The flowmeter for refueling applications with simple system integration

**Application**
- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Accurate measurement of cryogenic gases in refueling applications

**Device properties**
- Flow rates up to 18,000 kg/h (660 lb/min)
- Medium temperature up to –196 °C (–321 °F)
- Nominal diameter: DN 8 to 25 (³⁄₈ to 1”)
- Robust, compact transmitter housing
- Modbus RS485
- Designed to meet application needs

**Your benefits**
- Excellent operational safety – reliable under extreme ambient conditions
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in/outlet run needs
- Space-saving transmitter – full functionality on smallest footprint
- Fast commissioning – preconfigured devices
- Automatic recovery of data for servicing
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## Document information

### Symbols used

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Direct current](symbol1) | Direct current  
A terminal to which DC voltage is applied or through which direct current flows. |
| ![Alternating current](symbol2) | Alternating current  
A terminal to which alternating voltage is applied or through which alternating current flows. |
| ![Direct current and alternating current](symbol3) | Direct current and alternating current  
• A terminal to which alternating voltage or DC voltage is applied.  
• A terminal through which alternating current or direct current flows. |
| ![Ground connection](symbol4) | Ground connection  
A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
| ![Protective ground connection](symbol5) | Protective ground connection  
A terminal which must be connected to ground prior to establishing any other connections. |
| ![Equipotential connection](symbol6) | Equipotential connection  
A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice. |

### Symbols for certain types of information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Allowed](symbol7) | Allowed  
Indicates procedures, processes or actions that are allowed. |
| ![Preferred](symbol8) | Preferred  
Indicates procedures, processes or actions that are preferred. |
| ![Forbidden](symbol9) | Forbidden  
Indicates procedures, processes or actions that are forbidden. |
| ![Tip](symbol10) | Tip  
Indicates additional information. |
| ![Reference to documentation](symbol11) | Reference to documentation  
Refers to the corresponding device documentation. |
| ![Reference to page](symbol12) | Reference to page  
Refers to the corresponding page number. |
| ![Reference to graphic](symbol13) | Reference to graphic  
Refers to the corresponding graphic number and page number. |
| ![Visual inspection](symbol14) | Visual inspection |

### Symbols in graphics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ![Item numbers](symbol15) | 1, 2, 3,...  
Item numbers |
| ![Series of steps](symbol16) | ![, ], …  
Series of steps |
| ![Views](symbol17) | A, B, C, ...  
Views |
| ![Sections](symbol18) | A-A, B-B, C-C, ...  
Sections |
Function and system design

**Measuring principle**

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

\[ F_C = 2 \cdot \Delta m \cdot (v \cdot \omega) \]

- \( F_C \) = 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 rotational velocity \( \omega \), the sensor uses oscillation.

In the sensor, two parallel measuring tubes containing flowing fluid oscillate in antiphase, acting like a tuning fork. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):

- At zero flow (when the fluid is at a standstill) the two tubes oscillate in phase (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).

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

**Density measurement**

The measuring 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 medium density. The microprocessor utilizes this relationship to obtain a density signal.

**Volume measurement**

Together with the measured mass flow, this is used to calculate the volume flow.
**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 signal.

**Measuring system**
The device consists of a transmitter and a sensor. If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

One device version is available: compact version, transmitter and sensor form a mechanical unit.

**Transmitter**

| LNGmass | Device versions and materials:  
| Compact, aluminum coated:  
| Coated aluminum AlSi10Mg  
| Configuration:  
| Via operating tools (e.g. FieldCare) |

**Sensor**

| LNGmass | • Simultaneous measurement of flow, volume flow, density and temperature (multivariable)  
| • Immune to process influences  
| • Nominal diameter range: DN 8 to 25 (⅜ to 1”)  
| • Materials:  
| – Sensor: stainless steel 1.4301 (304)  
| – Measuring tubes: stainless steel 1.4539 (904L)  
| – Process connections: stainless steel 1.4404 (316/316L) |

**Safety Barrier Promass 100**

| • Dual-channel safety barrier for installation in non-hazardous locations or Zone 2/Div. 2:  
| – Channel 1: DC 24 V power supply  
| – Channel 2: Modbus RS485  
| • In addition to current, voltage and power limitation, it offers galvanic isolation of circuits for explosion protection.  
| • Easy top-hat rail mounting (DIN 35mm) for installation in control cabinets |
Device architecture

Possibilities for integrating measuring devices into a system

1. Control system (e.g. PLC)
2. Modbus RS485
3. Safety Barrier Promass 100
4. Modbus RS485 intrinsically safe
5. Non-hazardous area
6. Non-hazardous area and Zone 2/Div. 2
7. Intrinsically safe area and Zone 1/Div. 1

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

<table>
<thead>
<tr>
<th>Measuring ranges for liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DN</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>25</td>
</tr>
</tbody>
</table>

Recommended measuring range

*Flow limit* section (→ 21)
Output

Output signal  
Modbus RS485

<table>
<thead>
<tr>
<th>Physical interface</th>
<th>In accordance with EIA/TIA-485-A standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminating resistor</td>
<td>Integrated, can be activated via DIP switch on the transmitter electronics module</td>
</tr>
</tbody>
</table>

Signal on alarm  
Depending on the interface, failure information is displayed as follows:

Modbus RS485

<table>
<thead>
<tr>
<th>Failure mode</th>
<th>Choose from:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• NaN value instead of current value</td>
</tr>
<tr>
<td></td>
<td>• Last valid value</td>
</tr>
</tbody>
</table>

Operating tool  
Via service interface

Plain text display  
With information on cause and remedial measures

Additional information on remote operation (→  28)

Light emitting diodes (LED)

<table>
<thead>
<tr>
<th>Status information</th>
<th>Status indicated by various light emitting diodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The following information is displayed depending on the device version:</td>
</tr>
<tr>
<td></td>
<td>• Supply voltage active</td>
</tr>
<tr>
<td></td>
<td>• Data transmission active</td>
</tr>
<tr>
<td></td>
<td>• Device alarm/error has occurred</td>
</tr>
</tbody>
</table>

Ex connection data  
These values only apply for the following device version:  
Order code for 'Output', option M: Modbus RS485, for use in intrinsically safe areas

Safety Barrier Promass 100

Safety-related values

<table>
<thead>
<tr>
<th>Terminal numbers</th>
<th>Supply voltage</th>
<th>Signal transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 (L-)</td>
<td>1 (L+)</td>
</tr>
<tr>
<td></td>
<td>U_{nom} = DC 24 V</td>
<td>U_{nom} = DC 5 V</td>
</tr>
<tr>
<td></td>
<td>U_{max} = AC 260 V</td>
<td>U_{max} = AC 260 V</td>
</tr>
</tbody>
</table>

Intrinsically safe values

<table>
<thead>
<tr>
<th>Terminal numbers</th>
<th>Supply voltage</th>
<th>Signal transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 (L-)</td>
<td>10 (L+)</td>
</tr>
<tr>
<td></td>
<td>U_o = 16.24 V</td>
<td>U_o = 92.8 μH</td>
</tr>
<tr>
<td></td>
<td>I_o = 623 mA</td>
<td>C_o = 0.433 μF</td>
</tr>
<tr>
<td></td>
<td>P_o = 2.45 W</td>
<td>L_o/R_o = 14.6 μH/Ω</td>
</tr>
</tbody>
</table>

* The gas group depends on the sensor and nominal diameter.

For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the 'Safety Instructions' (XA) document for the measuring device.
Transmitter

*Intrinsically safe values*

<table>
<thead>
<tr>
<th>Order code for “Approvals”</th>
<th>Terminal numbers</th>
<th>Supply voltage</th>
<th>Signal transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 (L-)</td>
<td>10 (L+)</td>
<td>62 (A)</td>
<td>72 (B)</td>
</tr>
<tr>
<td>Option BM: ATEX II2G + IECEx Z1 Ex ia, II2D Ex tb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option BU: ATEX II2G + IECEx Z1 Ex ia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option C2: CSA C/US IS Cl. I, II, III Div. 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option 85: ATEX II2G + IECEx Z1 Ex ia + CSA C/US IS Cl. I, II, III Div. 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The gas group depends on the sensor and nominal diameter.*

For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the “Safety Instructions” (XA) document for the measuring device.

Low flow cut off

The switch points for low flow cut off are user-selectable.

Galvanic isolation

The following connections are galvanically isolated from each other:

- Outputs
- Power supply

Protocol-specific data

Modbus RS485

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Modbus Applications Protocol Specification V1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device type</td>
<td>Slave</td>
</tr>
<tr>
<td>Slave address range</td>
<td>1 to 247</td>
</tr>
<tr>
<td>Broadcast address range</td>
<td>0</td>
</tr>
<tr>
<td>Function codes</td>
<td>03: Read holding register, 04: Read input register, 06: Write single registers, 08: Diagnostics, 16: Write multiple registers, 23: Read/write multiple registers</td>
</tr>
<tr>
<td>Broadcast messages</td>
<td>Supported by the following function codes: 06: Write single registers, 16: Write multiple registers, 23: Read/write multiple registers</td>
</tr>
<tr>
<td>Supported baud rate</td>
<td>1200 BAUD, 2400 BAUD, 4800 BAUD, 9600 BAUD, 19200 BAUD, 38400 BAUD, 57600 BAUD, 115200 BAUD</td>
</tr>
<tr>
<td>Data transfer mode</td>
<td>ASCII, RTU</td>
</tr>
<tr>
<td>Data access</td>
<td>Each device parameter can be accessed via Modbus RS485. For Modbus register information (+ 30)</td>
</tr>
</tbody>
</table>
Power supply

Terminal assignment

Overview: housing version

A  Housing version: compact, aluminum coated
1  Connection version: Modbus RS485
1.1  Signal transmission
1.2  Supply voltage
Transmitter

*Modbus RS485 connection version, for use in intrinsically safe areas*

Order code for "Output", option M (connection via Safety Barrier Promass 100)

| Order code for "Housing" | Connection methods available | Power supply | Possible options for order code "Electrical connection"
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Options A</td>
<td>Terminals</td>
<td>Terminals</td>
<td>• Option B: thread M20x1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Option C: thread G ½”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Option D: thread NPT ½”</td>
</tr>
</tbody>
</table>

Order code for "Housing":
Option A: compact, coated aluminum

---

2  *Modbus RS485 terminal assignment, connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)*

1  *Intrinsically safe power supply*

2  *Modbus RS485*

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>20 (L-)</th>
<th>10 (L+)</th>
<th>72 (B)</th>
<th>62 (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option M</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Order code for "Output":
Option M: Modbus RS485, for use in intrinsically safe areas (connection via Safety Barrier Promass 100)
Safety Barrier Promass 100

Supply voltage

- For device version with all communication types except Modbus RS485 intrinsically safe: DC 20 to 30 V
- For device version with Modbus RS485 intrinsically safe: power supply via Safety Barrier Promass 100

The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

Safety Barrier Promass 100

DC 20 to 30 V

Power consumption

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>Maximum Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option M: Modbus RS485, for use in intrinsically safe areas</td>
<td>2.45 W</td>
</tr>
</tbody>
</table>

Safety Barrier Promass 100

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>Maximum Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option M: Modbus RS485, for use in intrinsically safe areas</td>
<td>4.8 W</td>
</tr>
</tbody>
</table>

Current consumption

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>Maximum Current consumption</th>
<th>Maximum switch-on current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option M: Modbus RS485, for use in intrinsically safe areas</td>
<td>145 mA</td>
<td>16 A (&lt;0.4 ms)</td>
</tr>
</tbody>
</table>
Safety Barrier Promass 100

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>Maximum Current consumption</th>
<th>Maximum switch-on current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option M: Modbus RS485, for use in intrinsically safe areas</td>
<td>230 mA</td>
<td>10 A (&lt;0.8 ms)</td>
</tr>
</tbody>
</table>

**Power supply failure**
- Totalizers stop at the last value measured.
- Configuration is retained in the device memory.
- Error messages (incl. total operated hours) are stored.

**Electrical connection**

**Connecting the transmitter**

1. Housing version: compact, aluminum coated
2. Cable entry for signal transmission
3. Cable entry for supply voltage

**Terminal assignment**

Connection examples

**Modbus RS485**

- Control system (e.g. PLC)
- Cable shield, observe cable specifications
- Safety Barrier Promass 100
- Observe cable specifications
- Non-hazardous area
- Non-hazardous area and Zone 2/Div. 2
- Intrinsically safe area
- Transmitter

**Potential equalization**

No special measures for potential equalization are required.

For devices intended for use in hazardous locations, please observe the guidelines in the Ex documentation (XA).
Terminals

**Transmitter**
Spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

**Safety Barrier Promass 100**
Plug-in screw terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

- Cable gland: M20 × 1.5 with cable ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - NPT ½"
  - G ½"
  - M20

Cable specification

**Permitted temperature range**
- −40 °C (−40 °F) to +80 °C (+176 °F)
- Minimum requirement: cable temperature range ≥ ambient temperature +20 K

**Power supply cable**
Standard installation cable is sufficient.

**Signal cable**

*Modbus RS485*
The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

<table>
<thead>
<tr>
<th>Cable type</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic impedance</td>
<td>135 to 165 Ω at a measuring frequency of 3 to 20 MHz</td>
</tr>
<tr>
<td>Cable capacitance</td>
<td>&lt;30 pF/m</td>
</tr>
<tr>
<td>Wire cross-section</td>
<td>&gt;0.34 mm² (22 AWG)</td>
</tr>
<tr>
<td>Cable type</td>
<td>Twisted pairs</td>
</tr>
<tr>
<td>Loop resistance</td>
<td>≤110 Ω/km</td>
</tr>
<tr>
<td>Signal damping</td>
<td>Max. 9 dB over the entire length of the cable cross-section</td>
</tr>
<tr>
<td>Shielding</td>
<td>Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.</td>
</tr>
</tbody>
</table>

**Connecting cable between Safety Barrier Promass 100 and measuring device**

<table>
<thead>
<tr>
<th>Cable type</th>
<th>Shielded twisted-pair cable with 2x2 wires. When grounding the cable shield, observe the grounding concept of the plant.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum cable resistance</td>
<td>2.5 Ω, one side</td>
</tr>
</tbody>
</table>

Comply with the maximum cable resistance specifications to ensure the operational reliability of the measuring device.

The maximum cable length for individual wire cross-sections is specified in the table below. Observe the maximum capacitance and inductance per unit length of the cable and connection values for hazardous areas (→ 7).

<table>
<thead>
<tr>
<th>Wire cross-section</th>
<th>Maximum cable length</th>
</tr>
</thead>
<tbody>
<tr>
<td>[mm²]</td>
<td>[AWG]</td>
</tr>
<tr>
<td>0.5</td>
<td>20</td>
</tr>
<tr>
<td>0.75</td>
<td>18</td>
</tr>
<tr>
<td>1.0</td>
<td>17</td>
</tr>
<tr>
<td>Wire cross-section</td>
<td>Maximum cable length</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>[mm²]</td>
<td>[AWG]</td>
</tr>
<tr>
<td>1.5</td>
<td>16</td>
</tr>
<tr>
<td>2.5</td>
<td>14</td>
</tr>
</tbody>
</table>

### Performance characteristics

#### Reference operating conditions
- Error limits based on ISO 11631
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Specifications as per calibration protocol
- Accuracy based on accredited calibration rigs that are traced to ISO 17025.

To obtain measured errors, use the Applicator sizing tool (→ 30)

#### Maximum measured error

- o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

#### Base accuracy

**Mass flow and volume flow (liquids)**
±0.15 % o.r.

To Design fundamentals (→ 16)

#### Density (liquids)

- Reference conditions: ±0.0005 g/cm³
- Standard density calibration: ±0.02 g/cm³ (valid over the entire temperature range and density range)

**Temperature**
±0.5 °C ± 0.005 · T °C (±0.9 °F ± 0.003 · (T – 32) °F)

#### Zero point stability

<table>
<thead>
<tr>
<th>DN</th>
<th>Zero point stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>[mm]</td>
<td>[in]</td>
</tr>
<tr>
<td>8</td>
<td>³⁄₈</td>
</tr>
<tr>
<td>15</td>
<td>½</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Flow values

Flow values as turndown parameter depending on nominal diameter.

**SI units**

<table>
<thead>
<tr>
<th>DN</th>
<th>1:1</th>
<th>1:10</th>
<th>1:20</th>
<th>1:50</th>
<th>1:100</th>
<th>1:500</th>
</tr>
</thead>
<tbody>
<tr>
<td>[mm]</td>
<td>[kg/h]</td>
<td>[kg/h]</td>
<td>[kg/h]</td>
<td>[kg/h]</td>
<td>[kg/h]</td>
<td>[kg/h]</td>
</tr>
<tr>
<td>8</td>
<td>2000</td>
<td>200</td>
<td>100</td>
<td>40</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>6500</td>
<td>650</td>
<td>325</td>
<td>130</td>
<td>65</td>
<td>13</td>
</tr>
<tr>
<td>25</td>
<td>18000</td>
<td>1800</td>
<td>900</td>
<td>360</td>
<td>180</td>
<td>36</td>
</tr>
</tbody>
</table>
LNGmass

**US units**

<table>
<thead>
<tr>
<th>DN</th>
<th>1:1</th>
<th>1:10</th>
<th>1:20</th>
<th>1:50</th>
<th>1:100</th>
<th>1:500</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[inch]</td>
<td>[lb/min]</td>
<td>[lb/min]</td>
<td>[lb/min]</td>
<td>[lb/min]</td>
<td>[lb/min]</td>
</tr>
<tr>
<td>%</td>
<td>73.5</td>
<td>7.35</td>
<td>3.675</td>
<td>1.47</td>
<td>0.735</td>
<td>0.147</td>
</tr>
<tr>
<td>½</td>
<td>238</td>
<td>23.8</td>
<td>11.9</td>
<td>4.76</td>
<td>2.38</td>
<td>0.476</td>
</tr>
<tr>
<td>1</td>
<td>660</td>
<td>66</td>
<td>33</td>
<td>13.2</td>
<td>6.6</td>
<td>1.32</td>
</tr>
</tbody>
</table>

**Repeatability**

- **Base repeatability**
  - **Mass flow and volume flow (liquids)**
    - ±0.075 % o.r.
  - **Density (liquids)**
    - ±0.00025 g/cm³
  - **Temperature**
    - ±0.25 °C ± 0.0025 · T °C (±0.45 °F ± 0.0015 · (T–32) °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**

- **Mass flow and volume flow**
  - When there is a difference between the temperature for zero point adjustment and the process temperature, the typical measured error of the sensor is ±0.0002 % of the full scale value/°C (±0.0001 % of the full scale value/°F).
  - **Density**
    - When there is a difference between the density calibration temperature and the process temperature, the typical measured error of the sensor is ±0.0001 g/cm³/°C (±0.00005 g/cm³/°F). Field density calibration is possible.

---

5  Field density calibration, for example at +20 °C (+68 °F)

**Temperature**

- ±0.005 · T °C (±0.005 · (T–32) °F)
Influence of medium pressure

A difference between the calibration pressure and process pressure does not affect accuracy.

Design fundamentals

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

BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.

MeasValue = measured value; ZeroPoint = zero point stability

Calculation of the maximum measured error as a function of the flow rate

<table>
<thead>
<tr>
<th>Flow rate</th>
<th>Maximum measured error in % o.r.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\geq \text{ZeroPoint} \cdot \text{100}$</td>
<td>$\pm \text{BaseAccu}$</td>
</tr>
<tr>
<td>$&lt; \text{ZeroPoint} \cdot \text{100}$</td>
<td>$\pm \left(\frac{\text{ZeroPoint} \cdot \text{MeasValue}}{\text{100}}\right)$</td>
</tr>
</tbody>
</table>

Calculation of the maximum repeatability as a function of the flow rate

<table>
<thead>
<tr>
<th>Flow rate</th>
<th>Maximum repeatability in % o.r.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\geq \frac{1}{2} \cdot \text{ZeroPoint} \cdot \text{100}$</td>
<td>$\pm \text{BaseRepeat}$</td>
</tr>
<tr>
<td>$&lt; \frac{1}{2} \cdot \text{ZeroPoint} \cdot \text{100}$</td>
<td>$\pm \frac{1}{2} \cdot \left(\frac{\text{ZeroPoint} \cdot \text{MeasValue}}{\text{100}}\right)$</td>
</tr>
</tbody>
</table>

Example for max. measured error

![Graph](image)

$E$ Error: Maximum measured error as % o.r. (example)

$Q$ Flow rate as %

Design fundamentals (→ 16)

Installation

No special measures such as supports are necessary. External forces are absorbed by the construction of the device.

Mounting location

To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.
Orientation

The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

<table>
<thead>
<tr>
<th>Orientation</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Vertical orientation</td>
</tr>
<tr>
<td>B</td>
<td>Horizontal orientation, transmitter head up</td>
</tr>
<tr>
<td>C</td>
<td>Horizontal orientation, transmitter head down</td>
</tr>
<tr>
<td>D</td>
<td>Horizontal orientation, transmitter head at side</td>
</tr>
</tbody>
</table>

1) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.

2) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

If a sensor is installed horizontally with a curved measuring tube, match the position of the sensor to the fluid properties.

Inlet and outlet runs

No special precautions need to be taken for fittings which create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs (→ 21).
Special mounting instructions

Zero point adjustment

All measuring devices are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions (→ 14). Therefore, a zero point adjustment in the field is generally not required.

Experience shows that 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).

Mounting Safety Barrier Promass 100

Mounting Safety Barrier Promass 100

Minimum distance between additional Safety Barrier Promass 100 or other modules. Engineering unit mm (in)

环境

环境温度范围

<table>
<thead>
<tr>
<th>装置</th>
<th>温度范围</th>
</tr>
</thead>
<tbody>
<tr>
<td>测量装置</td>
<td>–40 to +60 °C (–40 to +140 °F)</td>
</tr>
<tr>
<td>安全屏障 Promass 100</td>
<td>–40 to +60 °C (–40 to +140 °F)</td>
</tr>
</tbody>
</table>

如果在户外操作：
避免阳光直射，特别是在温暖的气候区域。

温度表

在以下表格中，最大介质温度

对 T1-T6 和最大环境温度

T apply when operating the device in hazardous areas.

Ex ia, C/sCAUS I5

SI units

<table>
<thead>
<tr>
<th>订货号</th>
<th>T1</th>
<th>T6</th>
<th>T5</th>
<th>T4</th>
<th>T3</th>
<th>T2</th>
<th>T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI</td>
<td>°C</td>
<td>[85 °C]</td>
<td>[100 °C]</td>
<td>[135 °C]</td>
<td>[200 °C]</td>
<td>[300 °C]</td>
<td>[450 °C]</td>
</tr>
<tr>
<td>A001694</td>
<td>35</td>
<td>50</td>
<td>85</td>
<td>120</td>
<td>125</td>
<td>125</td>
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<tr>
<td>A001698</td>
<td>50</td>
<td>–</td>
<td>85</td>
<td>120</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
<tr>
<td>A001700</td>
<td>60</td>
<td>–</td>
<td>–</td>
<td>120</td>
<td>125</td>
<td>125</td>
<td>125</td>
</tr>
</tbody>
</table>
US units

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Option A 'Compact coated alu'</td>
<td>95</td>
<td>122</td>
<td>185</td>
<td>248</td>
<td>257</td>
<td>257</td>
<td>257</td>
</tr>
<tr>
<td></td>
<td>122</td>
<td>–</td>
<td>185</td>
<td>248</td>
<td>257</td>
<td>257</td>
<td>257</td>
</tr>
<tr>
<td></td>
<td>140</td>
<td>–</td>
<td>–</td>
<td>248</td>
<td>257</td>
<td>257</td>
<td>257</td>
</tr>
</tbody>
</table>

Explosion hazards arising from dust and gas

Determine the temperature class and surface temperature using the temperature table

- For gas: determine the temperature class depending on the ambient temperature $T_a$ and medium temperature $T_m$.
- For dust: determine the maximum surface temperature depending on the maximum ambient temperature $T_a$ and the maximum medium temperature $T_m$.

Example

- Maximum ambient temperature: $T_a = 50 °C$
- Measured maximum medium temperature: $T_{mm} = 108 °C$

![Temperature Table]

Storage temperature

-40 to +80 °C (~-40 to +176 °F), preferably at +20 °C (+68 °F)

Climate class

DIN EN 60068-2-38 (test Z/AD)

Degree of protection

- Transmitter and sensor
  - As standard: IP66/67, type 4X enclosure
  - When housing is open: IP20, type 1 enclosure

Safety Barrier Promass 100

| IP20

Shock resistance

As per IEC/EN 60068-2-31
**Vibration resistance**

Acceleration up to 1 g, 10 to 150 Hz, based on IEC/EN 60068-2-6

**Electromagnetic compatibility (EMC)**

- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
- Complies with emission limits for industry as per EN 55011 (Class A)

Details are provided in the Declaration of Conformity.

---

**Process**

**Medium temperature range**

- Sensor
  -196 to +125 °C (−320 to +257 °F)

**Seals**

- No internal seals

**Medium density**

0 to 5 000 kg/m³ (0 to 312 lb/cf)

**Pressure-temperature ratings**

The following material load diagrams refer to the entire device and not just the process connection.

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

![Material Load Diagram](image)

- With flange material 1.4404 (316/316L)
Flange connection according to ASME B16.5

10 With flange material 1.4404 (316/316L)

Secondary containment pressure range
The sensor housing is filled with helium and protects the electronics and mechanics inside. The housing does not have pressure vessel classification.
Reference value for the pressure loading capacity of the sensor housing: 16 bar (232 psi)

Flow limit
Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.
For an overview of the measuring range full scale values, see the "Measuring range" section (→ 6)
- The minimum recommended full scale value is approx. 1/20 of the maximum 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 liquids with entrained solids): flow velocity <1 m/s (<3 ft/s).

Pressure loss
To calculate the pressure loss, use the Applicator sizing tool (→ 30)

System pressure
It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas. This is prevented by means of a sufficiently high system pressure.
For this reason, the following mounting locations are recommended:
- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)

Vibrations
The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.
Mechanical construction

Design, dimensions

Compact version

Order code for "Housing", option A "Alu"

Dimensions SI units

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>8</td>
<td>136</td>
<td>147.5</td>
<td>93.5</td>
<td>54</td>
<td>273</td>
<td>362</td>
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<tr>
<td>15</td>
<td>136</td>
<td>147.5</td>
<td>93.5</td>
<td>54</td>
<td>273</td>
<td>373</td>
<td>8.30</td>
<td>100</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>136</td>
<td>147.5</td>
<td>93.5</td>
<td>54</td>
<td>270</td>
<td>372</td>
<td>12.0</td>
<td>102</td>
<td>48</td>
<td></td>
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</table>

1) dependent on respective process connection

Dimensions US units

<table>
<thead>
<tr>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>¾</td>
<td>5.35</td>
<td>5.81</td>
<td>3.68</td>
<td>2.13</td>
<td>10.7</td>
<td>14.3</td>
<td>0.21</td>
<td>3.50</td>
<td>1.57</td>
<td></td>
</tr>
<tr>
<td>½</td>
<td>5.35</td>
<td>5.81</td>
<td>3.68</td>
<td>2.13</td>
<td>10.7</td>
<td>14.7</td>
<td>0.33</td>
<td>3.94</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5.35</td>
<td>5.81</td>
<td>3.68</td>
<td>2.13</td>
<td>10.6</td>
<td>14.6</td>
<td>0.47</td>
<td>4.02</td>
<td>1.89</td>
<td></td>
</tr>
</tbody>
</table>

1) dependent on respective process connection
Process connections in SI units

Flange connections EN (DIN)

Flange according to EN 1092-1 (DIN 2501 / DIN 2512N) / PN 40: 1.4404 (316/316L) (order code for "Process connection", option D2S)

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 1)</td>
<td>95</td>
<td>65</td>
<td>4 × Ø14</td>
<td>16</td>
<td>17.3</td>
<td>232</td>
</tr>
<tr>
<td>15</td>
<td>95</td>
<td>65</td>
<td>4 × Ø14</td>
<td>16</td>
<td>17.3</td>
<td>279</td>
</tr>
<tr>
<td>25</td>
<td>115</td>
<td>85</td>
<td>4 × Ø14</td>
<td>18</td>
<td>28.5</td>
<td>329</td>
</tr>
</tbody>
</table>

1) DN 8 with DN 15 flanges as standard

Flange connections ASME B16.5

Endress+Hauser
### Flange according to ASME B16.5 / Cl 150: 1.4404 (316/316L) (order code for "Process connection", option AAS)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 ¹¹</td>
<td>88.9</td>
<td>60.5</td>
<td>4 × Ø15.7</td>
<td>11.2</td>
<td>15.7</td>
<td>232</td>
</tr>
<tr>
<td>15</td>
<td>88.9</td>
<td>60.5</td>
<td>4 × Ø15.7</td>
<td>11.2</td>
<td>15.7</td>
<td>279</td>
</tr>
<tr>
<td>25</td>
<td>108.0</td>
<td>79.2</td>
<td>4 × Ø15.7</td>
<td>14.2</td>
<td>26.7</td>
<td>329</td>
</tr>
</tbody>
</table>

¹¹) DN 8 with DN 15 flanges as standard

### Flange according to ASME B16.5 / Cl 300: 1.4404 (316/316L) (order code for "Process connection", option ABS)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 ¹¹</td>
<td>95.2</td>
<td>66.5</td>
<td>4 × Ø15.7</td>
<td>14.2</td>
<td>15.7</td>
<td>232</td>
</tr>
<tr>
<td>15</td>
<td>95.2</td>
<td>66.5</td>
<td>4 × Ø15.7</td>
<td>14.2</td>
<td>15.7</td>
<td>279</td>
</tr>
<tr>
<td>25</td>
<td>123.9</td>
<td>88.9</td>
<td>4 × Ø19.0</td>
<td>17.5</td>
<td>26.7</td>
<td>329</td>
</tr>
</tbody>
</table>

¹¹) DN 8 with DN 15 flanges as standard
Process connections in US units

Flange connections ASME B16.5

| Flange according to ASME B16.5 / Cl 150: 1.4404 (316/316L) (order code for "Process connection", option AAS) |
|---|---|---|---|---|---|---|
| DN [\(\text{in}\)] | A [\(\text{in}\)] | B [\(\text{in}\)] | C [\(\text{in}\)] | D [\(\text{in}\)] | E [\(\text{in}\)] | L [\(\text{in}\)] |
| \(\frac{3}{8}\) \(^{1}\) | 3.50 | 2.38 | 4 × Ø0.62 | 0.44 | 0.62 | 9.13 |
| \(\frac{1}{2}\) | 3.50 | 2.38 | 4 × Ø0.62 | 0.44 | 0.62 | 11.0 |
| 1 | 4.25 | 3.12 | 4 × Ø0.62 | 0.56 | 1.05 | 13.0 |

1) DN \(\frac{3}{8}\)" with DN \(\frac{1}{2}\)" flanges as standard

| Flange according to ASME B16.5 / Cl 300: 1.4404 (316/316L) (order code for "Process connection", option ABS) |
|---|---|---|---|---|---|---|
| DN [\(\text{in}\)] | A [\(\text{in}\)] | B [\(\text{in}\)] | C [\(\text{in}\)] | D [\(\text{in}\)] | E [\(\text{in}\)] | L [\(\text{in}\)] |
| \(\frac{3}{8}\) \(^{1}\) | 3.75 | 2.62 | 4 × Ø0.62 | 0.56 | 0.62 | 9.13 |
| \(\frac{1}{2}\) | 3.75 | 2.62 | 4 × Ø0.62 | 0.56 | 0.62 | 11.0 |
| 1 | 4.88 | 3.50 | 4 × Ø0.75 | 0.69 | 1.05 | 13.0 |

1) DN \(\frac{3}{8}\)" with DN \(\frac{1}{2}\)" flanges as standard

Safety Barrier Promass 100

Top-hat rail EN 60715:
- TH 35 x 7.5
- TH 35 x 15
### Weight

**Compact version**

*Weight in SI units*

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

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>25</td>
<td>8</td>
</tr>
</tbody>
</table>

*Weight in US units*

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

<table>
<thead>
<tr>
<th>DN [in]</th>
<th>Weight [lbs]</th>
</tr>
</thead>
<tbody>
<tr>
<td>³⁄₈</td>
<td>13</td>
</tr>
<tr>
<td>½</td>
<td>13</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
</tr>
</tbody>
</table>

**Safety Barrier Promass 100**

49 g (1.73 ounce)

### Materials

**Transmitter housing**

Order code for "Housing", option A "Compact, aluminum coated":

Coated aluminum AlSi10Mg
Cable entries/cable glands

1. Cable entry in transmitter housing, wall-mount housing or connection housing with internal thread M20 x 1.5
2. Cable gland M20 x 1.5
3. Adapter for cable entry with internal thread G ½" or NPT ½"

Order code for "Housing", option A "Compact, coated aluminum"

The various cable entries are suitable for hazardous and non-hazardous areas.

<table>
<thead>
<tr>
<th>Cable entry/cable gland</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable gland M20 x 1.5</td>
<td>Nickel-plated brass</td>
</tr>
<tr>
<td>Adapter for cable entry with internal thread G ½&quot;</td>
<td></td>
</tr>
<tr>
<td>Adapter for cable entry with internal thread NPT ½&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Sensor housing
- Acid and alkali-resistant outer surface
- Stainless steel 1.4301 (304)

Measuring tubes
- Stainless steel 1.4539 (904L); manifold: 1.4404 (316L)
- Surface quality:
  - Not polished
  - Ra max = 0.8 µm (32 µin)

Process connections
For all process connections:
Stainless steel 1.4404 (316/316L)

List of all available process connections (→ 27)

Seals
Welded process connections without internal seals

Safety Barrier Promass 100
Housing: Polyamide

Process connections
Flanges:
- EN 1092-1 (DIN 2501)
- ASME B16.5

For information on the materials of the process connections (→ 27)
Operability

Operating concept
Operator-oriented menu structure for user-specific tasks
- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning
- Individual menus for applications
- Menu guidance with brief explanations of the individual parameter functions

Reliable operation
Operation in the following languages:
Via 'FieldCare' operating tool:
English, German

Efficient diagnostics increase measurement availability
- Troubleshooting measures can be called up via the operating tools and Web browser
- Diverse simulation options
- Status indicated by several light emitting diodes (LEDs) on the electronic module in the housing compartment

Remote operation
Via service interface (CDI)
This communication interface is present in the following device version:
Order code for "Output", option M: Modbus RS485

Certificates and approvals

CE mark
The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.
Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

C-Tick symbol
The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval
The measuring device is certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.
The separate Ex documentation (XA) containing all the relevant explosion protection data is available from your Endress+Hauser sales center.

**ATEX/IECEx**

Currently, the following versions for use in hazardous areas are available:

**Ex ia**

<table>
<thead>
<tr>
<th>Category (ATEX)</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>II2G</td>
<td>Ex ia IIC T6-T1 Gb</td>
</tr>
<tr>
<td>II2G</td>
<td>Ex ia IIC T6-T1 Gb or Ex ia IIB T6-T1 Gb</td>
</tr>
<tr>
<td>II1/2G, II2D</td>
<td>Ex ia IIC T6-T1 Ga/Gb or Ex ia IIB T6-T1 Ga/Gb Ex tb IIIC T* Db</td>
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<tr>
<td>II2G, II2D</td>
<td>Ex ia IIC T6-T1 Gb or Ex ia IIB T6-T1 Gb Ex tb IIIC T* Db</td>
</tr>
</tbody>
</table>

**Modbus RS485 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.

**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

**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).

<table>
<thead>
<tr>
<th>Communication-specific accessories</th>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Commubox FXA291</td>
<td>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see “Technical Information” TI00405C</td>
</tr>
</tbody>
</table>
### Service-specific accessories

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
</table>
| Applicator  | Software for selecting and sizing Endress+Hauser measuring devices:  
  • Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections.  
  • Graphic illustration of the calculation results  
  Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.  
  Applicator is available:  
  • Via the Internet: [https://wapps.endress.com/applicator](https://wapps.endress.com/applicator)  
  • On CD-ROM for local PC installation. |
| W@M         | Life cycle management for your plant  
  W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle.  
  The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records.  
  W@M is available:  
  • Via the Internet: [www.endress.com/lifecyclemanagement](http://www.endress.com/lifecyclemanagement)  
  • On CD-ROM for local PC installation. |
| FieldCare   | FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.  
  For details, see Operating Instructions BA00027S and BA00059S |

### Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:

- The CD-ROM provided for the device (depending on the device version, the CD-ROM might not be part of the delivery!)
- The W@M Device Viewer: Enter the serial number from the nameplate ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer))
- The Endress+Hauser Operations App: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

<table>
<thead>
<tr>
<th>Standard documentation</th>
<th>Communication</th>
<th>Document type</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- - - -</td>
<td>Brief Operating Instructions</td>
<td>KA01153D</td>
</tr>
<tr>
<td></td>
<td>Modbus RS485</td>
<td>Operating Instructions</td>
<td>BA01261D</td>
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</table>

<table>
<thead>
<tr>
<th>Supplementary device-dependent documentation</th>
<th>Document type</th>
<th>Contents</th>
<th>Documentation code</th>
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<tbody>
<tr>
<td>Safety Instructions</td>
<td>ATEX/IECEx Ex i</td>
<td>XA01217D</td>
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<tr>
<td>cCSAus IS</td>
<td>XA01218D</td>
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<td>INMetros</td>
<td>XA01246D</td>
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<td>NEPSI</td>
<td>XA01247D</td>
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<td></td>
</tr>
<tr>
<td>Special Documentation</td>
<td>Modbus RS485 Register Information</td>
<td>SD01165D</td>
<td></td>
</tr>
<tr>
<td>Installation Instructions</td>
<td>Specified for each individual accessory (→ 29)</td>
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<td></td>
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</tbody>
</table>
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