Badger Meter Europa

Racine® Vortex meters

Badger Meter Europa GmbH
Nürtinger Str. 76
72639 Neuffen (Germany)
Tel. +49-7025-9208-0
Fax +49-7025-9208-15
www.badgermeter.de
badger@badgermeter.de

High-accuracy Vortex-shedding flow meters for gases, liquids and air in wafer, insertion and in-line design

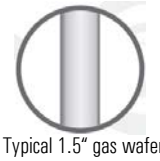
Racine® Vortex vs. common construction

Racine® Vortex flow meters utilize ultrasonic technology to measure tiny vortices that form when media in the pipe move across a strut, or "bluff bar". The number of vortices formed is directly proportional to flow rate, and the resulting product is a flow meter with high turndown ratio (up to 70:1) and high accuracy (±1% of reading).
With Smart electronics and HART® communications, the Racine® Vortex flow meter is an excellent choice for process plants and refineries. With no moving parts and little or no maintenance required, the meters are also an excellent choice for OEM companies working with water supply, quality or treatment equipment.

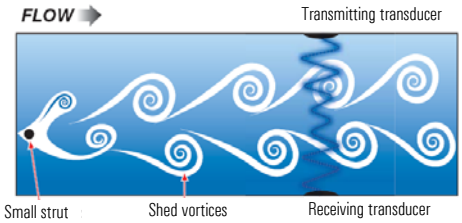
Typical Vortex shedding flow meters use a large bluff body, often in conjunction with a piezoelectric sensor or pressure transducer. These large bodies are needed in order to generate a pivot, torque or pressure differential of sufficient magnitude (see example below). Racine® Vortex flow meters utilize 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" gas wafer flow meter. Bluff body blocks 9% of pipe cross-sectional area.



Typical 1.5" gas wafer flow meter. Bluff body blocks 43% of pipe cross-sectional area.



Applications

- Gas/Biogas
- Liquids
- Air/Pressure air

Operating principle

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).

*Racine® Federated is a division of Badger Meter, Inc.

racine™

Vortex gas flow meters – stainless steel

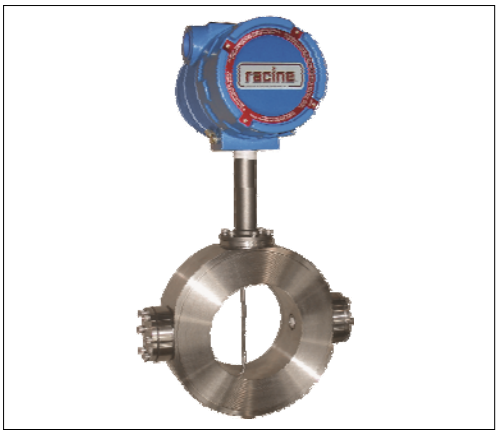
RWG & RWBG series wafer-style gas meter

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



Technical data

Medium	Gas/air
Flow range	0.1 – 7.5 through 9.5 – 280 l/s
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	24 VDC
Certifications	CE: EN61326-1:2002 Optional: ATEX II 2G Ex ib IIB T4 Zone 1 Group IIB T4 and AEx ib IIB T4

RNG series insertion-style liquid flow meter

Features

- Not sensitive to gas composition changes
- High accuracy in wet gas applications
- 70:1 turndown ratio
- HART® communications protocol

Applications

- Flare gas
- Stack gas
- Natural gas
- Digester gas (Biogas: CH_4 + CO_2)
- Air

Technical data

Medium	Gas/air
Flow range	0.6 – 43 m/s
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	24 VDC
Certifications	CE: EN61326-1:2002 Optional: ATEX II 2G Ex ib IIB T4 Zone 1 Group IIB T4 and AEx ib IIB T4

Vortex liquid flow meters – stainless steel

RNL series insertion-style liquid flow meter

Applications

- Boiler feed water and condensate
- Cooling tower
- Pool and water park
- Chemical processing
- Municipal water treatment
- Ground water monitoring
- Irrigation systems

Features

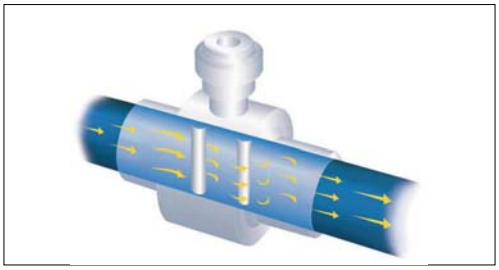
- Pipe sizes 4" (DN100) and higher
- Very low pressure drop

Technical data

Medium	Liquids
Flow range	0.6 – 5.5 m/s
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 to 32 VDC
Certifications	CE

Vortex liquid flow meters – thermoplastic

The RVL series meter utilizes vortex-shedding technology to provide a repeatable flow measurement accurate to 1% 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 2-wire (4-20mA) or 3-wire (0-5 VDC 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 recalibrated 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).



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 4-20mA, 0-5 VDC 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.

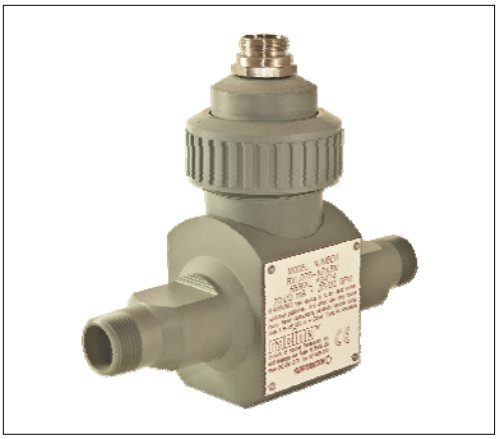
Applications

- Semiconductor equipment
- Low viscosity slurry
- Chemical processing/highly corrosive chemicals
- DI water: semiconductor, institutional
- DI water skids
- Water/waste water, ultrapure water
- Pharmaceutical

RVL series in-line liquid flow meters

Technical data

Connections	Butt or NPT thread
Line sizes	1/2" to 2" (DN15 – DN50)
Flow range	2 - 18 l/min through 60 – 750 l/min (0.6 – 5 GPM through 16.7 – 200 GPM)
Accuracy	±1% of full scale, 4-20 mA and 0-5 VDC ±2% of full scale, frequency pulse
Repeatability	±0.25% actual flow
Output signal	4-20 mA, 0-5 VDC or frequency pulse (source-sink driver; 1A source / 1.5A sink; typical output resistance 10 ohms)
Input power	13 to 30 VDC
Certifications	CSA standard C22.2 n° 0-M and n° 142-M; CE
Material options	PVC, CPVC, PVDF



RVL series wafer liquid flow meters

Technical data

Connections	Wafer (mounts between flanges)
Line sizes	1/2" to 3" (DN15 – DN80)
Flow range	0.08 – 1 l/s through 1.5 - 20 l/s (1.3 - 15 GPM through 25 – 300 GPM)
Accuracy	±1% of full scale, 4-20 mA and 0-5 VDC ±2% of full scale, frequency pulse
Repeatability	±0.25% actual flow
Output signal	4-20 mA, 0-5 VDC or frequency pulse (source-sink driver; 1A source / 1.5A sink; typical output resistance 10 ohms)
Input power	13 to 30 VDC
Certifications	CSA standard C22.2 n° 0-M and n° 142-M; CE
Material options	PVC, CPVC, PP, PVDF

RVL series in-line flare end liquid flow meters

Technical data

Connections	Tube (flare-end)
Line sizes	1/2" to 1" (DN15 – DN25)
Flow range	0.03 – 0.3 l/s through 0.1 – 1.5 l/s (0.6 – 5 GPM through 2.1 – 25 GPM)
Accuracy	±1% of full scale, 4-20 mA and 0-5 VDC ±2% of full scale, frequency pulse
Repeatability	±0.25% actual flow
Output signal	4-20 mA, 0-5 VDC or frequency pulse (source-sink driver; 1A source / 1.5A sink; typical output resistance 10 ohms)
Input power	13 to 30 VDC
Certifications	CSA standard C22.2 n° 0-M and n° 142-M; CE
Material options	PVDF

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 needs 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.

Chemical compatibility

	Compatibility			
Chemical	**PVC**	**PVDF**	**CPVC**	**PP**
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
Hydrofluoric 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

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.