RELIABLE FLOW MEASURING SYSTEM FOR STEAM, AIR AND WATER

Features

High-performance vortex flowmeter with robust sensor for highly accurate volume or mass flow measurements of saturated and superheated steam, air and water.

1. DSC (Differential Switched Capacitance) sensor offers a wide measuring range, with a high resistance to thermal shock, vibration and water hammer.
2. Integrated flow computer calculates mass flow from measured volume flow and temperature variables.
3. Measures steam dryness fraction (80 to 100%) — Optional for EF200F. See page 4 for conditions.
4. Capable of simultaneous pulse (interval) and analog (instantaneous) output.
5. Requires no maintenance, has no moving parts, and experiences no zero point drift.
6. Low pressure drop through body.

Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>EF200W</th>
<th>EF200F</th>
<th>EF200R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Between Flanges</td>
<td>Flanged (Full Bore)</td>
<td>Flanged (Reduced Bore)</td>
</tr>
<tr>
<td>Size (mm)</td>
<td>15, 25, 40, 50, 80, 100, 150</td>
<td>15, 25, 40, 50, 80, 100, 150</td>
<td>25, 40, 50, 80, 100, 150</td>
</tr>
<tr>
<td>Connection Compatibilities</td>
<td>See details in the Dimensions section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Press. Range (MPaG)</td>
<td>0 to 4.96 (See the graph to the right for details)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Range (°C)</td>
<td>-200° to +400 (See the graph to the right for details)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable Fluids</td>
<td>Steam, Air, Water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accuracy

| Volume Flow | Steam/Air : ± 1% of reading (Re > 20000), ± 10% of reading (Re: 5000 to 20000) Water : ± 0.75% of reading (Re > 20000), ± 10% of reading (Re: 5000 to 20000) |
| Mass Flow | Saturated steam : ± 2% of reading (Re > 20000), ± 10% of reading (Re: 5000 to 20000) |

Repeatability

± 0.2% of reading

Mounting Position

No restriction with regards to meter accuracy

Accessories

Centering rings, threaded bolts, nuts, washers and flange gaskets

Expansion Class

Non-explosion proof

Ambient Temperature

-40 to +80 °C

Protection Class

IP 66/67, Type 4X

Output

1 x Pulse output: Open collector pulse 1 x Analog output: 4 to 20 mA DC Simultaneous output possible

Power Source

13 to 35 V DC (24 V DC recommended)

Power Consumption

Max. 2.77 VA

Power Line Connection

G(PF)½

Field Wiring

2-wire System (2-conductor, shielded, 0.5 to 2.5 mm²) (AWG 20 to 14)

Load Line Resistance

Max. 5000 ohms at 24 V

Accessories

Connecting Cable (30m)

To avoid abnormal operation, accidents or serious injury, DO NOT use this product outside of the specification range. Local regulations may restrict the use of this product to below the conditions quoted.

CAUTION

E  ESC  E  ESC  E  ESC

Sample display

Display

Terminal Connection Method

Power Source

24 V DC recommended

With only EF200 in use

Reynolds Number (Re) Calculation:

Re = d x V

d = pipe diameter  V = velocity  ν = viscosity

Transmitter

Sample graph

Maximum Operating Pressure

1 MPa = 10.197 kg/cm²

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Specifications

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>DIN EN</th>
<th>ASTM/AISI</th>
</tr>
</thead>
<tbody>
<tr>
<td>q</td>
<td>Meter Body</td>
<td>Cast Stainless Steel</td>
<td>EN 1.4408*</td>
<td>A351 Gr.CF3M</td>
</tr>
<tr>
<td>w</td>
<td>Bluff Body</td>
<td>Cast Stainless Steel</td>
<td>EN 1.4408*</td>
<td>A351 Gr.CF3M</td>
</tr>
<tr>
<td>e</td>
<td>DSC Sensor (wetted parts)</td>
<td>Stainless Steel</td>
<td>DIN 1.4435</td>
<td>AISI316L*</td>
</tr>
<tr>
<td>r</td>
<td>DSC Sensor (non-wetted parts)</td>
<td>Stainless Steel</td>
<td>DIN EN 1.4301</td>
<td>AISI304*</td>
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<tr>
<td>t</td>
<td>Housing Support</td>
<td>Cast Stainless Steel</td>
<td>EN 1.4408*</td>
<td>A351 Gr.CF3M</td>
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<tr>
<td>y</td>
<td>Transmitter Housing</td>
<td>Die-cast Aluminium</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>u</td>
<td>Gasket</td>
<td>Graphite</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>i</td>
<td>Nameplate</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Equivalent

Piping Installation

### Required Length of Straight Piping

**Element**

- **Control Valve**
- **Concentric Reducer (Convergent-Pipe)**
- **Concentric Diffuser (Expansion-Pipe)**
- **Eccentric Reducer (Convergent-Pipe)**
- **One 90 Elbow or T-piece**
- **Two 90 Elbows (2-Dimensional)**
- **Two 90 Elbows (3-Dimensional)**
- **Combination Pipe (Elbows & Eccentric Reducer, etc.)**

**No Flow Conditioner**

- Upstream
- Downstream

**With Flow Conditioner**

- Upstream
- Downstream

**Rectifier**

**Flow Conditioner**

- A = Upstream
- B = Downstream
- D = Nominal Diameter

*Cannot be used in conjunction with the Steam Dryness Fraction Calculator option*

**Mounting Position**

- There is no restriction for mounting position (A – D) in regards to meter accuracy. However, special care is recommended for the following flow mediums:
  1. **High-temperature Fluids**
     For high-temperature fluids (steam, condensate), positions A, B or C should be selected to protect the transmitter from heat.
  2. **Water**
     To make sure the pipes are completely flooded with water, position C is recommended.

**Pressure Measurement Points**

If a pressure measuring point is installed after the device, ensure that there is a large enough distance between the device and the measuring point so that there are no negative effects on vortex formation in the sensor.

**Pipeline Insulation**

The pipe stand serves as a radiator and protects the electronics from overheating. Therefore, ensure that sufficient surface area remains exposed. Be sure not to insulate past the level marked “max.” on the pipe stand.

**Ensuring Steam Quality**

Wet steam has a higher density than saturated steam. Since the flowmeter mass flow calculations are based on saturated steam density, the actual mass flow of wet steam will be higher than shown by the flowmeter. The upstream installation of a separator (DC3S) is suggested to ensure steam quality and flowmeter accuracy. The proper separation and drainage of condensate is a recommended practice for all steam applications.

**Steam Dryness Fraction Calculator**

Enables the measurement of steam dryness fraction of saturated steam between 80 to 100%.

This option applies only for Model EF200F (25, 40, 50, 80, 100 mm sizes) and must also satisfy other conditions. See page 4 for further restrictions.

**Overvoltage Protection**

Protects the circuit from lightning

**Flow Conditioner**

Compatible with ASME Class 150, 300, JIS 10K/20K, and DIN 2501 PN 10/16, 25/40 flange standards and other optional standards (including flangeless). Cannot be used in conjunction with the Steam Dryness Fraction Calculator option.

**Pipe Mounting Kit for Remote Transmitter**

Suitable for pipes with 20 to 70 mm outer diameter. (Includes bracket, threaded bolts and nuts.)

**Sunshade for Transmitter**

Protects the transmitter from temperature rises due to direct sunlight when installed in an external location.

Options

Steam Dryness Fraction Calculator

- Enables the measurement of steam dryness fraction of saturated steam between 80 to 100%.
- This option applies only for Model EF200F (25, 40, 50, 80, 100 mm sizes) and must also satisfy other conditions. See page 4 for further restrictions.

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Pipe Mounting Kit for Remote Transmitter

- Suitable for pipes with 20 to 70 mm outer diameter. (Includes bracket, threaded bolts and nuts.)

Sunshade for Transmitter

- Protects the transmitter from temperature rises due to direct sunlight when installed in an external location.
Flow Rate for Saturated Steam

### EF200W
#### Flangeless

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid Type</th>
<th>Size (mm)</th>
<th>15</th>
<th>25</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF200W</td>
<td>Air (0 °C, Atm. Press.)</td>
<td>4.4</td>
<td>30</td>
<td>13</td>
<td>140</td>
<td>29</td>
<td>325</td>
<td>46</td>
<td>527</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Water (20 °C)</td>
<td>1.7</td>
<td>24</td>
<td>72</td>
<td>272</td>
<td>40</td>
<td>350</td>
<td>48</td>
<td>527</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Air (0 °C, Atm. Press.)</td>
<td>0.6</td>
<td>10</td>
<td>62</td>
<td>272</td>
<td>40</td>
<td>350</td>
<td>48</td>
<td>527</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Water (20 °C)</td>
<td>0.3</td>
<td>4</td>
<td>18</td>
<td>272</td>
<td>40</td>
<td>350</td>
<td>48</td>
<td>527</td>
<td>102</td>
</tr>
</tbody>
</table>

### EF200F
#### Flanged

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid Type</th>
<th>Size (mm)</th>
<th>15</th>
<th>25</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF200F</td>
<td>Air (0 °C, Atm. Press.)</td>
<td>0.6</td>
<td>10</td>
<td>62</td>
<td>272</td>
<td>40</td>
<td>350</td>
<td>48</td>
<td>527</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Water (20 °C)</td>
<td>0.3</td>
<td>4</td>
<td>18</td>
<td>272</td>
<td>40</td>
<td>350</td>
<td>48</td>
<td>527</td>
<td>102</td>
</tr>
</tbody>
</table>

### EF200R
#### Flanged (Reduced Bore)

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid Type</th>
<th>Size (mm)</th>
<th>15</th>
<th>25</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF200R</td>
<td>Air (0 °C, Atm. Press.)</td>
<td>0.6</td>
<td>10</td>
<td>62</td>
<td>272</td>
<td>40</td>
<td>350</td>
<td>48</td>
<td>527</td>
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<tr>
<td></td>
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Flows in ( ) are the min./max. flows possible when used with the optional Steam Dryness Fraction Calculator

### Flow Rate for Air and Water

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<thead>
<tr>
<th>Model</th>
<th>Fluid Type</th>
<th>Size (mm)</th>
<th>15</th>
<th>25</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>80</th>
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<th>150</th>
</tr>
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<tbody>
<tr>
<td>EF200W</td>
<td>Air (0 °C, Atm. Press.)</td>
<td>4.4</td>
<td>30</td>
<td>13</td>
<td>140</td>
<td>29</td>
<td>325</td>
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<td>350</td>
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</tbody>
</table>

### Flow Rate for Air and Water (Unit: m³/h)

<table>
<thead>
<tr>
<th>Model</th>
<th>Fluid Type</th>
<th>Size (mm)</th>
<th>15</th>
<th>25</th>
<th>40</th>
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</tbody>
</table>

1 MPa = 10.197 kg/cm²
Steam Dryness Fraction
The ratio of steam by mass in wet saturated steam
Steam Dryness Fraction (%) = \( \frac{\text{Steam mass flow rate}}{\text{Steam mass flow rate} + \text{Water mass flow rate}} \times 100 \)
This function can be used only for the following models and under the following conditions.

<table>
<thead>
<tr>
<th>Model</th>
<th>Flow Rate (m/s)</th>
<th>Temp. Range (°C)</th>
<th>Press. Range (MPaG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF200F</td>
<td>5 ≤ u ≤ 25</td>
<td>120 &lt; T &lt; 185</td>
<td>0.1 &lt; P &lt; 1.0</td>
</tr>
<tr>
<td>40</td>
<td>5 ≤ u ≤ 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5 ≤ u ≤ 45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>5 ≤ u ≤ 50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>5 ≤ u ≤ 30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Flow Rates
Refer to the EF200F table on page 3 for the measurable flow rates.

Mounting Position
Meter body must be installed in the downward position.

Operating Conditions
Use at a stable pressure and flow rate.

Measurable Dryness Range
80 to 100%
(When used with superheated steam, steam dryness fraction will be displayed as 100%, the maximum possible reading)

Accuracy for wetted steam
Mass Flow: ± 4% of reading
Dryness: See graph to the right.

Flow Conditioner
Cannot be used in conjunction with a flow conditioner. Ensure the required length straight piping upstream.

Applicable Fluids
When equipped with the Steam Dryness Fraction Calculator function, the EF200F can be used with steam and water, but cannot be used with air.

External Output
Steam dryness fraction output is analog. Flow computer EC351 and an additional compensation signal (for pressure or temperature) are required to display the instantaneous mass flow rate.