racine

Superior Performance

Badger Meter

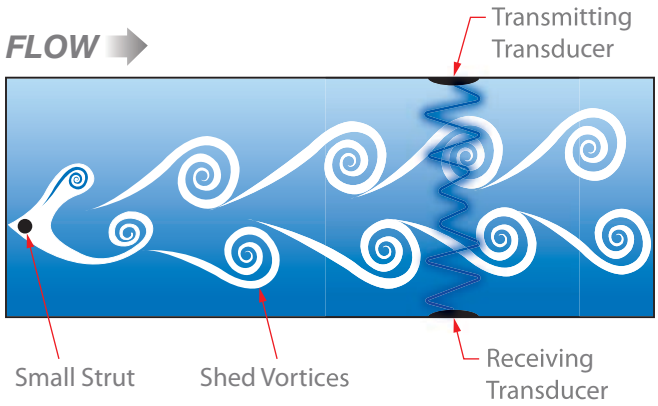
Vortex Shedding Products

Vortex Gas/Liquid Flow Meters – Stainless Steel

Operating Principle

An everyday example of a vortex shedding phenomenon is a flag waving in the breeze: the flag waves due to the vortices shed by wind moving across the flagpole. Within the flow meter as flowing media moves across the strut or "bluff bar" vortices are also shed, but on a smaller scale. The meter transmits an ultrasonic beam through the vortex pattern downstream of the strut. As vortices are shed, the carrier wave of the ultrasonic signal modulates. The modulation of the carrier wave is measurable and proportional to the number of vortices shed. Digital processing enables the vortices to be counted, and this value is converted into a velocity. Software converts velocity into a volumetric flow rate, in units of measure selected by the operator.

Racine Vortex flow meters utilize the smallest strut in the industry, which allows for high levels of sensitivity; superior performance at low flow rates; high turndown ratios; and low pressure drop. Through the use of an internal RTD and an external pressure sensor (optional), the flow meter software will compensate for changes in pressure and temperature, to achieve an accurate mass flow measurement (gas meters).



Flow Meter Selection

Racine vortex offers a sophisticated software program to aid in the flow meter selection process. The program accounts for system pressure and temperature, as well as media density, viscosity and specific gravity. Select from a complete list of Metric and English engineering units, using default or customized reference standards for pressure and temperature. This program may be downloaded at no charge from www.racinevortex.com.

Racine Vortex vs Common Construction

Typical vortex shedding flow meters use a large bluff body, often in conjunction with a piezoelectric sensor or pressure transducer. These large bodies are needed in order to generate a pivot, torque or pressure differential of sufficient magnitude (see example below). Racine vortex flow meters utilize ultrasonic sensing technology, allowing the meters to perform with an extremely small bluff body. As a result, system pressure drop and meter turndown ratio are greatly improved.

Pipe head-on view

Racine Vortex 1.5 in. Gas Wafer Flow Meter. Bluff body blocks 9 percent of pipe cross-sectional area.

Typical 1.5 in. Gas Wafer Flow Meter. Bluff body blocks 43 percent of pipe cross-sectional area.

Vortex Gas Flow Meters – Stainless Steel

RWG & RWBG Series Wafer Style Specifications

Applications	Combustion air Compressed air Incineration gas Natural gas Nitrogen Digester gas (BioGas: CH_4 + CO_2) Chemical processing
Features	• Low pressure drop • NIST traceable calibration • HART® Communications Protocol
Measured	Gas/Air
Flow Range	0.4…16 through 20…600 acfm
Accuracy	±1% of reading over the upper 90% of the flow range
Repeatability	0.5% of reading
Output Signal	2-wire, 4-20 mA loop
Input Power	24V DC
Certifications	CE: EN61326-1:2002 Optional Intrinsically Safe conforms to: ATEX Ⓔx II 2G Ex ib IIB T4 Zone 1 Group IIB T4 (Canada) and AEx ib IIB T4 (USA)

RNG Series Insertion Style Specifications

Applications	Flare gas Stack gas Natural gas Digester gas (BioGas: $CH_4 + CO_2$) Air
Features	• Not sensitive to gas composition changes • High accuracy in wet gas applications • 70:1 turndown ratio • HART® Communications Protocol
Measured	Gas/Air
Velocity Range	2…140 fps (0.6…43 mps)
Accuracy	±1% of reading over the upper 90% of the flow range
Repeatability	0.5% of reading
Output Signal	2-wire, 4-20 mA loop
Input Power	24V DC
Certifications	CE: EN61326-1:2002 Optional Intrinsically Safe conforms to: ATEX Ⓔx II 2G Ex ib IIB T4 Zone 1 Group IIB T4 (Canada) and AEx ib IIB T4 (USA)

Vortex Liquid Flow Meters – Stainless Steel

RNL Series Insertion Style Specifications

Applications	Boiler feed water and condensate Cooling tower Pool and water park Chemical processing Municipal water treatment Ground water monitoring Irrigation systems
Features	• Pipe sizes 4 in. (102 mm) and higher • Very low pressure drop
Measured	Liquids
Velocity Range	2…18 fps (0.6…5.5 mps)
Accuracy	±2% of reading
Repeatability	0.5% of reading
Output Signal	2-wire, 4-20 mA loop; 3-wire, 4-20 mA and/or pulse
Input Power	13…32V DC
Certifications	CE

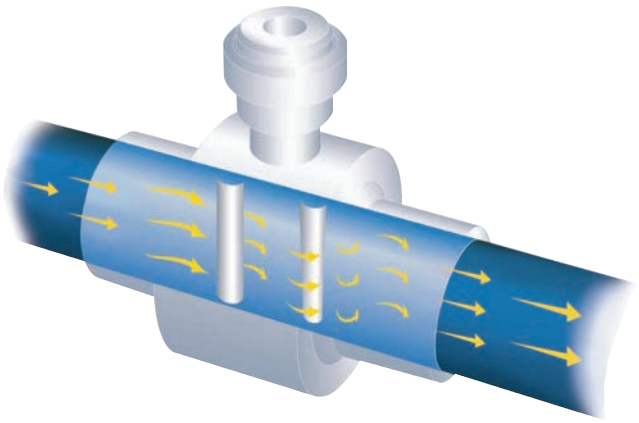
Vortex Liquid Flow Meters – Thermoplastic

Operating Principle

Operation of the RVL vortex flow meter is based on the vortex shedding principle. As fluid moves around a body, vortices (eddies) are formed and move downstream. They form alternately, from one side to the other, causing pressure fluctuations. These are sensed by a piezoelectric crystal in the sensor tube, and are converted to a 4-20 milliamperes, 0…5 Volt DC or pulse signal. The frequency of the vortices is directly proportional to the flow rate. This results in extremely accurate and repeatable measurements using no moving parts.

The RVL series meter utilizes vortex-shedding technology to provide a repeatable flow measurement accurate to 1 percent of full scale. The meter has no moving parts, and any potential for fluid contamination is eliminated by the meter's corrosion-resistant all plastic construction. The meter includes a compact two-wire (4-20 milliamperes) or three-wire (0…5 Volt DC or pulse) transmitter, contained within a conveniently replaceable plug-in electronics module. All electronics are housed in a corrosion-resistant enclosure.

Unlike meters containing metal or moving parts, the RVL is perfect for aggressive or easily contaminated fluids. Applications range from ultra-pure water to highly corrosive chemicals and slurries. Units may be re-calibrated and the meter output span reprogrammed in the field. RVL meters are available in the following materials of construction: CPVC, PVC, PVDF and Polypropylene (PP).



Material Selection

When choosing the best flow meter for a process, it is necessary to review the fluid to be measured, its concentration, the minimum and maximum operating temperatures, operating pressure, fluid viscosity, suspended particles, density of the fluid and, most importantly, expected flow range.

One advantage of utilizing a RVL vortex flow meter is that there are no gaskets or elastomers in the meter. Therefore, one need only be concerned with the thermoplastic material used in body construction. In a thermoplastic piping system, the material chosen for the flow meter should match that of the pipe wherever possible.

Note: See product specifications.

Chemical Compatibility

Chemical	PVC	PVDF	CPVC	Polypropylene
Aluminum Hydroxide	A	A	A	A
Chlorine Water	A	B	A	D
Fuel Oils	A	B	N/A	A
Hydraulic Oil	A	A	N/A	D
Hydrochloric Acid 37%	B	A	A	C
Hydrochloric Acid 20%	B	A	C	A
Isopropyl Alcohol	A	N/A	C	A
Nitric Acid (Concentrated)	B	A	D	D
Phosphoric Acid (>40%)	B	B	A	A
Potassium Hydroxide	A	A	A	A
Propylene Glycol	C	N/A	C	A
Sulfuric Acid (10…75%)	A	A	A	A

A= Excellent **B**= Good **C**= Fair **D**= Severe Effect

RVL Series In-Line Style Specifications

Applications	Semiconductor equipment Low viscosity slurry Chemical processing DI water: semiconductor, institutional DI water skids Water/wastewater Pharmaceutical
Connection	Butt or NPT thread
Line Sizes	1/4…2 in. (6.3…50.8 mm)
Flow Ranges	0.6…5 gpm through 16.7…200 gpm (2.3…18.9 lpm through 63.1…757 lpm)
Accuracy	±1% of full scale, 4-20 mA and 0…5V DC; ±2% of full scale, frequency pulse
Repeatability	±0.25% actual flow
Output Signal	4-20 mA, 0…5V DC or frequency pulse (source – sink driver; 1A source/1.5A sink; typical output resistance 10 Ω)
Input Power	13…30V DC
Material Options	PVC, CPVC, PVDF

RVL Series Wafer Style Specifications

Applications	Semiconductor equipment Low viscosity slurry Chemical processing DI water: semiconductor, institutional DI water skids Water/wastewater Pharmaceutical
Connection	Wafer (mounted between flanges)
Line Sizes	1/2…3 in. (12.7…76.2 mm)
Flow Ranges	1.3…15 gpm through 25…300 gpm (4.7…56.8 lpm through 94.6…1136 lpm)
Accuracy	±1% of full scale, 4-20 mA and 0…5V DC; ±2% of full scale, frequency pulse
Repeatability	±0.25% actual flow
Output Signal	4-20 mA, 0…5V DC or frequency pulse (source – sink driver; 1A source/1.5A sink; typical output resistance 10 Ω)
Input Power	13…30V DC
Material Options	PVC, CPVC, PP, PVDF

RVL Series In-Line Flare End Style Specifications

Applications	Semiconductor equipment Low viscosity slurry Chemical processing DI water: semiconductor, institutional DI water skids Water/wastewater Pharmaceutical
Connection	Tube (flared ends)
Line Sizes	1/2…1 in. (12.7…25.4 mm)
Flow Ranges	0.6…5 gpm through 2.1…25 gpm (2.3…18.9 lpm through 7.9…94.6 lpm)
Accuracy	±1% of full scale, 4-20 mA and 0…5V DC; ±2% of full scale, frequency pulse
Repeatability	±0.25% actual flow
Output Signal	4-20 mA, 0…5V DC or frequency pulse (source – sink driver; 1A source/1.5A sink; typical output resistance 10 Ω)
Input Power	13…30V DC
Material Options	PVDF

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