

### 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.

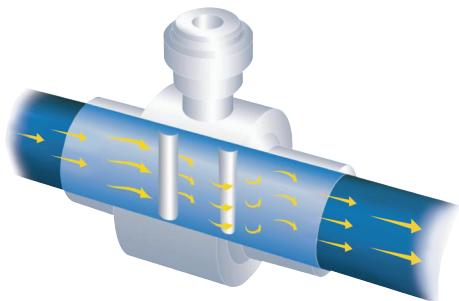
### APPLICATION

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.



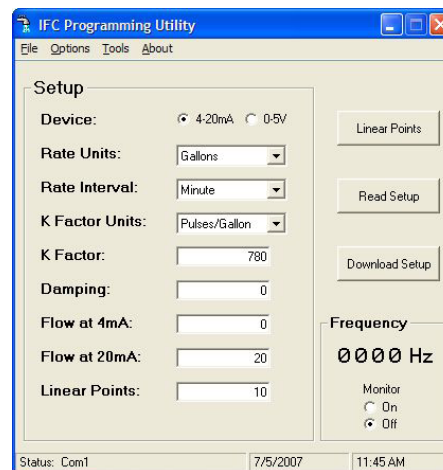
### CONSTRUCTION

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 thermoplastic materials.

| Chemical                                      | PVC | PVDF | CPVC | Polypropylene |
|-----------------------------------------------|-----|------|------|---------------|
| Aluminum Hydroxide                            | A   | A    | A    | A             |
| Chlorine Water                                | A   | B    | A    | D             |
| Fuel Oils                                     | A   | B    | —    | A             |
| Hydraulic Oil                                 | A   | A    | —    | D             |
| Hydrochloric Acid 37%                         | B   | A    | A    | C             |
| Hydrochloric Acid 20%                         | B   | A    | C    | A             |
| Isopropyl Alcohol                             | 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   | —    | C    | A             |
| Sulfuric Acid (10...75%)                      | A   | A    | 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

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

\*Requires two flare tubing nuts (not included)

## Pressure vs Temperature Ratings

### NPT/Butt End Fittings

| Maximum Fluid Temperature | Maximum Operating Pressure |                     |                     |
|---------------------------|----------------------------|---------------------|---------------------|
|                           | PVC                        | 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)            | 93 psig (6.4 bar)          | 120 psig (8.3 bar)  | 150 psig (10.3 bar) |
| 70° F (21° C)             | 150 psig (10.3 bar)        | 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 |                     |                     |                     |
|---------------------------|----------------------------|---------------------|---------------------|---------------------|
|                           | PVC                        | PP                  | CPVC                | PVDF                |
| 203° F (95° C)            | —                          | —                   | 24 psig (1.6 bar)   | 40 psig (2.7 bar)   |
| 150° F (66° C)            | —                          | 90 psig (6.2 bar)   | 100 psig (6.9 bar)  | 130 psig (8.9 bar)  |
| 100° F (38° C)            | 130 psig (8.9 bar)         | 130 psig (8.9 bar)  | 130 psig (8.9 bar)  | 150 psig (10.3 bar) |
| 70° F (21° C)             | 150 psig (10.3 bar)        | 150 psig (10.3 bar) | 150 psig (10.3 bar) | 150 psig (10.3 bar) |

### Flare End Fittings

| Maximum Fluid Temperature | Maximum Operating Pressure |  |
|---------------------------|----------------------------|--|
|                           | PVDF                       |  |
| 203° F (95° C)            | 20 psig (1.4 bar)          |  |
| 140° F (60° C)            | 37 psig (2.6 bar)          |  |
| 100° F (38° C)            | 67 psig (4.6 bar)          |  |
| 70° F (21° C)             | 150 psig (10.3 bar)        |  |

**FLOW RANGES****NPT/Butt End Fittings**

| <b>Meter Size</b>   | <b>Minimum Flow</b> | <b>Maximum Flow</b> | <b>Turndown Ratio</b> |
|---------------------|---------------------|---------------------|-----------------------|
| 1/4 in. (6.3 mm)    | 0.6 gpm (2.3 lpm)   | 5 gpm (19 lpm)      | 8:1                   |
| 1/2 in. (12.7 mm)   | 1.3 gpm (4.7 lpm)   | 15 gpm (56.8 lpm)   | 12:1                  |
| 3/4 in. (19.1 mm)   | 2.1 gpm (7.9 lpm)   | 25 gpm (94.6 lpm)   | 12:1                  |
| 1 in. (25.4 mm)     | 4.2 gpm (15.8 lpm)  | 50 gpm (189 lpm)    | 12:1                  |
| 1-1/2 in. (38.1 mm) | 8.3 gpm (31.5 lpm)  | 100 gpm (379 lpm)   | 12:1                  |
| 2 in. (50.8 mm)     | 16.7 gpm (63.1 lpm) | 200 gpm (757 lpm)   | 12:1                  |

**Wafer End Fittings**

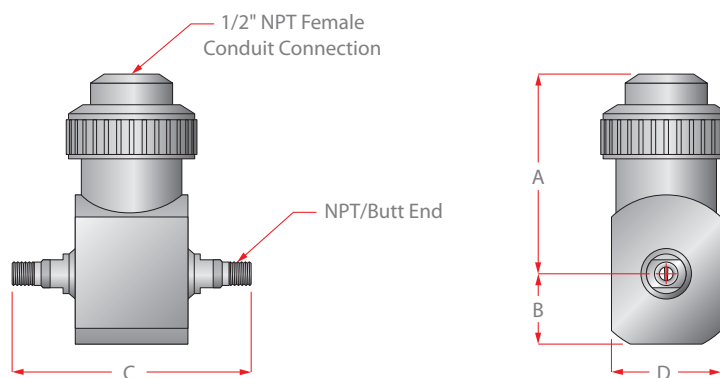
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|---------------------|---------------------|---------------------|-----------------------|
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| 3/4 in. (19.1 mm)   | 2.1 gpm (7.9 lpm)   | 25 gpm (94.6 lpm)   | 12:1                  |
| 1 in. (25.4 mm)     | 4.2 gpm (15.8 lpm)  | 50 gpm (189 lpm)    | 12:1                  |
| 1-1/2 in. (38.1 mm) | 8.3 gpm (31.5 lpm)  | 100 gpm (379 lpm)   | 12:1                  |
| 2 in. (50.8 mm)     | 16.7 gpm (63.1 lpm) | 200 gpm (757 lpm)   | 12:1                  |
| 3 in. (76.2 mm)     | 25 gpm (94.6 lpm)   | 300 gpm (1136 lpm)  | 12:1                  |

**Flare End Fittings**

| <b>Tube Size</b>  | <b>Minimum Flow</b> | <b>Maximum Flow</b> | <b>Turndown Ratio</b> |
|-------------------|---------------------|---------------------|-----------------------|
| 1/2 in. (12.7 mm) | 0.6 gpm (2.3 lpm)   | 5 gpm (19 lpm)      | 8:1                   |
| 3/4 in. (19.1 mm) | 1.3 gpm (4.7 lpm)   | 15 gpm (56.8 lpm)   | 12:1                  |
| 1 in. (25.4 mm)   | 2.1 gpm (7.9 lpm)   | 25 gpm (94.6 lpm)   | 12:1                  |

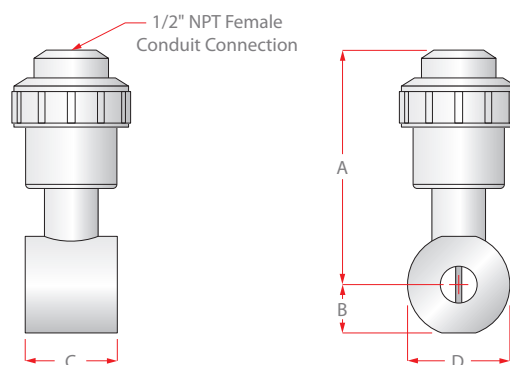
## DIMENSIONS

### NPT/Butt End Fittings



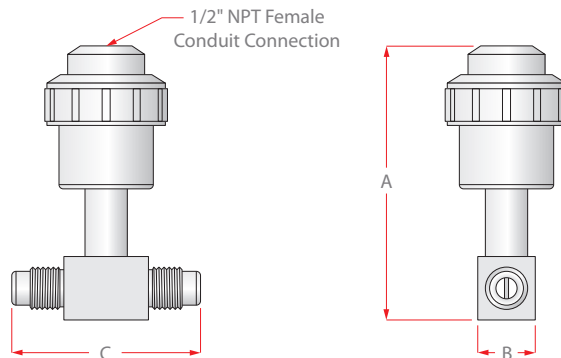
| Meter Size          | PVC/CPVC in. (mm) |           |            |          | PVDF (Butt) in. (mm) |           |            |           |
|---------------------|-------------------|-----------|------------|----------|----------------------|-----------|------------|-----------|
|                     | 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) | 5.9 (150)            | 0.63 (16) | 4.87 (124) | 1.31 (33) |
| 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                 |
| 1/2 in. (12.7 mm)   | 5.85 in. (149 mm) | 0.78 in. (20 mm) | 2.03 in. (52 mm)  | 1.75 in. (44 mm)  |
| 3/4 in. (19.1 mm)   | 5.90 in. (150 mm) | 0.94 in. (24 mm) | 2.03 in. (52 mm)  | 2.13 in. (54 mm)  |
| 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) |

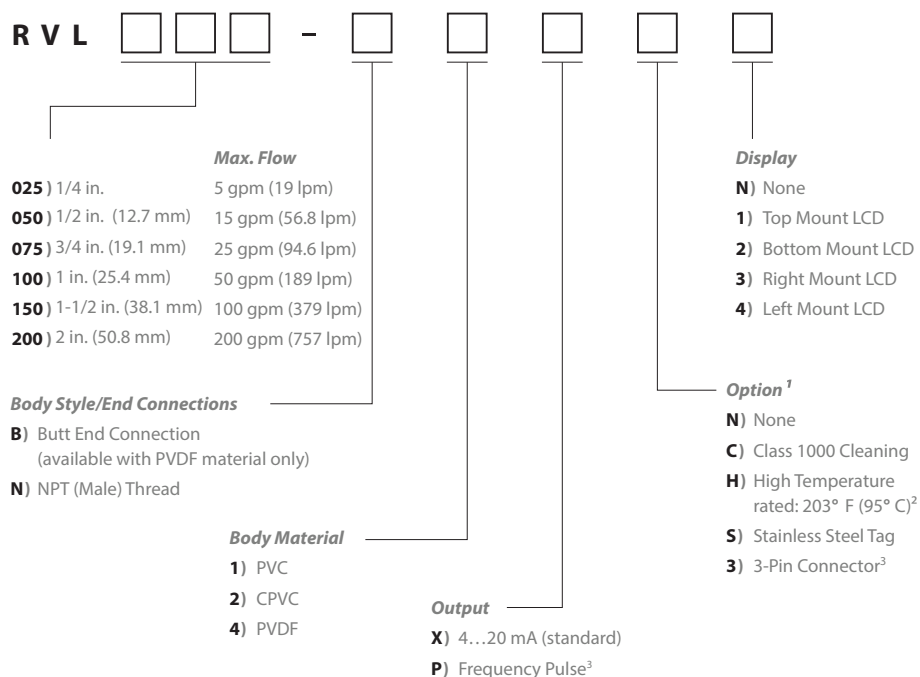
## Flare End Fittings



| Meter Size        | PVDF              |                  |                   |
|-------------------|-------------------|------------------|-------------------|
|                   | A                 | B                | C                 |
| 1/2 in. (12.7 mm) | 6.25 in. (159 mm) | 1.31 in. (33 mm) | 4.87 in. (124 mm) |
| 3/4 in. (19.1 mm) | 6.25 in. (159 mm) | 1.31 in. (33 mm) | 4.66 in. (118 mm) |
| 1 in. (25.4 mm)   | 6.59 in. (167 mm) | 1.44 in. (37 mm) | 5.42 in. (138 mm) |

## PART NUMBER CONSTRUCTION

### NPT/Butt End Fittings

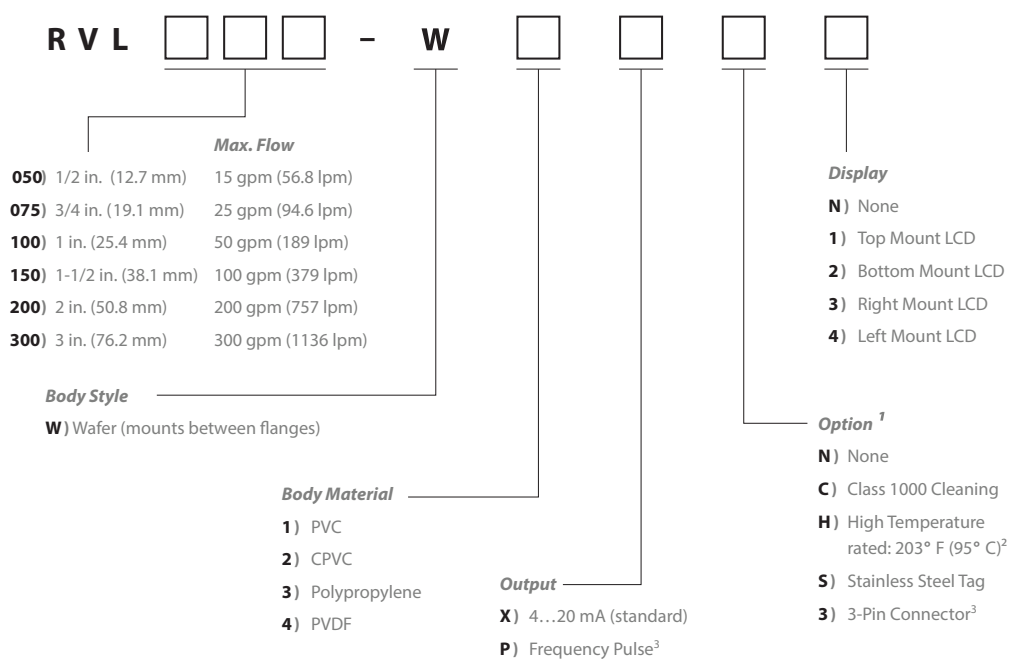


<sup>1</sup> Multiple options may be selected

<sup>2</sup> High Temperature option **ONLY** available with CPVC and PVDF body materials

<sup>3</sup> Not available with display

## Wafer End Fittings

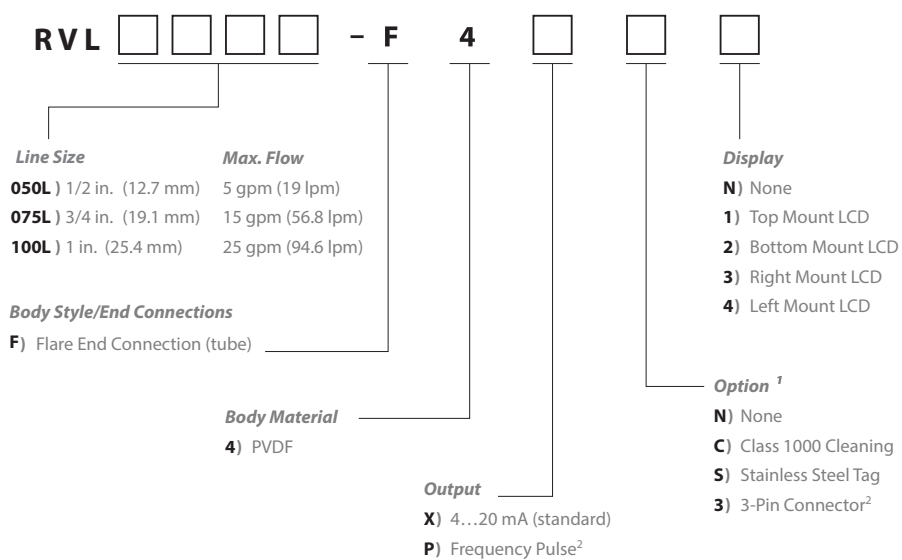


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## Flare End Fittings

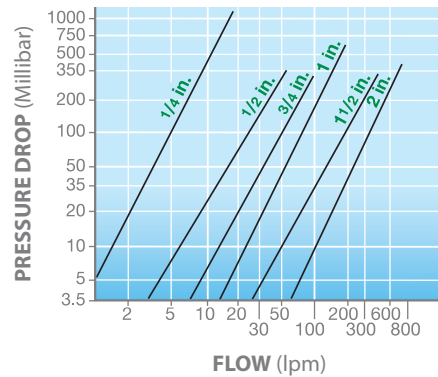
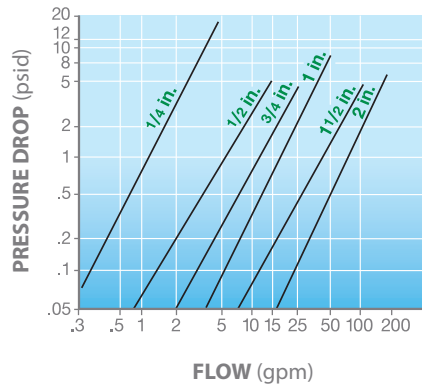


<sup>1</sup> Multiple options may be selected

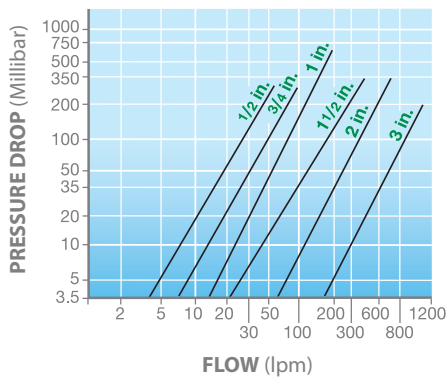
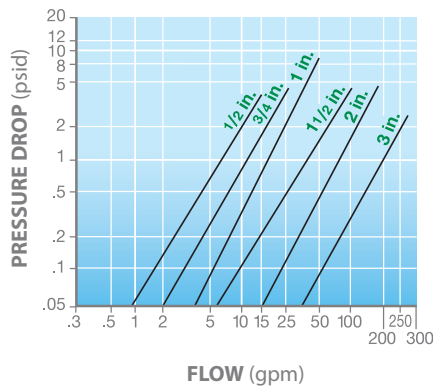
<sup>2</sup> Not available with display

## PRESSURE DROP VS FLOW RATE

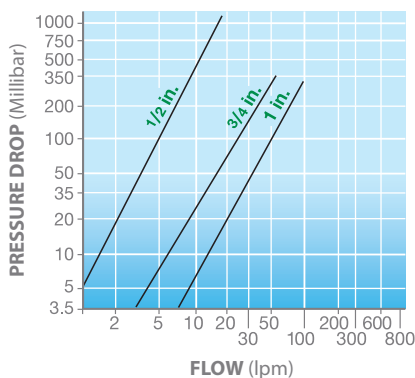
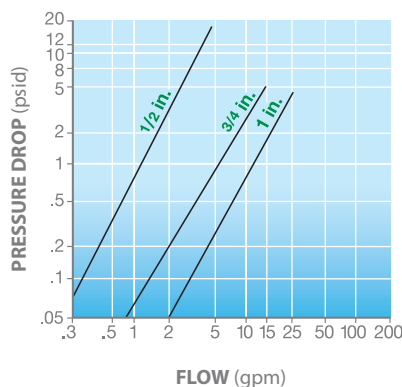
### NPT/Butt End Fittings



### Wafer End Fittings



### Flare End Fittings



## Control. Manage. Optimize.

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