Vortex flowmeters

- Product family introduction
- Principle of operation
- Product review
- Applications
- Key product features
Product family of SITRANS FX300

Product family
Principle of operation
Product overview
Application
Key features
Principle of operation

Principle of the vortex technology

Frequency \( \propto \) Velocity

Vol. Flow = Circular Area x Velocity

Mass Flow = \( Q_v \times \text{Density} \)

- An obstruction in a flowing stream will cause vortices to ‘shed’
- The distance (d) between vortices shed by the obstruction is changed by flow velocity
- Vortex meters use this principle to determine flow velocity which can be used to determine volume flow
Principle of operation

Product family

Principle of operation

Product overview

Application

Key features
Principle of operation

Siemens piezo, Flow sensor and pick up

Product family

Principle of operation

Product overview

Application

Key features

Piezo Stacks

Potting compound

PT 1000 class A
(Temperature Sensor)
Principle of operation

Signal effects of the piezo crystal sensor

Product family

Principle of operation

Product overview

Application

Key features

Flow

Clean signal
**Signal effects of the piezo crystal sensor**

**Process Noise**

- Piezo 1
- Piezo 2

**Differential amplifier**

- Output signal

**Result**

- Dirty signal
  - Eliminated
Principles of operation

SITRANS F X: Robust construction that provides quality measurement.

Product family

Principle of operation

Fully-welded bluff body

- No problems with pressure shocks

Pick up in the shadow of the bluff body

- Affords small mechanical stress of the pick up
- Protects the pick-up from passing solid contents
- Minimizes deposits on the pick-up that can lead to sensor error failure
Family overview

<table>
<thead>
<tr>
<th>MEASURING METHOD</th>
<th>Flange version</th>
<th>Flange version</th>
<th>Flange version</th>
<th>Flange version</th>
<th>Sandwich vers.</th>
<th>Sandwich vers.</th>
<th>Sandwich vers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volumetric</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Mass flow</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Display</th>
<th>2 lines, 10 characters per line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keypad</td>
<td>●</td>
</tr>
<tr>
<td>Connection</td>
<td>DN15 - 300 (1/2&quot; - 12&quot;) EN 1092-1; ASME</td>
</tr>
<tr>
<td></td>
<td>DN15 - 100 (1/2&quot; - 4&quot;) EN 1092-1; ASME</td>
</tr>
<tr>
<td>Pressure rating</td>
<td>PN 10 - PN 100 Class 150 - 600</td>
</tr>
<tr>
<td></td>
<td>PN 16 - PN 100 Class 150 - 600</td>
</tr>
<tr>
<td>Material sensor</td>
<td>Stainless Steel 1.4404 (316L) / 1.4435 (316L) / FPM or FFKM: Hastelloy C22 (on request)</td>
</tr>
<tr>
<td>Material transmitter</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Flow rate liquid</td>
<td>0.45 - 1600 m³/h</td>
</tr>
<tr>
<td>Flow rate air</td>
<td>6.8 - 18370 m³/h</td>
</tr>
<tr>
<td>Flow rate steam</td>
<td>5.25 - 126775 kg/h</td>
</tr>
<tr>
<td>Flow rate liquid</td>
<td>0.45 - 186 m³/h</td>
</tr>
<tr>
<td>Flow rate air</td>
<td>6.8 - 2125 m³/h</td>
</tr>
<tr>
<td>Flow rate steam</td>
<td>5.25 - 16665 kg/h</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Steam and gases: +/- 1% Liquids: +/- 0.75%</td>
</tr>
<tr>
<td>Medium temp.</td>
<td>-40 °C - 240 °C (-40 °F - 464 °F)</td>
</tr>
<tr>
<td>Endorsement rating</td>
<td>IP 66 / 67</td>
</tr>
<tr>
<td>Temperature sensor</td>
<td>●</td>
</tr>
<tr>
<td>Pressure sensor</td>
<td>●</td>
</tr>
<tr>
<td>Isolation valve</td>
<td>●</td>
</tr>
<tr>
<td>Temperature compensations</td>
<td>For saturated steam is integrated as standard</td>
</tr>
<tr>
<td>Temperature and pressure compensation</td>
<td>For steam, gases, wet gases and gas mixtures</td>
</tr>
<tr>
<td>Current output</td>
<td>4...20 mA</td>
</tr>
<tr>
<td>Pulse output</td>
<td>Pulse frequency max. 0.5 Hz</td>
</tr>
<tr>
<td>Digital output</td>
<td>HART®</td>
</tr>
<tr>
<td>Approvals</td>
<td>ATEX II 2G Ex d IIA IIC T6 and FM Class I, II, III Div. 1 &amp; 2</td>
</tr>
<tr>
<td>Power supply non Ex-Version</td>
<td>14...36 V DC</td>
</tr>
<tr>
<td>Power supply Ex-Version</td>
<td>14...28 V DC</td>
</tr>
</tbody>
</table>

Product family

Principle of operation

Product overview

Application

Key features
Product overview of SITRANS FX300

- Available as flange or sandwich versions
- Choose between single or dual converter
- Optional: pressure sensor with or without isolation valve
Product Family

Simplest Meter

- Flange or sandwich versions
- Measurement of steam, gas, or liquid
- Integrated temperature compensation for saturated steam as standard
- Centering rings for an easy install of sandwich versions
This flowmeter has a pressure sensor integrated and an isolation valve as an additional option. The advantages of this unique design include no additional cost-intensive installation of sensors, no additional cabling work, no faulty measurement results and a direct measurement of mass and/or energy.

This is a genuine redundant system with two independent sensors and two converters, which provides twofold functional measurement: reliability and availability.

This variant is optimally suited for measurements in multiproduct pipelines.
This sandwich flowmeter is suitable for universal use in the measurement of steam, gas and liquid. It is provided with additional optimized centering rings and can be centrically aligned by turning the centering rings, eliminating any offset between the vortex flowmeter and the pipeline.

As an option, the vortex flowmeter can be supplied with a shut-off valve (both for flange and sandwich versions) allowing the pressure sensor to be exchanged without interrupting the process and allowing pressure and leak testing of the pipeline. Calibration of the pressure sensor can take place at a later date.
Option: Pressure sensor

Flange and sandwich version with integrated pressure compensation for steam or gases
Option: Isolation valve

- Pressure sensor for leakage- and pressure tests capable of being isolated

- Pressure sensor can be checked and calibrated afterwards

- Exchanging of the pressure sensor under process conditions
Option: Dual converter

- If a redundant measurement is required
- Dual independent measurements
- Loss of signal nearly impossible
# Software version

<table>
<thead>
<tr>
<th>Product family</th>
<th>Product overview</th>
<th>Application</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic version:</td>
<td>Basic version:</td>
<td>Steam version:</td>
<td>Gas version:</td>
</tr>
<tr>
<td>- Uncompensated for steam, gases and liquids</td>
<td>- Thus, temperature compensation for saturated steam</td>
<td>- Temperature- and pressure compensation for superheated steam (e.g. energy measurement)</td>
<td>- Temperature- and pressure compensation for industrial gases (e.g. air, nitrogen, oxygen, etc.)</td>
</tr>
</tbody>
</table>
Flow seminar

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Product Family

Robust design
- Wear-resistant stainless steel components and rugged design with no moving parts
- Fully-welded stainless steel construction with high resistance to corrosion, pressure and temperature effects

Low cost of ownership
- Immediate operation through Plug & Play set up
- Maintenance free sensor construction
- Minimization of scheduled maintenance

Key features
## Applications of the SITRANS FX300

<table>
<thead>
<tr>
<th>Suitable applications</th>
<th>Limited suitability</th>
<th>Avoid these applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean liquids with low viscosity</td>
<td>Liquids with moderate viscosity</td>
<td>Liquids with high viscosity</td>
</tr>
<tr>
<td>Steam, vapors, liquefied gases</td>
<td>Slightly corrosive chemicals</td>
<td>Highly corrosive products</td>
</tr>
<tr>
<td>Hydrocarbons with low viscosity</td>
<td>Product with the tendency to shed particles or to cause slurries</td>
<td>Products that cause slurries, pastes and shed particles</td>
</tr>
<tr>
<td>Water, chemicals w/ low corrodibility</td>
<td></td>
<td>Multi-phase mixes</td>
</tr>
</tbody>
</table>
Main industries and applications of SITRANS FX300

- Chemical, 33%
- Oil & Gas, 17%
- Food & Beverage, 7%
- HVAC/Power, 7%
- Pharmacy, 5%
- Pulp & Paper, 5%

Source: Flow Research Institute, 2006
## Applications

<table>
<thead>
<tr>
<th>Product family</th>
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<th>Product overview</th>
<th>Application</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Controlling of compressor capacity, consumption measurement in compressed air networks</td>
<td>Controlling of steam boiler, superheated and saturated steam measurement</td>
<td>SIP &amp; CIP processes in the food &amp; beverage and pharma industry</td>
<td>Measuring of industrial gases</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Natural gas, Oxygen, Nitrogen, Hydrogen, Argon etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Burner consumption measurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Conductive and non conductive liquids &lt; 10 cP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Demi water, thermo oil, freezing agent etc.</td>
</tr>
</tbody>
</table>
Applications

In - and outlet pipelines

- Minimum inlet pipelines

1. General inlet run without disturbing flow ≥ 20 DN
2. Behind a control valve ≥ 50 DN
3. After a pipe diameter reduction ≥ 20 DN
Applications

In- and outlet pipelines

- Minimum outlet pipelines

Product family

Principle of operation

Product overview

Application

Key features

1. Upstream of pipe expanders, pipe bends, control valves, etc. ≥ 5 DN
2. Upstream of metering points ≥ 5 … 6 DN
Vortex Flowmeters

- Integrated temperature and pressure compensation
- ½” – 12”
- Improves industrial process performance
- Integrated solution in one product
- Easy installation: Plug and play
- Maintenance free sensor design
- Wide range of applications
- SITRANS F X is a unique 2-wire instrument
- Integrated pressure and temperature compensation
- A robust reliable instrument with SIEMENS Quality