Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

# Proline Promass 80H, 83H

## Coriolis Mass Flow Measuring System
## The single-tube system with a "fit-and-forget" design: does not harm the material being measured – chemical-resistant materials

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

- Extremely accurate measurement of liquids such as oils, lubricants, liquefied gases, paints, cleaning agents and solvents
- Fluid temperatures up to +200 °C (+392 °F)
- Process pressures up to 40 bar (580 psi)
- Mass flow measurement up to 70 t/h (2570 lb/min)

Approvals for hazardous area:
- ATEX, FM, CSA, TIIS, IECEx, NEPSI

Connection to all common process control systems:
- HART, PROFIBUS PA/DP, FOUNDATION Fieldbus, MODBUS

Relevant safety aspects:
- Secondary containment up to 25 bar (362 psi), Pressure Equipment Directive, SIL-2

**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 uniform **Proline transmitter concept** includes:
- 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
- Efficient protection against forces from piping thanks to robust construction
- Easy installation without taking inlet and outlet runs into account

TI074D/06/en/05.10
71116465

Endress+Hauser
People for Process Automation

# Table of contents

# Function and system design

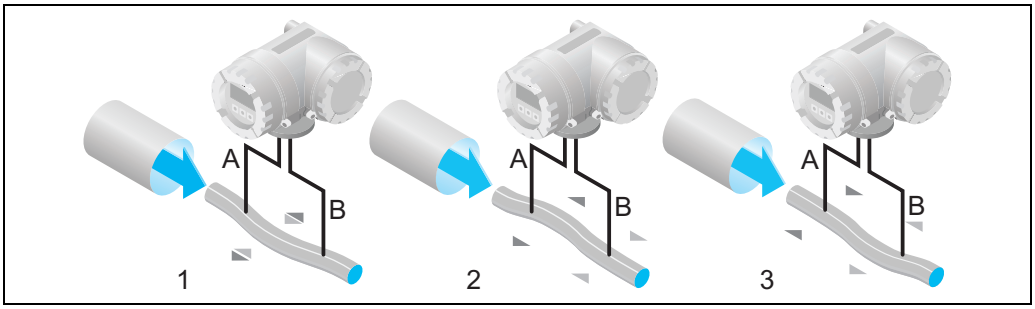
## Measuring principle

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

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

This causes the tube through which the fluid is flowing to oscillate. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):
- If there is zero flow, i.e. when the fluid stands still, the oscillation measured at points A and B has the same phase, and thus 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.
For the Promass H, the system balance is created by a counterweight that runs parallel to the measuring tube. This counterweight oscillates in antiphase to the measuring tubes and thus creates a balanced system. The patented ITB™ (Intrinsic Tube Balance) system ensures balance and stability, thus providing accurate measurements over a wide range of process and environmental conditions.
Therefore, the Promass H is just as easy to install as the familiar two-tube systems! Consequently, no special measures for attachment are required in front of or behind the sensor.
The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

### Density measurement

The measuring tube is continuously excited at its resonance frequency. A change in the mass and thus the density of the oscillating system (comprising the 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.

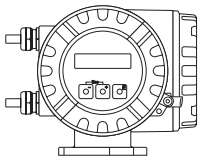
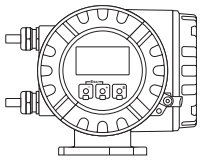
### Temperature measurement

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.

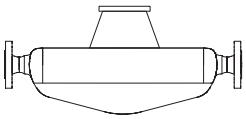
**Measuring system**

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.

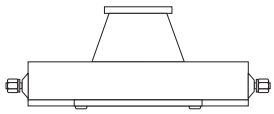
### Transmitter

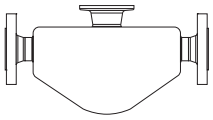
| | |
|---|---|
| **Promass 80**<br>  <br>a0003671 | ■ Two-line liquid-crystal display<br>■ Operation with push buttons |
| **Promass 83**<br>  <br>a0003672 | ■ Four-line liquid-crystal display<br>■ Operation with "Touch control"<br>■ Application-specific Quick Setup<br>■ Mass flow, volume flow, density and temperature measurement as well as calculated variables (e.g. fluid concentrations) |

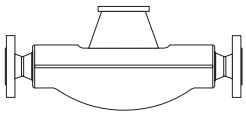
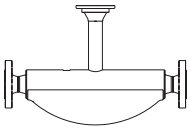
### Sensor

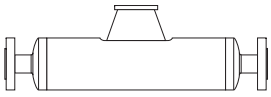
| | | |
|---|---|---|
| **H**<br>  <br>a0003677 | ■ Single bent tube. Low pressure loss and chemically resistant material<br>■ Nominal diameters DN 8 to 50 (3/8" to 2")<br>■ Material: Zirconium 702/R 60702, Tantalum 2.5W | Documentation No. TI074D |

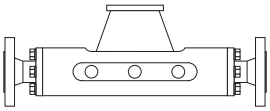
### Other sensors can be found in the separate documentation

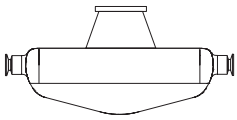
| | | |
|---|---|---|
| **A**<br>  <br>a0003679 | ■ Single-tube system for highly accurate measurement of very small flows<br>■ Nominal diameters DN 1 to 4 (1/24" to 1/8")<br>■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 (process connection) | Documentation No. TI054D |

| | | |
|---|---|---|
| **E**<br>  <br>a0002271 | ■ General purpose sensor, ideal replacement for volumetric flowmeters.<br>■ Nominal diameters DN 8 to 80 (3/8" to 3")<br>■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L | Documentation No. TI061D |

| | | |
|---|---|---|
| **F**<br>  <br>a0003673 | ■ Universal sensor for fluid temperatures up to +200 °C (+392 °F).<br>■ Nominal diameters DN 8 to 250 (3/8" to 10").<br>■ Material: Stainless steel EN 1.4539/ASTM 904L, EN 1.4404/ASTM 316L, Alloy C-22 DIN 2.4602 | Documentation No. TI101D |
| **F (High-temperature)**<br>  <br>a0003675 | ■ Universal high-temperature sensor for fluid temperatures up to +350 °C (+662 °F).<br>■ Nominal diameters DN 25, 50, 80 (1", 2", 3")<br>■ Material: Alloy C-22, DIN 2.4602, EN 1.4404/ASTM 316L | |

| | | |
|---|---|---|
| **I**<br>  <br>a0003678 | ■ Straight single-tube instrument. Minimal shear stress on fluid, hygienic design, low pressure loss<br>■ Nominal diameters DN 8 to 80 (3/8" to 3")<br>■ Material: Titanium, Ti Grade 2, Ti Grade 9 | Documentation No. TI075D |

| | | |
|---|---|---|
| **M**<br>  <br>a0003676 | ■ Robust sensor for extreme process pressures, high requirements for the secondary containment and fluid temperatures up to +150 °C (+302 °F)<br>■ Nominal diameters DN 8 to 80 (3/8" to 3")<br>■ Material: Titanium, Ti Grade 2, Ti Grade 9 | Documentation No. TI102D |

| | | |
|---|---|---|
| **S**<br>  <br>a0006828 | ■ Single bent tube. Hygienic design, low pressure loss, for fluid temperatures up to 150 °C (+302 °F)<br>■ Nominal diameters DN 8 to 50 (3/8" to 2")<br>■ Material: Stainless steel, EN 1.4539/ASTM 904L, EN 1.4435/ASTM 316L | Documentation No. TI076D |

# Input

**Measured variable**

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

**Measuring range**

**Measuring ranges for liquids**

| DN | | Range for full scale values (liquids) $\dot{m}_{min(F)}$...$\dot{m}_{max(F)}$ | |
|---|---|---|---|
| [mm] | [inch] | [kg/h] | [lb/min] |
| 8 | 3/8" | 0 to 2000 | 0 to 73.5 |
| 15 | ½" | 0 to 6500 | 0 to 238 |
| 25 | 1" | 0 to 18000 | 0 to 660 |
| 40 | 1½" | 0 to 45000 | 0 to 1650 |
| 50 | 2" | 0 to 70000 | 0 to 2570 |

**Operable flow range**

Greater than 1 000: 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, $R_i$ = 5 kΩ, galvanically isolated.
Configurable for: totalizer reset, positive zero return, error message reset, zero point adjustment start, batching start/stop (optional), totalizer reset for batching (optional).

**Status input (auxiliary input) with PROFIBUS DP**

U = 3 to 30 V DC, $R_i$ = 3 kΩ, galvanically isolated.
Switch level: ±3…±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, $R_i$ = 3 kΩ, galvanically isolated.
Switch level: ±3…±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, $R_L$ < 700 Ω, $U_{out}$ = 24 V DC, short-circuit proof
- Passive: 0/4 to 20 mA, $R_i$ = 150 Ω, $U_{max}$ = 30 V DC

# Output

**Output signal**

**Promass 80**

*Current output*

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

*Pulse/frequency output*

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 selectable, pulse width configurable (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
- Permitted 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 x Analog Input, 2 x 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 configured via miniature switches or via the local display (optional)

**Promass 83**

*Current output*

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

*Pulse/frequency output*

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

*PROFIBUS DP interface*

- PROFIBUS DP in accordance with EN 50170 Volume 2
- Profile Version 3.0
- Data transmission rate: 9.6 kBaud to 12 MBaud
- Automatic data transmission rate recognition
- Signal encoding: NRZ Code
- Function blocks: 6 x Analog Input, 3 x Totalizer
- Output data: Mass flow, Volume flow, Corrected volume flow, Density, Reference density, Temperature, Totalizers 1 to 3
- Input data: Positive zero return (ON/OFF), Zero point adjustment, Measuring mode, Totalizer control
- Bus address can be configured via miniature switches or via the local display (optional)
- Available output combination → 📄 11

*PROFIBUS PA interface*

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

*MODBUS interface*

- MODBUS device type: slave
- Address range: 1 to 247
- Supported function codes: 03, 04, 06, 08, 16, 23
- Broadcast: supported with the function codes 06, 16, 23
- Physical interface: RS485 in accordance with EIA/TIA-485 standard
- Supported baud rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud
- Transmission mode: RTU or ASCII
- Response times:
  Direct data access = typically 25 to 50 ms
  Auto-scan buffer (data range) = typically 3 to 5 ms
- Possible output combinations → 🖹 11

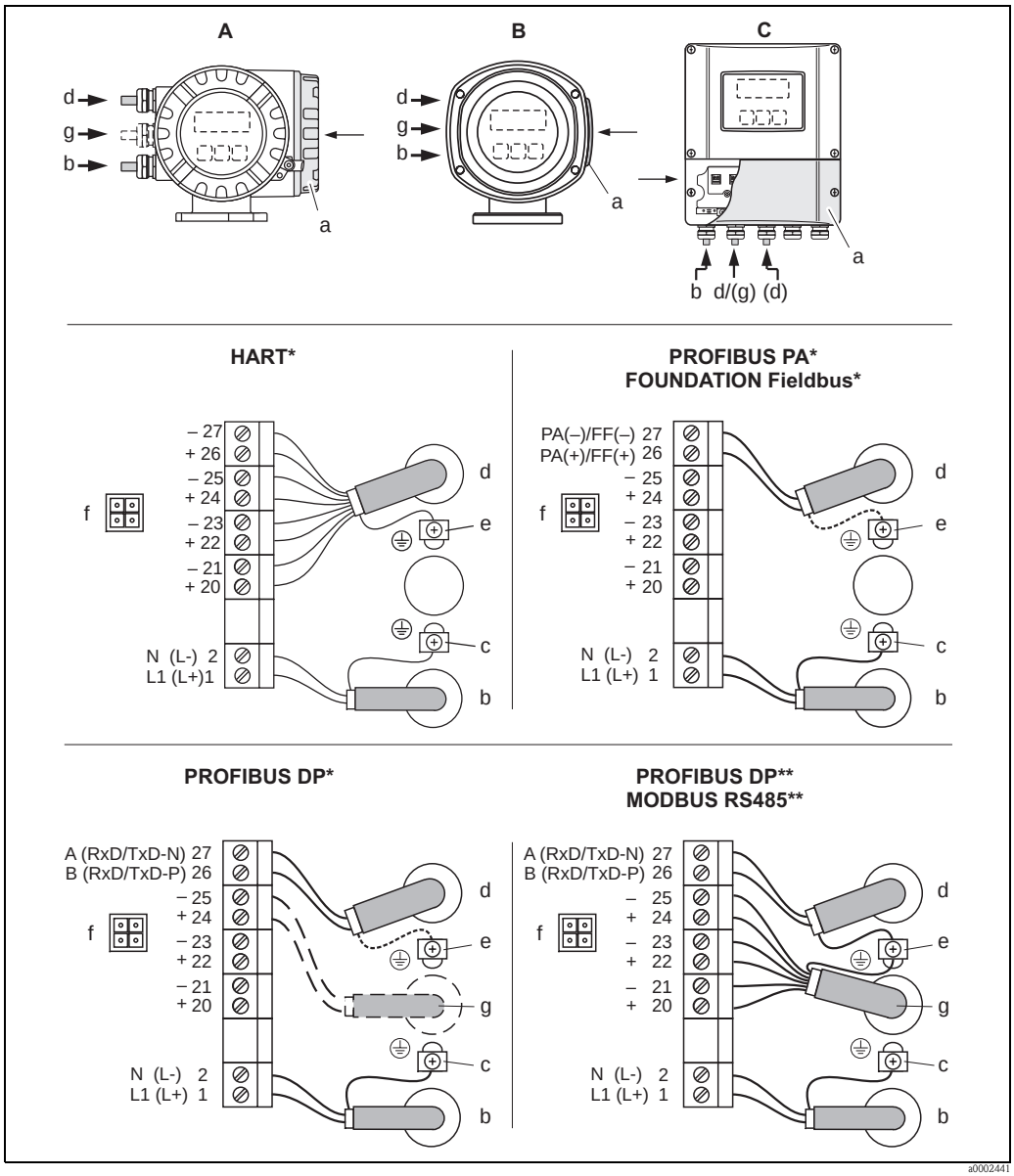
*FOUNDATION Fieldbus interface*

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

| | |
|---|---|
| **Signal on alarm** | **Current output**<br>Failsafe mode selectable (e.g. in accordance with NAMUR Recommendation NE 43)<br><br>**Pulse/frequency output**<br>Failsafe mode selectable<br><br>**Status output (Promass 80)**<br>Nonconductive in the event of a fault or if the power supply fails<br><br>**Relay output (Promass 83)**<br>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 cut off are selectable. |
| **Galvanic isolation** | All circuits for inputs, outputs, and power supply are galvanically isolated from each other. |
| **Switching output** | **Status output (Promass 80)**<br>■ Open collector<br>■ max. 30 V DC / 250 mA<br>■ galvanically isolated<br>■ Configurable for: error messages, Empty Pipe Detection (EPD), flow direction, limit values<br><br>**Relay output (Promass 83)**<br>■ max. 30 V / 0.5 A AC; 60 V / 0.1 A DC<br>■ galvanically isolated<br>■ Normally closed (NC or break) or normally open (NO or make) contacts available (factory setting: relay 1 = NO, relay 2 = NC) |

# Power supply

**Electrical connection**
**Measuring unit**




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

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

**) fixed communication board*
***) flexible communication board*
*a Connection compartment cover*
*b Cable for power supply: 85 to 260 V AC, 20 to 55 V AC, 16 to 62 V DC*
*Terminal No. 1: L1 for AC, L+ for DC*
*Terminal No. 2: N for AC, L– for DC*
*c Ground terminal for protective ground*
*d Signal cable: see Terminal assignment → 📄 11*
*Fieldbus cable:*
*Terminal No. 26: DP / PA (+) / FF (+) / MODBUS RS485 /(PA, FF: with reverse polarity protection)*
*Terminal No. 27: DP / PA (–) / FF (–) / MODBUS RS485 / (PA, FF: with reverse polarity protection)*
*e Ground terminal for signal cable shield / fieldbus cable / RS485 line*
*f Service adapter for connecting service interface FXA 193 (FieldCare)*
*g Signal cable: see Terminal assignment → 📄 11*
*g Cable for external termination (only for PROFIBUS DP with permanent assignment communication board):*
*Terminal No. 24: +5 V*
*Terminal No. 25: DGND*

**Electrical connection, terminal assignment**

### Promass 80

| Order version | 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 |

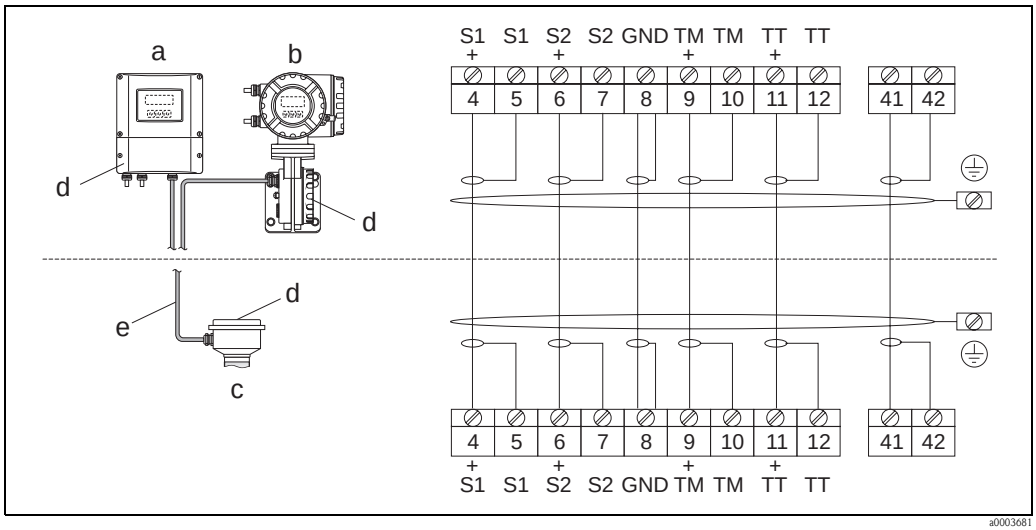
### Promass 83

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 version | Terminal No. (inputs/outputs) 20 (+) / 21 (–) | 22 (+) / 23 (–) | 24 (+) / 25 (–) | 26 (+) / 27 (–) |
|---|---|---|---|---|
| *Fixed communication boards (permanent assignment)* | | | | |
| 83***-**********A | – | – | Frequency output | Current output, HART |
| 83***-**********B | Relay output | Relay output | Frequency output | Current output, HART |
| 83***-**********F | – | – | – | PROFIBUS PA, Ex i |
| 83***-**********G | – | – | – | FOUNDATION 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 |
| *Flexible communication boards* | | | | |
| 83***-**********C | Relay output 2 | Relay output 1 | Frequency output | Current output, HART |
| 83***-**********D | Status input | Relay output | Frequency output | Current output, HART |
| 83***-**********E | Status input | Relay output | Current output 2 | Current output 1, HART |
| 83***-**********L | Status input | Relay output 2 | Relay output 1 | Current output, HART |
| 83***-**********M | Status input | Freq. 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 1HART |

| Order version | Terminal No. (inputs/outputs) | | | |
|---|---|---|---|---|
| | **20 (+) / 21 (–)** | **22 (+) / 23 (–)** | **24 (+) / 25 (–)** | **26 (+) / 27 (–)** |
| 83***-**********0 | Status input | Current output 3 | Current output 2 | Current output 1, HART |
| 83***-**********2 | Relay output | Current output 2 | Frequency output | Current output 1, HART |
| 83***-**********3 | Current input | Relay output | Current output 2 | Current output 1, HART |
| 83***-**********4 | Current input | Relay output | Frequency output | Current output, HART |
| 83***-**********5 | Status input | Current input | Frequency output | Current output, HART |
| 83***-**********6 | Status input | Current input | Current output 2 | Current output, HART |
| 83***-**********7 | Relay output 2 | Relay output 1 | Status input | MODBUS RS485 |

**Electrical connection**
**Remote version**




*Connecting the remote version*

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

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

**Supply voltage**

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

**Cable entries**

*Power-supply and signal cables (inputs/outputs):*
- Cable entry M20 x 1.5 (8 to 12 mm / 0.31" to 0.47")
- Thread for cable entries, 1/2" NPT, G 1/2"

*Connecting cable for remote version:*
- Cable entry M20 x 1.5 (8 to 12 mm / 0.31" to 0.47")
- Thread for cable entries, 1/2" NPT, G 1/2"

**Cable specification Remote version**

- 6 × 0.38 mm² (PVC cable with common shield and individually shielded cores
- Conductor resistance: ≤50 Ω/km (≤0.015 Ω/ft)
- Capacitance: core/shield: ≤420 pF/m (≤128 pF/ft)
- Cable length: max. 20 m (65 ft)
- Permanent operating temperature: max. +105 °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 IEC/EN 61326, and NAMUR recommendation NE 21/43.

**Power consumption**

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

*Switch-on current*:

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

**Power supply failure**

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

**Potential equalization**

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

# 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 ±5 °C (±9 °F) and ±2 bar (±30 psi)
- Accuracy based on accredited calibration rigs according to ISO 17025

**Maximum measured error**

The following values refer to the pulse/ frequency output. Measured error at the current output is typically ±5 µA. Design fundamentals → 16.

o.r. = of reading

**Mass and volume flow (liquids)**

*Zirconium 702/R 60702 and Tantalum 2.5W*

- Promass 83H: ±0.10% o.r.
- Promass 80H: ±0.15% o.r.

**Mass flow (gases)**

*Tantalum 2.5W*

Promass 83H, 80H: ±0.50% o.r.

**Density (liquids)**

*Zirconium 702/R 60702*

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

Special density calibration (optional):
- Calibration range: 0.0 to 1.8 g/cc, +10 to +80 °C (+50 to +176 °F)
- Operation range : 0.0 to 5.0 g/cc, –50 to +200 °C (–58 to +392 °F)

*Tantalum 2.5W*

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

Special density calibration (optional):
- Calibration range: 0.0 to 1.8 g/cc, +10 to +80 °C (+50 to +176 °F)
- Operation range : 0.0 to 5.0 g/cc, –50 to +150 °C (–58 to +302 °F)

1 g/cc = 1 kg/l

**Temperature**

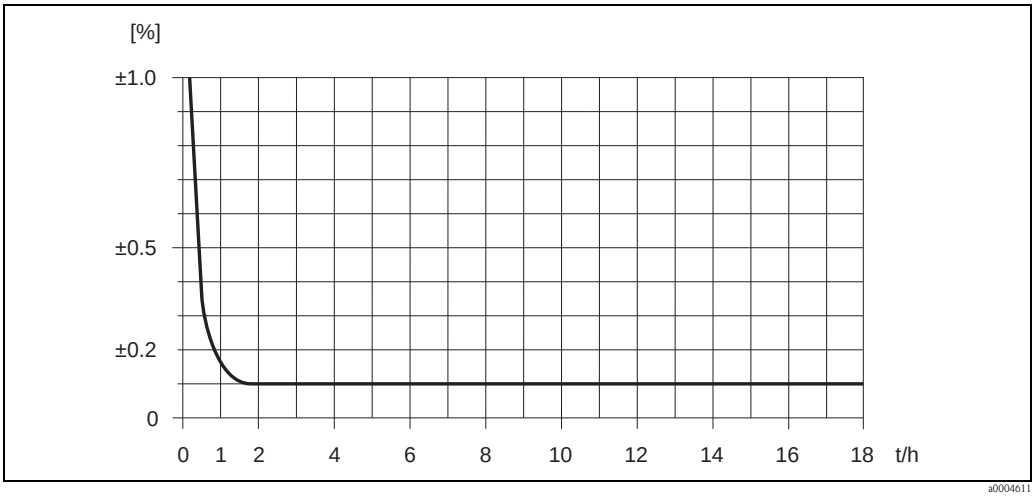
±0.5 °C ± 0.005 · T °C
(±1 °F ± 0.003 · (T - 32) °F)

T = medium temperature

**Zero point stability**

| DN | | Zero point stability | |
|---|---|---|---|
| [mm] | [inch] | [kg/h] or [l/h] | [lb/min] |
| 8 | 3/8" | 0.20 | 0.007 |
| 15 | ½" | 0.65 | 0.024 |
| 25 | 1" | 1.80 | 0.066 |
| 40 | 1½" | 4.50 | 0.165 |
| 50 | 2" | 7.00 | 0.257 |

**Example for max. measured error**




*Max. measured error in % o.r. (example: Promass 83H/ DN 25)*

*Flow values (example)*

Design fundamentals → 🖹 16

| Turn down | Flow | | Max. measured error |
|---|---|---|---|
| | [kg/h] or [l/h] | [lb/min] | [% o.r.] |
| 250 : 1 | 72 | 2.646 | 2.50 |
| 100 : 1 | 180 | 6.615 | 1.00 |
| 25 : 1 | 720 | 26.46 | 0.25 |
| 10 : 1 | 1800 | 66.15 | 0.10 |
| 2 : 1 | 9000 | 330.75 | 0.10 |

o.r. = of reading

**Repeatability**

Design fundamentals → 🖹 16.

o.r. = of reading

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

*Zirconium 702/R 60702 and Tantalum 2.5W*

Promass 80H, 83H: ±0.05% o.r.

**Mass flow (gases)**

*Tantalum 2.5W*

Promass 80H, 83H: ±0.25% o.r.

**Density (liquids)**

*Zirconium 702/R 60702*

±0.00025 g/cc

*Tantalum 2.5W*

±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 fluid temperature**

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

**Influence of fluid pressure**

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

| DN | | Promass H Zirconium 702/R 60702 | Promass H Tantalum 2.5W |
|---|---|---|---|
| [mm] | [inch] | [% o.r./bar] | [% o.r./bar] |
| 8 | 3/8" | –0.017 | –0.010 |
| 15 | ½" | –0.021 | –0.005 |
| 25 | 1" | –0.013 | –0.015 |
| 40 | 1½" | –0.018 | –0.050 |
| 50 | 2" | –0.020 | – |

o.r. = of reading

**Design fundamentals**

Dependent on the flow:

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

o.r. = of reading

| Base accuracy for | Promass 83H | Promass 80H |
|---|---|---|
| Mass flow liquids | 0.10 | 0.15 |
| Volume flow liquids | 0.10 | 0.15 |
| Mass flow gases | 0.50 | 0.50 |

# Operating conditions: Installation

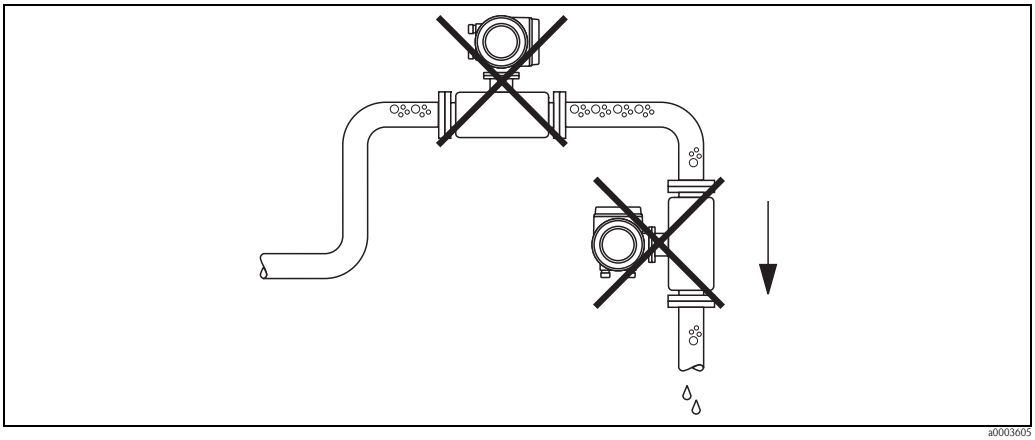
**Installation instructions**

Note the following points:

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

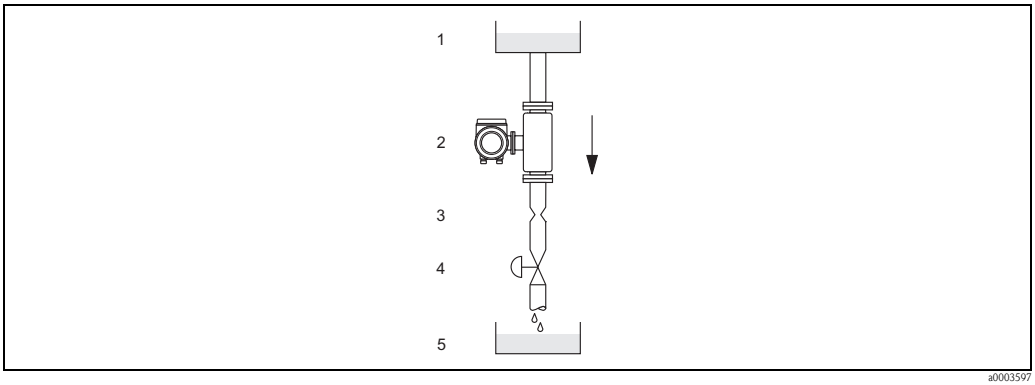
### Mounting location

Entrained air or gas bubbles in the measuring tube can result in an increase in measuring errors.
**Therefore, avoid** the following mounting locations in the pipe installation:
- Highest point of a pipeline. Risk of air accumulating.
- Directly upstream of 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.




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

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

| DN | | ∅ Orifice plate, pipe restriction | |
|---|---|---|---|
| [mm] | [inch] | [mm] | [inch] |
| 8 | 3/8" | 6 | 0.24 |
| 15 | ½" | 10 | 0.39 |
| 25 | 1" | 14 | 0.55 |
| 40 | 1½" | 22 | 0.87 |
| 50 | 2" | 28 | 1.10 |

### Orientation

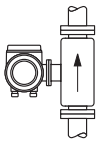
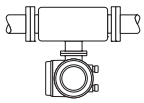
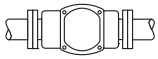
Make sure that the direction of the arrow on the nameplate of the sensor matches the direction of flow (direction of fluid flow through the pipe.

*Vertical (Fig. V)*

Recommended orientation with upward direction of flow. 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 buildup.

*Horizontal (Fig. H1, H2, H3)*

The transmitter can be installed in any orientation in a horizontal pipe run.
Please note the special installation instructions → 19.

| **Orientation:** | **Vertikal** | **Horizontal, Transmitter head up** | **Horizontal, Transmitter head down** | **Horizontal, Transmitter head to the side** |
|---|---|---|---|---|
| |  a0004572 *Fig. V* |  a0004576 *Fig. H1* |  a0004580 *Fig. H2* |  a0007558 *Fig. H3* |
| Standard, Compact version | ✔✔ | ✔✔ | ✔✔ | ✔✔ |
| Standard, Remote version | ✔✔ | ✔✔ | ✔✔ | ✔✔ |

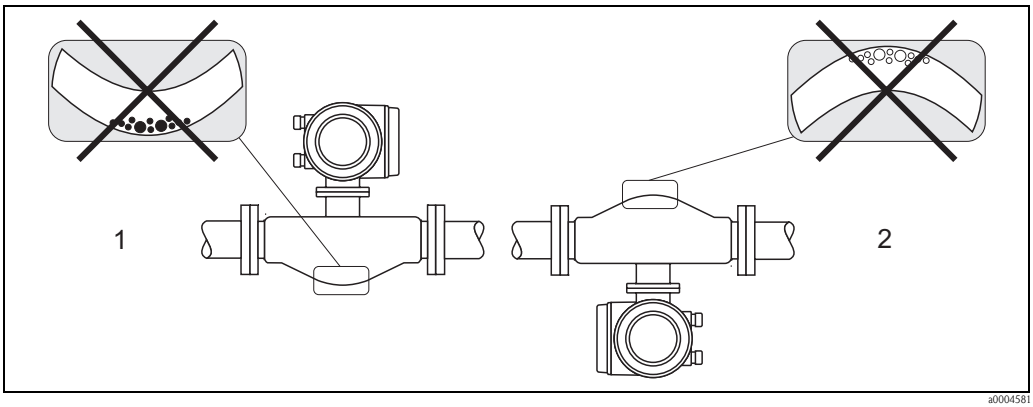
✔✔ = Recommended orientation
✔ = Orientation recommended in certain situations;
✘ = Impermissible orientation

In order to ensure that the permissible ambient temperature range for the transmitter (→ 20) is not exceeded, we recommend the following orientations:

- For fluids with very high temperatures we recommend the horizontal orientation with the transmitter head pointing downwards (Fig. H2) or the vertical orientation (Fig. V).
- For fluids with very low temperatures, we recommend the horizontal orientation with the transmitter head pointing upwards (Fig. H1) or the vertical orientation (Fig. V).

**Special installation instructions**

Caution!
The measuring tube is slightly curved. The position of the sensor, therefore, has to be matched to the fluid properties when the sensor is installed horizontally.




*Horizontal installation for sensors with curved measuring tube*

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

**Heating**

Some fluids require suitable measures to avoid heat transfer 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 the 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 → 📄 21.
- If using an electric trace heating system whose heating is regulated via phase angle control or pulse packages, influence on the measured values cannot be ruled out due to magnetic fields (i.e. for values that are greater than the values approved by the EN standard (sine 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 preferential 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 permitted temperature ranges → 📄 21

Special heating jackets, which can be ordered separately from Endress+Hauser as an accessory, 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. Calibration takes place under reference conditions → 📄 14.
Promass therefore does **not** require zero point adjustment!

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

**Inlet and outlet runs**

There are no installation requirements regarding inlet and outlet runs.

**Length of connecting cable**

Max. 20 meters (66 ft), remote version

**System pressure**

It is important to ensure that cavitation does not occur, because it would influence the oscillation of the measuring tube. No special measures need to be taken for fluids which have properties similar to water under normal conditions.
In the case of liquids with a low boiling point (hydrocarbons, solvents, liquefied gases) or in suction lines, it is important to ensure that pressure does not drop below the vapor pressure and that the liquid does not start to boil. It is also important to ensure that the gases that occur naturally in many liquids do not outgas. Such effects can be prevented when system pressure is sufficiently high.

Therefore, the following locations should be preferred for installation:
- Downstream from pumps (no danger of vacuum)
- At the lowest point in a vertical pipe

# Operating conditions: Environment

**Ambient temperature range**

Sensor, 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 +176 °F), preferably +20 °C (+68 °F)

**Degree of protection**

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

**Shock resistance**

According to IEC 68-2-31

**Vibration resistance**

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

**Electromagnetic compatibility (EMC)**

As per IEC/EN 61326 and NAMUR recommendation NE 21

# Operating conditions: Process

**Fluid temperature range**

**Sensor**

*Zirconium 702/R 60702*

–50 to +200 °C (–58 to +392 °F)

*Tantalum 2.5W*

–50 to +150 °C (–58 to +302 °F)

**Fluid pressure range (nominal pressure)**

**Flanges**

- according to DIN PN 40
- according to ASME B16.5 Cl 150, Cl 300
- JIS 10K, 20K

**Pressure ranges of secondary containment:**

*Zirconium 702/R 60702*

- DN 8 to 15 (3/8" to ½"): 25 bar (362 psi)
- DN 25 to 50 (1" to 2"): 16 bar (232 psi)

*Tantalum 2.5W*

- DN 8 to 25 (3/8" to 1"): 25 bar (362 psi)
- DN 40 to 50 (1½" to 2"): 16 bar (232 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. Dimensions → 23

**Limiting flow**

See information in the "Measuring range" section → 6

Select nominal diameter by optimizing between required flow range and permissible pressure loss. See the "Measuring range" section for a list of maximum possible full scale values.

- 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)).

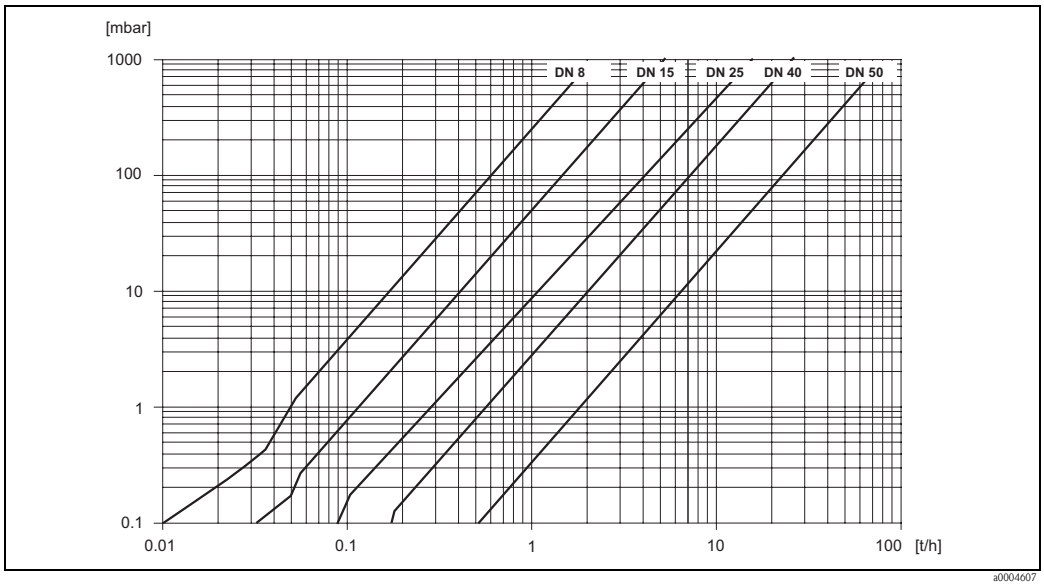
**Pressure loss**

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

| | |
|---|---|
| Reynolds number | $Re = \frac{4 \cdot \dot{m}}{\pi \cdot d \cdot \nu \cdot \rho}$ a0003381 |
| Re ≥ 2300 * | $\Delta p = K \cdot \nu^{0.25} \cdot \dot{m}^{1.75} \cdot \rho^{-0.75} + \frac{K3 \cdot \dot{m}^2}{\rho}$ a0004631 |
| Re < 2300 | $\Delta p = K1 \cdot \nu \cdot \dot{m} + \frac{K3 \cdot \dot{m}^2}{\rho}$ a0004633 |
| $\Delta p$ = pressure loss [mbar]<br>$\nu$ = kinematic viscosity [m²/s]<br>$\dot{m}$ = mass flow [kg/s] | $\rho$ = fluid density [kg/m³]<br>d = inside diameter of measuring tubes [m]<br>K to K3 = constants (depending on nominal diameter) |
| * To compute the pressure loss for gases, always use the formula for Re ≥ 2300. | |

### Pressure loss coefficients

| DN | | d[m] | K | K1 | K3 |
|---|---|---|---|---|---|
| [mm] | [inch] | | | | |
| 8 | 3/8" | $8.31 \cdot 10^{-3}$ | $8.78 \cdot 10^{6}$ | $3.53 \cdot 10^{7}$ | $1.30 \cdot 10^{6}$ |
| 15 | ½" | $12.00 \cdot 10^{-3}$ | $1.81 \cdot 10^{6}$ | $9.99 \cdot 10^{6}$ | $1.87 \cdot 10^{5}$ |
| 25 | 1" | $17.60 \cdot 10^{-3}$ | $3.67 \cdot 10^{5}$ | $2.76 \cdot 10^{6}$ | $4.99 \cdot 10^{4}$ |
| 40 | 1½" | $26.00 \cdot 10^{-3}$ | $8.00 \cdot 10^{4}$ | $7.96 \cdot 10^{5}$ | $1.09 \cdot 10^{4}$ |
| 50 | 2" | $40.50 \cdot 10^{-3}$ | $1.41 \cdot 10^{4}$ | $1.85 \cdot 10^{5}$ | $1.20 \cdot 10^{3}$ |
| Pressure loss data includes interface between measuring tube and piping | | | | | |




*Pressure loss diagram for water*

### Pressure loss (US units)

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

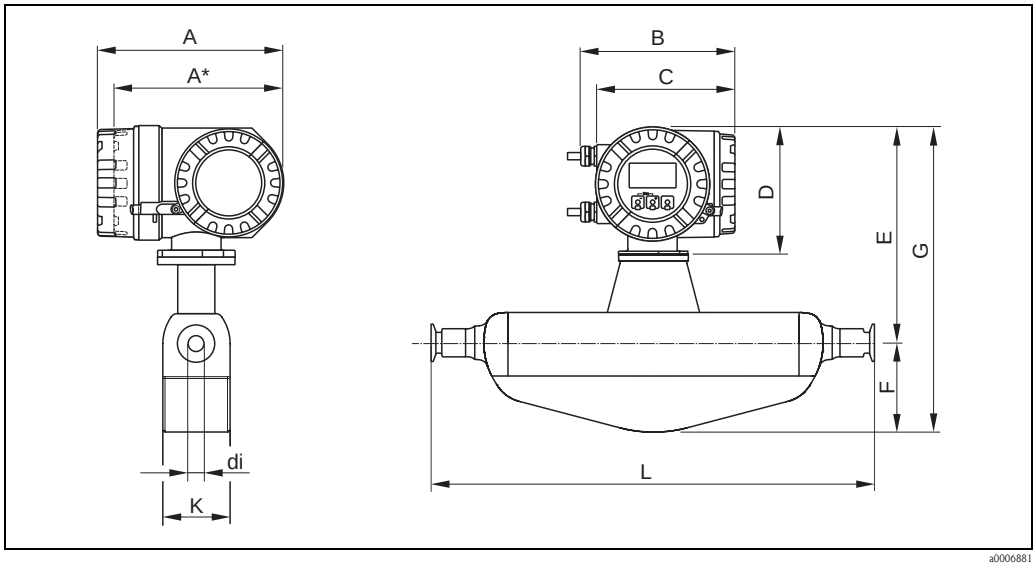
- Nominal diameter of the sensor with fluid characteristics such as viscosity, density, etc.
- Pressure loss downstream of the measuring point.
- Converting mass flow to volume flow, etc.
- Simultaneous display of various meter size.
- Determining measuring ranges.

The Applicator runs on any IBM compatible PC with windows.

# Mechanical construction

**Design/dimensions**

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




*Dimensions in SI units*

| DN | A | A* | B | C | D | E | F | G | L | di |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 227 | 207 | 187 | 168 | 160 | 280 | 108 | 388 | 1) | 1) |
| 15 | 227 | 207 | 187 | 168 | 160 | 280 | 108 | 388 | 1) | 1) |
| 25 | 227 | 207 | 187 | 168 | 160 | 280 | 121 | 401 | 1) | 1) |
| 40 | 227 | 207 | 187 | 168 | 160 | 304 | 173 | 477 | 1) | 1) |
| 50 | 227 | 207 | 187 | 168 | 160 | 315 | 241 | 556 | 1) | 1) |

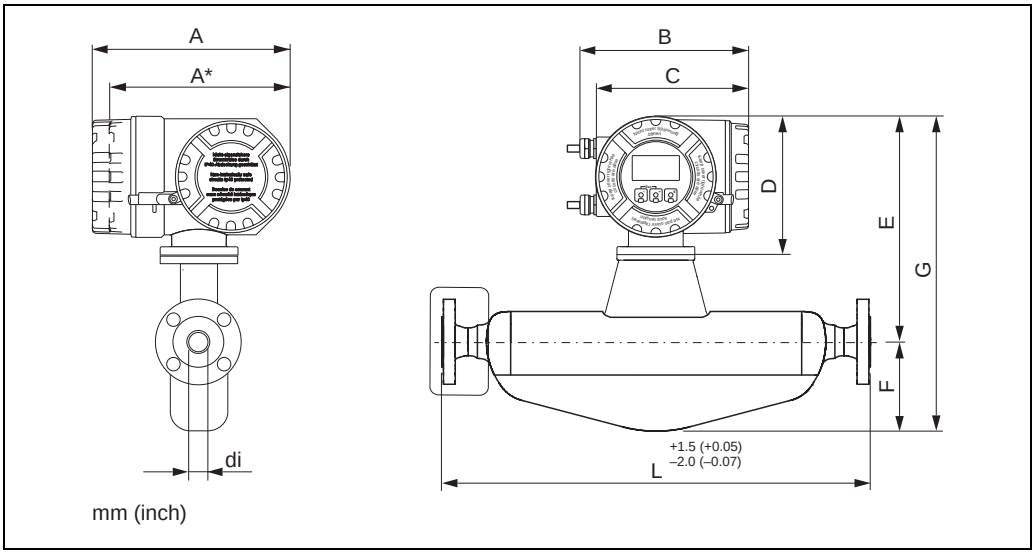
* Blind version (without local display)
1) dependent on respective process connection
All dimensions in [mm]

*Dimensions in US units*

| DN | A | A* | B | C | D | E | F | G | L | di |
|---|---|---|---|---|---|---|---|---|---|---|
| 3/8" | 9.45 | 8.54 | 8.11 | 7.32 | 7.01 | 11.02 | 4.79 | 15.82 | 1) | 1) |
| ½" | 9.45 | 8.54 | 8.11 | 7.32 | 7.01 | 11.02 | 4.83 | 15.86 | 1) | 1) |
| 1" | 9.45 | 8.54 | 8.11 | 7.32 | 7.01 | 11.02 | 5.46 | 16.49 | 1) | 1) |
| 1½" | 9.45 | 8.54 | 8.11 | 7.32 | 7.01 | 11.97 | 7.43 | 19.40 | 1) | 1) |
| 2" | 9.45 | 8.54 | 8.11 | 7.32 | 7.01 | 12.40 | 10.19 | 22.59 | 1) | 1) |

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

**Field housing compact version, powder-coated die-cast aluminum (II2G/zone 1)**




*Dimensions in SI units*

| DN | A | A* | B | C | D | E | F | G | K | L | di |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 240 | 217 | 206 | 186 | 178 | 280 | 122 | 402 | 92 | 1) | 1) |
| 15 | 240 | 217 | 206 | 186 | 178 | 280 | 123 | 403 | 92 | 1) | 1) |
| 25 | 240 | 217 | 206 | 186 | 178 | 280 | 139 | 419 | 92 | 1) | 1) |
| 40 | 240 | 217 | 206 | 186 | 178 | 304 | 189 | 493 | 132 | 1) | 1) |
| 50 | 240 | 217 | 206 | 186 | 178 | 315 | 259 | 574 | 167 | 1) | 1) |

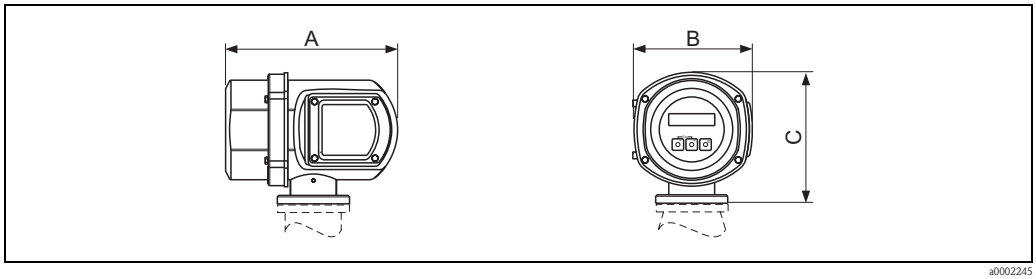
* Blind version (without local display)
1) dependent on respective process connection
All dimensions in [mm]

*Dimensions in US units*

| DN | A | A* | B | C | D | E | F | G | K | L | di |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/8" | 9.08 | 8.28 | 7.48 | 6.72 | 6.40 | 11.02 | 4.25 | 15.28 | 3.62 | 1) | 1) |
| ½" | 9.08 | 8.28 | 7.48 | 6.72 | 6.40 | 11.02 | 4.25 | 15.28 | 3.92 | 1) | 1) |
| 1" | 9.08 | 8.28 | 7.48 | 6.72 | 6.40 | 11.02 | 4.76 | 15.79 | 3.62 | 1) | 1) |
| 1½" | 9.08 | 8.28 | 7.48 | 6.72 | 6.40 | 11.97 | 6.81 | 18.78 | 5.20 | 1) | 1) |
| 2" | 9.08 | 8.28 | 7.48 | 6.72 | 6.40 | 12.40 | 9.49 | 21.89 | 6.57 | 1) | 1) |

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

**Transmitter compact version, stainless steel**

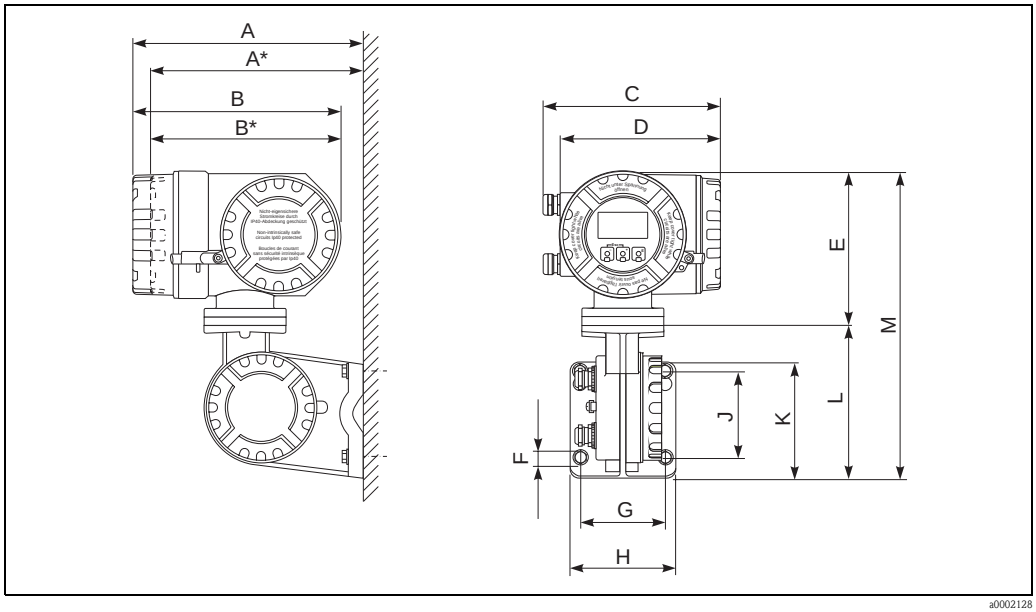



a0002245

*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 connection housing remote version (II2G/zone 1)**




a0002128

*Dimensions in SI units*

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

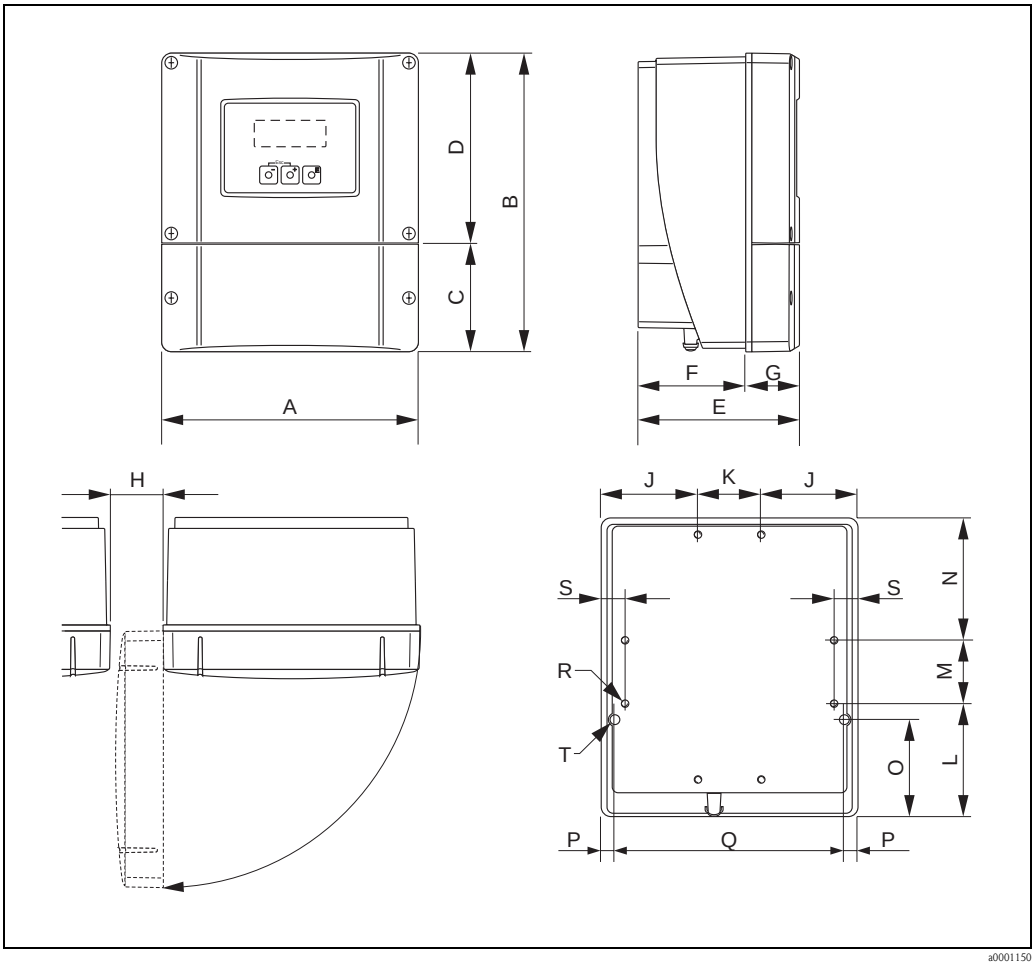
* Blind version (without local display)
All dimensions in [mm]

*Dimensions in US units*

| A | A* | B | B* | C | D | E | F ∅ | 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 local display)
All dimensions in [inch]

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




a0001150

*Dimensions in SI units*

| A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|
| 215 | 250 | 90.5 | 159.5 | 135 | 90 | 45 | >50 | 81 |
| K | L | M | N | O | P | Q | R | S |
| 53 | 95 | 53 | 102 | 81.5 | 11.5 | 192 | 8 × M5 | 20 |

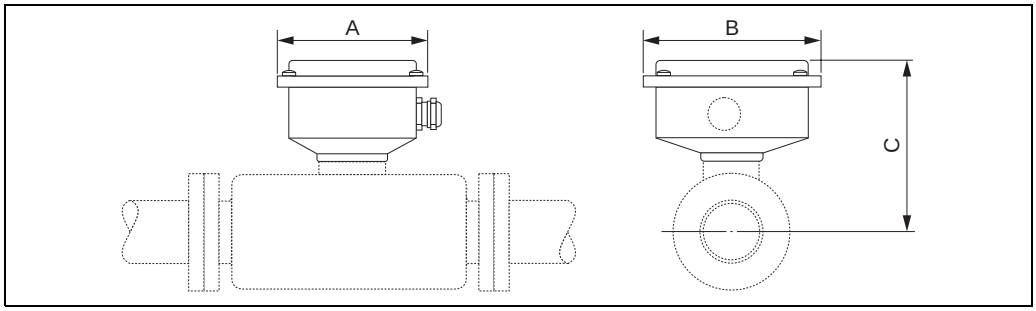
All dimensions in [mm]

*Dimensions in US units*

| A | B | C | D | E | F | G | H | J |
|---|---|---|---|---|---|---|---|---|
| 8.46 | 9.84 | 3.56 | 6.27 | 5.31 | 3.54 | 1.77 | >1.97 | 3.18 |
| K | L | M | N | O | P | Q | R | S |
| 2.08 | 3.74 | 2.08 | 4.01 | 3.20 | 0.45 | 7.55 | 8 × M5 | 0.79 |

All dimensions in [inch]

**Transmitter remote version, connection housing**




a0002516

*Dimensions in SI units*

| DN | A | B | C |
|---|---|---|---|
| 8 | 118.5 | 137.5 | 127 |
| 15 | 118.5 | 137.5 | 127 |
| 25 | 118.5 | 137.5 | 127 |
| 40 | 118.5 | 137.5 | 151 |
| 50 | 118.5 | 137.5 | 162 |

All dimensions in [mm]

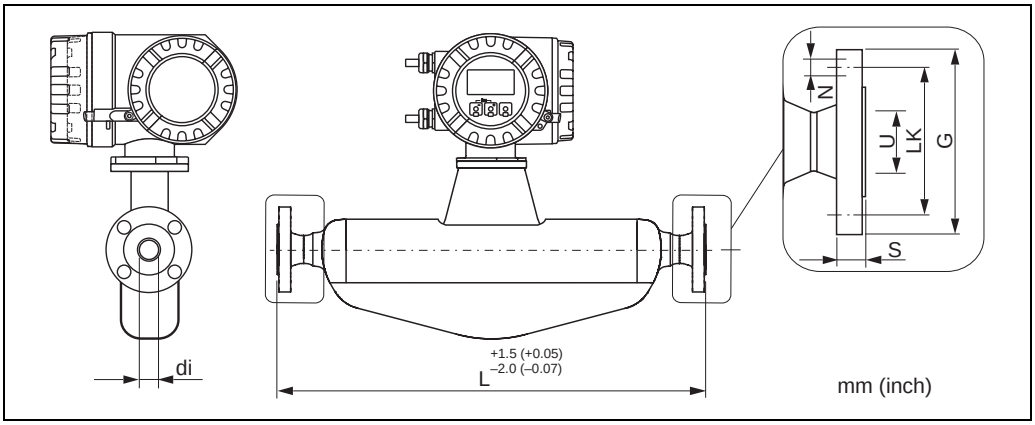
*Dimensions in US units*

| DN | A | B | C |
|---|---|---|---|
| 3/8" | 4.67 | 5.41 | 5.00 |
| ½" | 4.67 | 5.41 | 5.00 |
| 1" | 4.67 | 5.41 | 5.00 |
| 1½" | 4.67 | 5.41 | 5.94 |
| 2" | 4.67 | 5.41 | 6.38 |

All dimensions in [inch]

**Process connections in SI units**

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




*Flange connections EN (DIN)*

**Flange according to EN 1092-1 (DIN 2501 / DIN 2512N 1)) / PN 40:**
1.4301/304; fluid wetted parts: Zirconium 702, Tantalum

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm

| DN | G | L | N | S | LK | U | di |
|---|---|---|---|---|---|---|---|
| 8 [1)] | 95 | 336 | 4 x Ø14 | 20 | 65 | 17.30 | 8.51 |
| 15 | 95 | 440 | 4 x Ø14 | 20 | 65 | 17.30 | 12.00 |
| 25 | 115 | 580 | 4 x Ø14 | 19 | 85 | 28.50 | 17.60 |
| 40 | 150 | 794 | 4 x Ø18 | 21.5 | 110 | 43.10 | 25.50 |
| 50 | 165 | 1071 | 4 x Ø18 | 23.5 | 125 | 54.50 | 40.50 |

[1)] DN 8 with DN 15 flange as standard; All dimensions in [mm]

*Flange connections ASME B16.5*

**Flange according to ASME B16.5 / Cl 150:** 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum

Surface roughness (flange): Ra 3.2 to 6.3 µm

| DN | G | L | N | S | LK | U | di |
|---|---|---|---|---|---|---|---|
| 8 [1)] | 88.9 | 336 | 4 x Ø15.7 | 12.8 | 60.5 | 15.70 | 8.51 |
| 15 | 88.9 | 440 | 4 x Ø15.7 | 12.8 | 60.5 | 15.70 | 12.00 |
| 25 | 108.0 | 580 | 4 x Ø15.7 | 15.1 | 79.2 | 26.70 | 17.60 |
| 40 | 127.0 | 794 | 4 x Ø15.7 | 17.5 | 98.6 | 40.90 | 25.50 |
| 50 | 152.4 | 1071 | 4 x Ø19.1 | 23.6 | 120.7 | 52.60 | 40.50 |

[1)] DN 8 with DN 15 flange as standard; All dimensions in [mm]

**Flange according to ASME B16.5 / Cl 300:** 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum

Surface roughness (flange): Ra 3.2 to 6.3 µm

| DN | G | L | N | S | LK | U | di |
|---|---|---|---|---|---|---|---|
| 8 [1)] | 95.2 | 336 | 4 x Ø15.7 | 14.2 | 66.5 | 15.70 | 8.51 |
| 15 | 95.2 | 440 | 4 x Ø15.7 | 14.2 | 66.5 | 15.70 | 12.00 |
| 25 | 124.0 | 580 | 4 x Ø19.1 | 17.5 | 88.9 | 26.70 | 17.60 |
| 40 | 155.4 | 794 | 4 x Ø22.3 | 20.6 | 114.3 | 40.90 | 25.50 |
| 50 | 165.1 | 1071 | 4 x Ø19.1 | 23.6 | 127 | 52.60 | 40.50 |

[1)] DN 8 with DN 15 flange as standard; All dimensions in [mm]

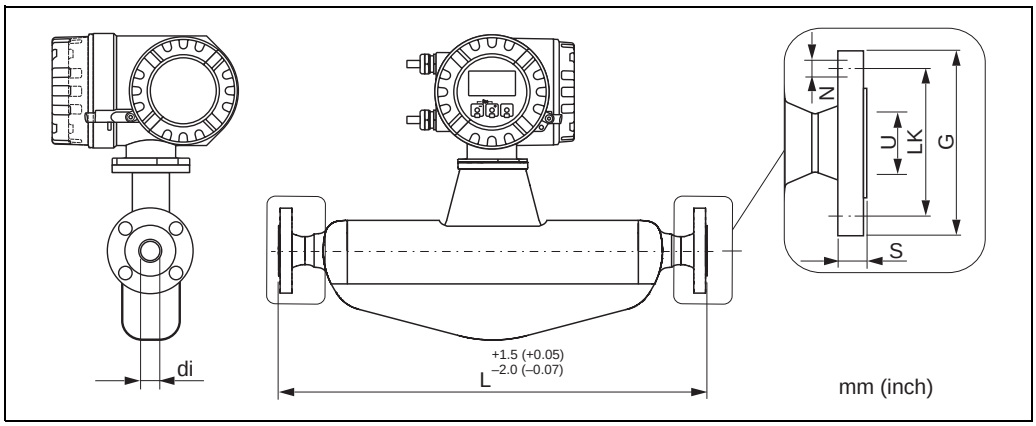
*Flange connections JIS*

| **Flange JIS B2220 / 20K:** 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum<br>Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | | |
|---|---|---|---|---|---|---|---|
| DN | G | L | N | S | LK | U | di |
| 8 [1] | 95 | 336 | 4 x Ø15 | 14 | 70 | 15.00 | 8.51 |
| 15 | 95 | 440 | 4 x Ø15 | 14 | 70 | 15.00 | 12.00 |
| 25 | 125 | 580 | 4 x Ø19 | 16 | 90 | 25.00 | 17.60 |
| 40 | 140 | 794 | 4 x Ø19 | 18 | 105 | 40.00 | 25.50 |
| 50 | 165 | 1071 | 8 x Ø19 | 22 | 120 | 50.00 | 40.50 |

[1] DN 8 with DN 15 flange as standard; All dimensions in [mm]

**Process connections in US units**

*Flange connections ASME B16.5*




a0003287-ae

*Flange connections ASME B16.5*

| **Flange according to ASME B16.5 / Cl 150:** 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum<br>Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | | |
|---|---|---|---|---|---|---|---|
| DN | G | L | N | S | LK | U | di |
| 3/8" [1] | 3.50 | 13.23 | 4 x Ø0.62 | 0.50 | 2.38 | 0.62 | 0.34 |
| ½" | 3.50 | 17.32 | 4 x Ø0.62 | 0.50 | 2.38 | 0.62 | 0.47 |
| 1" | 4.25 | 22.83 | 4 x Ø0.62 | 0.59 | 3.12 | 1.05 | 0.69 |
| 1 ½" | 5.00 | 31.26 | 4 x Ø0.62 | 0.69 | 3.88 | 1.61 | 1.00 |
| 2" | 6.00 | 42.17 | 4 x Ø0.75 | 0.93 | 4.75 | 2.07 | 1.59 |

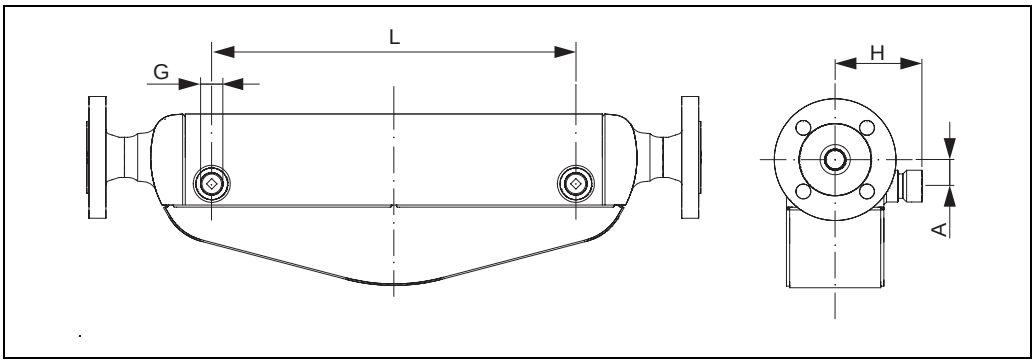
[1] DN 3/8" with DN ½" flange as standard; All dimensions in [inch]

| **Flange according to ASME B16.5 / Cl 300:** 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum<br>Surface roughness (flange): Ra 3.2 to 6.3 µm | | | | | | | |
|---|---|---|---|---|---|---|---|
| DN | G | L | N | S | LK | U | di |
| 3/8" [1] | 3.75 | 13.23 | 4 x Ø0.62 | 0.56 | 2.62 | 0.62 | 0.34 |
| ½" | 3.75 | 17.32 | 4 x Ø0.62 | 0.56 | 2.62 | 0.62 | 0.47 |
| 1" | 4.88 | 22.83 | 4 x Ø0.75 | 0.69 | 3.50 | 1.05 | 0.69 |
| 1 ½" | 6.12 | 31.26 | 4 x Ø0.88 | 0.81 | 4.50 | 1.61 | 1.00 |
| 2" | 6.50 | 42.17 | 4 x Ø0.75 | 0.93 | 5.00 | 2.07 | 1.59 |

[1] DN 3/8" with DN ½" flange as standard; All dimensions in [inch]

**Purge connections / secondary containment monitoring**

Caution!
- The secondary containment is filled with dry nitrogen ($N_2$). Do not open the purge connections unless the containment can be filled immediately with a dry inert gas. Use only low gauge pressure to purge. Maximum pressure: 5 bar (72,5 psi).
- Purge connections or secondary containment monitoring can not be combined with separately available heating jacket.




| DN | | G | A | | H | | | L | |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | [inch] | | [mm] | [inch] | [mm] | [inch] | [inch] | [mm] | [inch] |
| 8 | 3/8" | ½"-NPT | 25 | 0.98 | 82.0 | 3.23 | 3.57 | 110.0 | 4.33 |
| 15 | ½" | ½"-NPT | 25 | 0.98 | 82.0 | 3.23 | 3.57 | 204.0 | 8.03 |
| 25 | 1" | ½"-NPT | 25 | 0.98 | 82.0 | 3.23 | 3.57 | 344.0 | 13.54 |
| 40 | 1½" | ½"-NPT | 45 | 1.77 | 102.0 | 4.02 | 4.07 | 526.0 | 20.71 |
| 50 | 2" | ½"-NPT | 58 | 2.28 | 119.5 | 4.70 | 4.64 | 763.0 | 30.04 |

**Weight**

- Compact version: see table below
- Remote version
  - Sensor: see table below
  - Wall-mount housing: 5 kg (11 lb)

**Weight in SI units**

| DN [mm] | 8 | 15 | 25 | 40 | 50 |
|---|---|---|---|---|---|
| Compact version | 12 | 13 | 19 | 36 | 69 |
| Remote version | 10 | 11 | 17 | 34 | 67 |

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

**Weight in US units**

| DN [inch] | 3/8" | ½" | 1" | 1½" | 2" |
|---|---|---|---|---|---|
| Compact version | 26 | 29 | 42 | 79 | 152 |
| Remote version | 22 | 24 | 37 | 75 | 148 |

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

## Materials

### Transmitter housing

Compact version
- Powder coated die-cast aluminum
- Stainless steel housing: stainless steel 1.4301/ASTM 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

Stainless steel 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum

### Measuring tubes:

- Zirconium 702/R 60702
- Tantalum 2.5W

### Seals

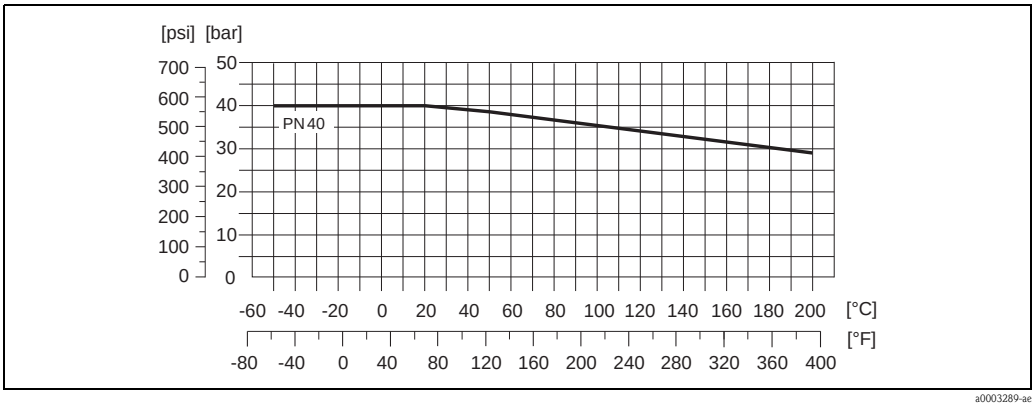
Welded process connections without internal seals

**Material load curves**

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

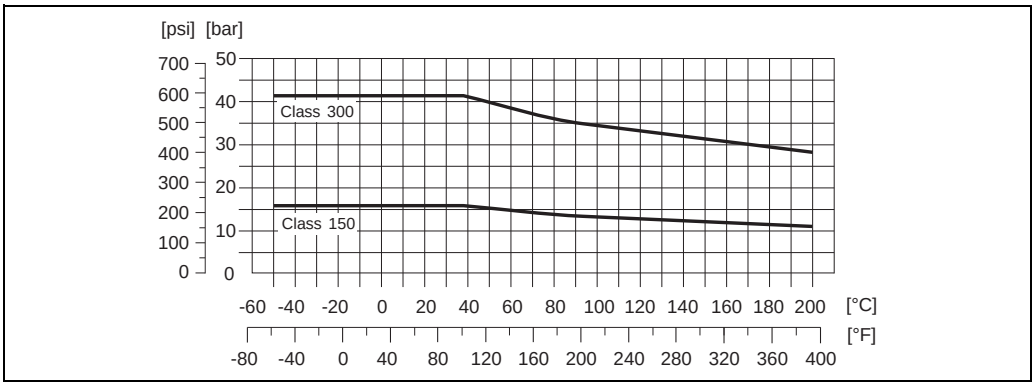
**Flange according to connection to EN 1092-1 (DIN 2501)**

Flange material: 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum



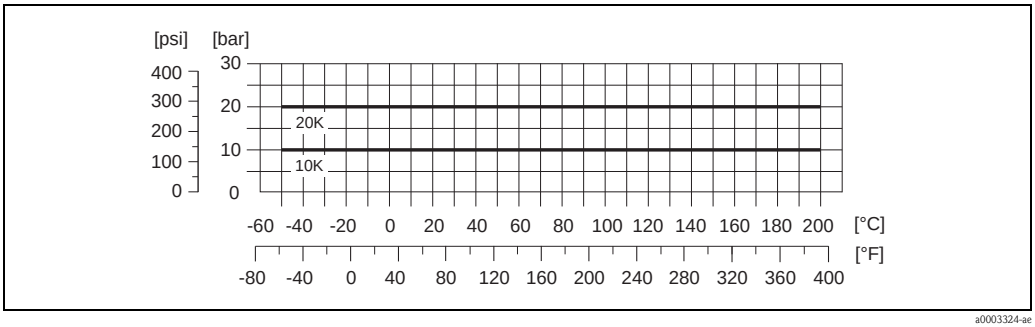

**Flange connection according to ASME B16.5**

Flange material: 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum




**Flange connection to JIS B2220**

Flange material: 1.4301/304; fluid wetted parts: Zirconium 702, Tantalum




**Process connections**

**Welded process connections**

- Flanges according to EN 1092-1 (DIN 2501), ASME B16.5, JIS B2220

# Human interface

**Display elements**

- Liquid-crystal display: backlit, four lines with 16 characters per line
- Selectable display of different measured values and status variables
- At ambient temperatures below –20 °C (–4 °F) the readability of the display may be impaired.

**Operating elements**

**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 groups**

Language groups available for operation in different countries:

- Western Europe and America (WEA):
  English, German, Spanish, Italian, French, Dutch and Portuguese
- Eastern Europe/Scandinavia (EES):
  English, Russian, Polish, Norwegian, Finnish, Swedish and Czech
- South and Eastern Asia (SEA):
  English, Japanese, Indonesian

**Only Promass 83**

- China (CN):
  English, Chinese

The language group is changed using the "FieldCare" operating program.

**Remote operation**

**Promass 80**

Remote operation via HART, PROFIBUS PA

**Promass 83**

Remote operation via HART, PROFIBUS DP/PA, FOUNDATION fieldbus, MODBUS RS485

# Certificates and approvals

**CE mark**

The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

**C-Tick symbol**

The measuring system complies with the EMC requirements of the "Australian Communications and Media Authority (ACMA)"

**Ex approval**

Information about currently available Ex versions (ATEX, FM, CSA, IECEx, NEPSI etc.) can be supplied by your Endress+Hauser Sales Center on request. All information relevant to explosion protection is available in separate Ex documents that you can order as necessary.

**FOUNDATION Fieldbus certification**

The flow device has successfully passed all the test procedures carried out and is certified and registered by the Fieldbus Foundations. The device thus meets all the requirements of the following specifications:

- Certified to FOUNDATION Fieldbus Specification
- The device meets all the specifications of the FOUNDATION Fieldbus H1.
- Interoperability Test Kit (ITK), revision status 5.01 (device certification number: on request)
- The device can also be operated with certified devices of other manufacturers
- Physical Layer Conformance Test of the Fieldbus Foundation

**PROFIBUS DP/PA certification**

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:

- Certified in accordance with PROFIBUS Profile Version 3.0 (device certification number: available on request)
- The device can also be operated with certified devices of other manufacturers (interoperability)

**MODBUS certification**

The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan.

**Other standards and guidelines**

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

**Pressure Equipment Directive**

The measuring devices can be ordered with or without PED (Pressure Equipment Directive). If a device with PED is required, this must be ordered explicitly. 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: accordance IEC 61508/IEC 61511-1 (FDIS)

"4–20 mA HART" 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 (FA005D)
- Technical Information
  - Promass 80A, 83A (TI054D)
  - Promass 80E, 83E (TI061D)
  - Promass 80F, 83F (TI101D)
  - Promass 80I, 83I (TI075D)
  - Promass 80M, 83M (TI102D)
  - Promass 80P, 83P (TI078D)
  - Promass 80S, 83S (TI076D)
- Operating Instructions/Description of Device Functions
  - Promass 80 HART (BA057D/BA058D)
  - Promass 80 PROFIBUS PA (BA072D/BA073D)
  - Promass 83 HART (BA059D/BA060D)
  - Promass 83 FOUNDATION Fieldbus (BA065D/BA066D)
  - Promass 83 PROFIBUS DP/PA(BA063D/BA064D)
  - Promass 83 MODBUS (BA107D/BA108D)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, IECEx NEPSI
- Functional safety manual Promass 80, 83 (SD077D)

# Registered trademarks

TRI-CLAMP ®
Registered trademark of Ladish & Co., Inc., Kenosha, WI, USA

HART®
Registered trademark of HART Communication Foundation, Austin, TX, USA

PROFIBUS®
Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

FOUNDATION™ Fieldbus
Registered trademark of the Fieldbus FOUNDATION, Austin, USA

MODBUS®
Registered trademark of the MODBUS Organization

HistoROM™, S-DAT®, T-DAT™, F-CHIP®, Fieldcheck®, FieldCare®, Applicator®
Registered or registration-pending trademarks of Endress+Hauser Flowtec AG, Reinach, CH

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Endress+Hauser

People for Process Automation

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71116465
FM+SGML6.0 ProMoDo