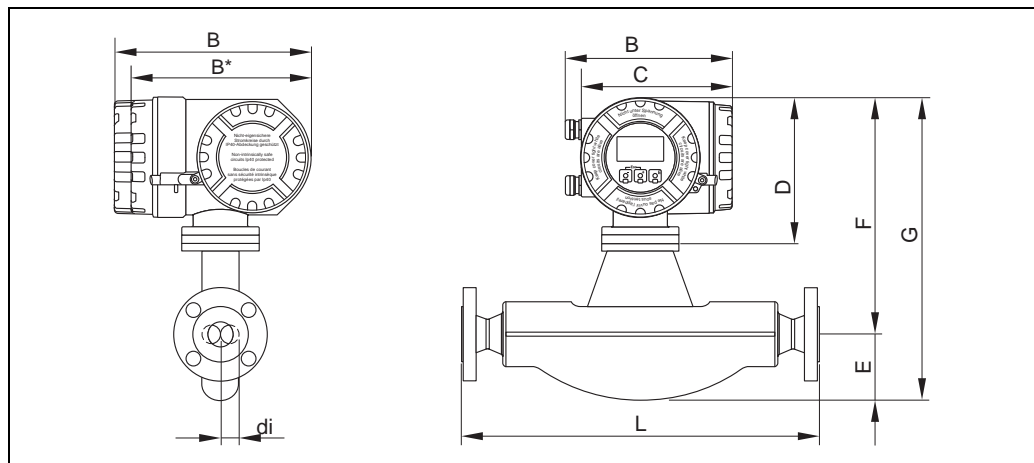
All dimensions in [inch];



Note!

Dimensions for transmitters II2G/Zone 1 → 22

## Field housing compact version, powder-coated die-cast aluminum (II2G/Zone1)



## Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	L	di
80	240	217	206	186	178	200	323	523	1)	1)
100	240	217	206	186	178	254	342	589	1)	1)
150	240	217	206	186	178	378	380	758	1)	1)

\*Blind version (without display)

<sup>1)</sup> dependent on respective process connection

All dimensions in [mm];

## Dimensions in US units

DN	A	A*	B	C	D	E	F	G	L	di
3"	9.45	8.54	8.11	7.32	7.01	7.87	12.72	20.59	1)	1)
4"	9.45	8.54	8.11	7.32	7.01	10.00	13.46	23.19	1)	1)
6"	9.45	8.54	8.11	7.32	7.01	14.88	14.96	29.84	1)	1)

\*Blind version (without display)

<sup>1)</sup> dependent on respective process connection

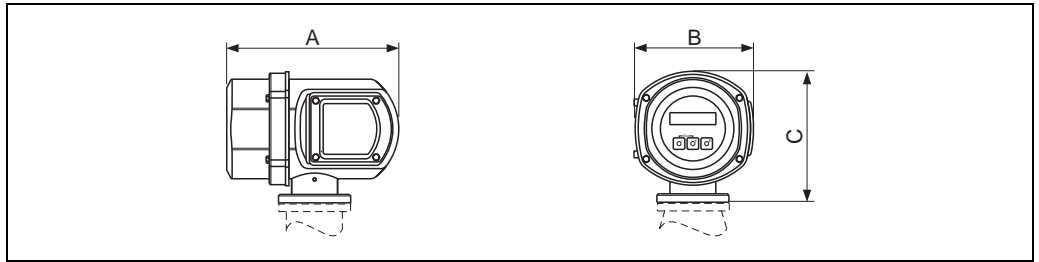
All dimensions in [inch];



Note!

Dimensions for remote version II2G/Zone 1 → 23

**Transmitter compact version, stainless steel**

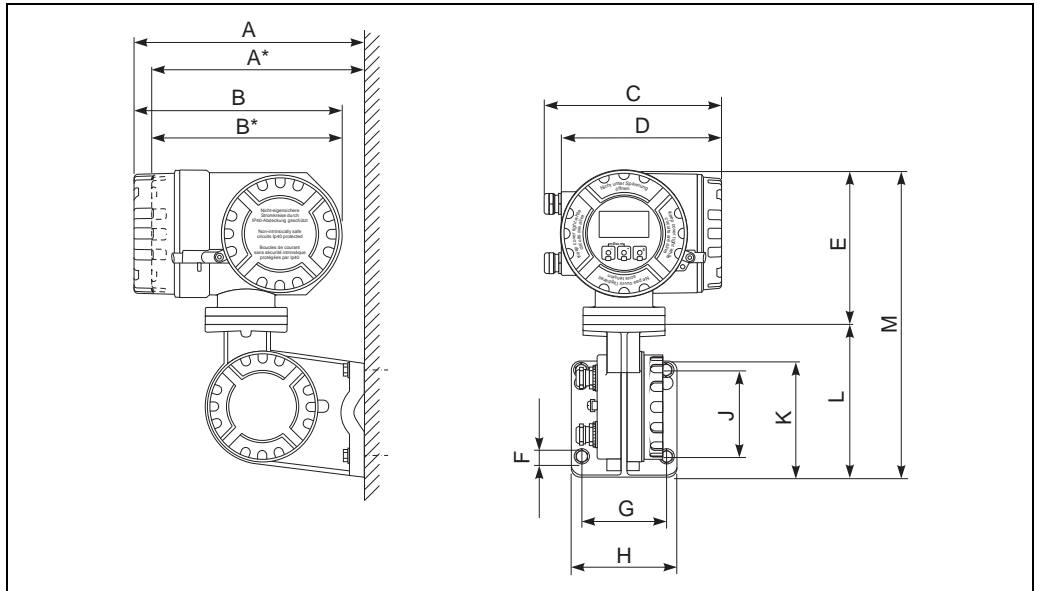


a0002245

*Dimensions in SI and US units*

A		B		C	
[mm]	[inch]	[mm]	[inch]	[mm]	[inch]
225	8.86	153	6.02	168	6.61

**Transmitter 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

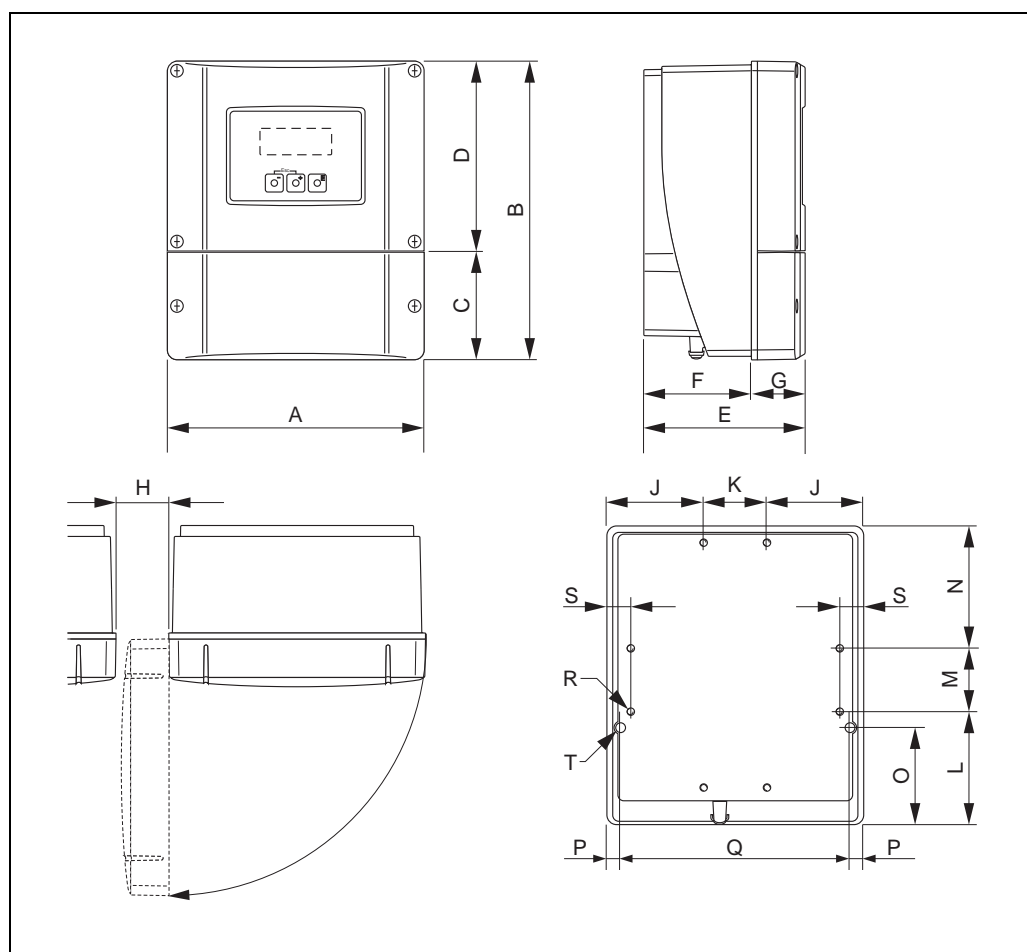
\* Blind version (without display)  
All dimensions in [mm]

*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 [inch]

## 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 <sup>1)</sup>	
95	53	102	81.5	11.5	192	8 × M5	20	2 × Ø 6.5	

<sup>1)</sup> Fixing bolt for wall assembly: M6 (screw head max. 10.5 mm)

All dimensions in [mm]

## Dimensions in US units

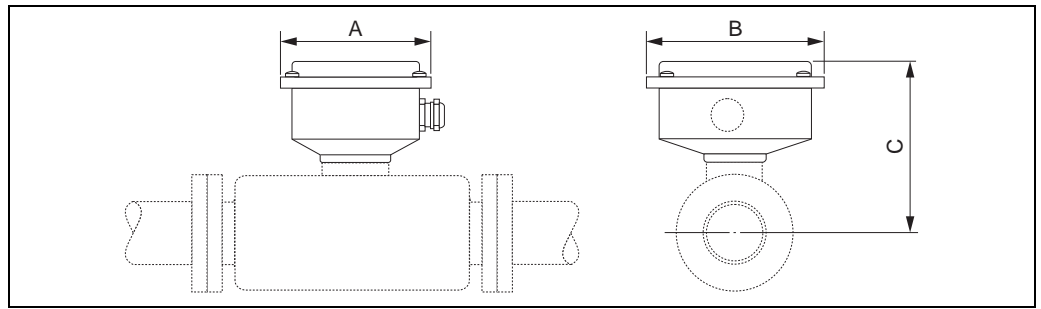
A	B	C	D	E	F	G	H	J	K
8.46	9.84	3.56	6.27	5.31	3.54	1.77	>1.97	3.18	2.08
L	M	N	O	P	Q	R	S	T <sup>1)</sup>	
3.74	2.08	4.01	3.20	0.45	7.55	8 × M5	0.79	2 × Ø 0.26	

<sup>1)</sup> Fixing bolt for wall assembly: M6 (screw head max. 0.41 inch)

All dimensions in [inch]



**Sensor remote version, connection housing**



a0002516

*Dimensions in SI units*

DN	A	B	C
80	118.5	137.5	152
100	118.5	137.5	171
150	118.5	137.5	209

All dimensions in [mm]

*Dimensions in US units*

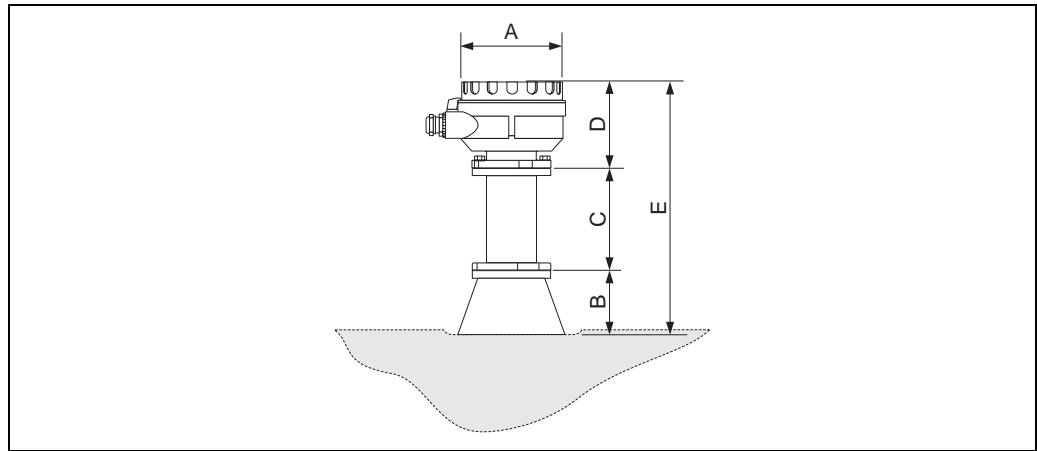
DN	A	B	C
3"	4.67	5.41	6.08
4"	4.67	5.41	6.84
6"	4.67	5.41	8.36

All dimensions in [inch]

**Sensor remote version, connection housing with an extended neck**

Note!

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



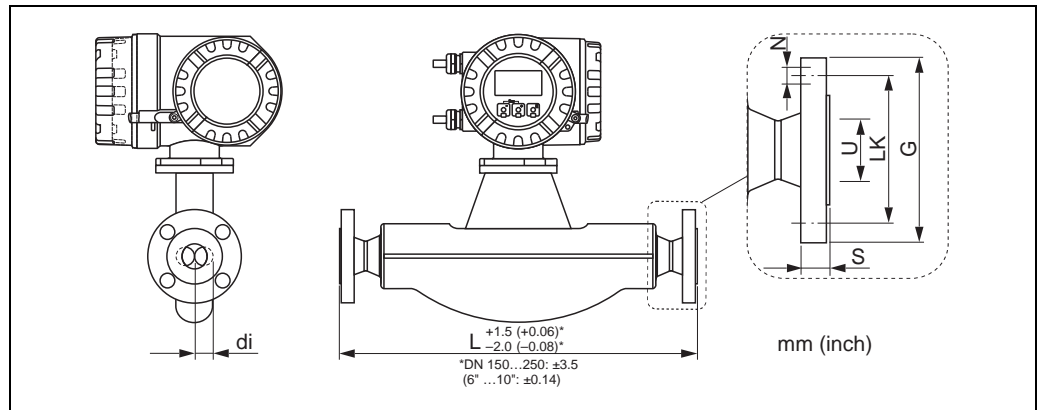
a0002517

*Dimensions in SI and US units*

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

**Process connections in SI units**

*Flange connections EN (DIN), ASME B16.5*



a0002501-ae

*Flange connections EN (DIN)*

<b>Flange according to EN 1092-1 (DIN 2501) / PN 160:</b> 25Cr duplex F53/EN 1.4410							
Optionally supplied with or without notch (Form D).							
Surface roughness (flange): EN 1092-1 Form B2 or Form D (DIN 2526 Form E), Ra 0.8 to 3.2 µm							
DN	G	L	N	S	LK	U	di
80	230	916	8 × Ø 26	36	180	80.9	38.5
100	265	1208	8 × Ø 30	40	210	104.3	49.0
150	355	1476	12 × Ø 33	50	290	155.7	66.1

All dimensions in [mm]

<b>Flange according to EN 1092-1 (DIN 2501) / PN 250:</b> 25Cr duplex F53/EN 1.4410							
Optionally supplied with or without notch (Form D).							
Surface roughness (flange): EN 1092-1 Form B2 or Form D (DIN 2526 Form E), Ra 0.8 to 3.2 µm							
DN	G	L	N	S	LK	U	di
80	255	948	8 × Ø 30	46	200	77.7	38.5
100	300	1248	8 × Ø 33	54	235	100.3	49.0
150	390	1540	12 × Ø 36	68	320	148.3	66.1

All dimensions in [mm]

*Flange connections ASME B16.5*

<b>Flange according to ASME B16.5 / CI 900 Sched 40/Sched 80: 25Cr duplex F53/EN 1.4410</b>								
Surface roughness (flange): Ra 3.2 to 6.3 $\mu\text{m}$								
DN	G	L	N	S	LK	U		di
						Sched 40	Sched 80	
80	241.3	962	8 × Ø 25.4	45.1	190.5	78.0	73.7	38.5
100	292.1	1251	8 × Ø 31.8	51.4	234.9	102.4	97.3	49.0
150	381.0	1513	12 × Ø 31.8	62.6	317.5	154.1	146.3	66.1

All dimensions in [mm]

<b>Flange according to ASME B16.5 / CI 1500 Sched 80: 25Cr duplex F53/EN 1.4410</b>								
Surface roughness (flange): Ra 3.2 to 6.3 $\mu\text{m}$								
DN	G	L	N	S	LK	U	di	
80	266.7	993	8 × Ø 31.8	54.8	203.2	73.7	38.5	
100	311.2	1270	8 × Ø 35.1	60.8	241.3	97.3	49.0	
150	393.7	1577	12 × Ø 38.1	89.6	317.5	146.3	66.1	

All dimensions in [mm]

<b>RTJ-Flange according to ASME B16.5 / CI 900 Sched 40/Sched 80: 25Cr duplex F53/EN 1.4410</b>								
Surface roughness (flange): Ra 3.2 to 6.3 $\mu\text{m}$								
DN	G	L	N	S	LK	U		di
						Sched 40	Sched 80	
80	241.3	963	8 × Ø 25.4	46.0	190.5	78.0	73.7	38.5
100	292.1	1252	8 × Ø 31.8	52.3	234.9	102.4	97.3	49.0
150	381.0	1515	12 × Ø 31.8	63.5	317.5	154.1	146.3	66.1

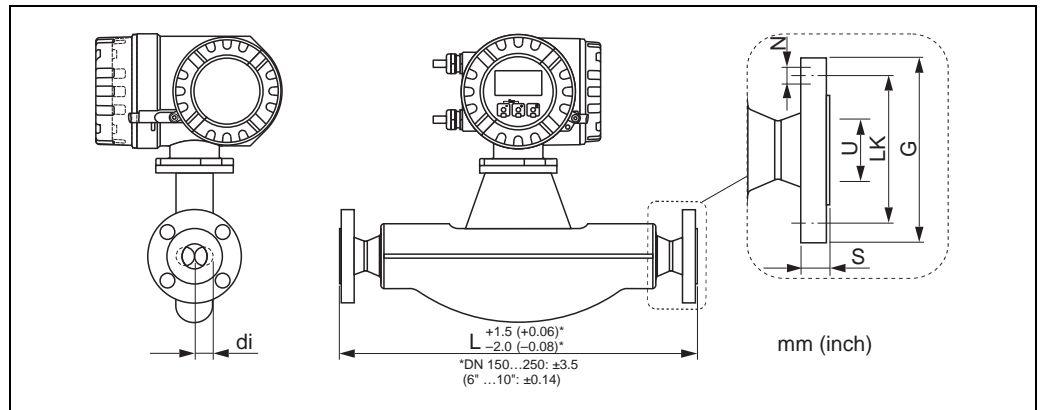
All dimensions in [mm]

<b>RTJ-Flange according to ASME B16.5 / CI 1500 Sched 80: 25Cr duplex F53/EN 1.4410</b>								
Surface roughness (flange): Ra 3.2 to 6.3 $\mu\text{m}$								
DN	G	L	N	S	LK	U	di	
80	266.7	995	8 × Ø 31.8	55.7	203.2	73.7	38.5	
100	311.2	1272	8 × Ø 35.1	61.7	241.3	97.3	49.0	
150	393.7	1582	12 × Ø 38.1	92.1	317.5	146.3	66.1	

All dimensions in [mm]

**Process connections in US units**

*Flange connections ASME B16.5*



a0002501-ae

**Flange according to ASME B16.5 / CI 900 Sched 40/Sched 80: 25Cr duplex F53/EN 1.4410**  
 Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U		di
						Sched 40	Sched 80	
3"	9.50	37.87	8 × Ø 1.00	1.78	7.50	3.07	2.90	1.52
4"	11.50	49.25	8 × Ø 1.25	2.02	9.25	4.03	3.83	1.93
6"	15.00	59.57	12 × Ø 1.25	2.46	12.50	6.07	5.76	2.60

All dimensions in [inch]

**Flange according to ASME B16.5 / CI 1500 Sched 80: 25Cr duplex F53/EN 1.4410**  
 Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U	di
3"	10.50	39.09	8 × Ø 1.00	2.16	8.00	2.90	1.52
4"	12.25	50.00	8 × Ø 1.38	2.39	9.50	3.83	1.93
6"	15.50	62.09	12 × Ø 1.50	3.53	12.50	5.76	2.60

All dimensions in [inch]

**RTJ-Flange according to ASME B16.5 / CI 900 Sched 40/Sched 80: 25Cr duplex F53/EN 1.4410**  
 Surface roughness (flange): Ra 3.2 to 6.3 µm

DN	G	L	N	S	LK	U		di
						Sched 40	Sched 80	
3"	9.50	37.91	8 × Ø 1.00	1.81	7.50	3.07	2.90	1.52
4"	11.50	49.29	8 × Ø 1.25	2.06	9.25	4.03	3.83	1.93
6"	15.00	59.65	12 × Ø 1.25	2.50	12.50	6.07	5.76	2.60

All dimensions in [inch]

<b>RTJ-Flange according to ASME B16.5 / Cl 1500 Sched 80: 25Cr duplex F53/EN 1.4410</b>							
Surface roughness (flange): Ra 3.2 to 6.3 $\mu\text{m}$							
DN	G	L	N	S	LK	U	di
80	10.50	39.17	8 $\times$ $\varnothing$ 1.00	2.19	8.00	2.90	1.52
100	12.25	50.08	8 $\times$ $\varnothing$ 1.38	2.43	9.50	3.83	1.93
150	15.50	62.28	12 $\times$ $\varnothing$ 1.50	3.63	12.50	5.76	2.60

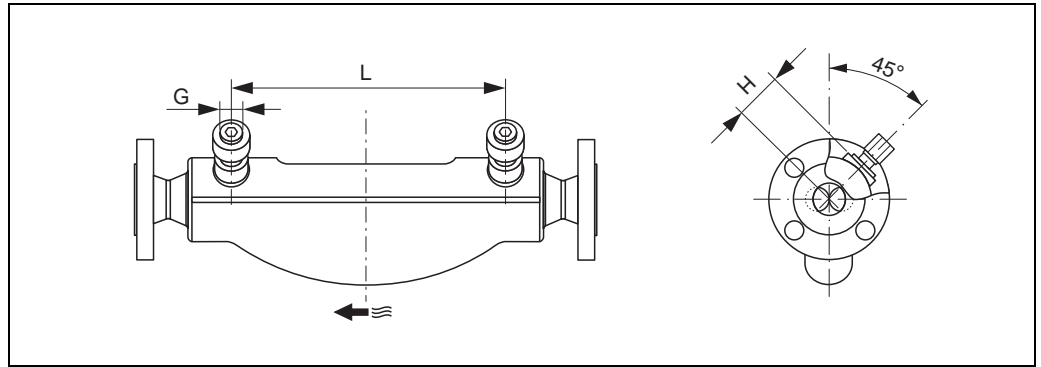
All dimensions in [inch]

**Purge connections / secondary containment monitoring**



Caution!

- The secondary containment is filled with dry nitrogen (N<sub>2</sub>). Do not open the purge connections unless the containment can be filled immediately with a dry inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar (72.5 psi).
- Purge connections or secondary containment monitoring can not be combined with separately available heating jacket.



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DN		G	H		L	
[mm]	[inch]		[mm]	[inch]	[mm]	[inch]
80	3	½"-NPT	101	3.98	560	22.0
100	4	½"-NPT	120	4.72	684	27.0
150	6	½"-NPT	141	5.55	880	34.6

### Rupture disk

Sensor housings with integrated rupture disks are optionally available.



#### Warning!

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



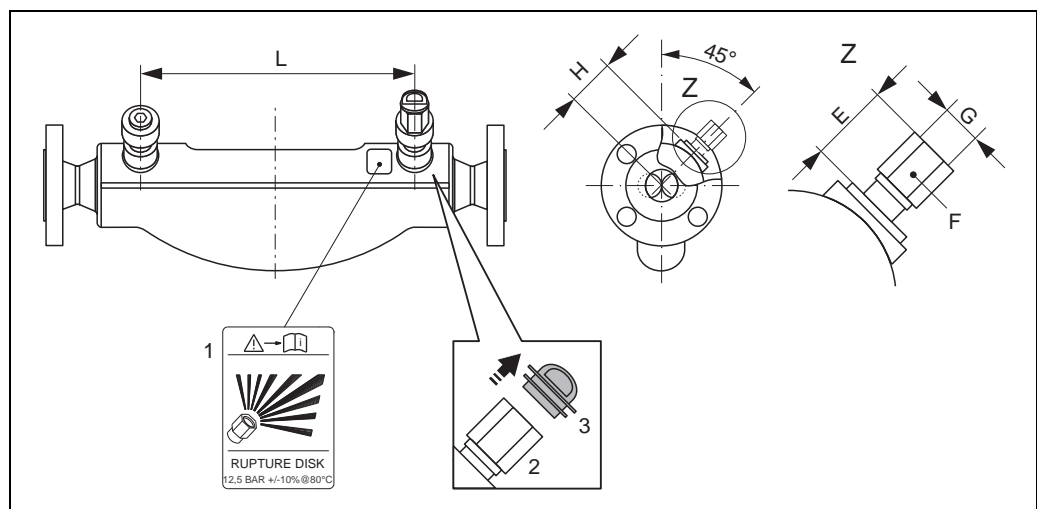
#### Caution!

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



#### Note!

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



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

DN		E		F	G	H		L	
[mm]	[inch]	[mm]	[inch]			[mm]	[inch]	[mm]	[inch]
80	3	approx. 42	approx. 1.65	SW 1"	1/2"-NPT	101	3.98	560	22.0
100	4	approx. 42	approx. 1.65	SW 1"	1/2"-NPT	120	4.72	684	27.0
150	6	approx. 42	approx. 1.65	SW 1"	1/2"-NPT	141	5.55	880	34.6



**Weight**

- Compact version: see tables below
- Remote version
  - Transmitter: see the tables below
  - Wall-mount housing: 5 kg (11 lbs)
  - Compact version Ex d (stainless steel): + 9kg (+ 20 lb)

**Weight information in SI units**

DN [mm]	80	100	150
Compact version	75	141	246
Remote version	73	139	244

All values (weight) refer to devices with Cl 900 flanges according to ASME  
Weight information in [kg].

**Weight information in US**

DN [inch]	3	4	6
Compact version	165	311	542
Remote version	161	306	538

All values (weight) refer to devices with Cl 900 flanges according to ASME  
Weight information in [lbs].

**Material****Transmitter housing**

Compact version

- Stainless steel housing: stainless steel CF3M
- Powder coated die-cast aluminum
- Window material: Glass or polycarbonate

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)**

- Stainless Steel 1.4301/304 (standard)
- Powder coated die-cast aluminum

**Process connections**

- Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5  
→ stainless steel 25Cr duplex F53/EN 1.4410 (superduplex)

**Measuring tubes**

Stainless Steel 25Cr duplex EN 1.4410/UNS S32750 (superduplex)

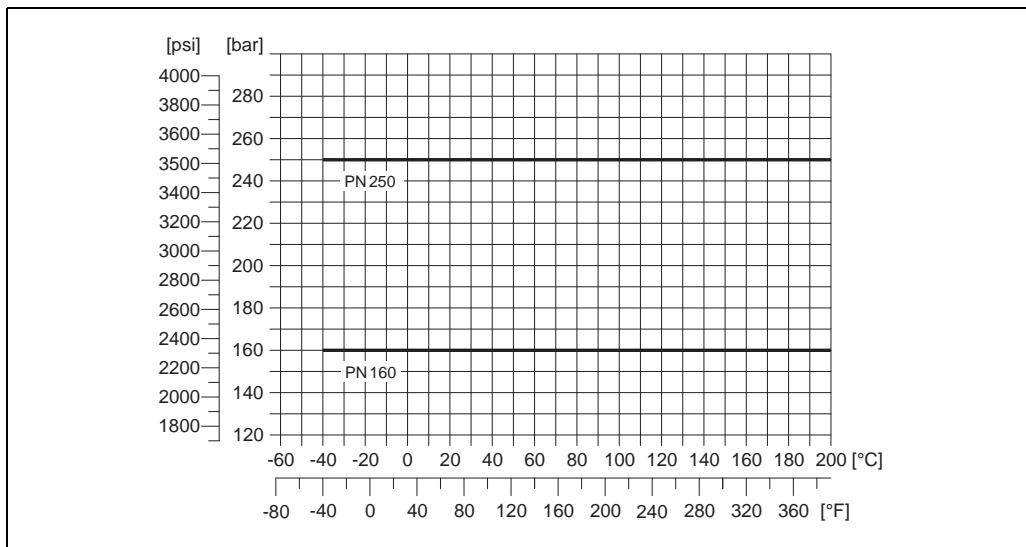
**Material load diagram**



Warning!  
The following material load curves refer to the entire sensor and not just the process connection.

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

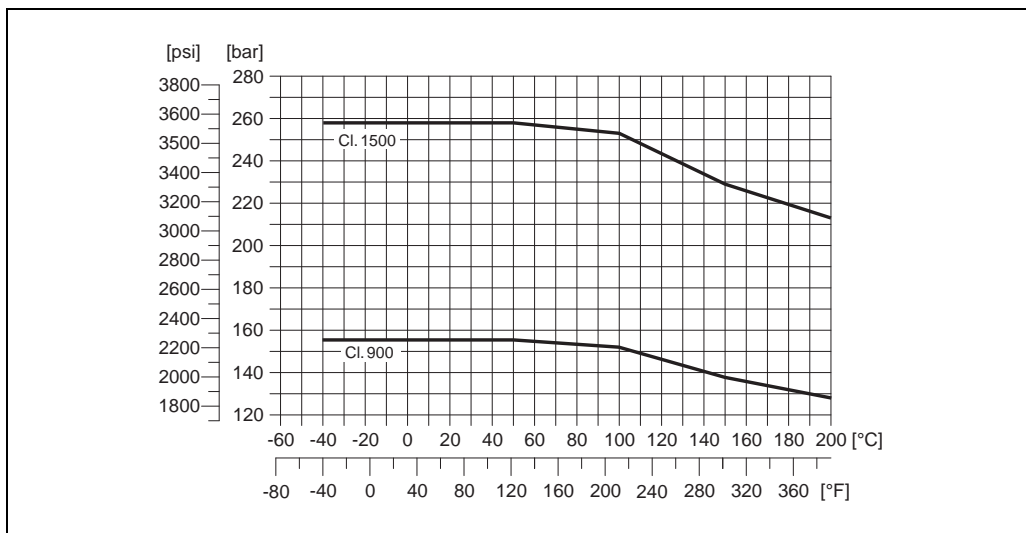
Flange material: 1.4410/F53



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**Flange connection according to ASME B16.5**

Flange material: 1.4410/F53



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**Process connections**

**Welded process connections**

Flanges according to EN 1092-1 (DIN 2501) and according to ASME B16.5

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## Human interface

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<b>Display elements</b>	<ul style="list-style-type: none"> <li>■ Liquid-crystal display: backlit and four lines with 16 characters per line</li> <li>■ Selectable display of different measured values and status variables</li> <li>■ At ambient temperatures below <math>-20\text{ °C}</math> (<math>-4\text{ °F}</math>) the readability of the display may be impaired.</li> </ul>
<b>Operating elements</b>	<ul style="list-style-type: none"> <li>■ Local operation with three optical keys (□/□/□)</li> <li>■ Application-specific Quick Setup menus for straightforward commissioning</li> </ul>
<b>Language group</b>	<p>Language groups available for operation in different countries:</p> <ul style="list-style-type: none"> <li>■ Western Europe and America (WEA): English, German, Spanish, Italian, French, Dutch and Portuguese</li> <li>■ Eastern Europe/Scandinavia (EES): English, Russian, Polish, Norwegian, Finnish, Swedish and Czech</li> <li>■ South and Eastern Asia (SEA): English, Japanese, Indonesian</li> <li>■ China (CN): English, Chinese</li> </ul> <p>The language group is changed using the "FieldCare" operating program.</p>
<b>Remote operation</b>	Remote operation via HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, MODBUS RS485

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## Certificates and approvals

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<b>CE mark</b>	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.
<b>C-Tick symbol</b>	The measuring system complies with the EMC requirements of the "Australian Communications and Media Authority (ACMA)"
<b>Ex approval</b>	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.
<b>FOUNDATION Fieldbus certification</b>	<p>The flowmeter has passed all the test procedures implemented and has been certified and registered by the Fieldbus Foundation. The flowmeter thus meets all the requirements of the specifications listed below:</p> <ul style="list-style-type: none"> <li>■ Certified to FOUNDATION Fieldbus specification</li> <li>■ The flowmeter meets all the specifications of the FOUNDATION Fieldbus-H1.</li> <li>■ Interoperability Test Kit (ITK), revision status 5.01 (Certification on request)</li> <li>■ The device can also be operated in conjunction with other-make certified devices.</li> <li>■ Physical Layer Conformance Test of the Fieldbus Foundation</li> </ul>
<b>PROFIBUS DP/PA certification</b>	<p>The flow device has successfully passed all the test procedures carried out and is certified and registered by the PNO (PROFIBUS User Organization). The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified to PROFIBUS Profile Version 3.0 (device certification number: on request)</li> <li>■ The device can also be operated with certified devices of other manufacturers (interoperability)</li> </ul>
<b>MODBUS certification</b>	The measuring device meets all the requirements of the MODBUS/TCP conformity and integration test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan.

**Other standards and guidelines**

- EN 60529  
Degrees of protection by housing (IP code)
- EN 61010-1  
Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.
- IEC/EN 61326  
"Emission in accordance with Class A requirements".  
Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21  
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.
- NAMUR NE 43  
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53  
Software of field devices and signal-processing devices with digital electronics

**Pressure 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, or less than 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.

**Functional safety**

SIL -2: accordance IEC 61508/IEC 61511-1 (FDIS)

"4-20 mA" - output according to the following options in the order characteristic for "Input/Output":  
A, B, C, D, E, L, M, R, S, T, U, W, 0, 2, 3, 4, 5, 6  
See also "Electrical connection, terminal assignment" →  9

## Ordering Information

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

## Accessories

Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor.

## Documentation

- Flow measuring technology (FA00005D)
- Technical Information
  - Promass 80A, 83A (TI00054D)
  - Promass 80E, 83E (TI00061D)
  - Promass 80H, 83H (TI00074D)
  - Promass 80I, 83I (TI00075D)
  - Promass 80M, 83M (TI00102D)
  - Promass 80P, 83P (TI00078D)
  - Promass 80S, 83S (TI00076D)
  - Promass 83X (TI00110D)
- Operating Instructions/Description of Device Functions
  - Promass 83 HART (BA00059D/BA00060D)
  - Promass 83 FOUNDATION Fieldbus (BA00065D/BA00066D)
  - Promass 83 PROFIBUS DP/PA(BA00063D/BA00064D)
  - Promass 83 MODBUS (BA00107D/BA00108D)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, IECEx NEPSI
- Special Documentation
  - Functional safety manual Promass 80, 83 (SD00077D)
  - Data transmission via EtherNet/IP (SD00138D)

## Registered trademarks

HART®

Registered trademark of HART Communication Foundation, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™ Fieldbus

Registered trademark of the Fieldbus FOUNDATION, Austin, USA

MODBUS®

Registered trademark of the MODBUS Organization

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

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





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