

DESCRIPTION

The RVL liquid flow meter uses vortex-shedding technology with embedded piezoelectric pressure sensors. The meter has no moving parts, and any potential for fluid contamination is eliminated by the non-metallic corrosion-resistant body materials. The meter includes a compact plug-in transmitter module with two-wire 4...20 mA or three-wire pulse output. All electronics are housed in a corrosion-resistant enclosure. Units can be recalibrated and reprogrammed in the field.

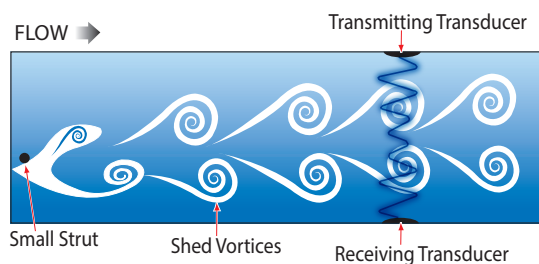
APPLICATION

The RVL is perfect for aggressive or easily contaminated fluids.

- Ultra-pure water distribution
- RO/DI skids
- Cooling water
- Chemical injection
- Nonabrasive slurries

OPERATING PRINCIPLE

Operation of the RVL vortex flow meter is based on the vortex shedding principle. As fluid moves around a strut, vortices (eddies) are formed and move downstream. They form alternately, from one side to the other, causing pressure fluctuations that are sensed by a piezoelectric crystal in the sensor tube. The frequency of the vortices is directly proportional to the flow rate.



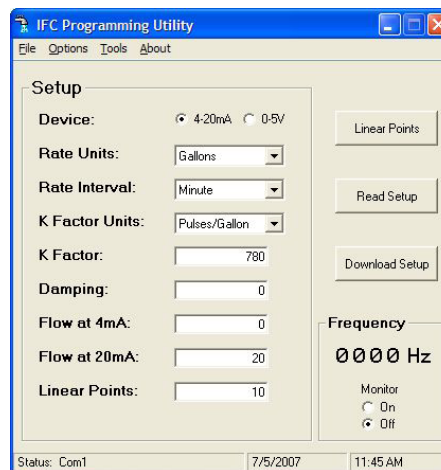
CONSTRUCTION

The precision machined bodies provide quality end fittings, while avoiding ionic contamination. There are no metallic wetted parts, gaskets or elastomers in the meter. The body material selected is homogeneous throughout the flow path.



OPTIONAL SOFTWARE

An optional software utility kit is available to configure the RVL 4...20 mA output. (The pulse output is not field configurable.) Part number RVS220-954 contains a RS232 nine-pin cable, software CD, TTL to RS232 converter and a board interface cable. The program enables easy configuration of span, damping and units of measurement.



MATERIAL SELECTION

When choosing the best flow meter for a process, review the concentration, operating temperatures and operating pressure of the fluid being measured. In a thermoplastic piping system, choose the same material for the meter and the pipe wherever possible to maintain fluid compatibility and aid in bonding the materials. The table below shows the compatibility of fluid types with the thermoplastic materials.

| Chemical | PVDF | CPVC |
|--|------|------|
| Aluminum Hydroxide | A | A |
| Chlorine Water | B | A |
| Fuel Oils | B | — |
| Hydraulic Oil | A | — |
| Hydrochloric Acid 37% | A | A |
| Hydrochloric Acid 20% | A | C |
| Isopropyl Alcohol | — | C |
| Nitric Acid (Concentrated) | A | D |
| Phosphoric Acid (>40%) | B | A |
| Potassium Hydroxide | A | A |
| Propylene Glycol | — | C |
| Sulfuric Acid (10...75%) | A | A |
| A= Excellent B= Good C= Fair D= Severe effect | | |

FLUID CONSIDERATIONS

In vortex flow meters, fluids with high viscosities tend to dampen the formation of vortices and reduce the effective range. Viscosities above 1 cSt raise the minimum readable flow rate, reducing rangeability. The effect is linear to viscosity. Particles and internal bubbles do not usually affect vortex meters. In slurry services, PVDF models typically work very well. Slurries containing grit can wear down the bluff body over a period of time and long fibers can catch and build up on the bluff, decreasing accuracy.

Liquids with specific gravities higher than 2.0 adversely affect the permissible amount and duration of over-flow range.

| Reduction of Range Based on Viscosity | | | |
|---------------------------------------|---------|---------|------------|
| Viscosity | Minimum | Maximum | Flow Range |
| 1 cSt | 1 | 12 | 12:1 |
| 2 cSt | 2 | 12 | 6:1 |
| 3 cSt | 3 | 12 | 4:1 |
| 4 cSt | 4 | 12 | 3:1 |
| 5 cSt | 5 | 12 | 2.4:1 |
| 6 cSt | 6 | 12 | 2:1 |

Meters are calibrated with tap water at 1 cSt (32 SSU) at ambient temperature

SPECIFICATIONS

| | |
|------------------------|--|
| Measured Fluids | Liquids |
| Connections | Butt or NPT thread Wafer (mounted between flanges) |
| Accuracy | ±1% of full scale, 4...20 mA; ±2% of full scale, frequency pulse |
| Repeatability | ±0.25% actual flow |
| Response Time | 2 seconds minimum, step change in flow |
| Input Power | 13...30V DC |
| Signal Output | 4...20 mA or frequency pulse (source-sink driver; 1A source/1.5A sink; typical output resistance 10 Ω) |
| Enclosure | NEMA 4X (IP 66) |
| Certifications | CE: EN50082-1:1992 |

Pressure vs Temperature Ratings

NPT/Butt End Fittings

| Maximum Fluid Temperature | Maximum Operating Pressure | |
|---------------------------|----------------------------|---------------------|
| | CPVC | PVDF |
| 203° F (95° C)* | 24 psig (1.6 bar) | 40 psig (2.7 bar) |
| 150° F (66° C) | 63 psig (4.3 bar) | 130 psig (8.9 bar) |
| 100° F (38° C) | 120 psig (8.3 bar) | 150 psig (10.3 bar) |
| 70° F (21° C) | 150 psig (10.3 bar) | 150 psig (10.3 bar) |

*Reduces low flow rate on 1/4 in. (6 mm) meter

Wafer End Fittings

| Maximum Fluid Temperature | Maximum Operating Pressure | |
|---------------------------|----------------------------|---------------------|
| | CPVC | PVDF |
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| 70° F (21° C) | 150 psig (10.3 bar) | 150 psig (10.3 bar) |

FLOW RANGES

NPT End Fittings

| Meter Size | Minimum Flow | Maximum Flow | Turndown Ratio |
|---------------------|---------------------|-------------------|----------------|
| 1/4 in. (6.3 mm) | 0.6 gpm (2.3 lpm) | 5 gpm (19 lpm) | 8:1 |
| 1/2 in. (12.7 mm) | 1.5 gpm (5.7 lpm) | 15 gpm (56.8 lpm) | 10:1 |
| 3/4 in. (19.1 mm) | 2.5 gpm (9.5 lpm) | 25 gpm (94.6 lpm) | 10:1 |
| 1 in. (25.4 mm) | 5.0 gpm (18.9 lpm) | 50 gpm (189 lpm) | 10:1 |
| 1-1/2 in. (38.1 mm) | 10.0 gpm (37.9 lpm) | 100 gpm (379 lpm) | 10:1 |
| 2 in. (50.8 mm) | 20.0 gpm (75.7 lpm) | 200 gpm (757 lpm) | 10:1 |

Butt End Fittings

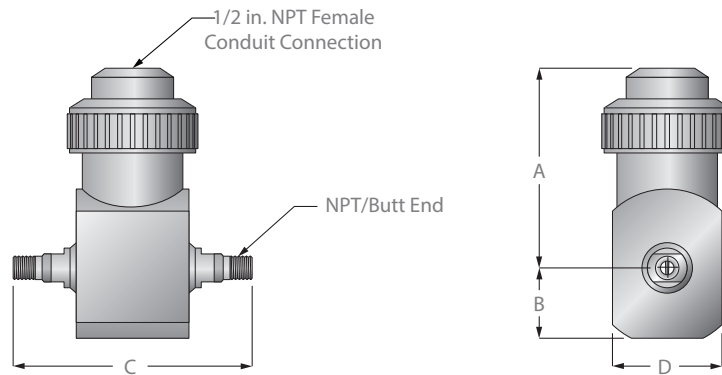
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|---------------------|---------------------|-------------------|----------------|
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| 2 in. (50.8 mm) | 20.0 gpm (75.7 lpm) | 200 gpm (757 lpm) | 10:1 |

Wafer End Fittings

| Meter Size | Minimum Flow | Maximum Flow | Turndown Ratio |
|---------------------|----------------------|--------------------|----------------|
| 1 in. (25.4 mm) | 5.0 gpm (18.9 lpm) | 50 gpm (189 lpm) | 10:1 |
| 1-1/2 in. (38.1 mm) | 10.0 gpm (37.9 lpm) | 100 gpm (379 lpm) | 10:1 |
| 2 in. (50.8 mm) | 20.0 gpm (75.7 lpm) | 200 gpm (757 lpm) | 10:1 |
| 3 in. (76.2 mm) | 30.0 gpm (113.6 lpm) | 300 gpm (1136 lpm) | 10:1 |

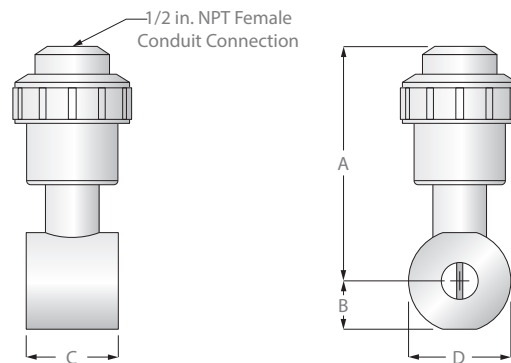
DIMENSIONS

NPT/Butt End Fittings



| Meter Size | PVC/CPVC in. (mm) | | | | PVDF (Butt) in. (mm) | | | |
|---------------------|-------------------|-----------|------------|----------|----------------------|-----------|------------|-----------|
| | A | B | C | D | A | B | C | D |
| 1/4 in. (6.3 mm) | 3.81 (97) | 1.75 (45) | 5.25 (133) | 2.5 (64) | — | — | — | — |
| 1/2 in. (12.7 mm) | 3.81 (97) | 1.75 (45) | 7.13 (181) | 2.5 (64) | 5.75 (146) | 0.78 (20) | 4.87 (124) | 1.31 (33) |
| 3/4 in. (19.1 mm) | 3.81 (97) | 1.75 (45) | 7.63 (194) | 2.5 (64) | 5.75 (146) | 0.94 (24) | 4.87 (124) | 1.44 (37) |
| 1 in. (25.4 mm) | 3.92 (100) | 1.75 (45) | 8.03 (204) | 2.5 (64) | 5.88 (149) | 1.19 (30) | 5.09 (129) | 2 (51) |
| 1-1/2 in. (38.1 mm) | 3.9 (99) | 2 (51) | 8.37 (213) | 2.5 (64) | 6.21 (158) | 1.50 (38) | 6.24 (158) | 2.50 (64) |
| 2 in. (50.8 mm) | 4.31 (109) | 2 (51) | 8.37 (213) | 2.5 (64) | 6.6 (168) | 1.88 (48) | 6.77 (172) | 3 (76) |

Wafer End Fittings



| Meter Size | PVDF | | | |
|---------------------|-------------------|------------------|-------------------|-------------------|
| | A | B | C | D |
| 1 in. (25.4 mm) | 5.69 in. (145 mm) | 1.19 in. (30 mm) | 2.25 in. (57 mm) | 2.47 in. (63 mm) |
| 1-1/2 in. (38.1 mm) | 6.00 in. (152 mm) | 1.50 in. (38 mm) | 2.63 in. (67 mm) | 3.25 in. (83 mm) |
| 2 in. (50.8 mm) | 6.37 in. (162 mm) | 1.88 in. (48 mm) | 3.22 in. (82 mm) | 4.00 in. (102 mm) |
| 3 in. (76.2 mm) | 6.88 in. (175 mm) | 2.50 in. (64 mm) | 4.25 in. (108 mm) | 5.24 in. (133 mm) |

PART NUMBER CONSTRUCTION

NPT End Fittings

RVL Piezoelectric Vortex Flow Meter
for Liquids (NPT Fittings)

| | | | | | | | | | | | |
|--|--|-----|--|--|--|-----|--|---|--|---|--|
| | | | | | | | | | | | |
| Model | | | | | | | | | | | |
| Piezoelectric Vortex Flow Meter for Liquids (In-Line) | | RVL | | | | | | | | | |
| Line Size | | | | | | | | | | | |
| 1/4 Inch 5 gpm (19 lpm) Maximum Flow Rate | | | | | | 025 | | | | | |
| 1/2 Inch 15 gpm (56.8 lpm) Maximum Flow Rate | | | | | | 050 | | | | | |
| 3/4 Inch 25 gpm (94.6 lpm) Maximum Flow Rate | | | | | | 075 | | | | | |
| 1 Inch 50 gpm (189 lpm) Maximum Flow Rate | | | | | | 100 | | | | | |
| 1-1/2 Inch 100 gpm (379 lpm) Maximum Flow Rate | | | | | | 150 | | | | | |
| 2 Inch 200 gpm (757 lpm) Maximum Flow Rate | | | | | | 200 | | | | | |
| Body Style | | | | | | | | | | | |
| NPT (Male) Thread | | | | | | | | N | | | |
| Body Material | | | | | | | | | | | |
| CPVC | | | | | | | | 2 | | | |
| PVDF | | | | | | | | 4 | | | |
| Output | | | | | | | | | | | |
| 4 ... 20 mA | | | | | | | | X | | | |
| Rate Frequency Pulse Not Available with Display | | | | | | | | P | | | |
| Options¹ | | | | | | | | | | | |
| None | | | | | | | | | | N | |
| High Temperature Rated: 203° F (95° C) ² | | | | | | | | | | H | |
| Stainless Steel Tags | | | | | | | | | | S | |
| 3-Pin (male) Output Connector ³ | | | | | | | | | | 3 | |
| Display Mounting | | | | | | | | | | | |
| None | | | | | | | | | | N | |
| Top Mount | | | | | | | | | | 1 | |
| Right Mount | | | | | | | | | | 3 | |

- 1.) Multiple Options may be listed in series on the part number - add as necessary
- 2.) High Temperature option ONLY available with Body Material options "2" and "4"
- 3.) When selecting Option 3, 3-Pin (male) Output Connector, a display cannot be mounted on the meter and Display Mounting must be marked as "N" for none.

Butt End Fittings

RVL Piezoelectric Vortex Flow Meter
for Liquids (Butt End Fittings)**Model**

Piezoelectric Vortex Flow Meter for Liquids (In-Line)

RVL

Line Size

1/2 Inch | 15 gpm (56.8 lpm) Maximum Flow Rate

050

3/4 Inch | 25 gpm (94.6 lpm) Maximum Flow Rate

075

1 Inch | 50 gpm (189 lpm) Maximum Flow Rate

100

1-1/2 Inch | 100 gpm (379 lpm) Maximum Flow Rate

150

2 Inch | 200 gpm (757 lpm) Maximum Flow Rate

200

Body Style

Butt End Connection

B

Body Material

PVDF

4

Output

4 ... 20 mA

X

Rate Frequency Pulse | **Not Available with Display**

P

Options ¹

None

N

High Temperature Rated: 203° F (95° C) ²

H

Stainless Steel Tags

S

3-Pin (male) Output Connector ³

3

Display Mounting

None

N

Top Mount

1

Right Mount

3

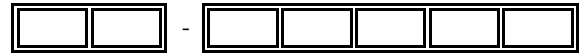
1.) Multiple Options may be listed in series on the part number - add as necessary

2.) High Temperature option ONLY available with Body Material option "4"

3.) When selecting Option 3, 3-Pin (male) Output Connector, a display cannot be mounted on the meter and Display Mounting must be marked as "N" for none.

Wafer End Fittings

RVL Piezoelectric Vortex Flow Meter for Liquids (Wafer End Fittings)



Model

Piezoelectric Vortex Flow Meter for Liquids (Wafer)

RVL

Line Size

1 Inch | 50 gpm (189 lpm) Maximum Flow Rate

100

1-1/2 Inch | 100 gpm (379 lpm) Maximum Flow Rate

150

2 Inch | 200 gpm (757 lpm) Maximum Flow Rate

200

3 Inch | 300 gpm (1136 lpm) Maximum Flow Rate

300

Body Style

Wafer

W

Body Material

CPVC

2

PVDF

4

Output

4 ... 20 mA

X

Rate Frequency Pulse | **Not Available with Display**

P

Options ¹

None

N

High Temperature Rated: 203° F (95° C) ²

H

Stainless Steel Tags

S

3-Pin (male) Output Connector³

3

Display Mounting

None

N

Top Mount

1

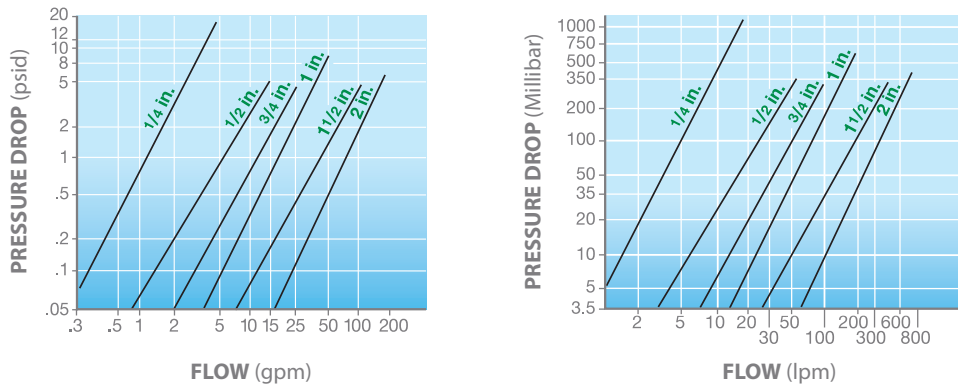
Right Mount

3

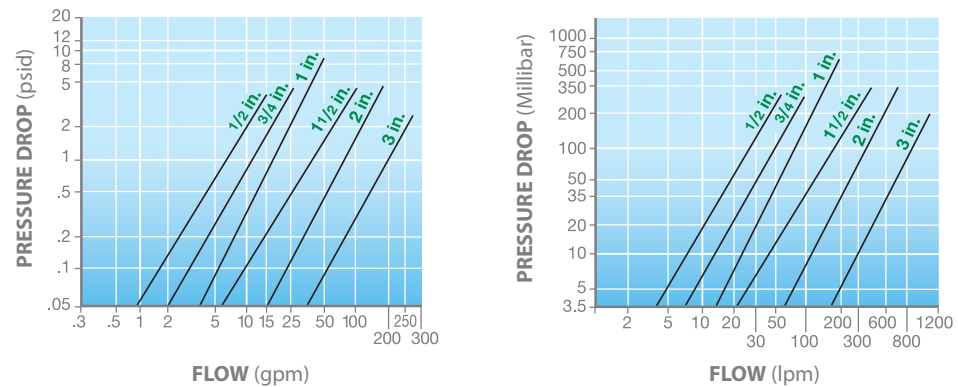
- 1.) Multiple Options may be listed in series on the part number - add as necessary
- 2.) High Temperature option ONLY available with Body Material options "2" and "4"
- 3.) When selecting Option 3, 3-Pin (male) Output Connector, a display cannot be mounted on the meter and Display Mounting must be marked as "N" for none..

PRESSURE DROP VS FLOW RATE

NPT/Butt End Fittings



Wafer End Fittings



ADDITIONAL RESOURCES

Vortex Shedding Flow Meters RVL Series User Manual, available on badgermeter.com

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