1. Vortex flow sensors

Introduction
This data booklet comprises an overview of the Grundfos vortex flow sensor range and related products.

The trademark Grundfos Direct Sensors™ is owned and controlled by the Grundfos group.

The Grundfos vortex flow sensor is an integrated flow and temperature measurement system designed and validated for harsh aqueous environments. The flow measurement is based on the vortex principle. The system elements include a flow pipe with an integrated bluff body and a differential pressure detector.

When a bluff body is placed in a flow inside a pipe, a series of vortices will be generated periodically on each side of the bluff body. These vortices propagate downstream giving rise to periodic pressure variations, which can be detected by the differential pressure detector. The frequency of the pressure variations is proportional to the volume flow through the pipe.

Fig. 1 Grundfos vortex flow sensors

The bluff body is designed to optimise the pulse strength of the pressure variations at the position of the differential pressure detector. The bluff body is an integrated part of the injection moulded flow pipe, or supplied as a composite insert solution.

Flow ranges are determined by the pipe diameter and the signal processing parameters. The differential pressure detector key elements are a bulk micromachined silicon chip and a microprocessor-based signal-conditioning circuit, both on the same PCB. The conditioning circuit converts the pressure reading to a signal proportional to the flow through the pipe.

The electronics are protected by an IP44 composite housing.

The chip has a square membrane, which deflects due to pressure. Strain gauges are incorporated in a Wheatstone bridge configuration on stress intensive positions on the membrane. The pressure and temperature sensitive area (the membrane region) is coated on both sides by an extremely corrosion and diffusion resistive thin film (Silicoat®). The coating provides direct environmental robustness of the chip. The separation of the media and media-free zones is provided by O-ring sealing.
2. Vortex flow sensor, industry (VFI)

VFI general data

Vortex flow sensor, industry

Technical overview

The VFI is the industrial version of the Grundfos vortex flowmeter range. The VFI is based on the principle of vortex shedding behind a bluff body. The VFI has no moving parts and is built into a stainless steel pipe. The rugged design allows the VFI to be used in a wide range of applications as a cost-effective and accurate flow sensor. The flow sensors are supplied with flanges or with threaded ends for use with union nuts.

Applications

- Water treatment and distribution
- Light chemical industry
- Water management
- Pool and water resorts
- Heating
- Air-conditioning
- Cooling towers
- Condensing units
- Solar collectors.

Features

- Flow range from 0.3 to 240 m³/h
- Based on the vortex principle
- Compact and well-proven design
- Approved for drinking water
- Wide temperature range.

Benefits

- No moving parts
- Compatible with wet, aggressive media
- Cost-effective and robust design
- System solution with Grundfos pumps.

Approvals

- WRAS
- KTW
- ACS
- NSF 61.

Markings

Electrical connections

Power supply: 12.5 - 30 V (screened cable)
Type: Loop-powered, 2-wire
## Type key

<table>
<thead>
<tr>
<th>Type designation</th>
<th>VFI - 0.3-6 m -1 -C -M 5.000 X -FG6 -SG -30 F -A-1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product group:</strong></td>
<td>VFI: Vortex flow sensor, industry</td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td>0.3-6</td>
</tr>
<tr>
<td><strong>Unit:</strong></td>
<td>m: m³/h</td>
</tr>
<tr>
<td><strong>Generation:</strong></td>
<td>1: 1st generation</td>
</tr>
<tr>
<td><strong>Electrical output type:</strong></td>
<td>C: 4-20 mA, 2-wire</td>
</tr>
<tr>
<td><strong>Sensor connector or cable type and cable connector in sensor end:</strong></td>
<td>M: M12x1, female straight, screened 4-wire cable</td>
</tr>
<tr>
<td><strong>Cable length:</strong></td>
<td>5.000= 5 m</td>
</tr>
<tr>
<td><strong>Cable connector opposite sensor:</strong></td>
<td>X: Open-ended</td>
</tr>
<tr>
<td><strong>Sealing material and class:</strong></td>
<td>First letter: E: EPDM (drinking-water approved)</td>
</tr>
<tr>
<td></td>
<td>Second letter: F: FKM (for use in oily media)</td>
</tr>
<tr>
<td></td>
<td>Third letter: G: Gel-filled</td>
</tr>
<tr>
<td></td>
<td>6: IP67</td>
</tr>
<tr>
<td><strong>Material:</strong></td>
<td>B: Brass</td>
</tr>
<tr>
<td></td>
<td>C: Composite</td>
</tr>
<tr>
<td></td>
<td>G: Cast iron</td>
</tr>
<tr>
<td></td>
<td>Q: Stainless steel flow pipe with composite insert (QT)</td>
</tr>
<tr>
<td></td>
<td>S: Stainless steel</td>
</tr>
<tr>
<td><strong>Dimension of mechanical connection:</strong></td>
<td>30: DIN PN25/40 DN18/25/32, ANSI B16.5 Class 300 - 1¼&quot;</td>
</tr>
<tr>
<td><strong>Mechanical connection type:</strong></td>
<td>F: Flange</td>
</tr>
<tr>
<td><strong>Packaging:</strong></td>
<td>A: Set with pre-assembled components</td>
</tr>
<tr>
<td></td>
<td>1: 1 piece</td>
</tr>
</tbody>
</table>
VFI 0.6-12 DN 25, technical data

Vortex flow sensor, industry, 0.6 - 12 m³/h

Dimensions

Flange material | Flange size | A [mm] | B [mm] | C [mm] | D [mm] | Weight [kg]
--- | --- | --- | --- | --- | --- | ---
Cast iron | DN 25/32 | 200 | 18 | 124 | 140 | 4.52
Stainless steel | (PN 40) | 200 | 18 | 124 | 140 | 4.58

The VFI sensor with threaded ends must be mounted with union nuts.

Specifications

<table>
<thead>
<tr>
<th>Flow</th>
<th>Measuring range</th>
<th>0.6 - 12 m³/h*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>± 1.5 % FS*</td>
<td></td>
</tr>
</tbody>
</table>

Response time < 1 s

Resolution 0.015 m³/h

Liquid types See appendix Minimum flow rate

Liquid max. pressure 28 bar

Liquid temperature (operation) -30 - 120 °C, non-freezing

Liquid temperature -30 - 120 °C, non-freezing

Ambient air temperature (operation) -25 - 60 °C

Ambient air temperature -55 - 70 °C

Storage temperature -55 - 70 °C

Humidity 0 - 95 % RH, non-condensing

System burst pressure 60 bar

Power supply 12.5 - 30 VDC (± 5 %)

Output signals - cut off 4 - 20 mA

21 mA

Power consumption Max. 660 mW

Load impedance Max. 60 Ω at 12.5 VDC

Max. 100 Ω at 13.3 VDC

Max. 600 Ω at 24 VDC

Max. 900 Ω at 30 VDC

Sensor materials

Measurement element Silicon-based MEMS sensor

Packing material EPDM or FKM rubber

Sensor housing Stainless steel 1.4404

Flow pipe Stainless steel 1.4408

Bluff body Stainless steel 1.4401

Corrosion-resistant coating EPDM or FKM rubber

Stainless steel 1.4401/04/08

Environmental standards

Enclosure class IP67

Temperature cycling IEC 68-2-14

Vibration (non-destructive) 20-2000 Hz, 10G, 4h

Electromagnetic compatibility EN 61326-1

Sensor output signals

Signal cut off

21 mA

4 mA

Qmin Qmax

Subject to alterations.