OEM Flow sensor for liquid media
Type 235

The type 235 is based on the type 200 but incorporates a brass housing. The flow sensor type 235 is based on the Kármán vortex trail. You can choose between various versions as integrated temperature measurement. With no moving parts the flow sensor is not sensitive to debris, has marginal pressure loss and high accuracy.

Flow range
0.9 ... 240 l/min

Nominal diameters
DN 8 / 10 / 15 / 20 / 25 / 32

Temperature measurement
-40 ... +125 ºC

+ Low cost product with high levels of accuracy
+ Temperature non-sensitive measuring principle
+ Excellent media resistance (measuring element not in contact with the media)
+ Wide application temperature range
+ Marginal loss of pressure
+ Measuring element not sensitive to debris
+ Direct temperature measurement in the medium with PT1000 or NTC
+ Drinking water approval ACS, WRAS
Flow measurement

Measuring principle: Vortex Piezoelectric sensor element

Measuring range: 0.1 ... 240 l/min

Nominal diameters: DN 8 / 10 / 15 / 20 / 25 / 32

Accuracy at ≤ 50% fs (water): < 1% fs

Accuracy at > 50% fs (water): < 2% measuring value

Response time: Immediately

Therefore suitable for spigot use.

Signal delay: < 100 ms

Response time: < 5 ms

Temperature measurement

Measuring principle: PT1000

PT100B

Measuring range: -40 ... +125 ºC

Accuracy: ± 0.3 K

@ T ≤ 0 ºC

@ T ≥ 0 ºC

NCT

Accuracy: ± 0.1 K

@ T = +25 ºC

@ T = +25 ºC

Measuring range: NTC 10 kOhm @ 25 ºC

β = 4050 @ T < +25 ºC ± 0.7 K ± 0.025 * ΔT

β = 4050 @ T > +25 ºC ± 0.7 K ± 0.050 * ΔT

Response time: < 5 ms

Signal delay: < 100 ms

Response time: < 5 ms

Temperature influences

Self-heating at temperature sensor

Conduction resistance to connector: 0.8 Ohm

Temperature measurement

Measuring principle: Resistance

Measuring range: PT1000

NTC

Accuracy: ± 0.3 K

@ T ≤ 0 ºC

@ T ≥ 0 ºC

Max pressure and medium temperature

Medium: Suitable for heating circuit water with the usual additives

Drinking water: Other medium on request

Ambient temperature: -15 ... +85 ºC

Storage temperature: -30 ... +85 ºC

Cavitation

The following equation is valid to prevent cavitation: P_{abs, outlet} / P_{difference} > 5.5

Electrical overview

Power supply: 5 VDC ±5%

Output flow (Q): Frequency Square pulse signal

Output temperature (T): Resistant signal

Resistant signal: PT1000 class B DIN EN 60751

Connector: RA 100-2.5 / 2.54

Connector: M12x1

Load against GND or IN: > 10 kOhm / < 10 nF

Current consumption: I_{IN, load free}

Version OEM: < 6 mA

Version standard: < 10 mA

Weight

with thread K

with thread M

with thread G

DN 8 with condensation protection: ~ 160 g

DN 10 with condensation protection: ~ 200 g

DN 15 with condensation protection: ~ 222 g

DN 20 with condensation protection: ~ 356 g

DN 25 with condensation protection: ~ 578 g

DN 32 with condensation protection: ~ 691 g

Packaging

Single packaging

Multiple packaging

Minimum life span on high flow rate and high temperature

Electromagnetic compatibility: acc. to EN 61326-2-3 (no protection at surge)

Drinking water approval: WRAS

Plastic parts with KTW and W270 approval

Temperature influences

Self-heating at temperature sensor

Conduction resistance to connector: 0.8 Ohm
### Nominal diameters dependent variables

<table>
<thead>
<tr>
<th>Nominal diameters</th>
<th>Tube connection</th>
<th>Measuring range</th>
<th>Quantity per pulse @ 50% fs</th>
<th>Flow rate</th>
<th>Frequency range</th>
<th>( Q_0 )</th>
<th>( K_f )</th>
<th>Pressure drop 1), 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 8</td>
<td>K, G</td>
<td>0.9 ... 15 l/min.</td>
<td>0.578 ml</td>
<td>0.133 ... 2.210 m/s</td>
<td>31 ... 427 Hz</td>
<td>0.2</td>
<td>0.0356</td>
<td>85.00 ° Q*</td>
</tr>
<tr>
<td></td>
<td>G, M</td>
<td>1.8 ... 32 l/min.</td>
<td>1.416 ml</td>
<td>0.265 ... 4.716 m/s</td>
<td>24 ... 374 Hz</td>
<td>0.2</td>
<td>0.0860</td>
<td>22.50 ° Q*</td>
</tr>
<tr>
<td>DN 10</td>
<td>K</td>
<td>2.0 ... 40 l/min.</td>
<td>1.419 ml</td>
<td>0.295 ... 5.895 m/s</td>
<td>26 ... 467 Hz</td>
<td>0.2</td>
<td>0.0860</td>
<td>22.50 ° Q*</td>
</tr>
<tr>
<td></td>
<td>G, M</td>
<td>3.5 ... 50 l/min.</td>
<td>3.036 ml</td>
<td>0.290 ... 4.145 m/s</td>
<td>20 ... 273 Hz</td>
<td>0.2</td>
<td>0.1836</td>
<td>6.70 ° Q*</td>
</tr>
<tr>
<td>DN 20</td>
<td>K</td>
<td>4.0 ... 85 l/min.</td>
<td>6.173 ml</td>
<td>0.265 ... 4.509 m/s</td>
<td>34 ... 229 Hz</td>
<td>0.3</td>
<td>0.3730</td>
<td>2.50 ° Q*</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>9.0 ... 150 l/min.</td>
<td>12.201 ml</td>
<td>0.283 ... 4.709 m/s</td>
<td>11 ... 205 Hz</td>
<td>0.2</td>
<td>0.7340</td>
<td>0.92 ° Q*</td>
</tr>
<tr>
<td>DN 25</td>
<td>K</td>
<td>24 ... 240 l/min.</td>
<td>27.513 ml</td>
<td>0.290 ... 4.974 m/s</td>
<td>9 ... 145 Hz</td>
<td>1.47</td>
<td>1.6710</td>
<td>0.25 ° Q*</td>
</tr>
</tbody>
</table>

#### Characteristic line formula frequency output

\[
Q_V = K_f \cdot f + Q_0
\]

#### Formula quantity per pulse (litres/pulse)

\[
\text{quantity per pulse} = Q_V \cdot K_f \cdot 60 \cdot (Q_V - Q_0)
\]

#### Legend

- \( Q_0 \): Volume flow rate (l/min)
- \( Q_0 \): Axis intercept (l/min)
- \( K_f \): Coefficient frequency output \([(l/min) / f]\)
- \( f \): Frequency (Hz)
- \( \text{quantity} \): Quantity per pulse (litres/pulse)

### Order code selection table

<table>
<thead>
<tr>
<th>Nominal diameters and flow range</th>
<th>235.</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
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</thead>
<tbody>
<tr>
<td>Output / power supply</td>
<td>235.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Frequency output, 0 ... 5 VDC (Square pulse signal)</td>
<td>5 VDC</td>
<td>OEM</td>
<td>9</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency output, 0 ... 5 VDC (Square pulse signal)</td>
<td>5 VDC</td>
<td>Standard</td>
<td>1</td>
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<tr>
<td>Electrical connection</td>
<td>235.</td>
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<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>3-pole connector RAST 2.5</td>
<td>235.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>2x3-pole connector RAST 2.5</td>
<td>235.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>3-pole connector RAST 2.5 (condensation protection)</td>
<td>235.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2x3-pole connector RAST 2.5 (condensation protection)</td>
<td>235.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3-pole circular connector M12x1</td>
<td>235.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5-pole circular connector M12x1</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

### Accessories (supplied loose)

<table>
<thead>
<tr>
<th>Order number</th>
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<tr>
<td>111668</td>
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<td>101817</td>
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<td>114604</td>
</tr>
<tr>
<td>114563</td>
</tr>
<tr>
<td>115024</td>
</tr>
</tbody>
</table>

[1] incl. 3xDi inlet and outlet side
[2] \( \text{PV in Pa; Q in l/min} \)
[3] No drinking water approval
**Dimension diagram**

Consider the following to ensure the correct function of the sensor.

- Only diameter changes from large to small are allowed.
- Avoid repeated elbows in the same level at entry side.

**Electrical connections**

**RAST 2.5 without temperature output**

**Connector 2x3-poles with temperature output**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>brown</td>
</tr>
<tr>
<td>2</td>
<td>blue</td>
</tr>
<tr>
<td>3</td>
<td>black</td>
</tr>
<tr>
<td>4</td>
<td>gray</td>
</tr>
</tbody>
</table>

**Connector M12x1 without temperature output**

**Connector M12x1 with temperature output**

**Tube mounting instructions**

- minimum 5xDN for alternative elbows
- minimum 0.5xDN for recommended 90º elbow with min. R 1.8xDN

**Dimensions**

- DN8 K: 33.3, 52.9, G 1/2, 77, 15
- DN8 G: 33.3, 55.7, G 1/4, 77, 15
- DN10 K: 43, 51.1, G 3/8, 86, 19
- DN10 M: 43, 54.1, G 1/2, 86, 19
- DN10 G: 43, 57.3, G 1, 86, 19
- DN15 K: 41, 59.9, G 1/2, 87, 22
- DN15 G: 41, 61.3, G 3/4, 87, 22
- DN20 K: 40.6, 61.3, G 1, 105, 27
- DN20 G: 40.6, 65.6, G 1 1/4, 105, 27
- DN25 K: 50, 68.1, G 1 1/4, 120, 34
- DN25 G: 50, 71.1, G 1 1/2, 120, 34
- DN32 K: 50, 74.9, G 1 3/4, 134, 41
With the following definitions we are able to correct the influence of media with higher viscosity than water (= media viscosity > 1.8 cST) in order to reach a measuring accuracy of 3% fs in the range of 1.8 - 4 cST and of 4% in the range of 4 - 14 cSt (υ = viscosity in cSt).

**Definition of viscosity of glycol-water-compound**

**Definition of respond threshold Q_{min} in l/min**

< DN10 not possible

- DN10: \( Q_{\text{min}} = \upsilon + 0.8 \)
- DN15: \( Q_{\text{min}} = \upsilon + 2.5 \)
- DN20: \( Q_{\text{min}} = \upsilon + 4.0 \)
- DN25: \( Q_{\text{min}} = \upsilon + 6.0 \)
- DN32: \( Q_{\text{min}} = \upsilon + 13.0 \)

**Formula characteristic line formula Q = k_{f} \cdot f + Q_{0} in l/min**

< DN10 not possible

Frequency output:

- DN10: \( Q = k_{f} \cdot f – 0.40\upsilon + 0.20 \)
- DN15: \( Q = k_{f} \cdot f – 0.45\upsilon + 0.25 \)
- DN20: \( Q = k_{f} \cdot f – 0.55\upsilon + 0.25 \)
- DN25: \( Q = k_{f} \cdot f – 0.80\upsilon + 0.60 \)
- DN32: \( Q = k_{f} \cdot f – 0.85\upsilon – 0.55 \)