

# Technical Information

## Proline Promass 80A, 83A

### Coriolis flowmeter



## The Single-tube for smallest quantities with extended transmitter functionality

### Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Measuring accurately smallest quantities of liquids and gases for continuous process control

### Device properties

- Nominal diameter: DN 1 to 4 ( $\frac{1}{24}$  to  $\frac{1}{8}$ " )
- Process pressure up to 400 bar (5800 psi)
- Medium temperature up to +200 °C (+392 °F)
- Device in compact or remote version

### Promass 83

- 4-line backlit display with touch control
- HART, PROFIBUS PA/DP, Modbus RS485, FF, EtherNet/IP

### Your benefits

- Highest process safety – self-drainable measuring tube design
- Fewer process measuring points – multivariable measurement (flow, density, temp)
- Space-saving installation – no in/outlet run needs

### Promass 83

- Quality – software for filling & dosing, density & concentration, advanced diagnostics
- Flexible data transfer options – numerous communication types
- Automatic recovery of data for servicing

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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

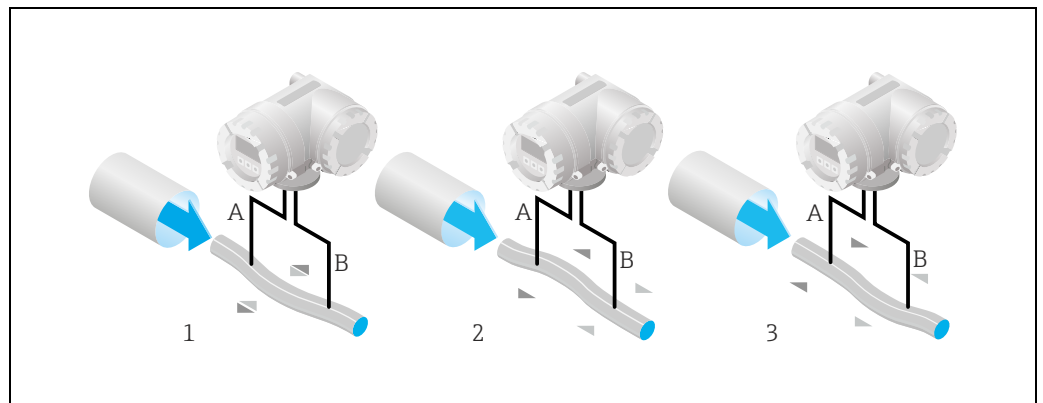
$\omega$  = rotational velocity

$v$  = 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 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).



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The phase difference (A-B) increases with increasing mass flow. Electrodynamical 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 utilizes this relationship to obtain a density signal.

### Temperature measurement

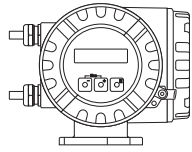
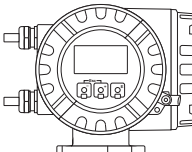
The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output.

**Measuring system**

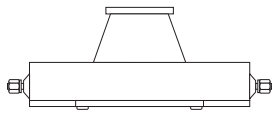
The measuring system consists of a transmitter and a sensor. Two versions are available:

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

**Transmitter**

<p><b>Promass 80</b></p>  <p style="text-align: right; font-size: small;">a0003671</p>	<ul style="list-style-type: none"> <li>▪ Two-line liquid-crystal display</li> <li>▪ Configuration also using key operation</li> </ul>
<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>

**Sensor**

<p><b>A</b></p>  <p style="text-align: right; font-size: small;">a0003679</p>	<ul style="list-style-type: none"> <li>▪ Single-tube system for high-precision measurement of minimum flow rates</li> <li>▪ Simultaneous measurement of flow, volume flow, density and temperature (multivariable)</li> <li>▪ Immune to process influences</li> <li>▪ Nominal diameters DN 1 to 4 (1/24 to 1/8")</li> <li>▪ Materials:                         <ul style="list-style-type: none"> <li>- Sensor: stainless steel, 1.4301 (304)</li> <li>- Measuring tube: stainless steel, 1.4539 (904L); Alloy C22</li> <li>- Process connections: stainless steel, 1.4404 (316/316L); stainless steel, 1.4539 (904L); Alloy C22</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**

Nominal Diameter		Range for full scale values (liquids), $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[in]	[kg/h]	[lb/min]
1	1/24"	0 to 20.00	0 to 0.735
2	1/12"	0 to 100.0	0 to 3.675
4	1/6"	0 to 450.0	0 to 16.54

### 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:

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

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

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

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

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:

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

*Recommended full scale values:*

See information in the "Limiting flow" Section →  23.

### 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 μA

- Active: 4 to 20 mA, R<sub>i</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

#### 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.r./°C, resolution: 0.5 μA

- Active: 0/4 to 20 mA, R<sub>L</sub> < 700 Ω (at HART: R<sub>L</sub> ≥ 250 Ω)
- Passive: 4 to 20 mA; supply voltage U<sub>S</sub> 18 to 30 V DC; R<sub>i</sub> ≥ 150 Ω

*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 × Analog Input, 2 × 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.r./°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:*

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 adjustable (0.05 to 2000 ms); the on/off ratio is 1:1 as of a frequency of  $1 / (2 \times \text{pulse width})$

*HART protocol*


Order code "Power supply; Display", option A, B, C, D, E, F, G, H, X, 7, 8 (HART 5)

- Valid until software: 3.01.XX


Order code "Power supply; Display", option P, Q, R, S, T, U, 4, 5 (HART 7)

- Valid as of software: 3.07.XX


*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 →  8

*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 →  8

*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 →  8

*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

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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

**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

<b>Load</b>	See "Output signal"
<b>Low flow cut off</b>	Switch points for low flow freely selectable.
<b>Galvanic isolation</b>	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****Terminal assignment****Promass 80**

Order characteristic for "inputs/outputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
A	-	-	Frequency output	Current output, HART
D	Status input	Status output	Frequency output	Current output, HART
H	-	-	-	PROFIBUS PA
S	-	-	Frequency output Ex i, passive	Current output Ex i Active, HART
T	-	-	Frequency output Ex i, passive	Current output Ex i Passive, HART
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 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



Order characteristic for "inputs/outputs"	Terminal No. (inputs/outputs)			
	20 (+) / 21 (-)	22 (+) / 23 (-)	24 (+) / 25 (-)	26 (+) / 27 (-)
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 1 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 HART
7	Relay output 2	Relay output 1	Status input	Modbus RS485

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

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**Power consumption**

AC: &lt;15 VA (including sensor)

DC: &lt;15 W (including sensor)

Switch-on current

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

**Power supply failure****Promass 80**

Lasting min. 1 power cycle

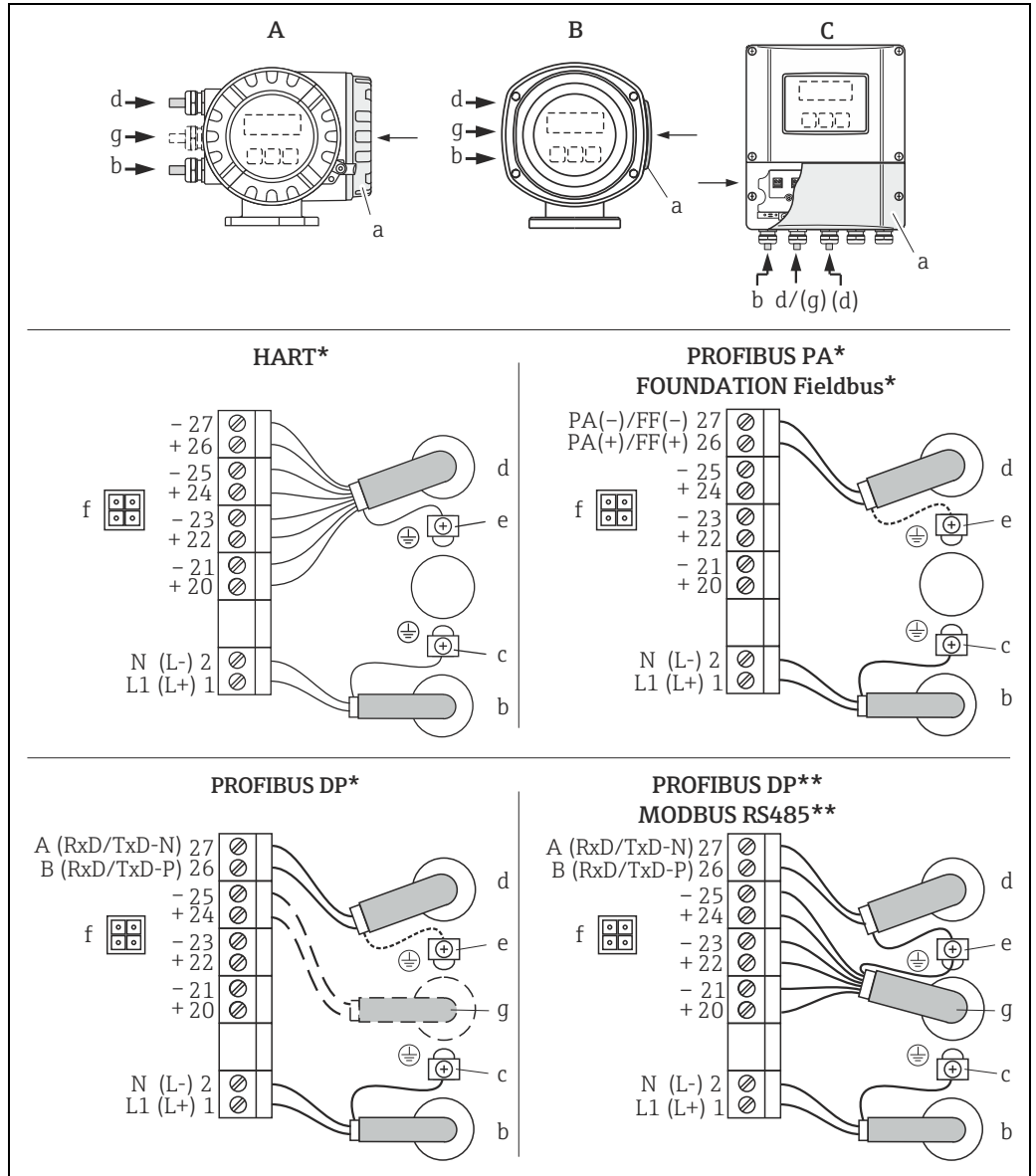
- EEPROM saves measuring system data if the power supply fails
- HistoROM/S-DAT: exchangeable data storage chip with sensor specific data (nominal diameter, serial number, calibration factor, zero point, etc.)

**Promass 83**

Lasting min. 1 power cycle:

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

**Electrical connection  
Measuring unit**



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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 → 8  
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

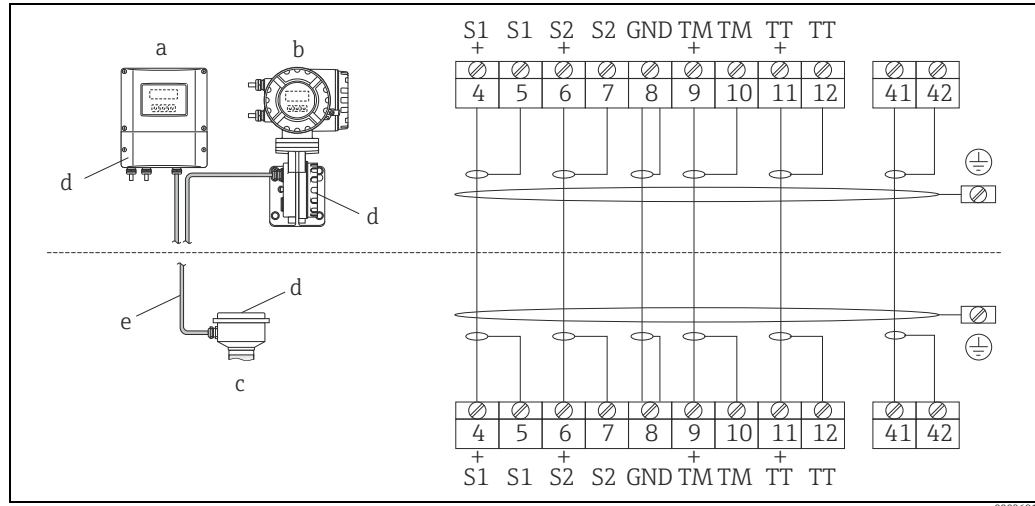
- f Service connector for connecting service interface FXA 193 (Fieldcheck, FieldCare)

- g Signal cable: see terminal assignment → 8

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

- Terminal No. 24: +5 V
- Terminal No. 25: DGND

## 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

## Potential equalization

No special measures for potential equalization are required. For instruments for use in hazardous areas, observe the corresponding guidelines in the specific Ex documentation.

## Cable entries

Power-supply and signal cables (inputs/outputs)

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

Connecting cable for remote version

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

## Remote version cable specifications

- 6 × 0.38 mm<sup>2</sup> PVC cable with common shield and individually shielded cores
- Conductor resistance: ≤50 Ω/km (≤0.015 Ω/ft)
- Capacitance: core/shield: ≤420 pF/m (≤128 pF/ft)
- Cable length: max. 20 m (65 ft)
- Operating temperature: max. +105 °C (+221 °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 ICE/EN 61326, and NAMUR recommendation NE 21/43.

## Performance characteristics

### Reference operating conditions

- Error limits following ISO 11631
- Water with 15 to 45 °C (59 to 113 °F); 2 to 6 bar (29 to 87 psi)
- Data according to calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025

To obtain measured errors, use the Applicator sizing tool *Applicator*. →  45

**Maximum measured error**

Design fundamentals → 14

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

**Base accuracy**

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

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

**Mass flow (gases)**

$\pm 0.50\%$  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 field density calibration under process conditions)
- Standard density calibrations:  $\pm 0.02 \text{ g/cm}^3$  (valid over the entire measuring range of the sensor → 19)
- Special density calibration:  $\pm 0.002 \text{ g/cm}^3$  (optional, valid range:  $+5$  to  $+80 \text{ }^\circ\text{C}$  ( $+41$  to  $+176 \text{ }^\circ\text{F}$ ) and  $0$  to  $2.0 \text{ g/cm}^3$ )

**Temperature**

$\pm 0.5 \text{ }^\circ\text{C} \pm 0.005 \cdot T \text{ }^\circ\text{C}$  ( $\pm 1 \text{ }^\circ\text{F} \pm 0.003 \cdot (T - 32) \text{ }^\circ\text{F}$ )

**Zero point stability**

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
1	1/24"	0.0010	0.000036
2	1/12"	0.0050	0.00018
4	1/8"	0.0225	0.000826

**Flow values**

Flow values as turndown parameter depending on nominal diameter.

*SI units*

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
1	20.00	2.000	1.000	0.400	0.200	0.040
2	100.0	10.00	5.000	2.000	1.000	0.200
4	450.0	45.00	22.50	9.000	4.500	0.900

*US units*

DN	1:1	1:10	1:20	1:50	1:100	1:500
[in]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
1/24"	0.735	0.074	0.037	0.015	0.007	0.001
1/12"	3.675	0.368	0.184	0.074	0.037	0.007
1/8"	16.54	1.654	0.827	0.330	0.165	0.033

**Accuracy of outputs**

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

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


*Current output*

Accuracy: Max.  $\pm 0.05\%$  o.f.s. or  $\pm 5\ \mu\text{A}$

*Pulse/frequency output*

Accuracy: Max.  $\pm 50\%$  ppm o.r.

**Repeatability**

Design fundamentals →  14

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

**Base repeatability**

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

$\pm 0.05\%$  o.r.

**Mass flow (gases)**

$\pm 0.25\%$  o.r.

**Density (liquids)**

$\pm 0.00025\ \text{g}/\text{cm}^3$

**Temperature**

$\pm 0.25\ ^\circ\text{C} \pm 0.0025 \cdot T\ ^\circ\text{C}$  ( $\pm 0.45\ ^\circ\text{F} \pm 0.0015 \cdot (T - 32)\ ^\circ\text{F}$ )

**Response time**

- The response time depends on the configuration (damping).
- Response time in the event of erratic changes in the measured variable (only mass flow): after 100 ms 95 % of the full scale value.

**Influence of medium temperature**

When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the sensor is  $\pm 0.0002\%$  of the full scale value /  $^\circ\text{C}$  ( $\pm 0.0001\%$  of the full scale value /  $^\circ\text{F}$ ).

**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**

o.r. = of reading


BaseAccu = base accuracy in % o.r.

BaseRepeat = base repeatability in % o.r.

MeasValue = measured value (in flow units consistent with the zero point stability value →  13)

ZeroPoint = zero point stability

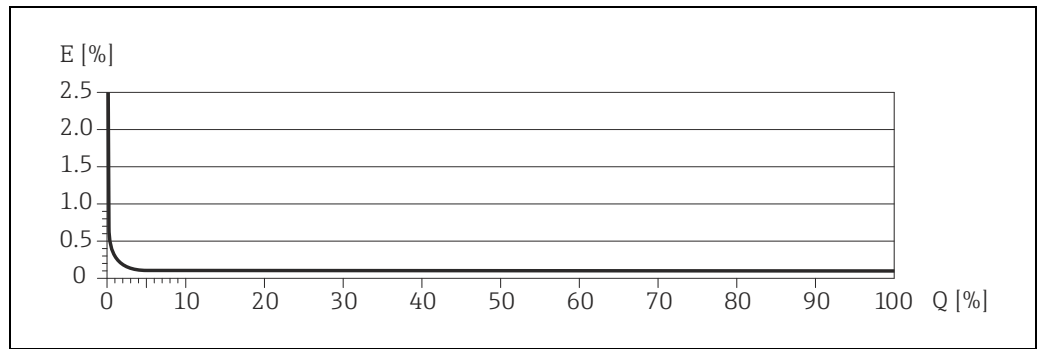
**Calculation of the maximum measured error depending on flowrate**

Flowrate (in flow units consistent with the zero point stability value →  13)	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021332</small>	$\pm \text{BaseAccu}$ <small>A0021339</small>
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A002133</small>	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021334</small>

Calculation of the repeatability depending on flowrate

Flowrate (in flow units consistent with the zero point stability value → 13)	Repeatability in % o.r.
$\geq \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ <small>A0021335</small>	$\pm \text{BaseRepeat}$ <small>A0021340</small>
$< \frac{1/2 \cdot \text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ <small>A0021336</small>	$\pm 1/2 \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021337</small>

Example for maximum measured error



E = Error: Maximum measured error as % o.r. (example Promass 83A)

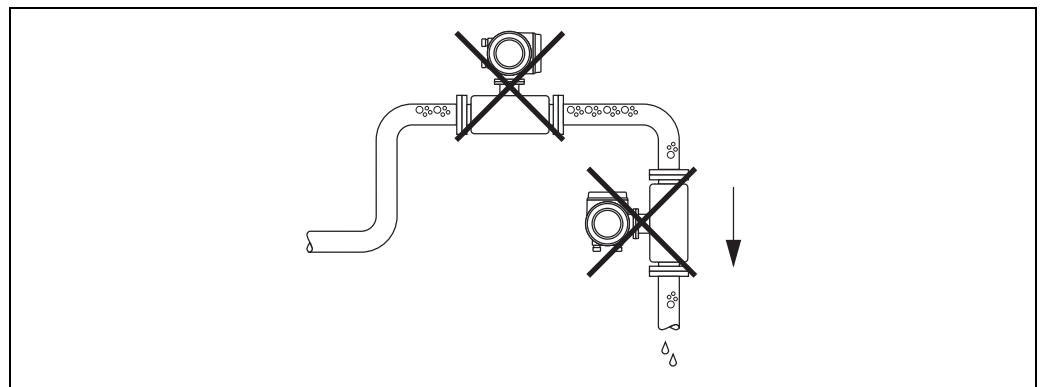
Q = Flow rate as %

Installation

Mounting location

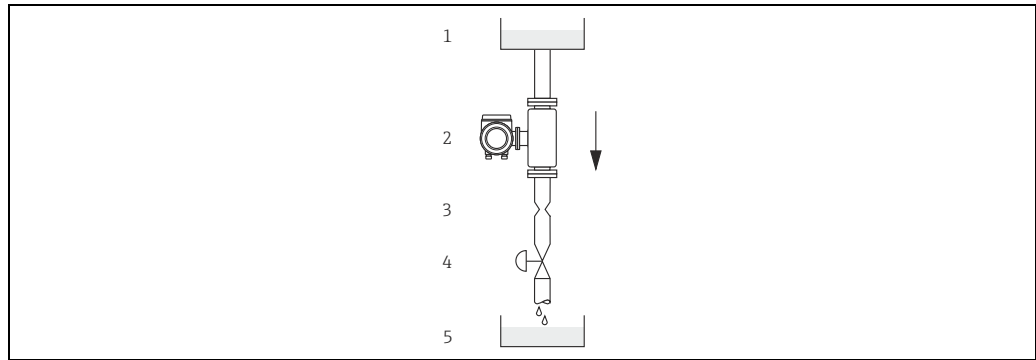
Entrained air or gas bubbles in the measuring tube can result in an increase in measuring errors. **For this reason, avoid** the following mounting locations in the pipe:

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



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]	[in]	[mm]	[inch]
1	1/24"	0.8	0.03
2	1/12"	1.5	0.06
4	1/8"	3.0	0.12

**Orientation**

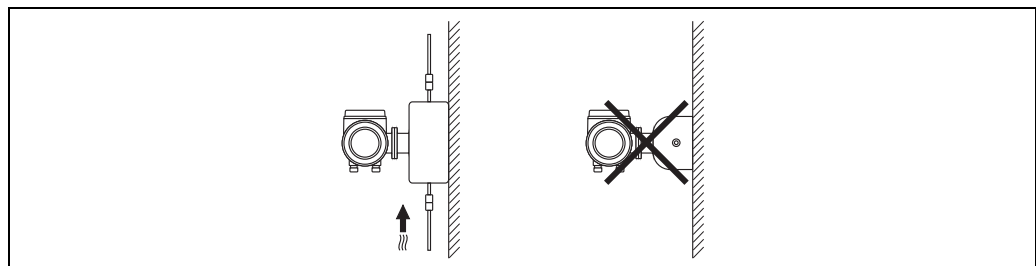
Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction of fluid flow through the pipe).

*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).



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**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.



**Inlet and outlet run** There are no installation requirements regarding inlet and outlet runs.

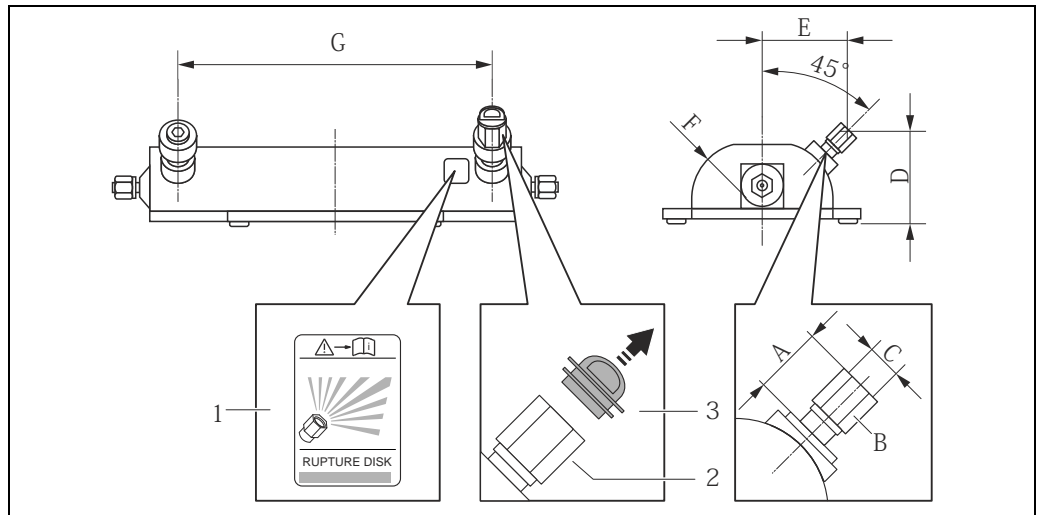
**Length of connecting cable** Max. 20 m (65 ft), remote version

**Special installation instructions**

**Rupture disk**

Make sure that the function and operation of the rupture disk is not impeded through the installation of the device. The position of the rupture disk is indicated on a sticker beside it. For additional information that is relevant to the process (→ 23).

The existing connecting nozzles are not designed for a rinse or pressure monitoring function.



1 = Rupture disk label, 2 = Rupture disk with 1/2" NPT internal thread with 1" width across flat, 3 = Transport protection

*Dimensions in SI units*

DN	A	B	C	D	E	F	G
[mm]	[mm]	[in]	[in]	[mm]	[mm]	[mm]	[mm]
1	ca. 42	SW 1	1/2 NPT	77.0	70.0	47.0	178
2	ca. 42	SW 1	1/2 NPT	77.0	70.0	47.0	260
4	ca. 42	SW 1	1/2 NPT	83.0	81.5	59.5	385

*Dimensions in US units*

DN	A	B	E	F	G	L	R
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1/24"	ca. 1.65	SW 1	1/2 NPT	3.0	2.8	1.85	7.01
1/12"	ca. 1.65	SW 1	1/2 NPT	3.0	2.8	1.85	10.24
1/8"	ca. 1.65	SW 1	1/2 NPT	3.3	3.2	2.34	15.16

## Wall mounting



Note!

Risk of measuring pipe fracture if sensor installed incorrectly!

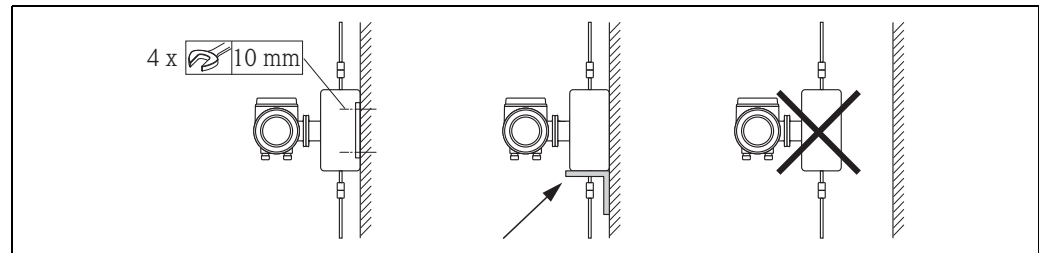
The sensor may not be installed in a pipe as a freely suspended sensor:

- 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.

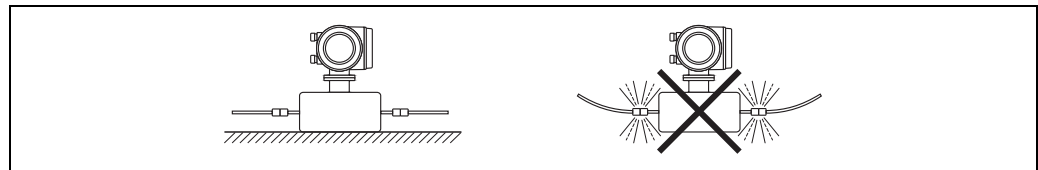


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*Horizontal*

We recommend the following installation version when mounting horizontally:

- Measuring device standing on a firm support base.



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## Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions (→ 12). Therefore, a zero point adjustment in the field is generally not required.

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

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

## Environment

### Ambient temperature range

Sensor and transmitter

- Standard:  $-20$  to  $+60$  °C ( $-4$  to  $+140$  °F)
- Optional:  $-40$  to  $+60$  °C ( $-40$  to  $+140$  °F)



Note!

- Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
- At ambient temperatures below  $-20$  °C ( $-4$  °F) the readability of the display may be impaired.

### Storage temperature

$-40$  to  $+80$  °C ( $-40$  to  $+175$  °F), preferably  $+20$  °C ( $+68$  °F)

### Ambient class

B, C, I

**Degree of protection** Standard: IP 67 (NEMA 4X) for transmitter and sensor

**Shock resistance** In accordance with IEC/EN 60068-2-31

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

**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 density** 0 to 5000 kg/m<sup>3</sup> (0 to 312 lb/ft<sup>3</sup>)

**Secondary containment pressure rating** The sensor housing is filled with dry nitrogen and protects the electronics and mechanics inside.  
The following secondary containment pressure rating is only valid for a fully welded sensor housing and/or a device equipped with closed purge connections (never opened, as delivered).

DN		Secondary containment rating (designed with a safety factor ≥ 4)		Burst pressure of secondary containment	
[mm]	[in]	[bar]	[psi]	[bar]	[psi]
1	1/24"	25	362	175	2535
2	1/12"	25	362	155	2245
4	1/8"	25	362	130	1885



**Note!**

In case a danger of measuring tube failure exists due to process characteristics, e.g. with corrosive process fluids, we recommend the use of sensors whose secondary containment is equipped with special pressure monitoring connections (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 gas detection (dimensions → 40).

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

If a device fitted with purge connections is connected to the purge system, the maximum nominal pressure is determined by the purge system itself or by the device, depending on which component has the lower nominal pressure. If, on the other hand, the device is fitted with a rupture disk, the rupture

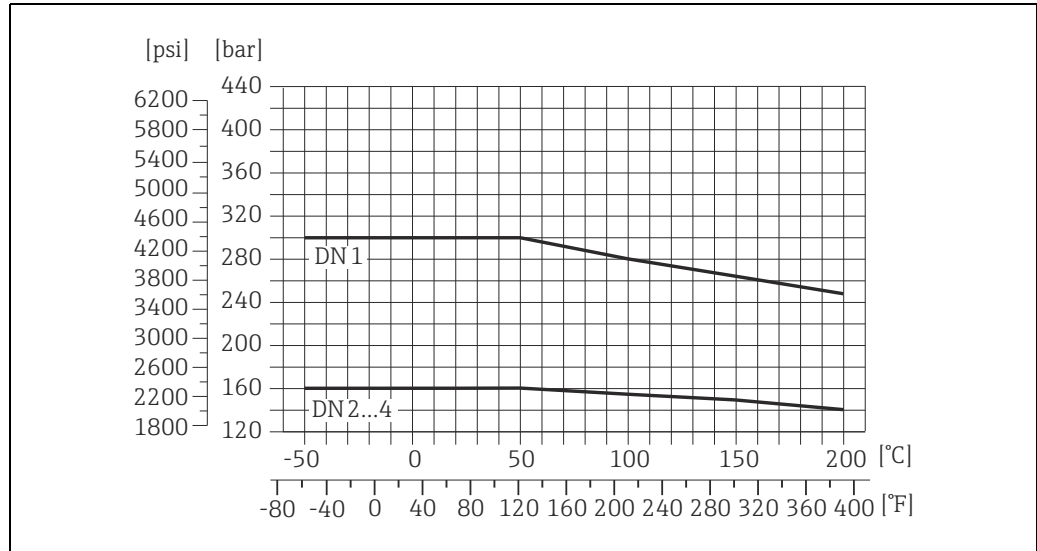
disk is decisive for the maximum nominal pressure (→ 23).

**Pressure-temperature ratings**

The following pressure-temperature ratings refer to the entire sensor and not just the process connection.

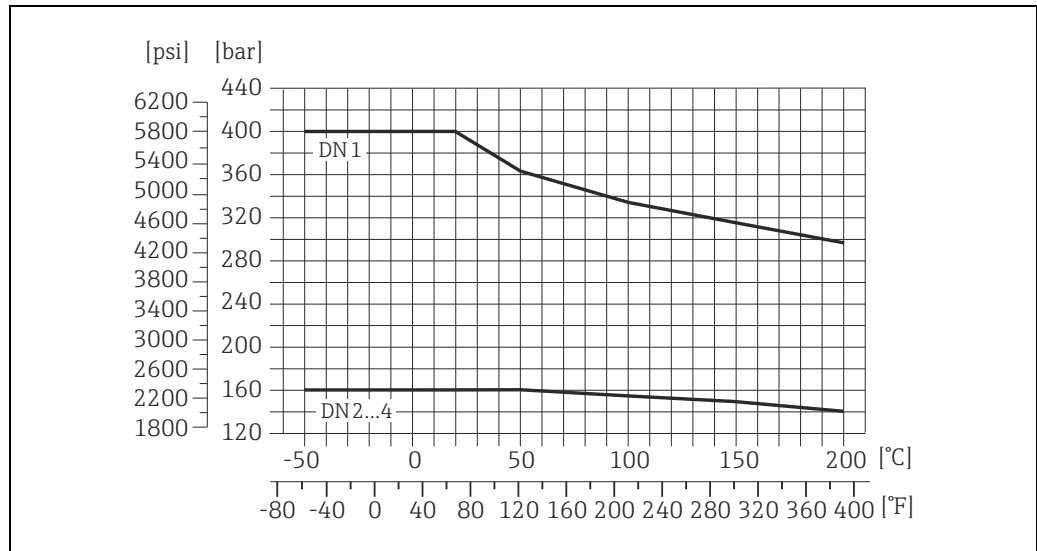
**4-VCO-4 coupling (welded)**

Connection material: 1.4539 (904L)



A0020967-EN

Connection material: Alloy C22



A0021023-EN

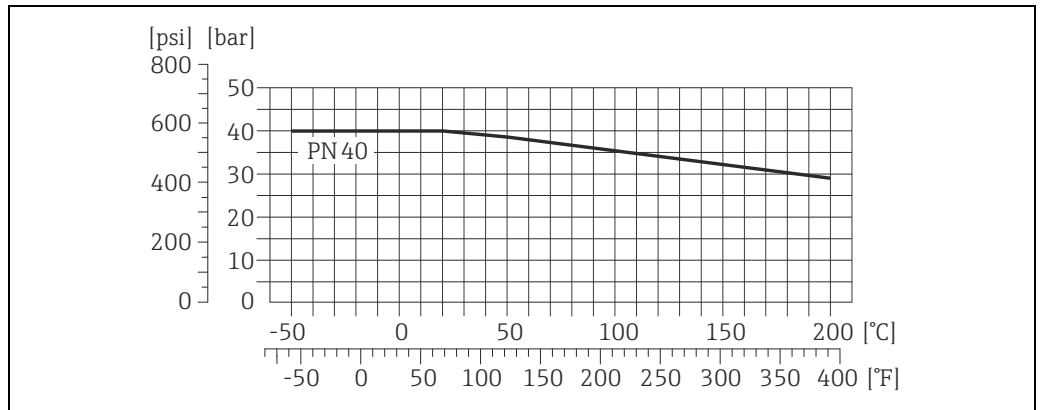
**Tri-Clamp**

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.

**4-VCO-4 coupling with mounting kit: Flange according to EN 1092-1 (DIN 2501)**

Wetted parts (flange, measuring tube): 1.4539 (904L); Alloy C22

Loose flanges (not wetted): 1.4404 (F316/F316L)

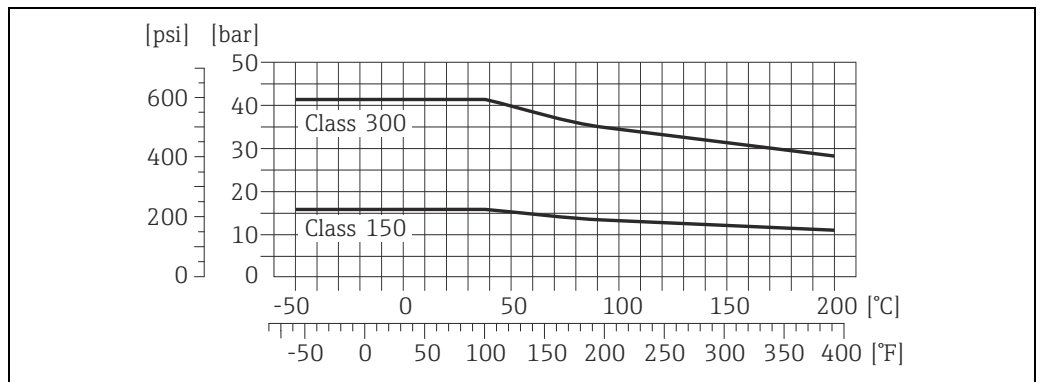


A0020836-EN

**4-VCO-4 coupling with mounting kit: Flange according to ASME B16.5**

Wetted parts (flange, measuring tube): 1.4539 (904L); Alloy C22

Loose flanges (not wetted): 1.4404 (F316/F316L)

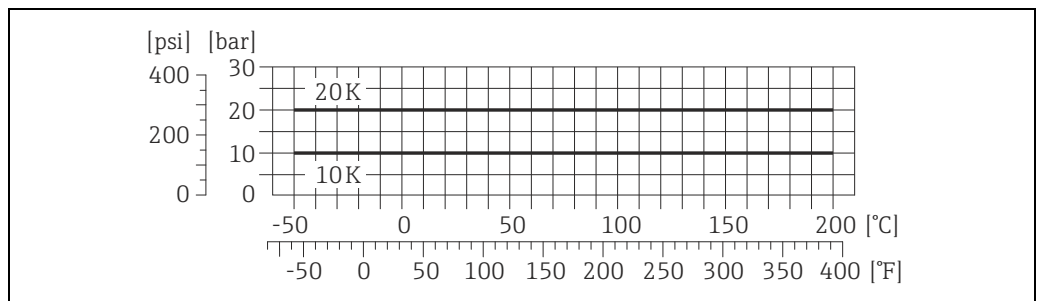


A0020920-EN

**4-VCO-4 coupling with mounting kit: JIS B2220, flange**

Wetted parts (flange, measuring tube): 1.4539 (904L); Alloy C22

Loose flanges (not wetted): 1.4404 (F316/F316L)

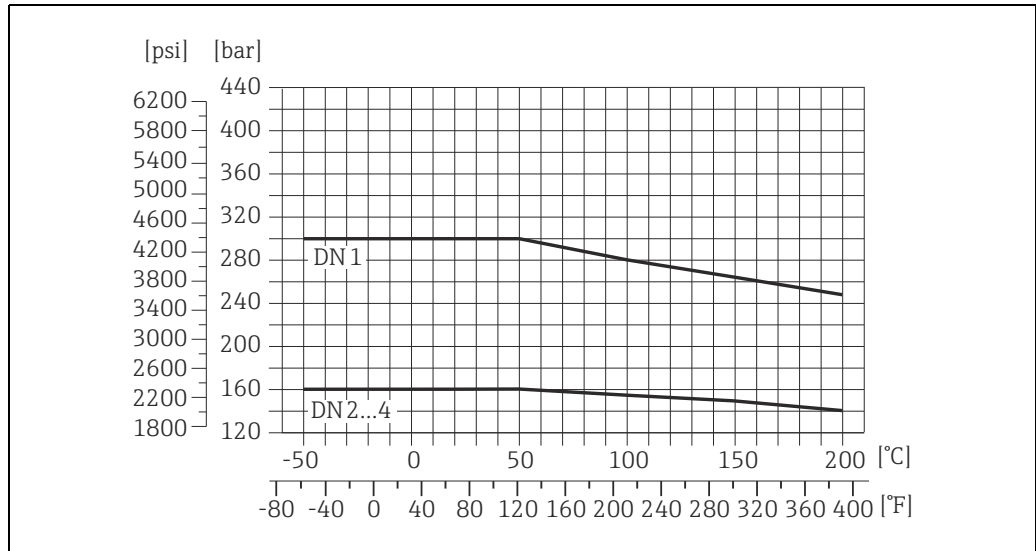


A0020922-EN

**4-VCO-4 coupling with mounting kit: NPTF threaded adapter, 1/4" and Swagelok threaded joint, 1/4" or 1/8"**

Connection material:

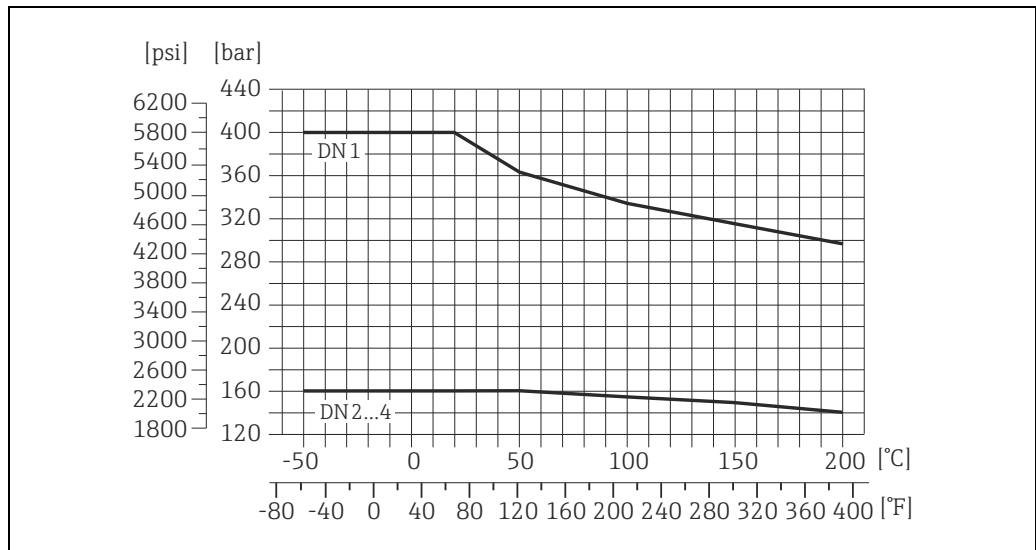
- 4-VCO-4; NPTF: 1.4539 (904L)
- Swagelok: 1.4401 (316/316L)



A0020967-EN

Connection material:

- 4-VCO-4; NPTF: Alloy C22
- Swagelok: 1.4401 (316/316L)

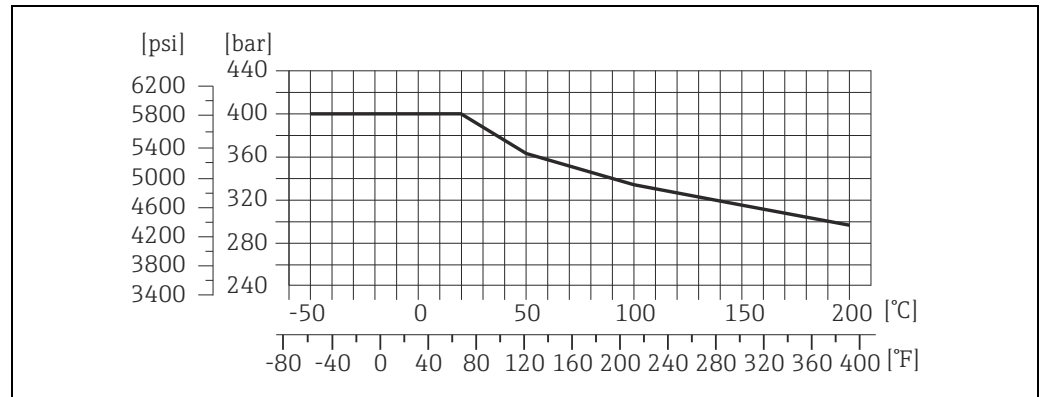


A0021023-EN

**High-pressure version (DN 2, 4)**

Connection material:

- 4-VCO-4; NPTF: 1.4539 (904L)
- Swagelok: 1.4401 (316/316L)



A0020921-EN

**Rupture disk**

To increase the level of safety, a device version with a rupture disk with a triggering pressure of 10 to 15 bar (145 to 217.5 psi) can be used. Special mounting instructions: (→ 17). Rupture disks cannot be combined with the separately available heating jacket (→ 45).

**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 → 5

**Pressure loss**

To calculate the pressure loss, use the *Applicator* sizing tool (→ 45).

**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.

For this reason, the following mounting locations are recommended:

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

## Heating



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

Note!

- 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.
- 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 (0.014")

















- Information on permissible temperature ranges → 19.

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

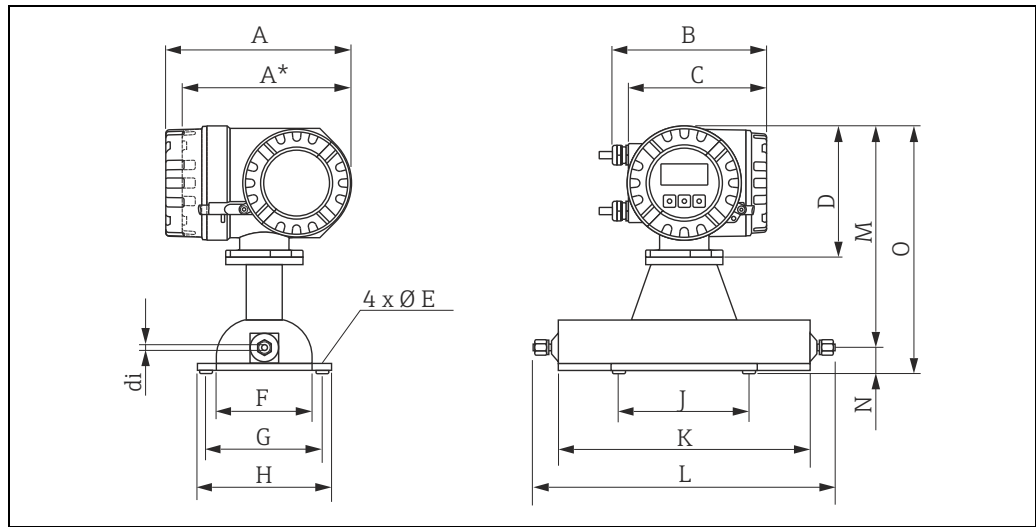


## Mechanical construction

### Design, dimensions

Dimensions	
Field housing compact version, powder-coated die-cast aluminum	→  26
Transmitter compact version, stainless steel	→  27
Transmitter remote version, connection housing (II2G, zone 1)	→  27
Transmitter remote version, wall-mount housing (non hazardous area and II3G, zone 2)	→  28
Sensor remote version, connections housing	→  29
Process connection in SI units	
4-VCO-4 coupling (welded)	→  30
Tri-Clamp ½", DIN 11866 line C, 3A (welded)	→  31
4-VCO-4 coupling with mounting kit: DN 15 flange according to EN1092-1 (DIN 2501) 4-VCO-4 coupling with mounting kit: ½" flange according to ASME B16.5 4-VCO-4 coupling with mounting kit: JIS B220, DN 15 flange	→  32
4-VCO-4 coupling with mounting kit: NPTF, ¼"	→  33
4-VCO-4 coupling with mounting kit: Swagelok ⅛" or ¼"	→  34
Process connection in US units	
4-VCO-4 coupling (welded)	→  35
Tri-Clamp ½", DIN 11866 line C, 3A (welded)	→  36
4-VCO-4 coupling with mounting kit: DN 15 flange according to EN1092-1 (DIN 2501) 4-VCO-4 coupling with mounting kit: ½" flange according to ASME B16.5 4-VCO-4 coupling with mounting kit: JIS B220, DN 15 flange	→  37
4-VCO-4 coupling with mounting kit: NPTF, ¼"	→  38
4-VCO-4 coupling with mounting kit: Swagelok ⅛" or ¼"	→  39
<b>Purge connections, pressure vessel monitoring</b>	→  40

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



A0007021

*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	ø6.5	120	145	165	160	228	<sup>1)</sup>	273	32	305	<sup>1)</sup>
2	227	207	187	168	160	ø6.5	120	145	165	160	310	<sup>1)</sup>	273	32	305	<sup>1)</sup>
4	227	207	187	168	160	ø6.5	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*

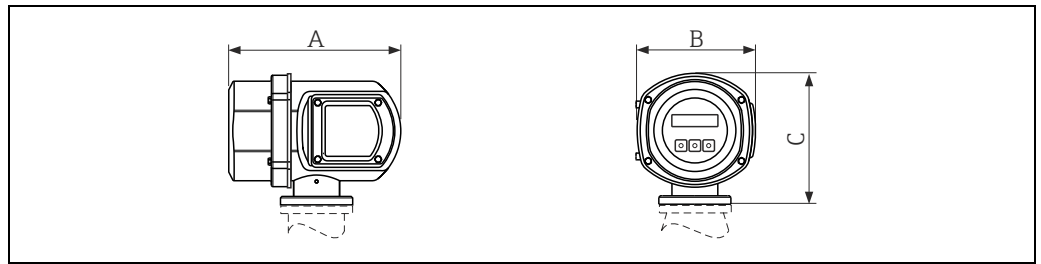
DN	A	A*	B	C	D	E	F	G	H	J	K	L	M	N	O	U/di
½"₄	8.94	8.15	7.68	6.61	6.30	ø0.26	4.72	5.71	6.50	6.30	8.98	<sup>1)</sup>	10.7	1.26	12.0	<sup>1)</sup>
½"₁₂	8.94	8.15	7.68	6.61	6.30	ø0.26	4.72	5.71	6.50	6.30	12.2	<sup>1)</sup>	10.7	1.26	12.0	<sup>1)</sup>
⅜"	8.94	8.15	7.68	6.61	6.30	ø0.26	5.90	6.89	7.68	8.67	17.1	<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 [in]

**Transmitter compact version, stainless steel**

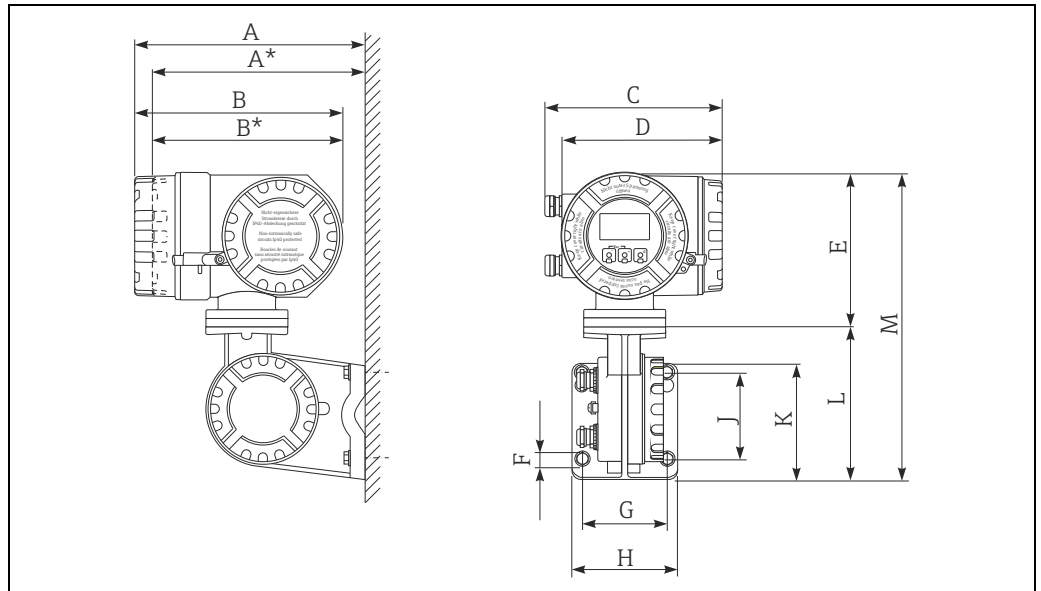


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*Dimensions in SI and US units*

A		B		C	
[mm]	[in]	[mm]	[in]	[mm]	[in]
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

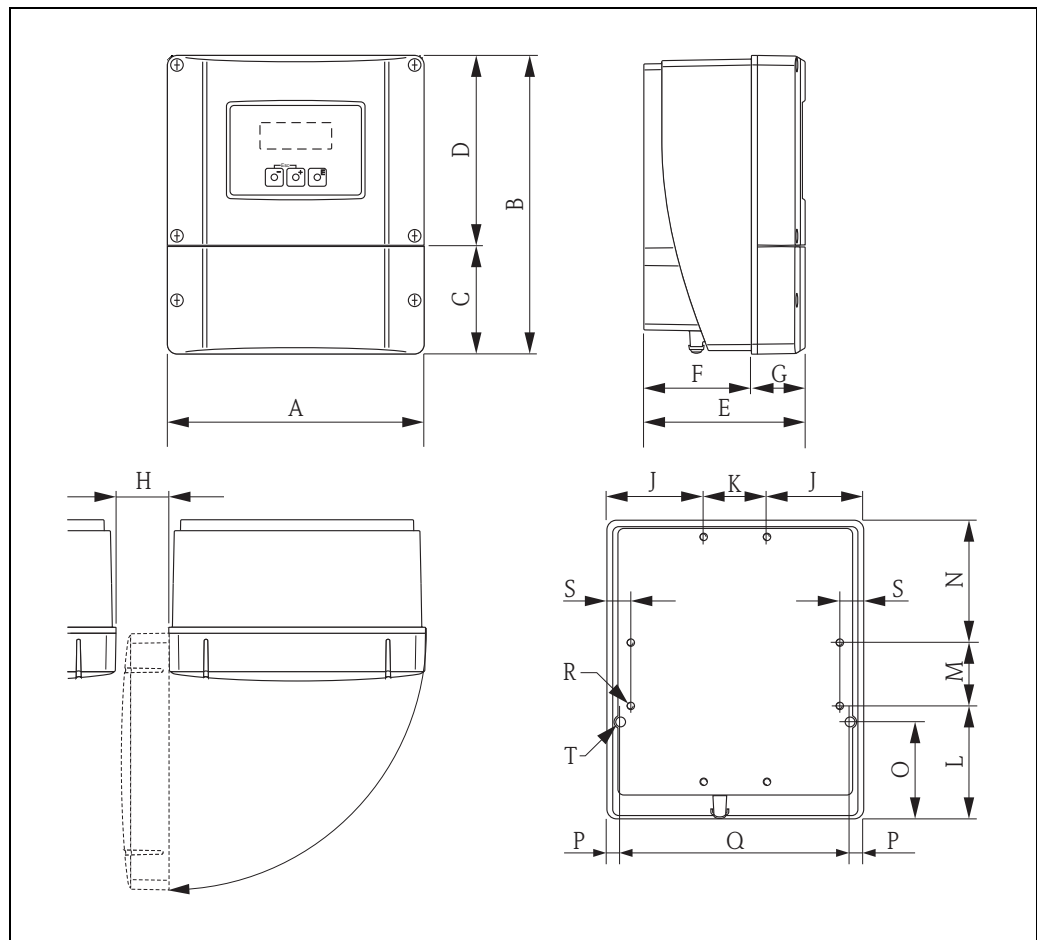
\* Blind version (without display)  
All dimensions in [mm]

*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 [in]

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



a0007001

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 Ø6.5	

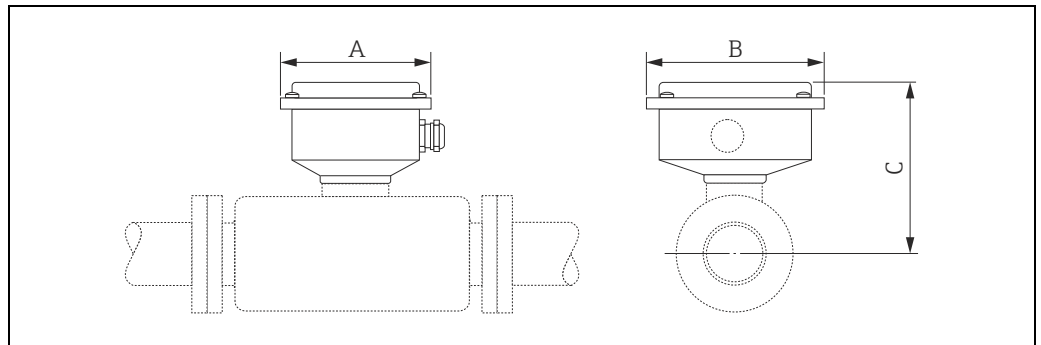
<sup>1)</sup> Fixing bolt for wall assembly: M6 (screw head max. 10.5 mm)  
All dimensions in [mm]

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 Ø0.26	

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

Sensor remote version, connections housing



A0006998

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]

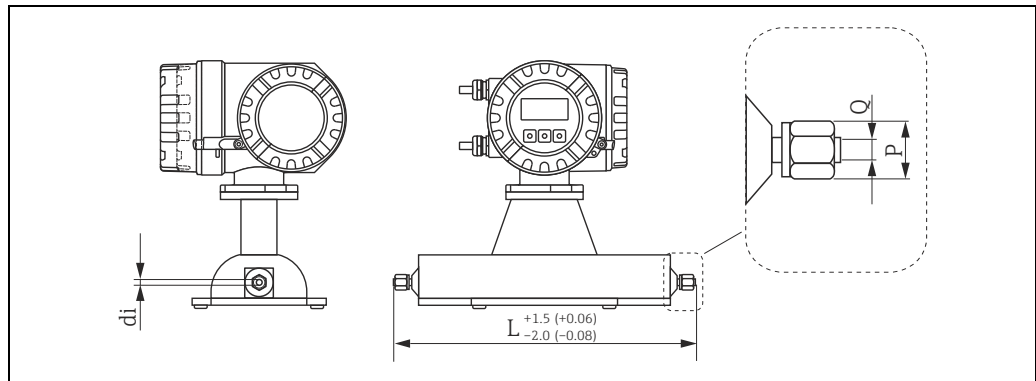
Dimensions in US units

DN	A	B	C
$\frac{1}{24}$ "	4.67	5.41	4.72
$\frac{1}{12}$ "	4.67	5.41	4.72
$\frac{1}{8}$ "	4.67	5.41	5.12

All dimensions in [in]

**Process connections in SI units**

*4-VCO-4 coupling (welded)*



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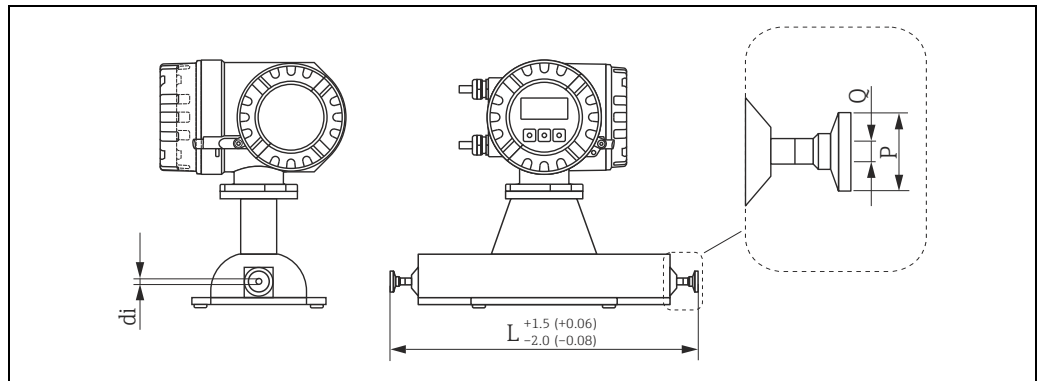
Engineering unit mm (in)

**4-VCO-4 coupling (welded): 1.4539 (904L); Alloy C22**  
**Order code for "process connection", option SVW**  
**4-VCO-4 coupling (welded): 1.4539 (904L), Ra ≤ 0.4 μm/240 grit**  
**Order code for "process connection", option PPD**

DN	L	P	Q / di
1	290	AF 11/16"	1.1
2	372	AF 11/16"	1.8
2 <sup>1)</sup>	372	AF 11/16"	1.4
4	497	AF 11/16"	3.5
4 <sup>1)</sup>	497	AF 11/16"	3.0

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

Tri-Clamp 1/2", DIN 11866 line C, 3A (welded)

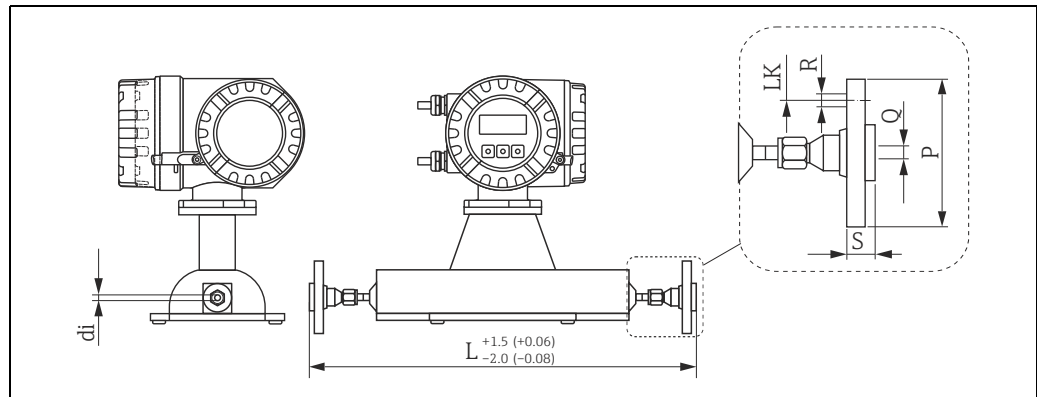


Engineering unit mm (in)

Tri-Clamp 1/2", 3A: 1.4539 (904L), Ra ≤ 0.4 μm/240 grit Order code for "process connection", option SPD Tri-Clamp, 1/2", 3A: 1.4539 (904L), Ra ≤ 0.8 μm/150 grit Order code for "process connection", option STA				
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

All dimensions in [mm]

- 4-VCO-4 coupling with mounting kit: DN 15 flange according to EN1092-1 (DIN 2501)
- 4-VCO-4 coupling with mounting kit: 1/2" flange according to ASME B16.5
- 4-VCO-4 coupling with mounting kit: JIS B220, DN 15 flange



Engineering unit mm (in)

4-VCO-4 coupling with mounting kit DN 15 flange according to EN 1092-1 (DIN 2501), PN 40: 1.4539 (904L); Alloy C22								
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 (F316/F316L)  
All dimensions in [mm]

4-VCO-4 coupling with mounting kit: 1/2" flange according to ASME B16.5: 1.4539 (904L); Alloy C22								
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

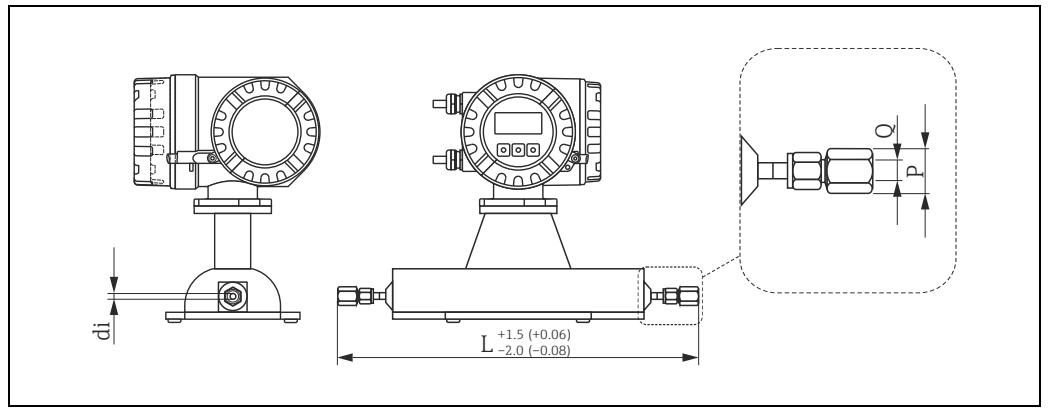
Loose flanges (not wetted) made of stainless steel, 1.4404 (F316/F316L)  
All dimensions in [mm]

4-VCO-4 coupling with mounting kit: JIS B220, DN 15 flange: 1.4539 (904L); Alloy C22								
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 (F316/F316L)  
All dimensions in [mm]



4-VCO-4 coupling with mounting kit: NPTF, 1/4"



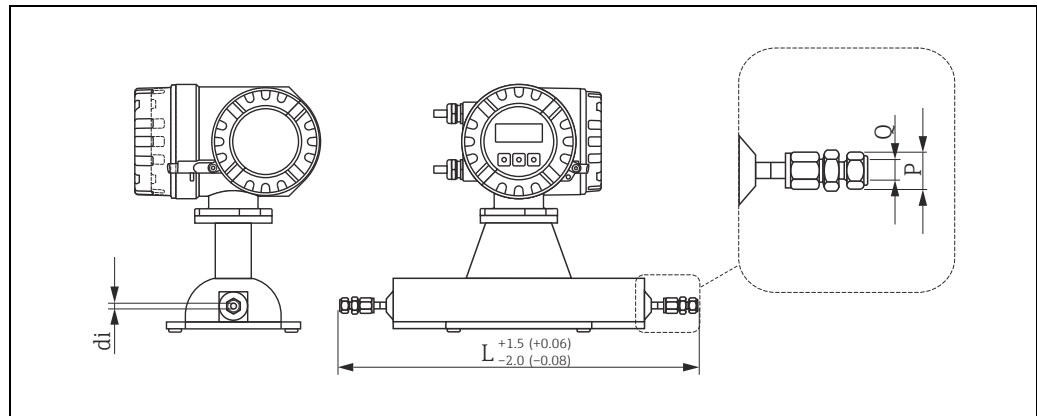
Engineering unit mm (in)

4-VCO-4 coupling with mounting kit: NPTF, 1/4": 1.4539 (904L); Alloy C22				
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

<sup>1)</sup> High-pressure version only available as 1.4539 (904L)

All dimensions in [mm]

4-VCO-4 coupling with mounting kit: Swagelok 1/8" or 1/4"



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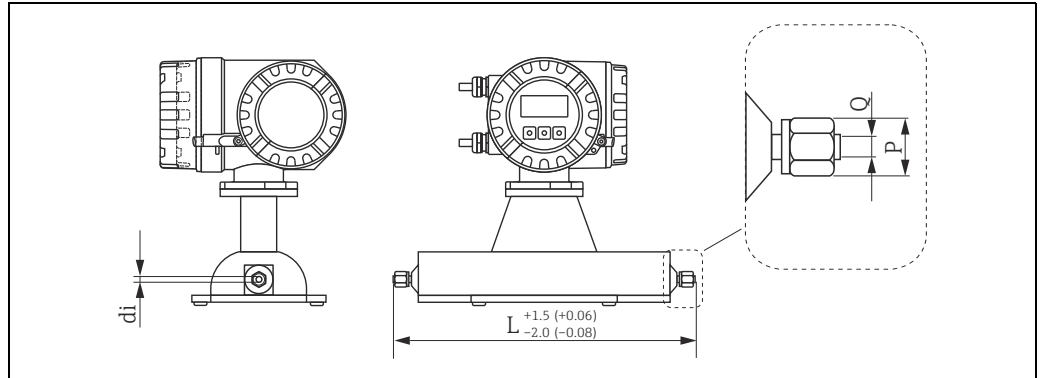
Engineering unit mm (in)

4-VCO-4 coupling with mounting kit: Swagelok 1/8" or 1/4" : 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 coupling (welded)

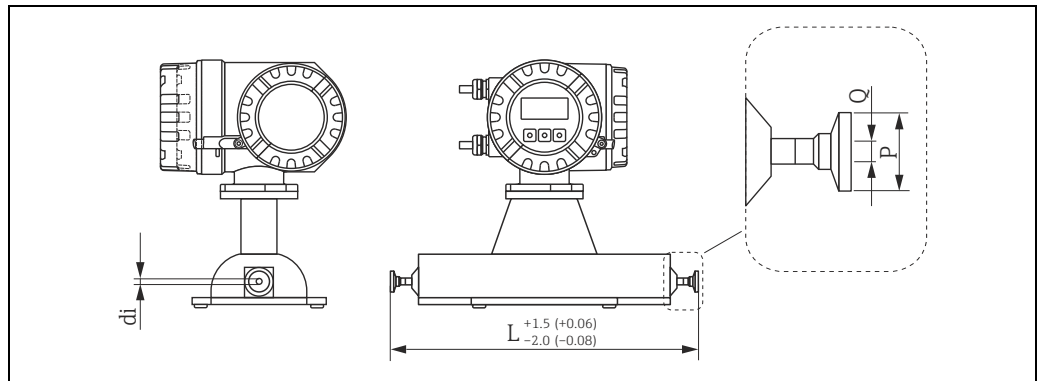


Engineering unit mm (in)

4-VCO-4 coupling (welded): 1.4539 (904L); Alloy C22 Order code for "process connection", option SVW 4-VCO-4 coupling (welded): 1.4539 (904L), Ra ≤ 16 µin/240 grit Order code for "process connection", option PPD			
DN	L	P	Q / di
1/24"	11.4	AF 11/16"	0.04
1/12"	14.6	AF 11/16"	0.07
1/12" <sup>1)</sup>	14.6	AF 11/16"	0.06
1/8"	19.6	AF 11/16"	0.14
1/8" <sup>1)</sup>	19.6	AF 11/16"	0.12

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

Tri-Clamp 1/2", DIN 11866 line C, 3A (welded)



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Engineering unit mm (in)

Tri-Clamp 1/2", 3A: 1.4539 (904L), Ra ≤ 0.4 μm/240 grit  
 Order code for "process connection", option SPD  
 Tri-Clamp, 1/2", 3A: 1.4539 (904L), Ra ≤ 0.8 μm/150 grit  
 Order code for "process connection", option SPD

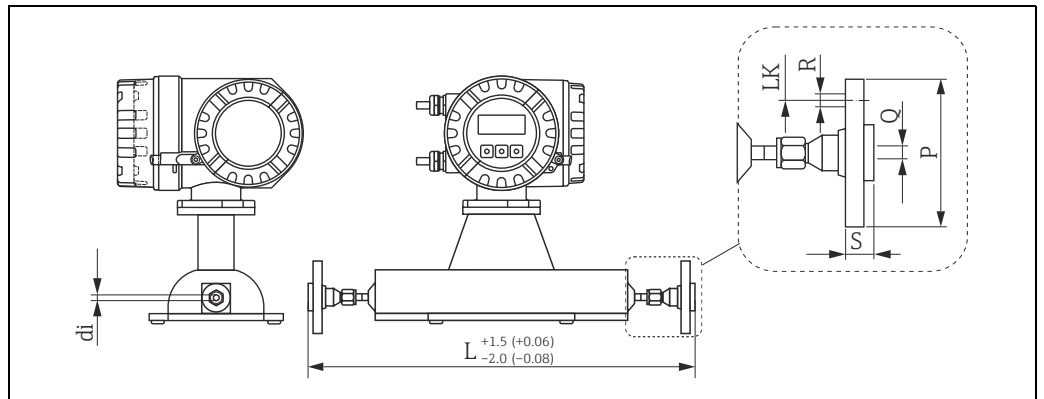
DN	L	P	Q	di
1/24"	11.7	0.98	0.37	0.04
1/12"	14.9	0.98	0.37	0.07
1/8"	19.8	0.98	0.37	0.14

All dimensions in [in]

4-VCO-4 coupling with mounting kit: DN 15 flange according to EN1092-1 (DIN 2501)

4-VCO-4 coupling with mounting kit: 1/2" flange according to ASME B16.5

4-VCO-4 coupling with mounting kit: JIS B220, DN 15 flange



Engineering unit mm (in)

**4-VCO-4 coupling with mounting kit DN 15 flange according to EN 1092-1 (DIN 2501), PN 40: 1.4539 (904L); Alloy C22**

DN	PN	L	P	Q	R	S	LK	di
1/24"	40	15.5	3.8	0.692	4 × Ø 0.56	1.12	2.6	0.04
1/12"	40	18.7	3.8	0.692	4 × Ø 0.56	1.12	2.6	0.07
1/8"	40	23.6	3.8	0.692	4 × Ø 0.56	1.12	2.6	0.14

Loose flanges (not wetted) made of stainless steel, 1.4404 (F316/F316L)

All dimensions in [in]

**4-VCO-4 coupling with mounting kit: 1/2" flange according to ASME B16.5: 1.4539 (904L); Alloy C22**

DN	ASME	L	P	Q	R	S	LK	di
1/24"	Cl 150	15.5	3.5	0.62	4 × Ø0.62	0.70	2.38	0.04
1/24"	Cl 300	15.5	3.7	0.62	4 × Ø0.62	0.81	2.62	0.04
1/12"	Cl 150	18.7	3.5	0.62	4 × Ø0.62	0.70	2.38	0.07
1/12"	Cl 300	18.7	3.7	0.62	4 × Ø0.62	0.81	2.62	0.07
1/8"	Cl 150	23.6	3.5	0.62	4 × Ø0.62	0.70	2.38	0.14
1/8"	Cl 300	23.6	3.7	0.62	4 × Ø0.62	0.81	2.62	0.14

Loose flanges (not wetted) made of stainless steel, 1.4404 (F316/F316L)

All dimensions in [in]

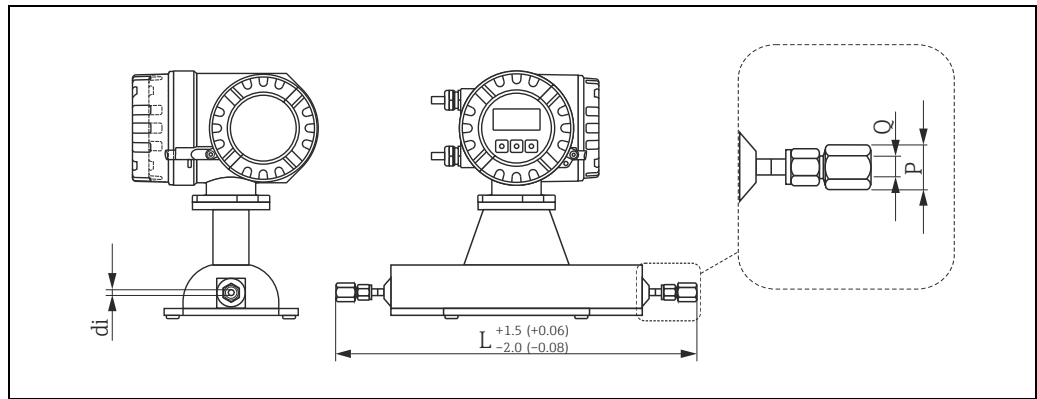
**4-VCO-4 coupling with mounting kit: JIS B220, DN 15 flange: 1.4539 (904L); Alloy C22**

DN	JIS	L	P	Q	R	S	LK	di
1/24"	10K	15.5	3.8	0.6	4 × Ø0.6	1.12	2.8	0.04
1/24"	20K	15.5	3.8	0.6	4 × Ø0.6	0.56	2.8	0.04
1/12"	10K	18.7	3.8	0.6	4 × Ø0.6	1.12	2.8	0.07
1/12"	20K	18.7	3.8	0.6	4 × Ø0.6	0.56	2.8	0.07
1/8"	10K	23.6	3.8	0.6	4 × Ø0.6	1.12	2.8	0.14
1/8"	20K	23.6	3.8	0.6	4 × Ø0.6	0.56	2.8	0.14

Loose flanges (not wetted) made of stainless steel, 1.4404 (F316/F316L)

All dimensions in [in]

4-VCO-4 coupling with mounting kit: NPTF, 1/4"

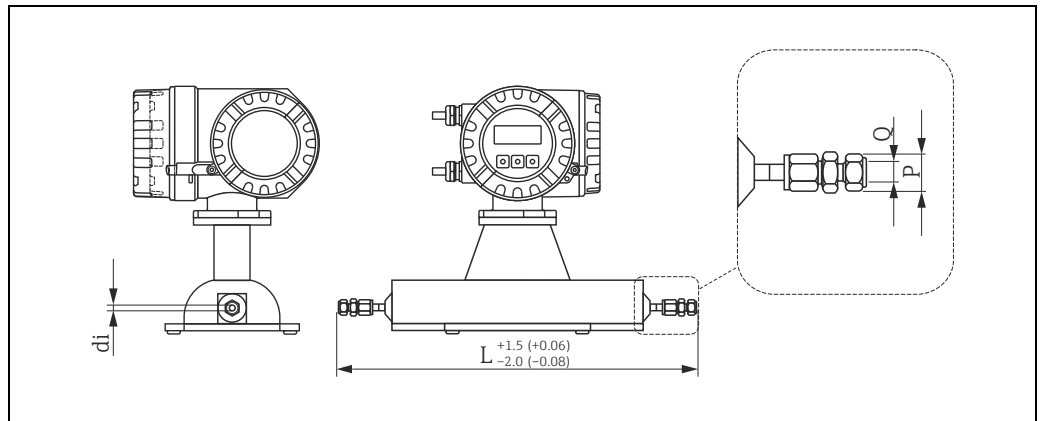


Engineering unit mm (in)

4-VCO-4 coupling with mounting kit: NPTF, 1/4": 1.4539 (904L); Alloy C22				
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 [in]

4-VCO-4 coupling with mounting kit: Swagelok 1/8" or 1/4"



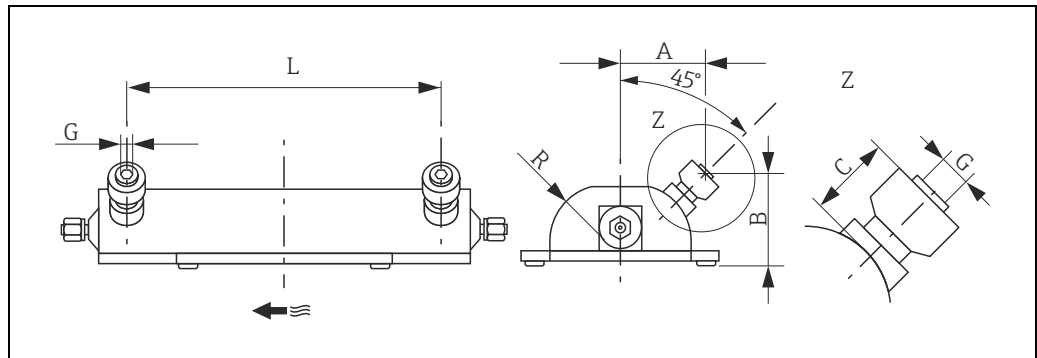
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Engineering unit mm (in)

4-VCO-4 coupling with mounting kit: Swagelok 1/8" or 1/4" : 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 [in]

Purge connections, pressure vessel monitoring



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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
¼"	2.8	3.0	1.3	½" NPT	7.01	1.85
½"	2.8	3.0	1.3	½" NPT	10.24	1.85
¾"	3.2	3.3	1.3	½" NPT	15.16	2.34

All dimensions in [in]

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 [in]	¼"	½"	¾"
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 aluminum
- Stainless steel housing: stainless steel, 1.4301 (304)
- 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, 1.4301 (304)

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

- Stainless steel, 1.4301 (304)

**Process connections**

Process connection	Material
4-VCO-4 coupling	Stainless steel, 1.4539 (904L); Alloy C22
Tri-Clamp ½", DIN 11866 line C, 3A	Stainless steel, 1.4539 (904L)
Mounting kit: flange according to EN1092-1 (DIN 2501) Mounting kit: flange according to ASME B16.5 Mounting kit: JIS B2220, flange	Stainless steel, 1.4539 (904L); Alloy C22 Loose flange (not wetted): stainless steel, 1.4404 (F316/316L)
Mounting kit: NPTF threaded adapter ¼"	Stainless steel, 1.4539 (904L); Alloy C22
Mounting kit: Swagelok threaded joint ¼" or ⅛"	Stainless steel, 1.4401 (316/316L)

**Measuring tubes**

- Stainless steel, 1.4539 (904L)
- Alloy C22

**Seals**

Welded process connections without internal seals

**Process connections**

- Welded process connections
  - 4-VCO-4 coupling
  - Tri-Clamp ½", DIN 11866 line C, 3A
- Screwed on process connections (mounting kits)
  - Flange according to EN1092-1 (DIN 2501)
  - Flange according to ASME B16.5
  - JIS B2220, flange
  - NPTF threaded adapter ¼"
  - Swagelok threaded joint ¼" or ⅛"

**Surface roughness**

All data relate to parts in contact with fluid.

- Not polished
- Ra<sub>max</sub> = 0.8 µm (32 µin) mechanically polished
- Ra<sub>max</sub> = 0.4 µm (16 µin) mechanically polished

## Operability

### Local operation

#### Display elements

- Liquid-crystal display: backlit, two lines (Promass 80) or four lines (Promass 83) with 16 characters per line.
- Selectable display of different measured values and status variables.
- At ambient temperatures below  $-20\text{ °C}$  ( $-4\text{ °F}$ ) the readability of the display may be impaired.

#### Operating elements

##### Promass 80

- Local operation with three keys (□, ⊕, ⊞)
- Quick Setup menus for straightforward commissioning

##### Promass 83

- Local operation with three optical keys (□, ⊕, ⊞)
- Application specific Quick Setup menus for straightforward commissioning

### Language group

Language groups available for operation in different countries:

Valid until software version 3.01.xx			
Order code	Option		Content
Power Supply; Display	WEA	Western Europe and America	English, German, Spanish, Italian, French, Dutch and Portuguese
	EES	Eastern Europe and Scandinavia	English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
	SEA	South and East Asia	English, Japanese, Indonesian
	only Promass 83		
	CN	China	English, Chinese

Valid as of software version 3.07.xx (only Promass 83)		
Order code	Option	Content
Power Supply; Display	P, Q	English, German, Spanish, Italian, French
	R, S	English, Russian, Portuguese, Dutch, Czech
	T, U	English, Japanese, Swedish, Norwegian, Finnish
	4, 5	English, Chinese, Indonesian, Polish

You can change the language group via the operating program "FieldCare".

### Remote operation


#### Promass 80

Operation via HART, PROFIBUS PA

#### Promass 83

Operation via HART, PROFIBUS PA/DP, FOUNDATION Fieldbus, Modbus RS485

## 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>Functional safety</b>	<p>SIL-2: In accordance with IEC 61508/IEC 61511-1 (FDIS)</p> <p>"4 to 20 mA" output according to the following order code: A, B, C, D, E, L, M, R, S, T, U, W, 0, 2, 3, 4, 5, 6, 8</p> <p>See also "Terminal assignment" →  8</p>
<b>HART certification</b>	<p>The flowmeter has successfully passed all the test procedures carried out and is certified and registered by the HCF (Hart Communication Foundation). The device thus meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> <li>■ Certified in accordance with HART Revisions 5 and 7 (device certification number: available on request)</li> <li>■ The measuring device can also be operated with certified devices of other manufacturers (interoperability).</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>Pressure measuring device approval</b>	<p>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.</p> <ul style="list-style-type: none"> <li>■ 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.</li> <li>■ Devices with this identification (with PED) are suitable for the following types of fluid: <ul style="list-style-type: none"> <li>– Fluids of Group 1 and 2 with a steam pressure greater than, or smaller and equal to 0.5 bar (7.3 psi).</li> <li>– Unstable gases.</li> </ul> </li> <li>■ 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.</li> </ul>

## 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
- EN 61508  
Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems
- 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 analogue output signal
- NAMUR NE 53  
Software of field devices and signal-processing devices with digital electronics

## Ordering Information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: [www.endress.com](http://www.endress.com) → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser Sales Center: [www.endress.com/worldwide](http://www.endress.com/worldwide)



Note!

### Product Configurator - the tool for individual product configuration

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

## Accessories

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

[www.endress.com](http://www.endress.com).

### Device-specific accessories

#### For the Transmitter

Accessories	Description
Transmitter	Transmitter for replacement or for stock. Use the order code to define the following specifications: <ul style="list-style-type: none"> <li>▪ Approvals</li> <li>▪ Degree of protection, version</li> <li>▪ Cable entries,</li> <li>▪ Display, power supply, operation</li> <li>▪ Software</li> <li>▪ Outputs, inputs</li> </ul>
Inputs/outputs for Proline Promass 83 HART	Conversion kit with appropriate plug-in point modules for converting the input/output configuration in place to date to a new version.

Accessories	Description
Software packages for Proline Promass 83	Software add-ons on F-Chip, can be ordered individually: <ul style="list-style-type: none"> <li>Advanced diagnostics</li> <li>Batching functions</li> <li>Concentration measurement</li> </ul>
Mounting set for transmitter	Mounting set for wall-mount housing (remote version). Suitable for: <ul style="list-style-type: none"> <li>Wall mounting</li> <li>Pipe mounting</li> <li>Installation in control panel</li> </ul> Mounting set for aluminum field housing: Suitable for pipe mounting (3/4" to 3")

#### For the Sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids. If using oil as a heating medium, please consult with Endress+Hauser. Heating jackets cannot be used with sensors fitted with a rupture disk. For details, see Operating Instructions BA00099D
Post mounting set for the sensor	Post mounting set for the Promass A
Mounting set for the sensor	Mounting set for Promass A, comprising: <ul style="list-style-type: none"> <li>2 process connections</li> <li>Seals</li> </ul>
Set of seals for sensor	For regular replacement of the seals of the Promass A sensors. Set consists of two seals.

#### Communication-specific accessories

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

#### Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: <ul style="list-style-type: none"> <li>Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections</li> <li>Graphic illustration of the calculation results</li> </ul> Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: <ul style="list-style-type: none"> <li>Via the Internet: <a href="https://wapps.endress.com/applicator">https://wapps.endress.com/applicator</a></li> <li>On CD-ROM for local PC installation</li> </ul>

Accessories	Description
W@M	<p>Life cycle management for your plant. W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.</p> <p>W@M is available:</p> <ul style="list-style-type: none"> <li>▪ Via the Internet: <a href="http://www.endress.com/lifecyclemanagement">www.endress.com/lifecyclemanagement</a></li> <li>▪ On CD-ROM for local PC installation</li> </ul>
Fieldcheck	<p>Tester/simulator for testing flowmeters in the field. When used in conjunction with the "FieldCare" software package, test results can be imported into a database, printed and used for official certification. Contact your Endress+Hauser representative for more information.</p>
FieldCare	<p>FieldCare is Endress+Hauser's FDT-based plant asset management tool and allows the configuration and diagnosis of intelligent field devices. By using status information, you also have a simple but effective tool for monitoring devices. The Proline flowmeters are accessed via a service interface or via the service interface FXA193.</p>
FXA193	<p>Service interface from the measuring device to the PC for operation via FieldCare.</p>

## System components

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

## 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<sup>®</sup> and VITON<sup>®</sup>

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

TRI-CLAMP<sup>®</sup>

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

SWAGELOK<sup>®</sup>

Registered trademark of Swagelok & Co., Solon, USA

HART<sup>®</sup>

Registered trademark of HART Communication Foundation, Austin, USA

PROFIBUS<sup>®</sup>

Registered trademark of the PROFIBUS User Organisation, Karlsruhe, Germany

FOUNDATION<sup>™</sup> Fieldbus

Registered trademark of the Fieldbus FOUNDATION, Austin, USA

Modbus<sup>®</sup>

Registered trademark of the SCHNEIDER AUTOMATION, INC.

Applicator<sup>®</sup>, FieldCare<sup>®</sup>, Fieldcheck<sup>®</sup>, HistoROM<sup>™</sup>, F-CHIP<sup>®</sup>, S-DAT<sup>®</sup>, T-DAT<sup>™</sup>

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