



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

# Proline Promass 80A, 83A

## Coriolis Mass Flow Measuring System

The single-tube system for highly accurate measurement of very small flows



### Application

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

- Suitable for continuous measurement, filling and dosing of very small flows.
- Extremely accurate measurement of liquids and gases such as emulsions, additives, flavouring, insulin, gases for high pressure and low pressure
- Fluid temperatures up to +200 °C (+392 °F)
- Process pressures up to 400 bar (5800 psi)

Approvals for hazardous area:

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

Approvals in the food industry/hygiene sector:

- 3A, FDA, EHEDG

Connection to process control system:

- HART, PROFIBUS DP/PA, FOUNDATION Fieldbus, Modbus

Relevant safety aspects:

- Pressure Equipment Directive, SIL-2
- Purge connection or rupture disk (optional)

### Your benefits

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

The **Proline transmitter concept** comprises:

- Modular device and operating concept resulting in a higher degree of efficiency
- 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:

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

## Table of contents

<b>Function and system design</b> .....	<b>3</b>	Medium pressure range (nominal pressure) .....	20
Measuring principle .....	3	Rupture disk (optional) .....	20
Measuring system .....	4	Limiting flow .....	20
		Pressure loss in SI units .....	21
<b>Input</b> .....	<b>5</b>	<b>Mechanical construction</b> .....	<b>22</b>
Measured variable .....	5	Design / dimensions .....	22
Measuring range .....	5	Weight .....	35
Operable flow range .....	5	Material .....	35
Input signal .....	5	Material load curves .....	36
		Process connections .....	37
<b>Output</b> .....	<b>6</b>	<b>Human interface</b> .....	<b>38</b>
Output signal .....	6	Display elements .....	38
Signal on alarm .....	8	Operating elements .....	38
Load .....	8	Language group .....	38
Low flow cut off .....	8	Remote operation .....	38
Galvanic isolation .....	8		
Switching output .....	8	<b>Certificates and approvals</b> .....	<b>39</b>
		CE mark .....	39
<b>Power supply</b> .....	<b>9</b>	C-Tick mark .....	39
Electrical connection Measuring unit .....	9	Ex approval .....	39
Electrical connection, terminal assignment .....	10	Sanitary compatibility .....	39
Electrical connection Remote version .....	11	FOUNDATION Fieldbus certification .....	39
Supply voltage .....	11	PROFIBUS DP/PA certification .....	39
Cable entries .....	12	Modbus certification .....	39
Remote version cable specifications .....	12	Other standards and guidelines .....	39
Power consumption .....	12	Pressure measuring device approval .....	40
Power supply failure .....	12	Functional safety .....	40
Potential equalisation .....	12		
		<b>Ordering Information</b> .....	<b>40</b>
<b>Performance characteristics</b> .....	<b>13</b>	<b>Accessories</b> .....	<b>40</b>
Reference operating conditions .....	13	<b>Documentation</b> .....	<b>41</b>
Maximum measured error .....	13	<b>Registered trademarks</b> .....	<b>41</b>
Repeatability .....	14		
Influence of medium temperature .....	15		
Influence of medium pressure .....	15		
Design fundamentals .....	15		
<b>Installation</b> .....	<b>16</b>		
Installation instructions .....	16		
Inlet and outlet run .....	18		
Length of connecting cable .....	18		
System pressure .....	18		
<b>Environment</b> .....	<b>19</b>		
Ambient temperature range .....	19		
Storage temperature .....	19		
Ambient class .....	19		
Degree of protection .....	19		
Shock resistance .....	19		
Vibration resistance .....	19		
CIP cleaning .....	19		
SIP cleaning .....	19		
Electromagnetic compatibility (EMC) .....	19		
<b>Process</b> .....	<b>20</b>		
Medium temperature range .....	20		

## 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

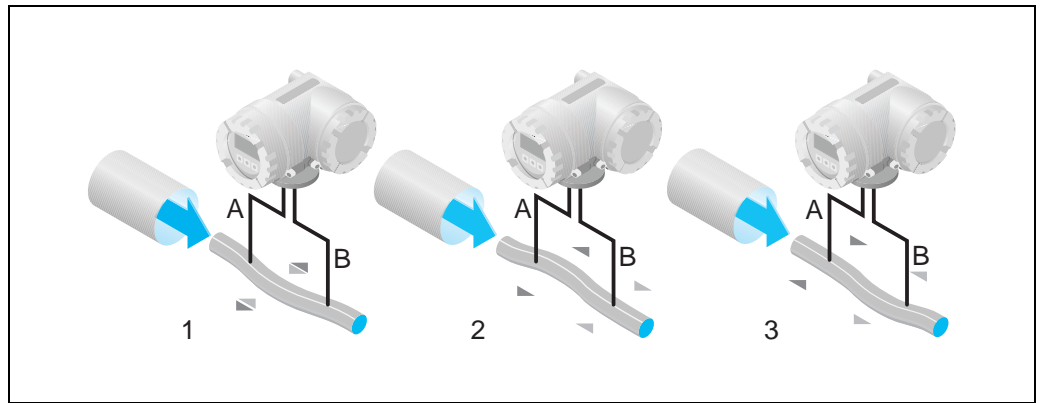
$\omega$  = rotational velocity

$v$  = radial velocity in 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 tube, through which the medium flows, oscillates. The Coriolis forces produced at the measuring tube cause a phase shift in the tube oscillations (see illustration):

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



a0003383

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

Compared to two-tube systems, other constructive solutions are required for the system balance for single-tube systems. For this purpose, Promass A has an internal reference mass.

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

### Density measurement

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

The microprocessor utilises this relationship to obtain a density signal.

### Temperature measurement

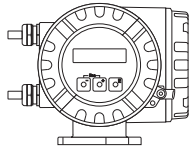
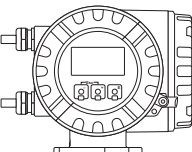
The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output.

**Measuring system**

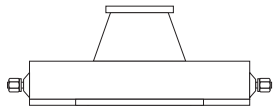
The measuring system consists of a transmitter and a sensor. Two versions are available:

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

**Transmitter**

<b>Promass 80</b>  <small>a0003671</small>	<ul style="list-style-type: none"> <li>■ Two-line liquid-crystal display</li> <li>■ Configuration also using key operation</li> </ul>
<b>Promass 83</b>  <small>a0003672</small>	<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>

**Sensor**

<b>A</b>  <small>a0003679</small>	<ul style="list-style-type: none"> <li>■ Single-tube system for highly accurate measurement of very small flows</li> <li>■ Nominal diameters DN 1 to 4 (1/24 to 1/8")</li> <li>■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 (process connection)</li> </ul>
--	--

## 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

Nominal Diameter		Range for full scale values (liquids), $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[inch]	[kg/h]	[lb/min]
1	1/24"	0 to 20	0 to 0.73
2	1/12"	0 to 100	0 to 3.7
4	1/8"	0 to 450	0 to 16.5

#### 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:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_{(G)} / 32 \text{ [kg/m}^3\text{]}$$

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

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

$\rho_{(G)}$  = gas density in [kg/m<sup>3</sup>] at process conditions

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

*Calculation example for gas:*

- Measuring device: Promass A, DN 2
- Gas: air with a density of 11.9 kg/m<sup>3</sup> (at +20 °C and 10 bar)
- Measuring range: 100 kg/h

Max. possible full scale value:

$$\dot{m}_{\max(G)} = \dot{m}_{\max(F)} \cdot \rho_{(G)} / 32 \text{ [kg/m}^3\text{]} = 100 \text{ kg/h} \cdot 11.9 \text{ kg/m}^3 / 32 \text{ kg/m}^3 = 37.2 \text{ kg/h}$$

*Recommended full scale values:*

See information in the "Limiting flow" Section → 20

### Operable flow range

Greater than 1000 :1.

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

### Input signal

#### Status input (auxiliary input):

U = 3 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 (only Promass 83)**

Active/passive selectable, galvanically isolated, resolution: 2  $\mu$ A

- Active: 4 to 20 mA,  $R_i \leq 700 \Omega$ ,  $U_{out} = 24$  V DC, short-circuit proof
- Passive: 0/4 to 20 mA,  $R_i \leq 150 \Omega$ ,  $U_{max} = 30$  V DC

**Output****Output signal****Promass 80***Current output:*

Active/passive selectable, galvanically isolated, time constant selectable (0.05 to 100 s), full scale value adjustable, Temperature coefficient: typ. 0.005% o.f.s./°C, resolution: 0.5  $\mu$ A

- Active: 0/4 to 20 mA,  $R_L < 700 \Omega$  (at 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:*

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

- Frequency output: full scale frequency 2 to 1000 Hz ( $f_{max} = 1250$  Hz), on/off ratio 1:1, pulse width max. 2 s
- Pulse output: pulse value and pulse polarity can be selected, pulse width adjustable (0.5 to 2000 ms).

*PROFIBUS PA interface:*

- PROFIBUS PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
- Profile Version 3.0
- Current consumption: 11 mA
- Permissible supply voltage: 9 to 32 V
- Bus connection with integrated reverse polarity protection
- Error current FDE (Fault Disconnection Electronic) = 0 mA
- Data transmission rate: 31.25 kBit/s
- Signal encoding: Manchester II
- Function blocks: 4  $\times$  Analog Input, 2  $\times$  Totalizer
- Output data: Mass flow, Volume flow, Density, Temperature, Totalizer
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be set at the measuring device via miniature switches or the on-site display (optional)

**Promass 83***Current output:*

Active/passive selectable, galvanically isolated, time constant selectable (0.05 to 100 s), full scale value adjustable, Temperature coefficient: typ. 0.005% o.f.s./°C, resolution: 0.5 µA


- Active: 0/4 to 20 mA,  $R_L < 700\ \Omega$  (at 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 ration 1:1, pulse width max. 2 s
- Pulse output: pulse value and pulse polarity selectable, pulse width adjustable (0.05 to 2000 ms); the on/off ratio is 1:1 as of a frequency of  $1 / (2 \times \text{pulse width})$


*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 × Analog Input, 3 × Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizer 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be set at the measuring device via miniature switches or the on-site display (optional)
- Available output combination →  10

*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
- Permissible 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 × Analog Input, 3 × Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizer 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be set at the measuring device via miniature switches or the on-site display (optional)
- Available output combination →  10

*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 baudrate: 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
- Available output combination →  10

*FOUNDATION Fieldbus interface:*

- FOUNDATION Fieldbus H1, IEC 61158-2, galvanically isolated
- Data transmission rate: 31.25 kBit/s
- Current consumption: 12 mA
- Permissible 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, Totalizer 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer reset
- Link Master function (LM) is supported

**Signal on alarm****Current output**

Failsafe mode selectable (e.g. in accordance with NAMUR Recommendation NE 43)

**Pulse/frequency output**

Failsafe mode selectable

**Status output**

"Non-conductive" in the event of a fault or if the power supply fails

**Relay output (Promass 83)**

"Dead" in the event of a fault or if the power supply fails

**Load**

see "Output signal"

**Low flow cut off**

Switch points for low flow freely selectable.

**Galvanic isolation**

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

**Switching output****Status output**

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

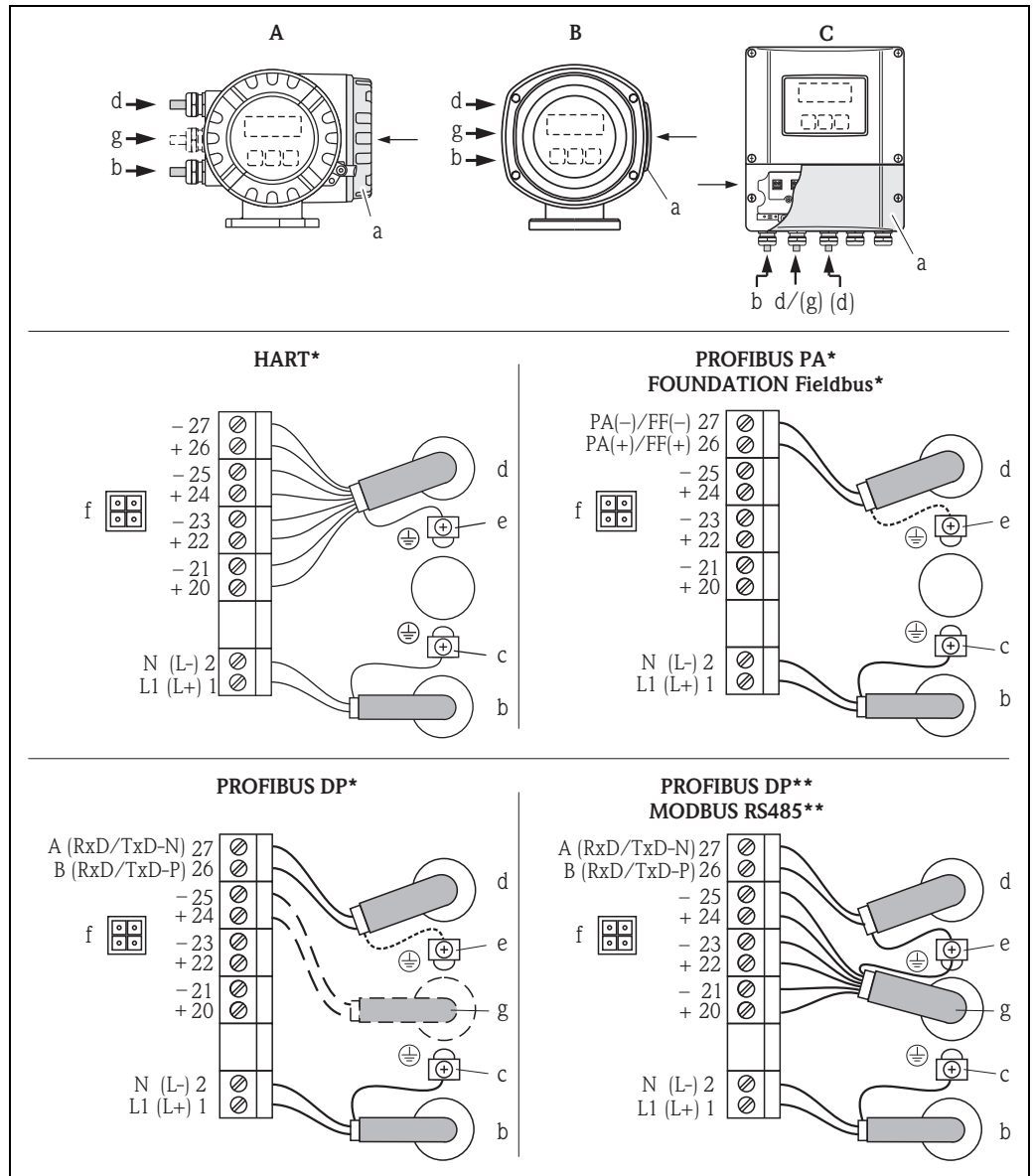
**Relay output (Promass 83)**

- Normally closed (NC or break) or normally open (NO or make) contacts available (factory setting: relay 1 = NO, relay 2 = NC)
- max. 30 V / 0.5 A AC; 60 V / 0.1 A DC
- galvanically isolated
- Configurable for: Error messages, Empty Pipe Detection (EPD), flow direction, limit values, filler valve 1 + 2 (optional)



## 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 Cover of the connection compartment

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 conductor

d Signal cable: see terminal assignment → 10

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 Earth terminal, signal cable screen / fieldbus cable / RS485 line

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

g Signal cable: see terminal assignment → 10

Cable for external termination (only for PROFIBUS DP with fixed communication board):

Terminal No. 24: +5 V

Terminal No. 25: DGND

**Electrical connection,  
terminal assignment****Promass 80**

Order variant	Terminal No. (inputs/outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
80***_*****A	-	-	Frequency output	Current output, HART
80***_*****D	Status input	Status output	Frequency output	Current output, HART
80***_*****H	-	-	-	PROFIBUS PA
80***_*****S	-	-	Frequency output Ex i, passive	Current output Ex i Active, HART
80***_*****T	-	-	Frequency output Ex i, passive	Current output Ex i Passive, HART
80***_*****8	Status input	Frequency output	Current output 2	Current output 1, HART

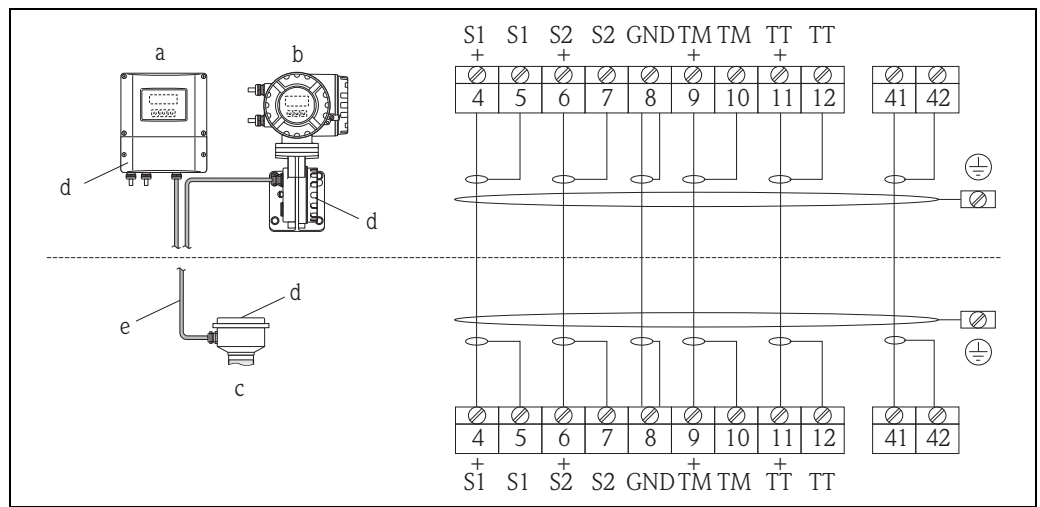
**Promass 83**

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

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

Order variant	Terminal No. (inputs/outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
83***_*****M	Status input	Frequency output 2	Frequency output 1	Current output HART
83***_*****N	Current output	Frequency output	Status input	Modbus RS485
83***_*****P	Current output	Frequency output	Status input	PROFIBUS DP
83***_*****V	Relay output 2	Relay output 1	Status input	PROFIBUS DP
83***_*****W	Relay output	Current output 3	Current output 2	Current output 1 HART
83***_*****0	Status input	Current output 3	Current output 2	Current output 1 HART
83***_*****2	Relay output	Current output 2	Frequency output	Current output 1 HART
83***_*****3	Current input	Relay output	Current output 2	Current output 1 HART
83***_*****4	Current input	Relay output	Frequency output	Current output HART
83***_*****5	Status input	Current input	Frequency output	Current output HART
83***_*****6	Status input	Current input	Current output 2	Current output HART
83***_*****7	Relay output 2	Relay output 1	Status input	Modbus RS485

## Electrical connection Remote version



Connection of the remote connection

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

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

## 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


<b>Cable entries</b>	<p>Power-supply and signal cables (inputs/outputs)</p> <ul style="list-style-type: none"> <li>■ Cable entry M20 × 1.5 (8 to 12 mm / 0.31 to 0.47")</li> <li>■ Thread for cable entries, ½" NPT, G ½"</li> </ul> <p>Connecting cable for remote version</p> <ul style="list-style-type: none"> <li>■ Cable entry M20 × 1.5 (8 to 12 mm / 0.31" to 0.47")</li> <li>■ Thread for cable entries, ½" NPT, G ½"</li> </ul>
<b>Remote version cable specifications</b>	<ul style="list-style-type: none"> <li>■ 6 × 0.38 mm<sup>2</sup> PVC cable with common shield and individually shielded cores</li> <li>■ Conductor resistance: ≤50 Ω/km (≤0.015 Ω/ft)</li> <li>■ Capacitance: core/shield: ≤420 pF/m (≤128 pF/ft)</li> <li>■ Cable length: max. 20 m (65 ft)</li> <li>■ Operating temperature: max. +105 °C (+221 °F)</li> </ul> <p>Operation in zones of severe electrical interference: The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of ICE/EN 61326, and NAMUR recommendation NE 21/43.</p>
<b>Power consumption</b>	<p>AC: &lt;15 VA (including sensor) DC: &lt;15 W (including sensor)</p> <p>Switch-on current</p> <ul style="list-style-type: none"> <li>■ Max. 13.5 A (&lt; 50 ms) at 24 V DC</li> <li>■ Max. 3 A (&lt; 5 ms) at 260 V AC</li> </ul>
<b>Power supply failure</b>	<p><b>Promass 80</b></p> <p>Lasting min. 1 power cycle</p> <ul style="list-style-type: none"> <li>■ EEPROM saves measuring system data if the power supply fails</li> <li>■ HistoROM/S-DAT: exchangeable data storage chip with sensor specific data (nominal diameter, serial number, calibration factor, zero point, etc.)</li> </ul> <p><b>Promass 83</b></p> <p>Lasting min. 1 power cycle:</p> <ul style="list-style-type: none"> <li>■ EEPROM and T-DAT save measuring system data if the power supply fails</li> <li>■ Histo-ROM/S-DAT: exchangeable data storage chip with sensor specific data (nominal diameter, serial number, calibration factor, zero point, etc.)</li> </ul>
<b>Potential equalisation</b>	<p>No special measures for potential equalization are required. For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.</p>

## Performance characteristics

### Reference operating conditions

- Error limits following ISO/DIN 11631
- Water, typically +20 to +30 °C (+68 to +86 °F); 2 to 4 bar (30 to 60 psi)
- Data according to calibration protocol  $\pm 5$  °C ( $\pm 9$  °F) and  $\pm 2$  bar ( $\pm 30$  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  $\pm 5$   $\mu$ A. Design fundamentals →  15.

o.r. = of reading

#### Mass flow and volume flow (liquids)

- Promass 83A:  $\pm 0.10\%$  o.r.
- Promass 80A:  $\pm 0.15\%$  o.r.

#### Mass flow (gases)

Promass 83A, 80A:  $\pm 0.50\%$  o.r.

#### Density (liquids)

- $\pm 0.0005$  g/cc (under reference conditions)
- $\pm 0.0005$  g/cc (after field density calibration under process conditions)
- $\pm 0.002$  g/cc (after special density calibration)
- $\pm 0.02$  g/cc (over the entire measuring range of the sensor)

1 g/cc = 1 kg/l

Special density calibration (optional):

- Calibration range: 0.0 to 1.8 g/cc, +5 to +80 °C (+41 to +176 °F)
- Operation range: 0.0 to 5.0 g/cc, -50 to +200 °C (-58 to +392 °F)

#### Temperature

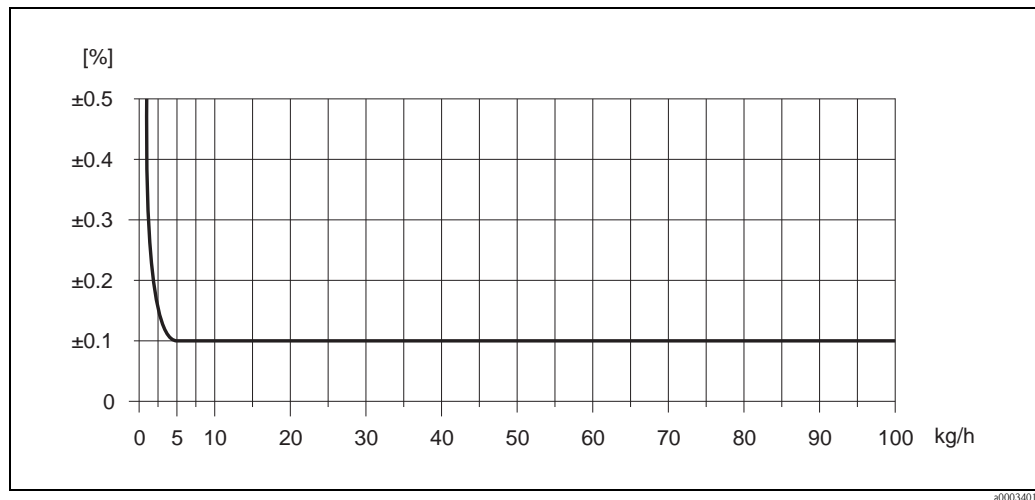
$\pm 0.5$  °C  $\pm 0.005 \cdot T$  °C

( $\pm 1$  °F  $\pm 0.003 \cdot (T - 32)$  °F)

T = medium temperature

#### Zero point stability

DN		Max. full scale value		Zero point stability	
[mm]	[inch]	[kg/h] or [l/h]	[lb/min]	[kg/h] or [l/h]	[lb/min]
1	1/24"	20	0.73	0.0010	0.000036
2	1/12"	100	3.7	0.0050	0.00018
4	1/8"	450	16.5	0.0225	0.0008

**Example for max. measured error**

Max. measured error in % o.r. (example: Promass 80A, 83A / DN 2)

Flow values (example)

Design fundamentals → 15

Turn down	Flow		Max. measured error [% o.r.]
	[kg/h]	[lb/min.]	
250:1	0,4	0,0147	1,250
100:1	1,0	0,0368	0,500
25:1	4,0	0,1470	0,125
10:1	10	0,3675	0,100
2:1	50	1,8375	0,100

o.r. = of reading

**Repeatability**

Design fundamentals → 15

o.r. = of reading

**Mass flow and volume flow (liquids)**

Promass 83A, 80A: ±0.05% o.r.

**Mass flow (gases)**

Promass 83A, 80A: ±0.25% o.r.

**Density (liquids)**

±0.00025 g/cc

1 g/cc = 1 kg/l

**Temperature**

±0.25 °C ± 0.0025 · T °C

(±1 °F ± 0.003 · (T - 32) °F)

T = medium temperature

---

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

---

**Influence of medium pressure** A difference in pressure between the calibration pressure and the process pressure does not have any effect on the accuracy.

---

**Design fundamentals** Dependent on the flow:

- Flow  $\geq$  Zero point stability  $\div$  (Base accuracy  $\div$  100)
  - Max. measured error:  $\pm$ Base accuracy in % o.r.
  - Repeatability:  $\pm \frac{1}{2} \cdot$  Base accuracy in % o.r.
- Flow < Zero point stability  $\div$  (Base accuracy  $\div$  100)
  - Max. measured error:  $\pm$  (zero point stability  $\div$  measured value)  $\cdot$  100% o.r.
  - Repeatability:  $\pm \frac{1}{2} \cdot$  (zero point stability  $\div$  measured value)  $\cdot$  100% o.r.

o.r. = of reading

Base accuracy for	Promass 83A	Promass 80A
Mass flow liquids	0.10	0.15
Volume flow liquids	0.10	0.15
Mass flow gases	0.50	0.50

## Installation

### Installation instructions

Note the following points:

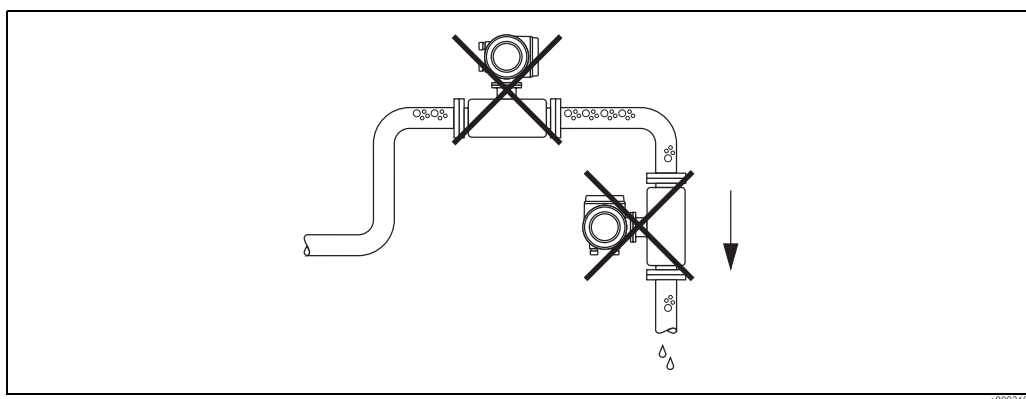
- No special measures such as supports are necessary. External forces are absorbed by the construction of the instrument, for example the secondary containment.
- The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by pipe vibrations.
- No special precautions need to be taken for fittings which create turbulence (valves, elbows, Tpieces, 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.

**For this reason, avoid** the following mounting locations in the pipe:

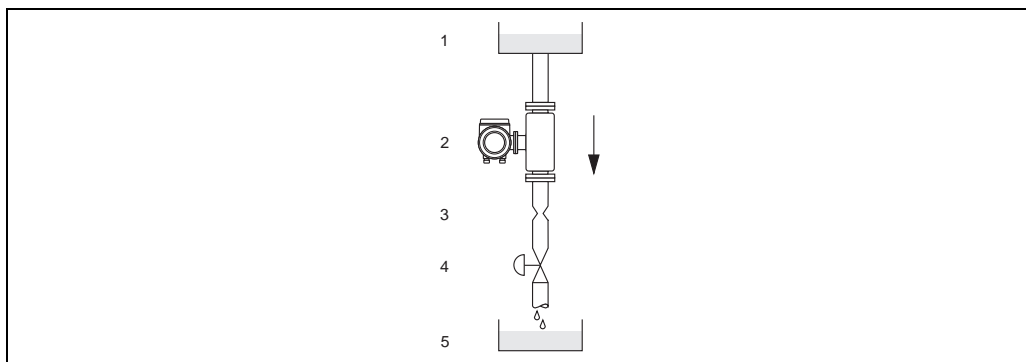
- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream from a free pipe outlet in a vertical pipeline.



a0003605

*Mounting location*

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)
- 4 Valve
- 5 Batching tank



Nominal Diameter		Ø Orifice plate, pipe restriction	
[mm]	[inch]	[mm]	[inch]
1	1/24"	0.8	0.03
2	1/12"	1.5	0.06
4	1/8"	3.0	0.12

### Orientation Promass A

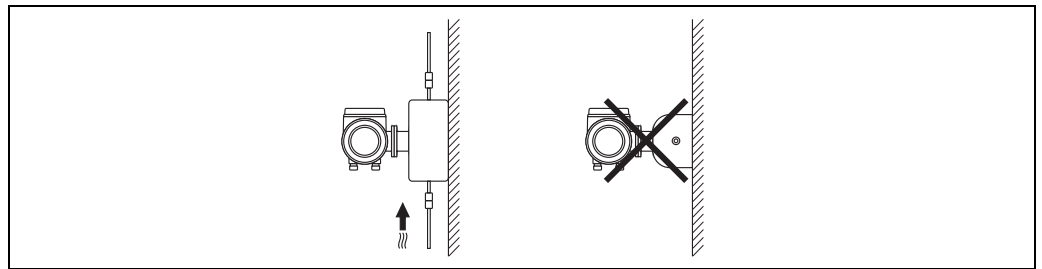
Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction of fluid flow through the pipe).

#### Vertical

Recommended orientation with direction of flow upwards. 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

When installation is correct the transmitter housing is above or below the pipe. This means that no gas bubbles or solids deposits can form in the bent measuring tube (single-tube system).



A0018978

### Special installation instructions for Promass A



Caution!

Risk of measuring pipe fracture if sensor installed incorrectly!

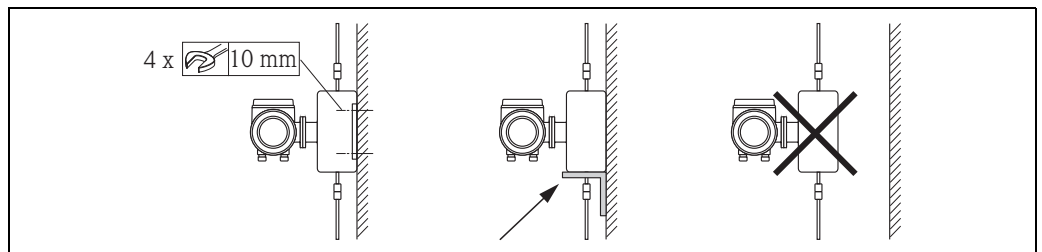
The sensor may not be installed in a pipe as a freely suspended sensor:

- Using the base plate, mount the sensor directly on the floor, the wall or the ceiling.
- Support the sensor on a firmly mounted support base (e.g. angle bracket).

#### Vertical

We recommend two installation versions when mounting vertically:

- Mounted directly on a wall using the base plate
- Measuring device supported on an angle bracket mounted on the wall

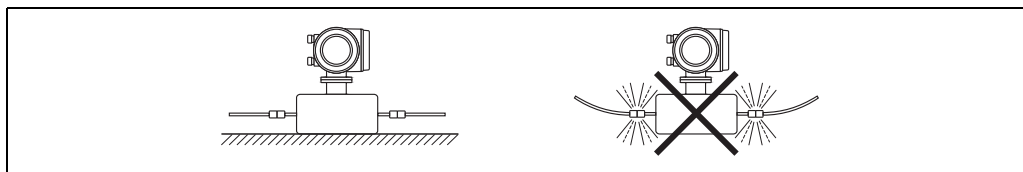


A0018980

### Horizontal

We recommend the following installation version when mounting horizontally:

- Measuring device standing on a firm support base



A0018979

### 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.
- With a fluid temperature between +200 to +350 °C (+392 to +662 °F) the remote version of the high-temperature version is preferable.
- When using electrical heat tracing whose heat is regulated using phase control or by pulse packs, it cannot be ruled out that the measured values are influenced by magnetic fields which may occur, (i.e. at values greater than those permitted by the EC standard (Sinus 30 A/m)). In such cases, the sensor must be magnetically shielded.

The secondary containment can be shielded with tin plates or electric sheets without privileged direction (e.g. V330-35A) with the following properties:

- Relative magnetic permeability  $\mu_r \geq 300$
- Plate thickness  $d \geq 0.35 \text{ mm}$  (0.014")

- Information on permissible temperature ranges → 20

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

### Zero point adjustment

All Promass 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 → 13

For this reason, Promass generally 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 small flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very high-viscosity fluids).

#### Inlet and outlet run

There are no installation requirements regarding inlet and outlet runs.

#### Length of connecting cable

max. 20 m (65 ft), remote version

#### System pressure

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

In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapour pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.

Consequently, it is generally best to install the sensor:

- Downstream from pumps (no risk of partial vacuum)
- At the lowest point in a vertical pipe

## 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)

### Ambient class

B, C, I

### Degree of protection

Standard: IP 67 (NEMA 4X) for transmitter and sensor

### Shock resistance

In accordance with IEC 68-2-31

### Vibration resistance

Acceleration up to 1g, 10 to 150 Hz, following IEC 68-2-6

### CIP cleaning

yes

### SIP cleaning

yes

### Electromagnetic compatibility (EMC)

To IEC/EN 61326 and NAMUR recommendation NE 21

## Process

### Medium temperature range

#### Sensor

–50 to +200 °C (–58 to +392 °F)

#### Seals:

(Only for mounting kits with screw-on connections)

- EPDM: –40 to +160 °C (–40 to +320 °F)
- Kalrez: –20 to +275 °C (–4 to +528 °F)
- Silicone: –60 to +200 °C (–76 to +392 °F)
- Viton: –15 to +200 °C (+5 to +392 °F)

### Medium pressure range (nominal pressure)

#### Threaded joints

- Standard versions: max. 160 bar (2320 psi)
- High-pressure versions: max. 400 bar (5800 psi)

#### Flanges

- DIN PN 40 to 100
- ASME Cl 150, Cl 300
- JIS 10K, 20K



Note!

Material load diagrams for the process connections can be found on → [Fig 36](#).

#### Pressure ranges of secondary containment

25 bar (375 psi)



Warning!

In case a danger of measuring tube failure exists due to process characteristics, e.g. with corrosive process fluids, we recommend the use of sensors whose secondary containment is equipped with special pressure monitoring connections (ordering option). With the help of these connections, fluid collected in the secondary containment in the event of tube failure can be bled off. This is especially important in high pressure gas applications. These connections can also be used for gas circulation and/or detection.

### Rupture disk (optional)

Further informationen → [Fig 34](#)

### Limiting flow

See information in the "Measuring range" Section → [Fig 5](#)

Select nominal diameter by optimising between required flow range and permissible pressure loss.

An overview of max. possible full scale values can be found in the "Measuring range" Section.

- The minimum recommended full scale value is approx. 1/20 of the max. full scale value.
- In most applications, 20 to 50% of the maximum full scale value can be considered ideal.
- Select a lower full scale value for abrasive substances such as fluids with entrained solids (flow velocity <1 m/s (<3 ft/s)).
- For gas measurement the following rules apply:
  - Flow velocity in the measuring tubes should not be more than half the sonic velocity (0.5 Mach).
  - The maximum mass flow depends on the density of the gas: formula → [Fig 5](#)

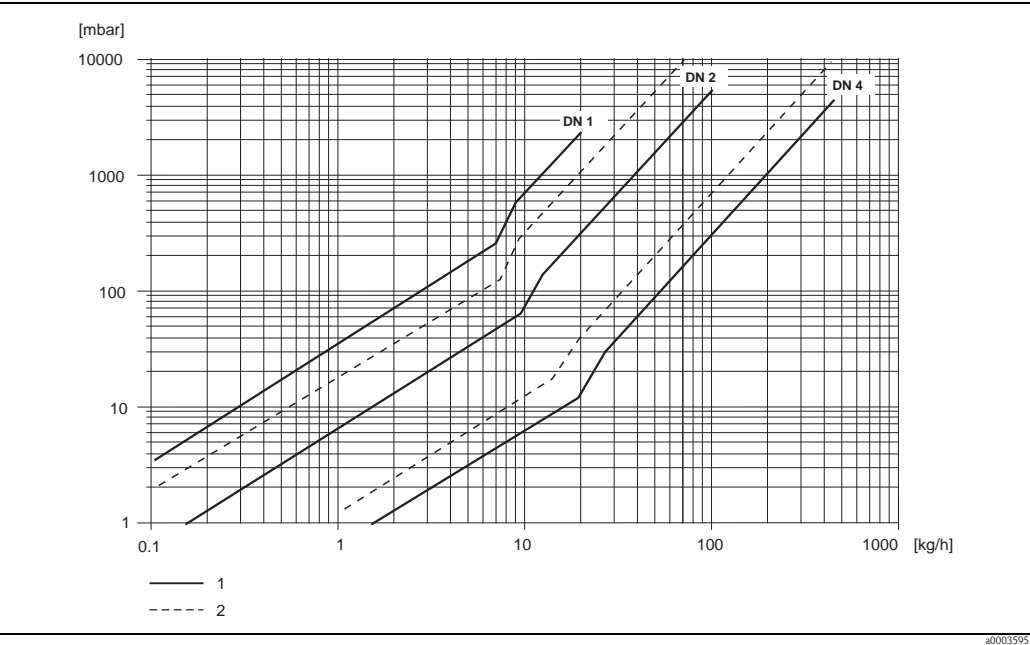
Pressure loss in SI units

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

Reynolds number	$Re = \frac{4 \cdot \dot{m}}{\pi \cdot d \cdot \nu \cdot \rho}$ <div>a0003381</div>
$Re \geq 2300$ <sup>1)</sup>	$\Delta p = K \cdot \nu^{0.25} \cdot \dot{m}^{1.75} \cdot \rho^{-0.75}$ <div>a0003380</div>
$Re < 2300$	$\Delta p = K1 \cdot \nu \cdot \dot{m}$ <div>a0003379</div>
<div><div><div>– <math>\Delta p</math> = pressure loss [mbar]</div><div>– <math>\nu</math> = kinematic viscosity [m2/s]</div><div>– <math>\dot{m}</math> = mass flow [kg/s]</div><div>– <math>\rho</math> = density [kg/m³]</div><div>– <math>d</math> = inside diameter of measuring tubes [m]</div><div>– <math>K...K1</math> = constant (depends on nominal diameter)</div></div><div><sup>1)</sup> To compute the pressure loss for gases, always use the formula for <math>Re \geq 2300</math>.</div></div>	

Pressure loss coefficients

DN [mm]	Standard version			High-pressure version		
	d [m]	K	K1	d [m]	K	K1
1	$1.1 \cdot 10^{-3}$	$1.2 \cdot 10^{11}$	$1.3 \cdot 10^{11}$	—		
2	$1.8 \cdot 10^{-3}$	$1.6 \cdot 10^{10}$	$2.4 \cdot 10^{10}$	$1.4 \cdot 10^{-3}$	$5.4 \cdot 10^{10}$	$6.6 \cdot 10^{10}$
4	$3.5 \cdot 10^{-3}$	$9.4 \cdot 10^8$	$2.3 \cdot 10^9$	$3.0 \cdot 10^{-3}$	$2.0 \cdot 10^9$	$4.3 \cdot 10^9$



Pressure loss diagram for water

- 1

Standard version
- 2

High-pressure version

### 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 of the measuring point.
- Converting mass flow to volume flow, etc.
- Simultaneous display of various meter size.
- Determining measuring ranges.

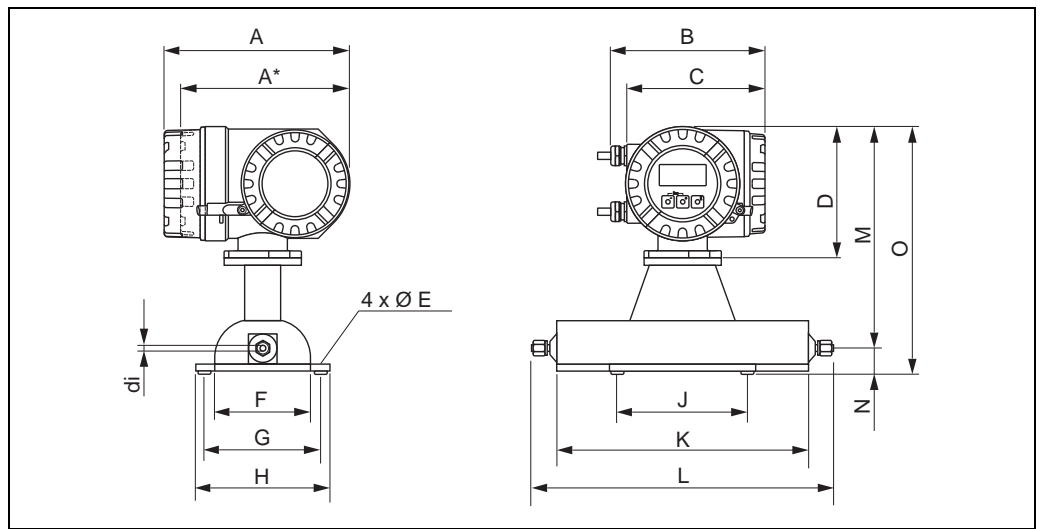
The Applicator runs on any IBM compatible PC with windows.

## Mechanical construction

### Design / dimensions

Dimensions	
Field housing compact version, powder-coated die-cast aluminum	→  23
Transmitter compact version, stainless steel	→  24
Transmitter remote version, connection housing (II2G/zone 1)	→  24
Transmitter remote version, wall-mount housing (non hazardous area and II3G/zone 2)	→  25
Sensor remote version, connection housing	→  26
Process connection in SI units	
4-VCO-4-connection (welded)	→  27
1/2" Tri-Clamp connection (welded)	→  27
4-VCO-4-connection with mounting kit: DN 15 flange	→  28
4-VCO-4-connection with mounting kit: 1/4" NPT-F	→  29
4-VCO-4-connection with mounting kit: 1/8" or 1/4" SWAGELOK	→  29
Process connection in US units	
4-VCO-4-connection (welded)	→  30
1/2" Tri-Clamp connection (welded)	→  30
4-VCO-4-connection with mounting kit: DN 15 flange	→  31
4-VCO-4-connection with mounting kit: 1/4" NPT-F	→  32
4-VCO-4-connection with mounting kit: 1/8" or 1/4" SWAGELOK	→  32
<b>Purge connections / pressure vessel monitoring</b>	→  33
<b>Rupture disc</b>	→  34

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



## Dimensions in SI units

DN	A	A*	B	C	D	E	F	G	H	J	K	L	M	N	O	U/di
1	227	207	187	168	160	Ø 6.5	120	145	165	160	228	<sup>1)</sup>	273	32	305	<sup>1)</sup>
2	227	207	187	168	160	Ø 6.5	120	145	165	160	310	<sup>1)</sup>	273	32	305	<sup>1)</sup>
4	227	207	187	168	160	Ø 6.5	150	175	195	220	435	<sup>1)</sup>	283	32	315	<sup>1)</sup>

\* Blind version (without display)

<sup>1)</sup> depends on the process connection

Dimensions for the holes (e) on the baseplate for a table, a wall or post mounting: Dimensions G x J

All dimensions in [mm]

## Dimensions in US units

DN	A	A*	B	C	D	E	F	G	H	J	K	L	M	N	O	U/di
1	8.94	8.15	7.68	6.61	6.30	Ø 0.26	4.72	5.71	6.50	6.30	8.98	<sup>1)</sup>	10.7	1.26	12.0	<sup>1)</sup>
2	8.94	8.15	7.68	6.61	6.30	Ø 0.26	4.72	5.71	6.50	6.30	12.2	<sup>1)</sup>	10.7	1.26	12.0	<sup>1)</sup>
4	8.94	8.15	7.68	6.61	6.30	Ø 0.26	5.90	6.89	7.68	8.67	17.1	<sup>1)</sup>	11.1	1.26	12.4	<sup>1)</sup>

\* Blind version (without display)

<sup>1)</sup> depends on the process connection

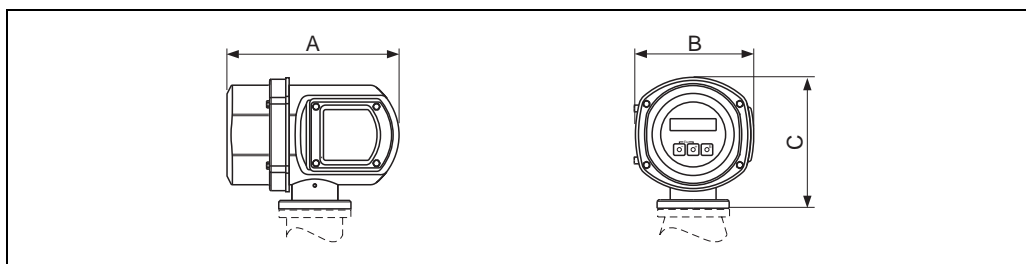
Dimensions for the holes (e) on the baseplate for a table, a wall or post mounting: Dimensions G x J

All dimensions in [inch]



Note!

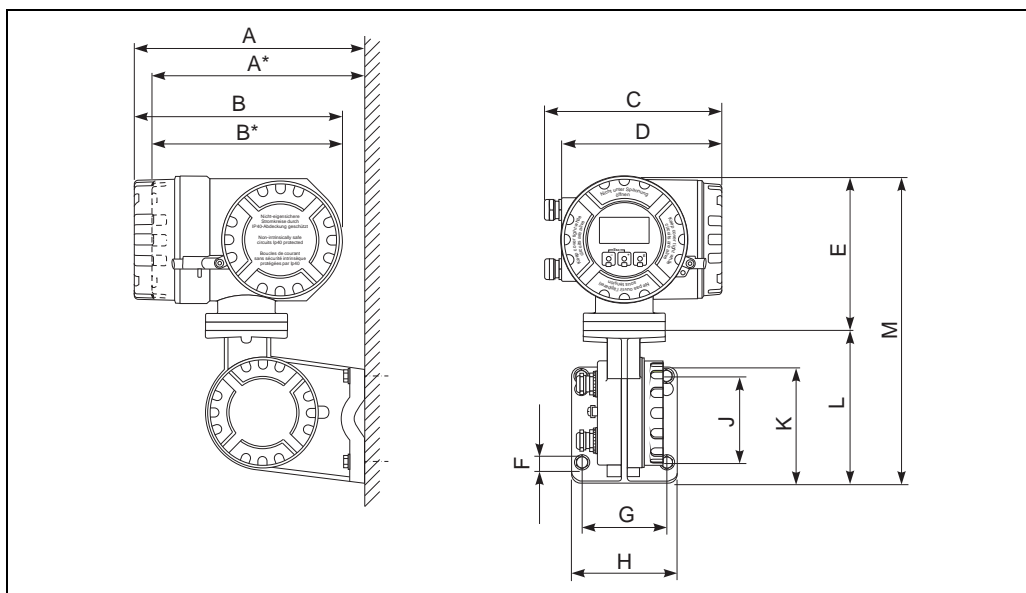
Dimensions for transmitter II2G/zone 1 → 24.

**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)**

a0006999

*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*

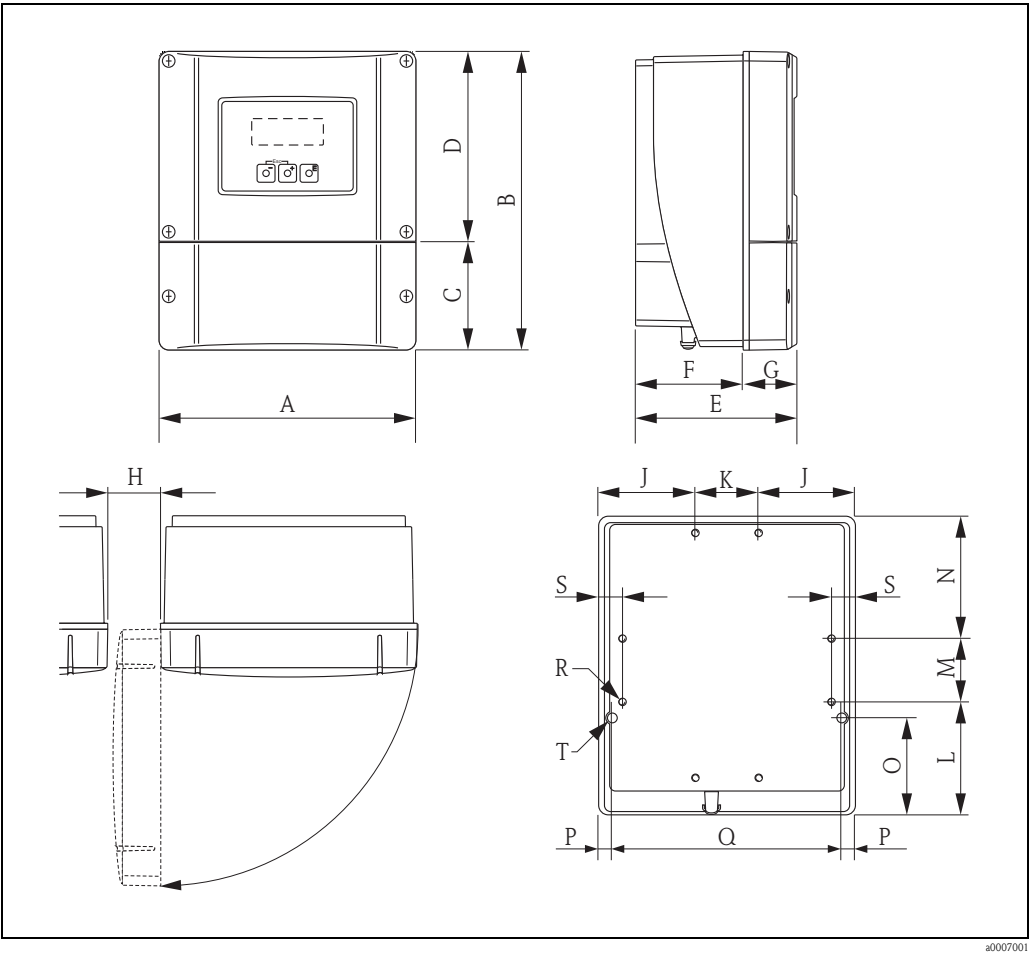
A	A*	B	B*	C	D	E	F Ø	G	H	J	K	L	M
10.4	9.53	9.45	8.54	8.11	7.32	7.01	0.34 (M8)	3.94	5.12	3.94	5.67	6.69	13.7

\* Blind version (without display)

All dimensions in [inch]



Transmitter remote version, wall-mount housing (non hazardous area and II3G/zone 2)



Dimensions in SI units

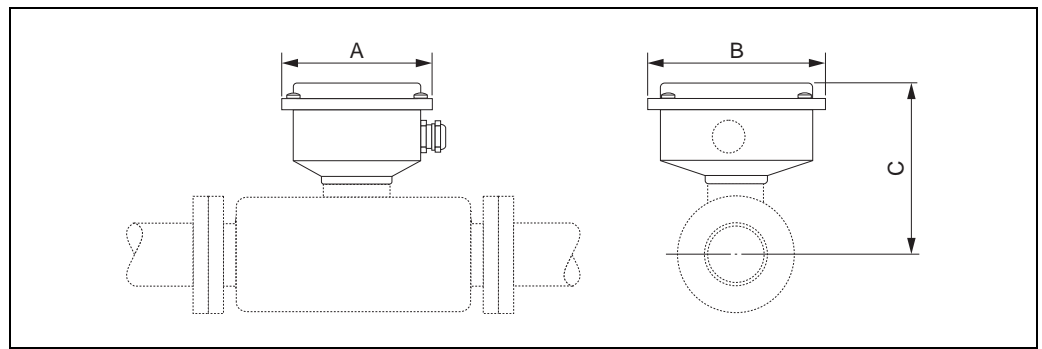
A	B	C	D	E	F	G	H	J	K
215	250	90.5	159.5	135	90	45	> 50	81	53
L	M	N	O	P	Q	R	S	T <sup>1)</sup>	
95	53	102	81.5	11.5	192	8 × M5	20	2 x Ø 6.5	

<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 x 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, connetion housing***Dimensions in SI units*

DN	A	B	C
1	118.5	137.5	120
2	118.5	137.5	120
4	118.5	137.5	130

All dimensions in [mm]

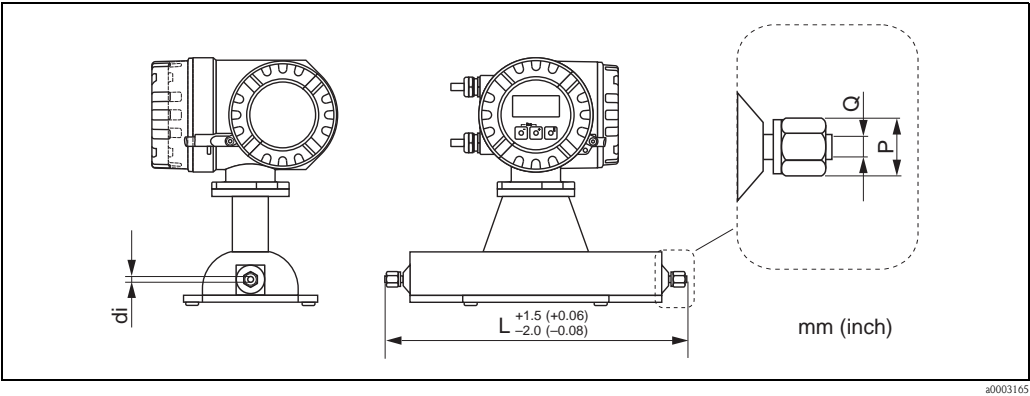
*Dimensions in US units*

DN	A	B	C
1/24"	4.67	5.41	4.72
1/12"	4.67	5.41	4.72
1/8"	4.67	5.41	5.12

All dimensions in [inch]

Process connections in SI units

4-VCO-4-connection (welded)



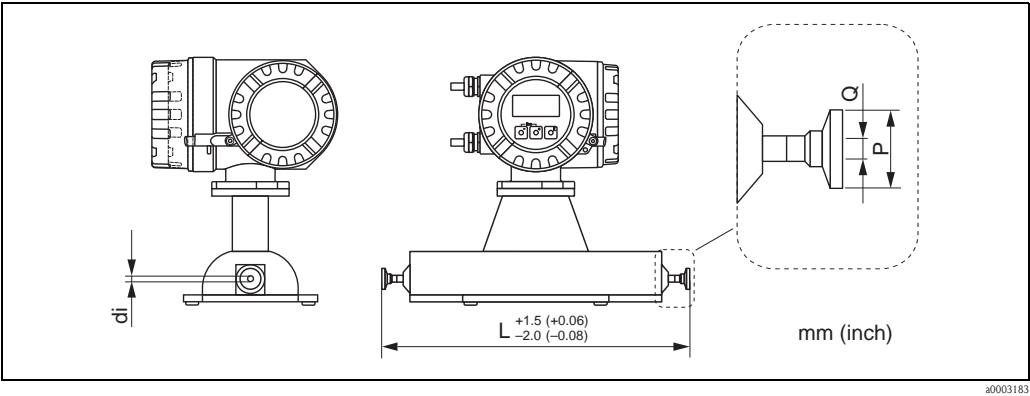
4-VCO-4-connection: 1.4539/904L, Alloy C-22			
DN	L	P	Q / di
1 <sup>1)</sup>	290	AF 11/16"	1.1
2 <sup>1)</sup>	372	AF 11/16"	1.8
2 <sup>2)</sup>	372	AF 11/16"	1.4
4 <sup>1)</sup>	497	AF 11/16"	3.5
4 <sup>2)</sup>	497	AF 11/16"	3.0

<sup>1)</sup> 3A version can be supplied ( $Ra \leq 0.4 \mu\text{m}/240 \text{ grit}$ ). Only for 1.4539/904L

<sup>2)</sup> High-pressure version

All dimensions in [mm]

1/2" Tri-Clamp connection (welded)

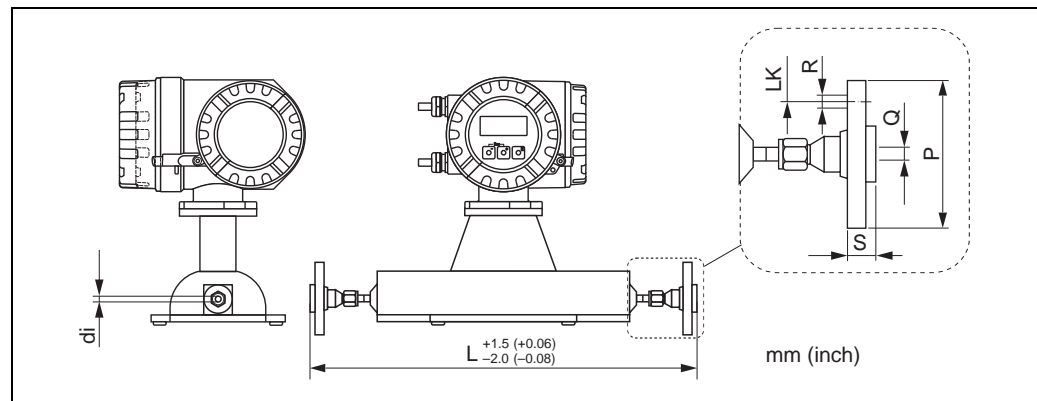


1/2" Tri-Clamp connection / 3A version <sup>1)</sup> : 1.4539/904L				
DN	L	P	Q	di
1	296	25	9.5	1.1
2	378	25	9.5	1.8
4	503	25	9.5	3.5

<sup>1)</sup> 3A version ( $Ra \leq 0.8 \mu\text{m}/150 \text{ grit}$ . option:  $Ra \leq 0.4 \mu\text{m}/240 \text{ grit}$ )

All dimensions in [mm]

## 4-VCO-4-connection with mounting kit: DN 15 flange



a0003184-ae

**Mounting kit DN 15 flange EN 1092-1 (DIN 2501) PN 40:** 1.4539/904L, Alloy C-22

DN	PN	L	P	Q	R	S	LK	di
1	40	393	95	17.3	4 × Ø14	28	65	1.1
2	40	475	95	17.3	4 × Ø14	28	65	1.8
4	40	600	95	17.3	4 × Ø14	28	65	3.5

Loose flanges (not wetted) made of stainless steel 1.4404/316L

All dimensions in [mm]

**Mounting kit ½" flange (ASME):** 1.4539/904L, Alloy C-22

DN	ASME	L	P	Q	R	S	LK	di
1	Cl 150	393	88.9	15.7	4 × Ø15.7	17.7	60.5	1.1
1	Cl 300	393	95.2	15.7	4 × Ø15.7	20.7	66.5	1.1
2	Cl 150	475	88.9	15.7	4 × Ø15.7	17.7	60.5	1.8
2	Cl 300	475	95.2	15.7	4 × Ø15.7	20.7	66.5	1.8
4	Cl 150	600	88.9	15.7	4 × Ø15.7	17.7	60.5	3.5
4	Cl 300	600	95.2	15.7	4 × Ø15.7	20.7	66.5	3.5

Loose flanges (not wetted) made of stainless steel 1.4404/316L

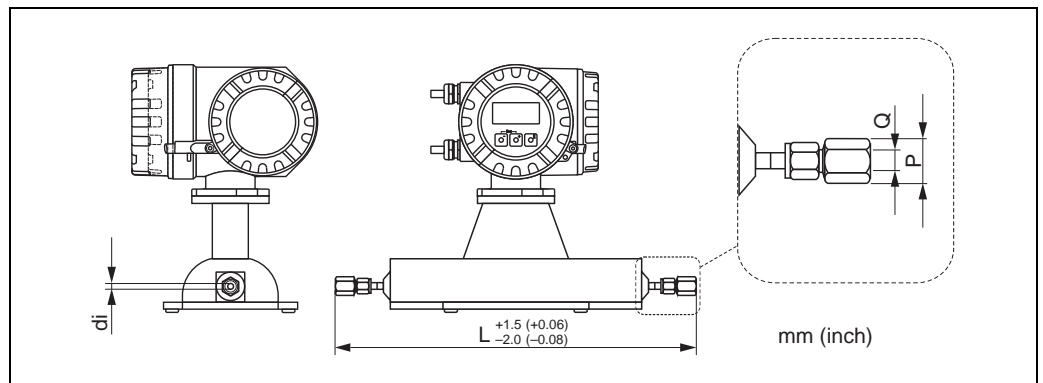
All dimensions in [mm]

**Mounting kit DN 15 flange (JIS):** 1.4539/904L, Alloy C-22

DN	JIS	L	P	Q	R	S	LK	di
1	10K	393	95	15.0	4 × Ø15	28	70	1.1
1	20K	393	95	15.0	4 × Ø15	14	70	1.1
2	10K	475	95	15.0	4 × Ø15	28	70	1.8
2	20K	475	95	15.0	4 × Ø15	14	70	1.8
4	10K	600	95	15.0	4 × Ø15	28	70	3.5
4	20K	600	95	15.0	4 × Ø15	14	70	3.5

Loose flanges (not wetted) made of stainless steel 1.4404/316L

All dimensions in [mm]

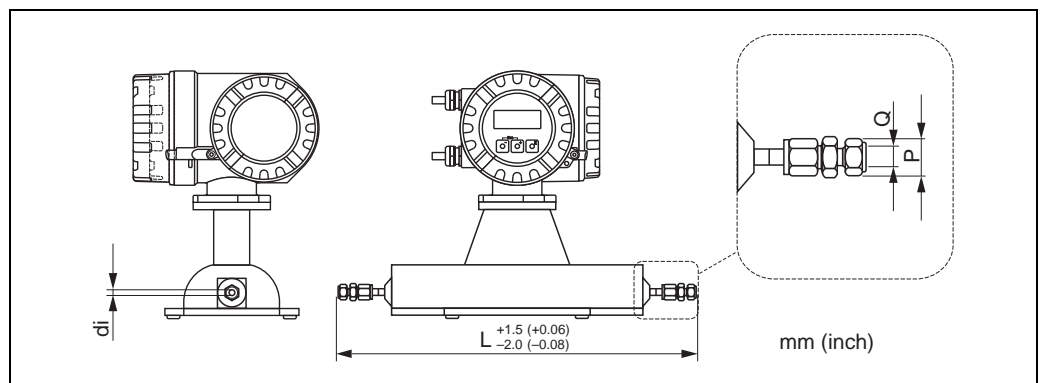
*4-VCO-4-connection with mounting kit: 1/4" NPT-F*

a0003185

**Mounting kit 1/4" NPT-F connection: 1.4539/904L, Alloy C-22**

DN	L	P	Q	di
1	361	AF 3/4"	1/4" NPT	1.1
2	443	AF 3/4"	1/4" NPT	1.8
2 <sup>1)</sup>	443	AF 3/4"	1/4" NPT	1.4
4	568	AF 3/4"	1/4" NPT	3.5
4 <sup>1)</sup>	568	AF 3/4"	1/4" NPT	3.0

High-pressure version only available as 1.4539/904L; All dimensions in [mm]; Further dimensions

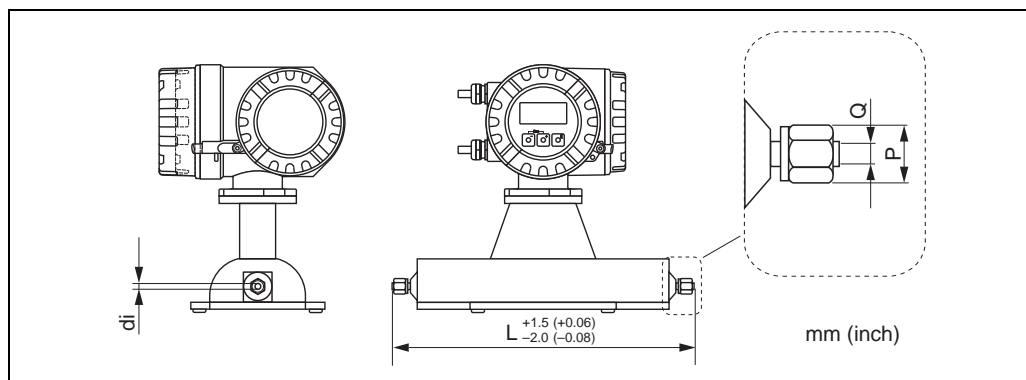
*4-VCO-4-connection with mounting kit: 1/8" or 1/4" SWAGELOK*

a0003186

**Mounting kit SWAGELOK connection: 1.4539/904L**

DN	L	P	Q	di
1	359.6	AF 7/16"	1/8"	1.1
1	364.6	AF 9/16"	1/4"	1.1
2	441.6	AF 7/16"	1/8"	1.8
2	446.6	AF 9/16"	1/4"	1.8
2 <sup>1)</sup>	441.6	AF 7/16"	1/8"	1.4
2 <sup>1)</sup>	446.6	AF 9/16"	1/4"	1.4
4	571.6	AF 9/16"	1/4"	3.5
4 <sup>1)</sup>	571.6	AF 9/16"	1/4"	3.0

<sup>1)</sup> High-pressure version; All dimensions in [mm]

**Process connection in US units***4-VCO-4-connection (welded)*

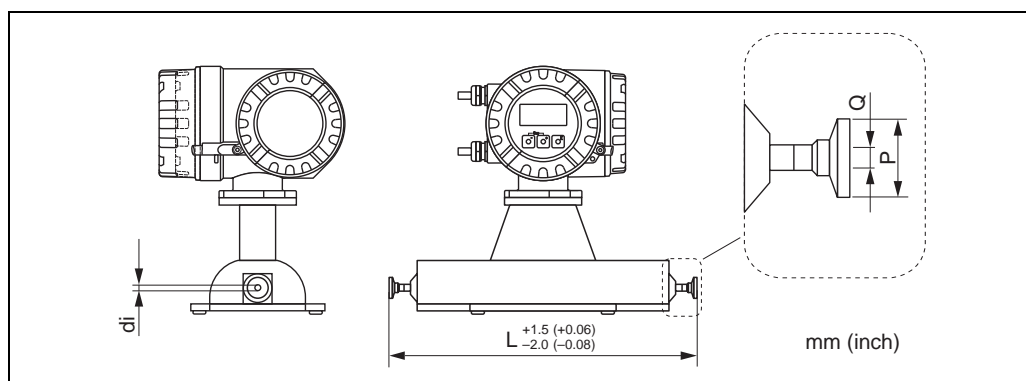
a0003165-en

**4-VCO-4-connection: 1.4539/904L, Alloy C-22**

DN	L	P	Q / di
1/24" <sup>1)</sup>	11.4	AF 11/16"	0.04
1/12" <sup>1)</sup>	14.6	AF 11/16"	0.07
1/12" <sup>2)</sup>	14.6	AF 11/16"	0.06
1/8" <sup>1)</sup>	19.6	AF 11/16"	0.14
1/8" <sup>2)</sup>	19.6	AF 11/16"	0.12

<sup>1)</sup> 3A version can be supplied ( $R_a \leq 0.4 \mu\text{m}/240$  grit). Only for 1.4539/904L<sup>2)</sup> High-pressure version

All dimensions in [inch]

*1/2" Tri-Clamp connection (welded)*

a0003183-en

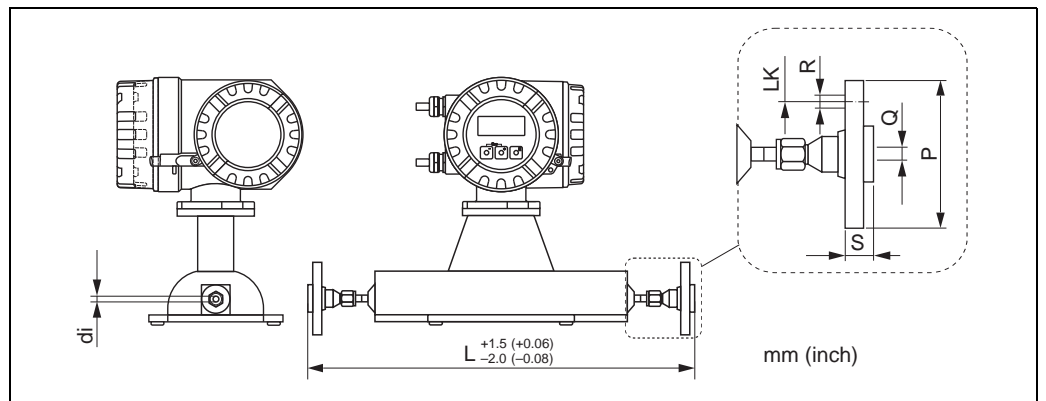
**1/2" Tri-Clamp connection / 3A version <sup>1)</sup>: 1.4539/904L**

DN	L	P	Q	di
1/24"	11.7	0.98	0.37	0.04
1/12"	14.9	0.98	0.37	0.07
1/8"	19.8	0.98	0.37	0.14

<sup>1)</sup> 3A version can be supplied ( $R_a \leq 0.8 \mu\text{m}/150$  grit. option:  $R_a \leq 0.4 \mu\text{m}/240$  grit)

All dimensions in [inch]

## 4-VCO-4-connection with mounting kit: DN 15 flange



a0003184-en

**Mounting kit DN 15 flange EN 1092-1 (DIN 2501) PN 40:** 1.4539/904L, Alloy C-22

DN	PN	L	P	Q	R	S	LK	di
1/24"	40	16	3.8	0.692	4 × Ø 0.56	1.12	2.6	0.04
1/12"	40	19	3.8	0.692	4 × Ø 0.56	1.12	2.6	0.07
1/8"	40	24	3.8	0.692	4 × Ø 0.56	1.12	2.6	0.14

Loose flanges (not wetted) made of stainless steel 1.4404/316L

All dimensions in [inch]

**Mounting kit DN 15 flange (JIS):** 1.4539/904L, Alloy C-22

DN	JIS	L	P	Q	R	S	LK	di
1/24"	10K	16	3.8	0.6	4 × Ø0.6	1.12	2.8	0.04
1/24"	20K	16	3.8	0.6	4 × Ø0.6	0.56	2.8	0.04
1/12"	10K	19	3.8	0.6	4 × Ø0.6	1.12	2.8	0.07
1/12"	20K	19	3.8	0.6	4 × Ø0.6	0.56	2.8	0.07
1/8"	10K	24	3.8	0.6	4 × Ø0.6	1.12	2.8	0.14
1/8"	20K	24	3.8	0.6	4 × Ø0.6	0.56	2.8	0.14

Loose flanges (not wetted) made of stainless steel 1.4404/316L

All dimensions in [inch]

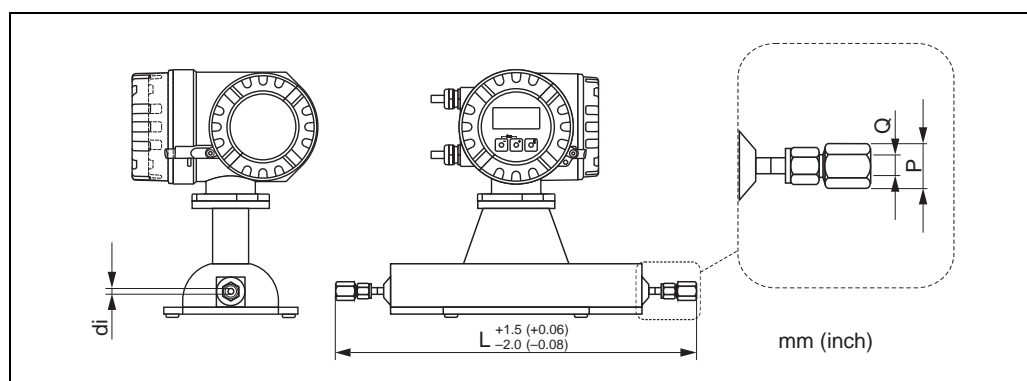
**Mounting kit ½" flange (ASME):** 1.4539/904L, Alloy C-22

DN	ASME	L	P	Q	R	S	LK	di
1/24"	Cl 150	16	3.5	0.62	4 × Ø0.62	0.70	2.38	0.04
1/24"	Cl 300	16	3.7	0.62	4 × Ø0.62	0.81	2.62	0.04
1/12"	Cl 150	19	3.5	0.62	4 × Ø0.62	0.70	2.38	0.07
1/12"	Cl 300	19	3.7	0.62	4 × Ø0.62	0.81	2.62	0.07
1/8"	Cl 150	24	3.5	0.62	4 × Ø0.62	0.70	2.38	0.14
1/8"	Cl 300	24	3.7	0.62	4 × Ø0.62	0.81	2.62	0.14

Loose flanges (not wetted) made of stainless steel 1.4404/316L

All dimensions in [inch]

4-VCO-4-connection with mounting kit: 1/4" NPT-F



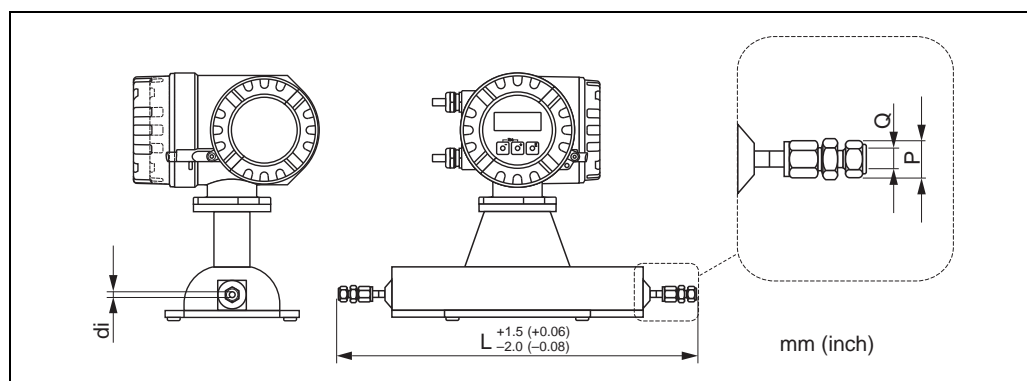
a0003185-en

**Mounting kit 1/4" NPT-F connection: 1.4539/904L, Alloy C-22**

DN	L	P	Q	di
1/24"	14.4	AF 3/4"	1/4" NPT	0.04
1/12"	14.9	AF 3/4"	1/4" NPT	0.07
1/12" <sup>1)</sup>	14.9	AF 3/4"	1/4" NPT	0.06
1/8"	22.4	AF 3/4"	1/4" NPT	0.14
1/8" <sup>1)</sup>	22.4	AF 3/4"	1/4" NPT	0.12

<sup>1)</sup> High-pressure version only available as 1.4539/904L; All dimensions in [inch]

4-VCO-4-connection with mounting kit: 1/8" or 1/4" SWAGELOK



a0003186-en

**Mounting kit SWAGELOK connection: 1.4539/904L**

DN	L	P	Q	di
1/24"	14.2	AF 7/16"	1/8"	0.04
1/24"	14.6	AF 9/16"	1/4"	0.04
1/12"	17.4	AF 7/16"	1/8"	0.07
1/12"	17.4	AF 9/16"	1/4"	0.07
1/12" <sup>1)</sup>	17.4	AF 7/16"	1/8"	0.06
1/12" <sup>1)</sup>	17.4	AF 9/16"	1/4"	0.06
1/8"	22.4	AF 9/16"	1/4"	0.14
1/8" <sup>1)</sup>	22.4	AF 9/16"	1/4"	0.12

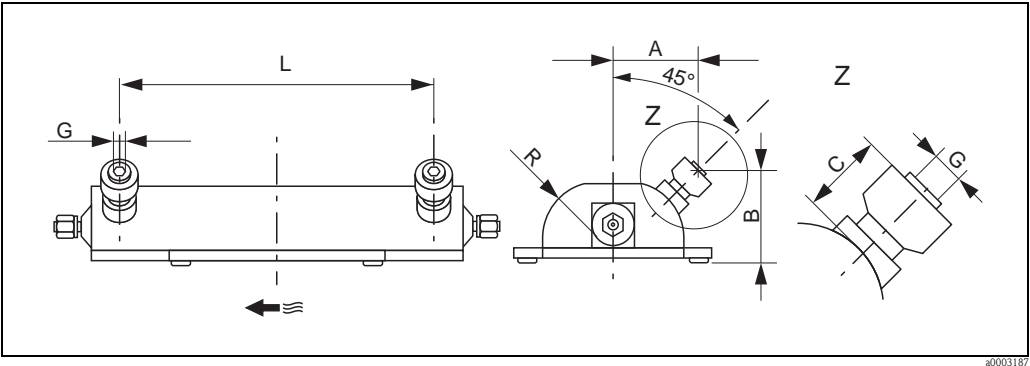
<sup>1)</sup> High-pressure version; All dimensions in [inch]



Purge connections / pressure vessel monitoring



Caution!  
The pressure vessel 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).



Dimensions in SI units

DN	A	B	C	G	L	R
1	70.0	77.0	33.0	½" NPT	178	47.0
2	70.0	77.0	33.0	½" NPT	260	47.0
4	81.5	83.0	33.0	½" NPT	385	59.5

All dimensions in [mm]

Dimensions in US units

DN	A	B	C	G	L	R
1/24"	2.8	3.0	1.3	½" NPT	7.01	1.85
1/12"	2.8	3.0	1.3	½" NPT	10.24	1.85
1/8"	3.2	3.3	1.3	½" NPT	15.16	2.34

All dimensions in [inch]

## Rupture disc

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.



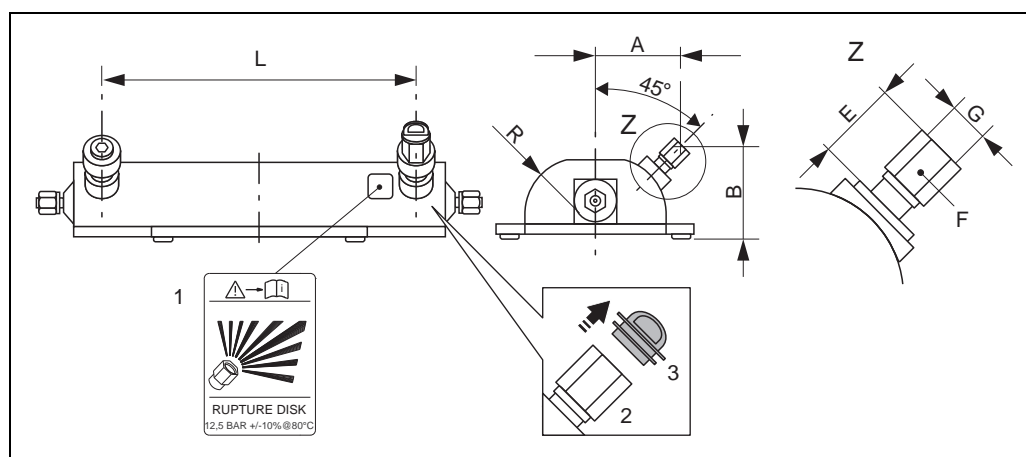
### Caution!

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.



### Dimensions in SI units

DN	A	B	E	F	G	L	R
1	70.0	77.0	ca. 42	AF 1"	½" NPT	178	47.0
2	70.0	77.0	ca. 42	AF 1"	½" NPT	260	47.0
4	81.5	83.0	ca. 42	AF 1"	½" NPT	385	59.5

All dimension in [mm]

### Dimensions in US units

DN	A	B	E	F	G	L	R
1/24"	2.8	3.0	ca. 1.65	AF 1"	½" NPT	7.01	1.85
1/12"	2.8	3.0	ca. 1.65	AF 1"	½" NPT	10.24	1.85
1/8"	3.2	3.3	ca. 1.65	AF 1"	½" NPT	15.16	2.34

All dimensions in [inch]

**Weight**

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

*Weight in SI units*

DN [mm]	1	2	4
Compact version	10	11	15
Remote version	8	9	13

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

*Weight in US units*

DN [inch]	1/24"	1/12"	1/8"
Compact version	22	24	33
Remote version	17	20	29

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

**Material****Transmitter housing**

Compact version

- Powder coated die-cast aluminium
- Stainless steel housing: stainless steel 1.4301/ASTM 304
- Window material: glass or polycarbonate

Remote version

- Remote field housing: powder coated die-cast aluminium
- Wall-mount housing: powder coated die-cast aluminium
- Window material: glass

**Sensor housing / containment:**

- Acid and alkali-resistant outer surface
- Stainless steel 1.4301/304

**Connection housing, sensor (remote version):**

- Stainless steel 1.4301/304

**Process connections**

Process connection	Material
EN 1092-1 (DIN 2501) / ASME B16.5 / JIS B2220 Mounting kit for flanges	Stainless steel 1.4539/904L Alloy C-22 2.4602/N 06022
EN 1092-1 (DIN 2501) / ASME B16.5 / JIS B2220 Loose flanges	Stainless steel 1.4404/316L
VCO coupling	Stainless steel 1.4539/904L Alloy C-22 2.4602/N 06022
Tri-Clamp (OD tubes), 1/2"	Stainless steel 1.4539/904L
Mounting kit for SWAGELOK (1/4", 1/8")	Stainless steel 1.4401/316
Mounting kit for NPT-F (1/4")	Stainless steel 1.4539/904L Alloy C-22 2.4602/N 06022

**Measuring tube(s):**

- Stainless steel 1.4539/904L
- Alloy C-22 2.4602/N 06022

**Seals:**

Welded process connections without internal seals

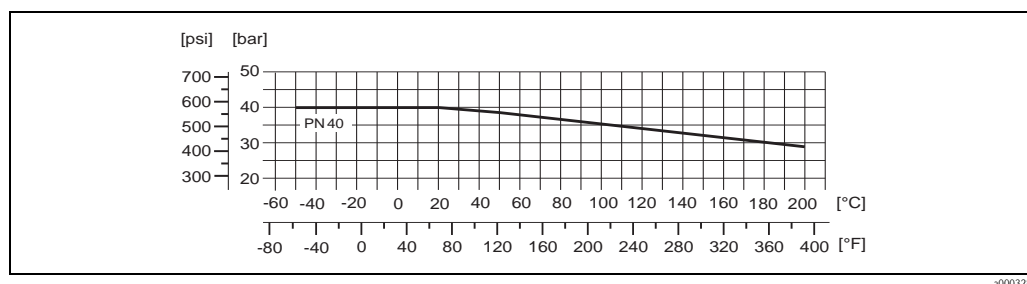
**Material load curves****Warning!**

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

**Flange connections to EN 1092-1 (DIN 2501) (mounting kit)**

Wetted parts (flange, measuring tube): 1.4539/904L, Alloy C-22

Loose flanges (not wetted): 1.4404/316L

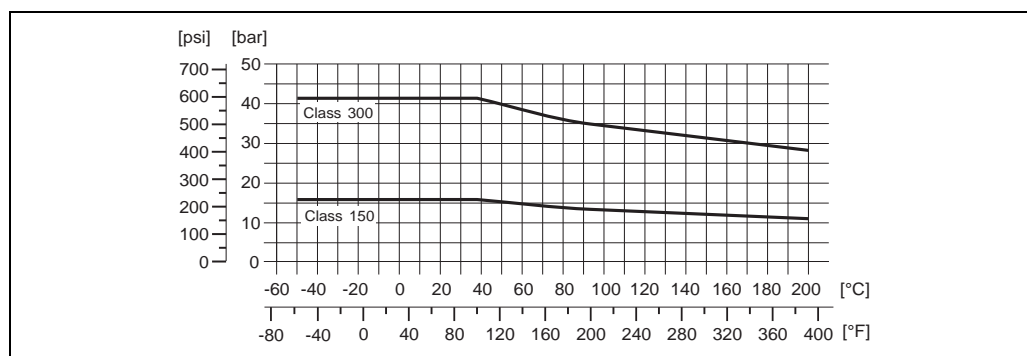


a0003284

**Flange connections to ASME B16.5 (mounting kit)**

Wetted parts (flange, measuring tube): 1.4539/904L, Alloy C-22

Loose flanges (not wetted): 1.4404/316L

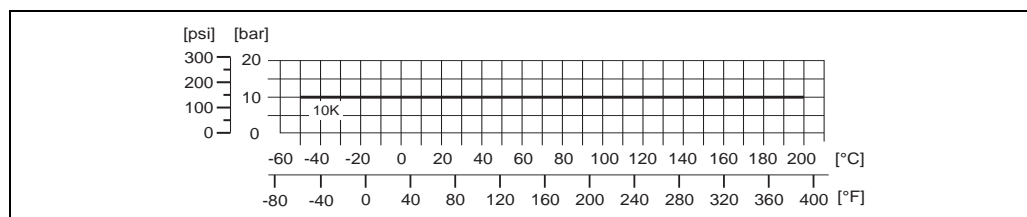


a0003285

**Flange connections to JIS B2220 (mounting kit)**

Wetted parts (flange, measuring tube): 1.4539/904L, Alloy C-22

Loose flanges (not wetted): 1.4404/316L



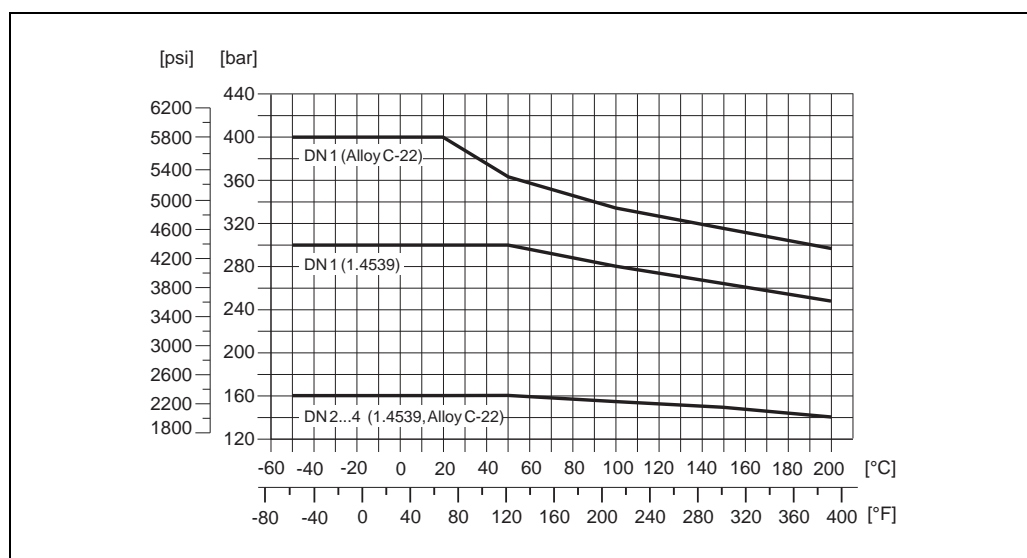
a0003312

**Tri-Clamp process connection**

The Clamp connections are suited up to a maximum pressure of 16 bar (232 psi). Please observe the operating limits of the clamp and seal used as they could be under 16 bar (232 psi). The clamp and the seal are not included in the scope of supply.

**Process connection: 4-VCO-4, 1/4" NPT-F, SWAGELOK**

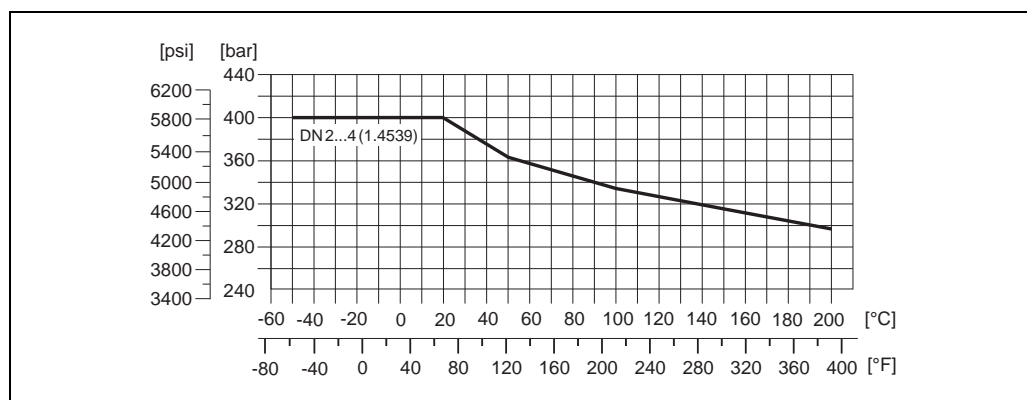
- 4-VCO-4-coupling (welded): 1.4539/904L, Alloy C-22
- 1/4" NPT threaded adapter (screwed, mounting kit): 1.4539/904L, Alloy C-22
- 1/4" or 1/8" SWAGELOK threaded joint (screwed, mounting kit): 1.4401/316



a0003309-ae

**Process connections for high-pressure version (DN 2 to 4)**

- 4-VCO-4-coupling (welded): 1.4539/904L, Alloy C-22
- 1/4" NPT threaded adapter (screwed, mounting kit): 1.4539/904L
- 1/4" or 1/8" SWAGELOK threaded joint (screwed, mounting kit): 1.4401/316



a0003310-ae

**Process connections**

- Welded process connections
  - 4-VCO-4 coupling
  - 1/2" Tri-Clamp
- Screwed on process connections
  - flanges EN 1092-1 (DIN 2501), ASME, JIS
  - 1/4" NPT threaded adapter
  - 1/8" or 1/4" SWAGELOK threaded joints

## Human interface

<b>Display elements</b>	<ul style="list-style-type: none"> <li>■ Liquid-crystal display: backlit, two lines (Promass 80) or four lines (Promass 83) with 16 characters per line</li> <li>■ Selectable display of different measured values and status variables</li> <li>■ At ambient temperatures below –20 °C (–4 °F) the readability of the display may be impaired.</li> </ul>
<b>Operating elements</b>	<p><b>Promass 80</b></p> <ul style="list-style-type: none"> <li>■ Local operation with three keys (◀, ▶, ⏎)</li> <li>■ Quick Setup menus for straightforward commissioning</li> </ul> <p><b>Promass 83</b></p> <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> </ul> <p>Only Promass 83</p> <ul style="list-style-type: none"> <li>■ China (CN): English, Chinese</li> </ul> <p>The language group is changed using the "FieldCare" operating program.</p>
<b>Remote operation</b>	<p><b>Promass 80</b></p> <p>Operation via HART, PROFIBUS PA</p> <p><b>Promass 83</b></p> <p>Operation via HART, PROFIBUS PA/DP, FOUNDATION Fieldbus, Modbus RS485</p>

## Certificates and approvals

<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 mark</b>	The measuring system is in conformity with the EMC requirements of the Australian Communication 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 Centre on request. All explosion protection data are given in a separate documentation which is available upon request.
<b>Sanitary compatibility</b>	<ul style="list-style-type: none"> <li>■ 3A approval</li> <li>■ EHEDG-tested</li> </ul>
<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.
<b>Other standards and guidelines</b>	<ul style="list-style-type: none"> <li>■ EN 60529 Degrees of protection by housing (IP code).</li> <li>■ EN 61010-1 Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures.</li> <li>■ IEC/EN 61326 "Emission in accordance with Class A requirements" Electromagnetic compatibility (EMC requirements).</li> <li>■ NAMUR NE 21 Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment.</li> <li>■ NAMUR NE 43 Standardisation of the signal level for the breakdown information of digital transmitters with analogue output signal.</li> <li>■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics</li> </ul>

**Pressure measuring device approval**

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. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary.

- 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 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.

**Functional safety**

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

"4 to 20 mA" output according to the following order code:

**Promass 80**

Promass80\*\*\*\_\*\*\*\*\*A  
 Promass80\*\*\*\_\*\*\*\*\*D  
 Promass80\*\*\*\_\*\*\*\*\*S  
 Promass80\*\*\*\_\*\*\*\*\*T  
 Promass80\*\*\*\_\*\*\*\*\*8

**Promass 83**

Promass83***_*****A	Promass83***_*****M	Promass83***_*****Ø
Promass83***_*****B	Promass83***_*****R	Promass83***_*****2
Promass83***_*****C	Promass83***_*****S	Promass83***_*****3
Promass83***_*****D	Promass83***_*****T	Promass83***_*****4
Promass83***_*****E	Promass83***_*****U	Promass83***_*****5
Promass83***_*****L	Promass83***_*****W	Promass83***_*****6

## 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 80E, 83E (TI00061D)
  - Promass 80F, 83F (TI00101D)
  - Promass 80H, 83H (TI00074D)
  - Promass 80I, 83I (TI00075D)
  - Promass 80P, 83P (TI00078D)
  - Promass 80S, 83S (TI00076D)
  - Promass 83O (TI00112D)
  - Promass 83X (TI00110D)
- Operating Instructions/Description of Device Functions
  - Promass 80 HART (BA00057D/BA00058D)
  - Promass 80 PROFIBUS PA (BA00072D/BA00073D)
  - 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
- Functional safety manual Promass 80, 83 (SD00077D)

## Registered trademarks

KALREZ® and VITON®

Registered trademarks of Firma E.I. Du Pont de Nemours & Co., Wilmington, USA

TRI-CLAMP®

Registered trademark of Ladish & Co., Inc., Kenosha, USA

SWAGELOK®

Registered trademark of Swagelok & Co., Solon, USA

HART®

Registered trademark of HART Communication Foundation, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organisation, Karlsruhe, Germany

FOUNDATION™ Fieldbus

Registered trademark of the Fieldbus FOUNDATION, Austin, USA

Modbus®

Registered trademark of the Modbus Organisation

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

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

---

## Instruments International

Endress+Hauser  
Instruments International AG  
Kaegenstrasse 2  
4153 Reinach  
Switzerland

Tel.+41 61 715 81 00  
Fax+41 61 715 25 00  
[www.endress.com](http://www.endress.com)  
[info@ii.endress.com](mailto:info@ii.endress.com)

**Endress+Hauser**   
People for Process Automation