



# **Partek**

*PFA/PTFE Sensing and Control/  
Spray Products*

*Catalog 4183  
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 **WARNING**

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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## Overview

Partek produces products that are made from only the finest Fluoropolymers available. These Fluoropolymers are resistant to numerous chemicals and solvents. This information provides only a brief technical overview. For more comprehensive technical and chemical compatibility information, please ask for Technical Bulletin 0002-T1/USA.

## Fluorinated Polymers

### Chemical Properties

- Flexibility at low temperatures
- Non-solubility
- Long term weatherability
- Non-adhesiveness
- Nonflammability

### Electrical Properties Mechanical Properties

- Resistivity to corrosive agents
- Low dielectric constant
- Low dissipation factor
- Low coefficient of friction
- High arc resistance
- Stability at high temperatures
- High surface resistance
- High volume resistivity

**PTFE** is a fluorocarbon resin that is isostatically compression molded into various shapes and configurations. It is chemically resistant to all chemicals and solvents with the exception of some molten alkali metals, molten sodium hydroxide, elemental fluorine and certain fluorinating agents. At Partek we use PTFE for machining the bodies and components of various valves and manifolds. It offers chemical resistance and stability at high temperatures.

**Modified PTFE** material is used primarily for diaphragms and bellows in our products. This material has the same processing and chemically resistant characteristics as the standard product but offers superior cycle life and integrity in diaphragm products.

**PFA** is a copolymer of tetrafluoroethylene and perfluoroalkyl vinyl ether. The resultant polymer contains the carbon-fluorine backbone chain typical of PTFE, but unlike PTFE, does not require special fabricating techniques. PFA pellets have good melt flow characteristics that allow for processing via extrusion, compression, blow, transfer and injection molding methods. It has outstanding chemical and solvent resistant characteristics over a temperature range even greater than PTFE. PFA is offered in various grades of purity and cleanliness making it the mate-

## C<sub>v</sub> and K<sub>v</sub> Formulas

$$Q = C_v \sqrt{\frac{\Delta P}{SG}}$$

Q = Flow (GPM)  
 $\Delta P$  = Pressure Drop (PSIG)  
 SG = Specific Gravity

$$Q = K_v \sqrt{\frac{\Delta P}{Y}}$$

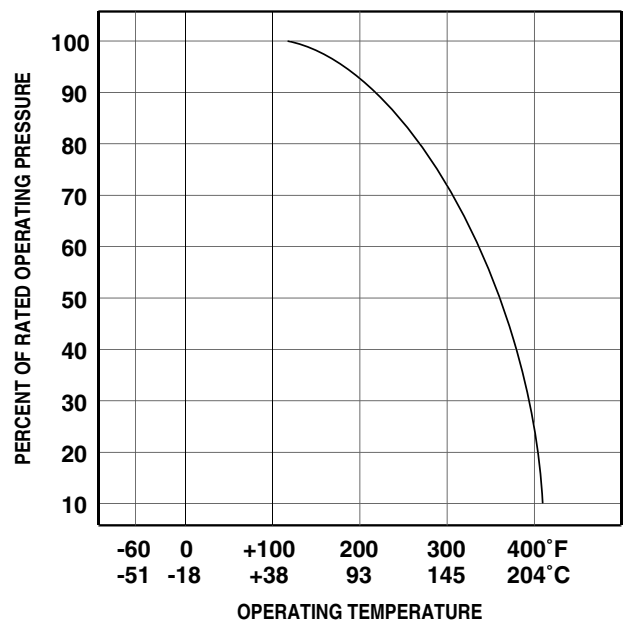
Q = Flow (LPM)  
 $\Delta P$  = Pressure Drop (BAR)  
 Y = Specific Gravity (kg/cm<sup>3</sup>)

$$1 K_v = 14.26 C_v$$

“C<sub>v</sub>” flow factor is the number of gallons of fluid that pass through a given orifice area in one minute, at a pressure drop of 1 PSIG.

“K<sub>v</sub>” flow factor is the number of liters of fluid that pass through a given orifice area in one minute, at a pressure drop of 1 bar.

## PERCENT OF RATED PRESSURE VS. TEMPERATURE



For operation at temperatures above ambient conditions, please refer to the chart above for reduced pressure

# PR-1 Pressure Regulator

## Product Overview

The 1/4" Pressure Regulators are designed for use in high purity semiconductor applications, and are also ideally suited for ultra-pure water and aggressive chemicals. The design utilizes a machined PFA body with precision machined seat.



## Features

**One piece precision machined diaphragms manufactured from the latest technology modified PTFE.**

**Provides over five times the flexural life as compared to conventional PTFE.**

**Non-relieving design- requires a 10 psi differential across the valve.**

**Tongue and groove diaphragm.**

## Benefits

**High cycle life.**

**Lower replacement costs.**

**Less downtime.**

**Stabilizes system pressure. Ideal for use in DI water systems.**

**Low hysteresis.**

**Seal provides protection for springs and adjusting screw.**

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE

Non Wetted Surfaces - ABS, Brass, SS, PVDF, SS Spring, Chrome Vanadium Die Spring, HDPE.

### Pressure Ranges:

Max Primary Pressure - 120 PSIG (8.3 bar)

Secondary Pressure Options - 0 to 30 PSIG and 0 to 60 PSIG

Pressure ranges above are for operation at ambient temperature.

For use at higher temperatures consult Pressure/Temperature chart on page 3.

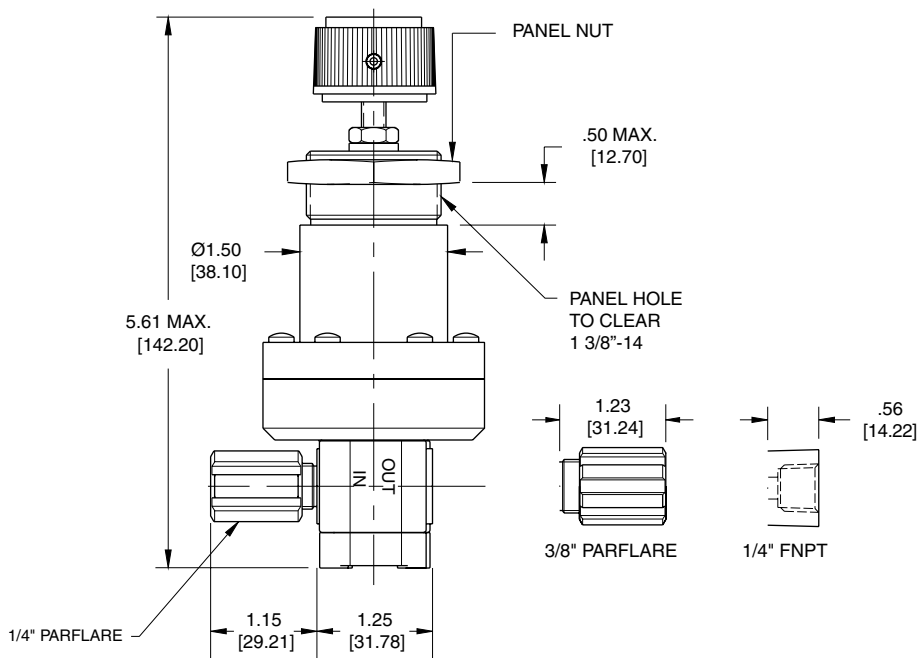
### Temperature Ranges:

0°F - 150°F (-17°C - 66° C) Ambient

0°F - 266°F (-17°C - 130° C) Fluid

# PR-1 Pressure Regulator

BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number | Trim Material | Port Configuration | Secondary Pressure-X                 |
|--------------|---------------|--------------------|--------------------------------------|
| PR-1-2214-X  | HDPE          | 1/4" FNPT          | 1 = 0 to 30 PSIG<br>2 = 0 to 60 PSIG |
| PR-1-2264-X  |               | 1/4" Parflare      |                                      |
| PR-1-2266-X  |               | 3/8" Parflare      |                                      |

# PR-3 Pressure Regulator

## Product Overview

The 1/2" and 1" PTFE Pressure Regulators are designed for use in high purity semiconductor applications, and are also ideally suited for ultra-pure water and aggressive chemicals. The design utilizes a machined PTFE body with precision machined seat and diaphragm sealing area. The large diaphragm allows for quicker reaction time to changes upstream, preventing the effects of pressure surges to be transferred downstream.

## Features

One piece precision machined diaphragms manufactured from the latest technology modified PTFE.

Provides over five times the flexural life as compared to conventional PTFE.

Non-relieving design requires a 10 psi differential across the valve.

Tongue and groove diaphragm.

## Benefits

High cycle life.

Lower replacement costs.

Less downtime.

Stabilizes system pressure. Ideal for use in DI water systems.

Low hysteresis.

Seal provides protection of springs and adjusting screw.

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE

Non Wetted Surfaces - ABS, Brass, SS, PVDF, SS Spring, Chrome Vanadium Die Spring, HDPE.

### Pressure Ranges:

Max Primary Pressure - 120 PSIG (8.3 bar)

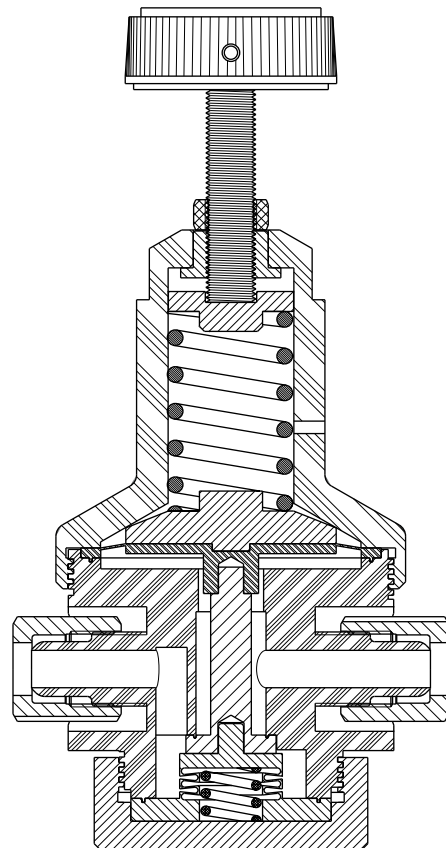
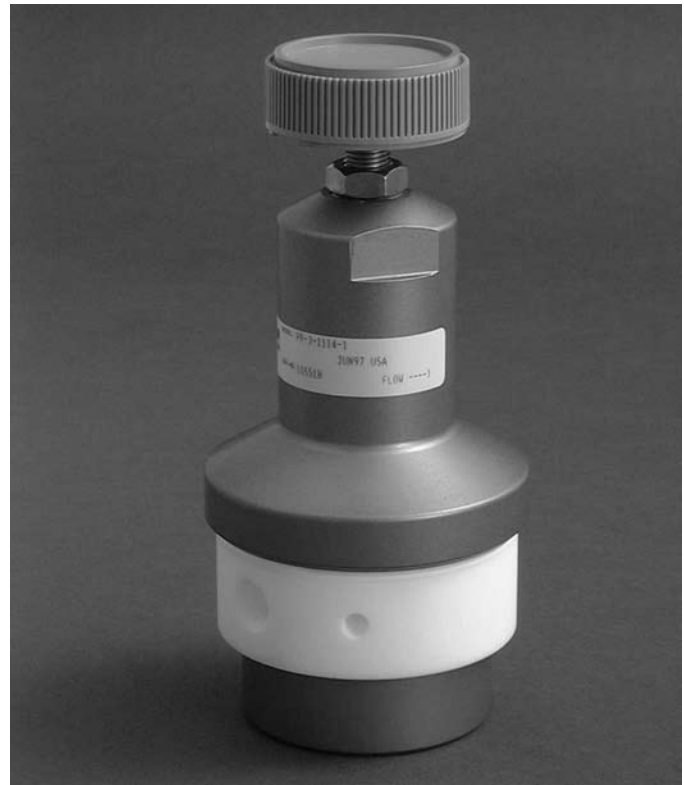
Secondary Pressure Options - 0 to 30 PSIG and 0 to 60 PSIG

Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

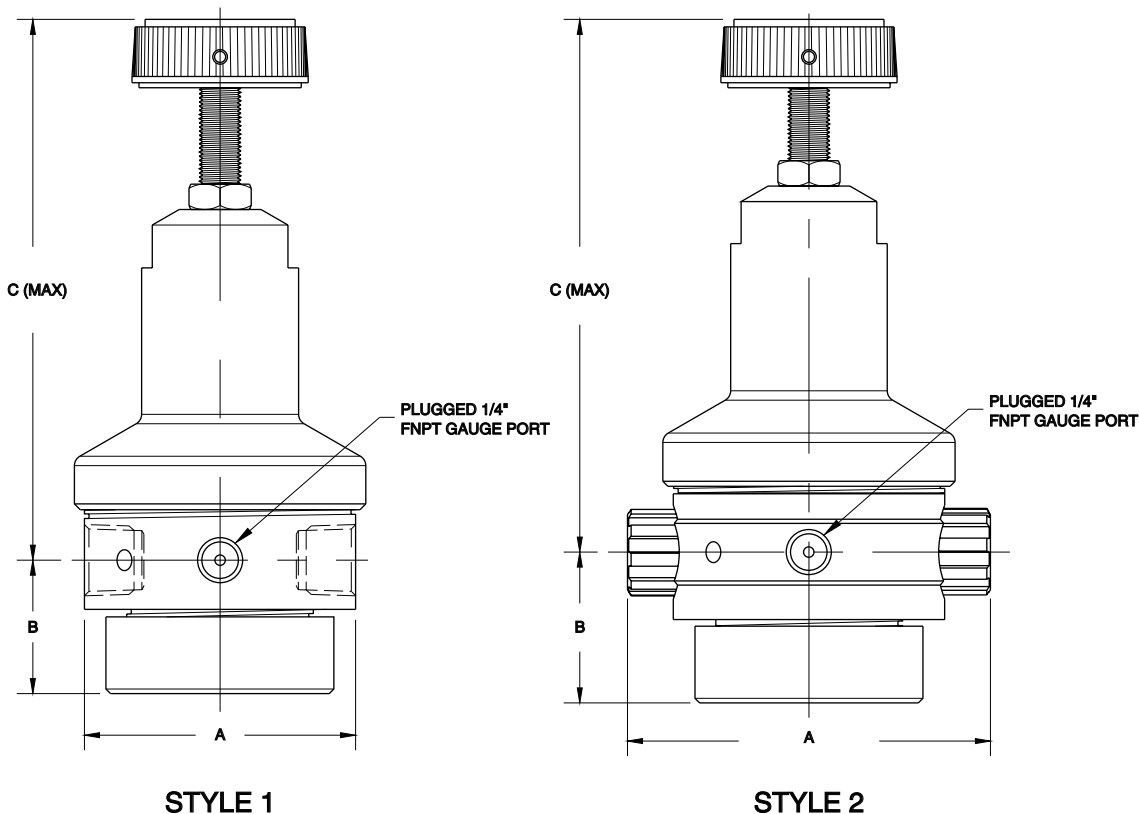
0°F - 150°F (-17°C - 66°C) Ambient

0°F - 266°F (-17°C - 130°C) Fluid



# PR-3 Pressure Regulator

BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number | Style | Trim Material     | Port Configuration | Secondary Pressure-X           | A               | B            | C             |
|--------------|-------|-------------------|--------------------|--------------------------------|-----------------|--------------|---------------|
| PR-3-1118-X  | 1     | Anodized Aluminum | 1/2" FNPT          | 1 = 0-30 PSIG<br>2 = 0-60 PSIG | Ø 3.25 [82.55]  | 1.60 [40.64] | 6.52 [165.61] |
| PR-3-1168-X  | 2     | Anodized Aluminum | 1/2" Parflare      |                                | Ø 4.35 [110.49] | 1.81 [45.97] | 6.63 [168.40] |
| PR-3-11116-X | 1     | Anodized Aluminum | 1" FNPT            |                                | Ø 4.50 [114.30] | 2.45 [62.23] | 7.92 [201.17] |
| PR-3-3118-X  | 1     | PVDF              | 1/2" FNPT          |                                | Ø 3.25 [82.55]  | 1.60 [40.64] | 6.52 [165.61] |
| PR-3-3168-X  | 2     | PVDF              | 1/2" Parflare      |                                | Ø 4.35 [110.49] | 1.81 [45.97] | 6.63 [168.40] |

# PR-08 1/2" Pressure Regulator

## Product Overview

The PR-08 pressure regulator features improved performance with no exposed metals. It is designed for use in high purity fluid handling applications, including ultra-pure water, aggressive chemicals and slurry applications. The design utilizes a machined PTFE body with precision machined seat and diaphragm sealing area. The large diaphragm allows for greater sensitivity to changes upstream, preventing the effects of pressure surges being transferred downstream.

## Features

One piece precision machined diaphragm manufactured from modified PTFE (provides over five times the flexural life as compared to conventional PTFE)

Non-relieving design requires 5 psi differential across the valve

Tongue and groove diaphragm seal

Positionable mounting ring

Flow direction arrow

## Benefits

High cycle life, lower replacement cost, excellent cleanliness and less downtime

Stabilizes system pressure, better droop characteristics and low hysteresis

Ensures product reliability and contains media from atmosphere

For ease of installation and time savings

Ensures proper installation



## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE, PTFE  
Non Wetted Surfaces - Polypro, PTFE, PFA, PVDF, SS Ball, PTFE coated SS Spring, SS Spring

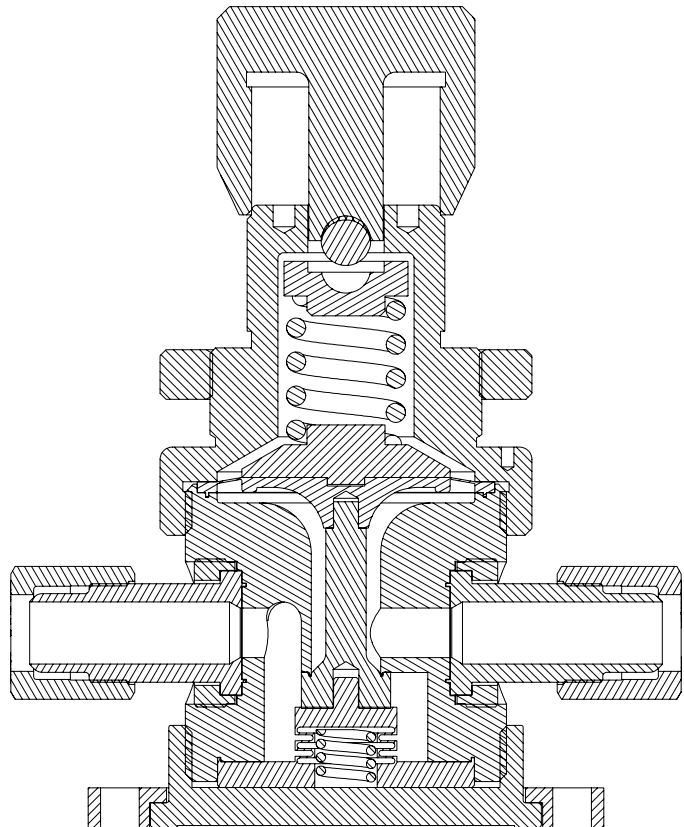
### Pressure Range:

Max Primary (Upstream) Pressure - 120 PSIG (8.3 bar)  
Max Secondary (Downstream) - 60 PSIG (4.1 bar)

Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure vs. Temperature chart on page 3.

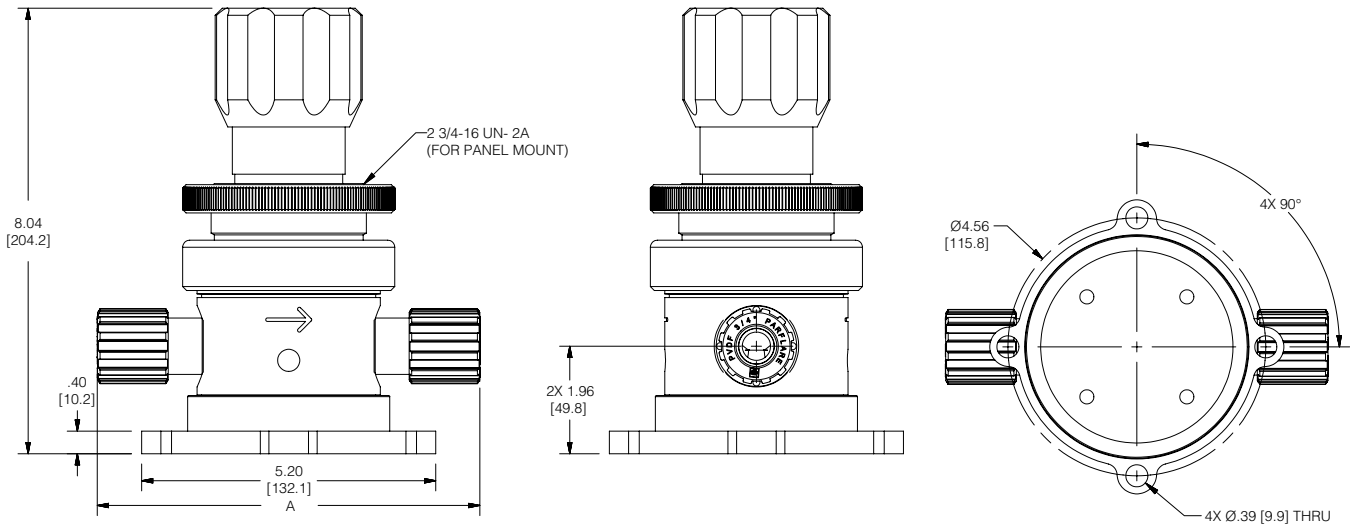
### Temperature Range:

0°F - 150°F (-17°C - 66°C) Ambient  
0°F - 266°F (-17°C - 130°C) Fluid



# PR-08 1/2" Pressure Regulator

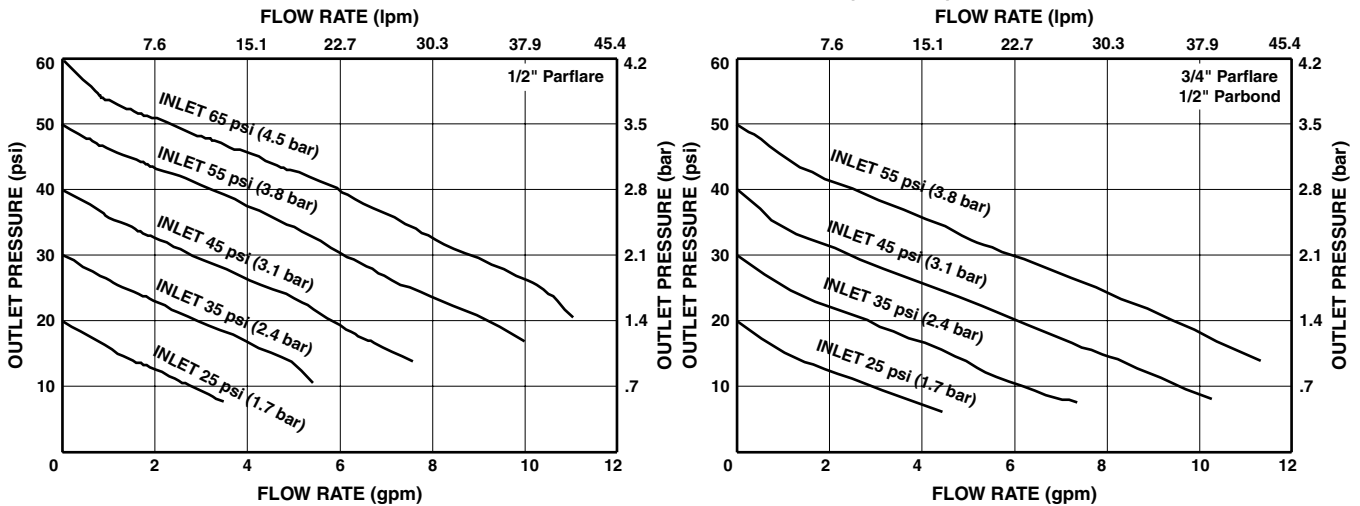
BRACKETED DIMENSIONS  
ARE IN mm.



| Part Number   | Body Material | Housing Material | Secondary Pressure | Port Connection | Panel Nut | A inch [mm]   |
|---------------|---------------|------------------|--------------------|-----------------|-----------|---------------|
| PR-08-52608   | PTFE          | POLYPRO          | 0-60 PSIG          | 1/2" Parflare   | No        | 6.29 [159.77] |
| PR-08-52612   |               |                  |                    | 3/4" Parflare   |           | 6.77 [171.96] |
| PR-08-52708   |               |                  |                    | 1/2" Parbond    |           | 6.19 [157.23] |
| PR-08-52712   |               |                  |                    | 3/4" Parbond    |           | 6.19 [157.23] |
| PR-08-52608-P | PTFE          | POLYPRO          | 0-60 PSIG          | 1/2" Parflare   | Yes       | 6.29 [159.77] |
| PR-08-52612-P |               |                  |                    | 3/4" Parflare   |           | 6.77 [171.96] |
| PR-08-52708-P |               |                  |                    | 1/2" Parbond    |           | 6.19 [157.23] |
| PR-08-52712-P |               |                  |                    | 3/4" Parbond    |           | 6.19 [157.23] |

Additional end connections available upon request.

## OUTLET PRESSURE VS. FLOW RATE (DROOP)



# DPR-08 Pressure Regulator

## Product Overview

The DPR-08 dome loaded pressure regulator features improved performance with no exposed metals. It is designed for use in high purity fluid handling applications, including ultra-pure water, aggressive chemicals and slurry applications. The design utilizes a machined PTFE body with precision machined seat and diaphragm sealing area. The large diaphragm allows for greater sensitivity to changes upstream, preventing the effects of pressure surges being transferred downstream.



## Features

One piece precision machined diaphragm manufactured from modified PTFE (provides over five times the flexural life as compared to conventional PTFE)

Non-relieving design requires 5 psi differential across the valve

Tongue and groove diaphragm seal

Positionable mounting ring

Flow direction arrow

## Benefits

High cycle life, lower replacement cost, excellent cleanliness and less downtime

Stabilizes system pressure, better droop characteristics and low hysteresis

Ensures product reliability and contains media from atmosphere

For ease of installation and time savings

Ensures proper installation

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE, PTFE  
Non Wetted Surfaces - Polypro, PTFE, PFA, PVDF, SS Spring

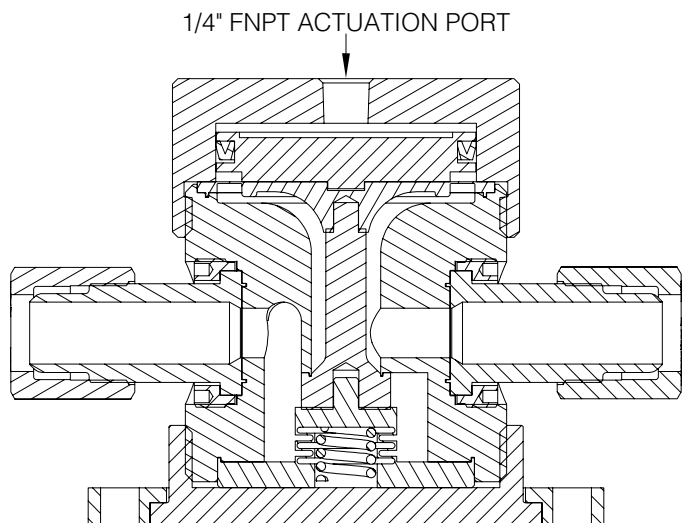
### Pressure Range:

Max Primary (Upstream) Pressure - 120 PSIG (8.3 bar)  
Max Secondary (Downstream) - 60 PSIG (4.1 bar)

Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure vs. Temperature chart on page 3 of Catalog 4183.

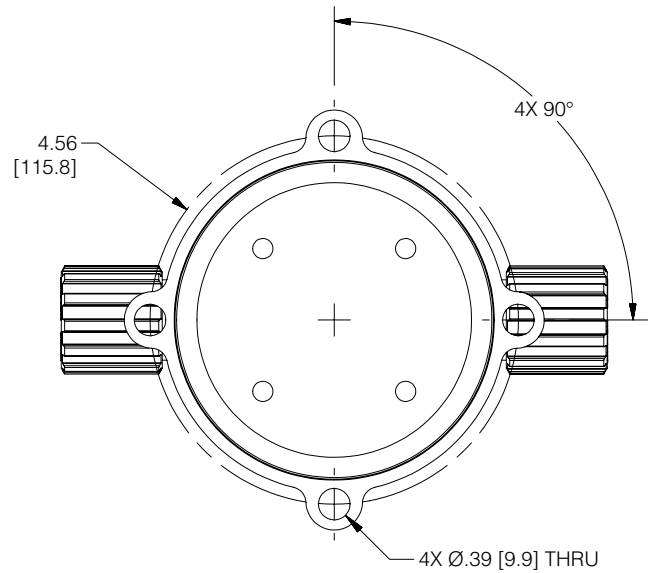
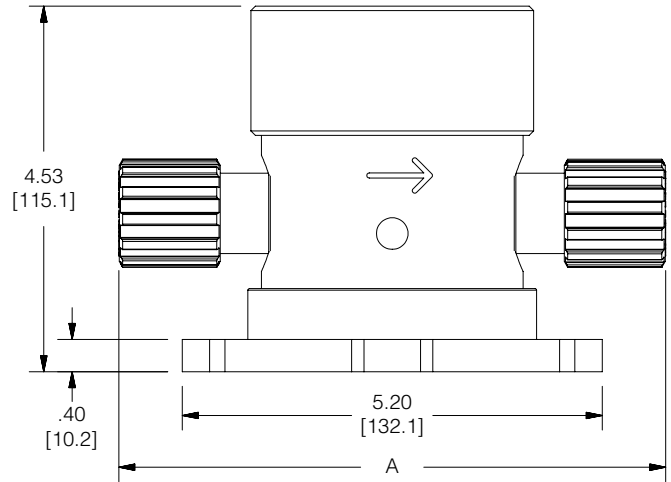
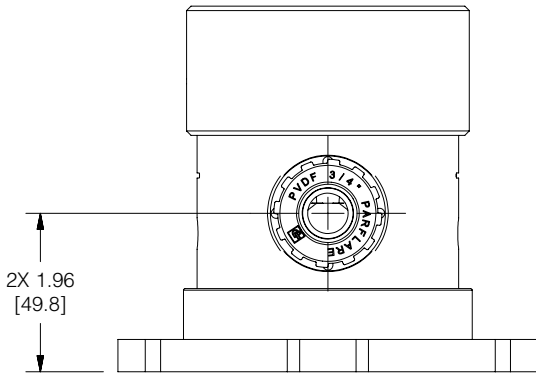
### Temperature Range:

0°F - 150°F (-17°C - 66°C) Ambient  
0°F - 266°F (-17°C - 130°C) Fluid



# DPR-08 Pressure Regulator

BRACKETED DIMENSIONS  
ARE IN mm.



| Part Number  | Body Material | Housing Material | Secondary Pressure | Port Connection | Panel Nut | A inch [mm]   |
|--------------|---------------|------------------|--------------------|-----------------|-----------|---------------|
| DPR-08-52608 | PTFE          | POLYPRO          | 0-60 PSIG          | 1/2" Parflare   | No        | 6.29 [159.77] |
| DPR-08-52612 |               |                  |                    | 3/4" Parflare   |           | 6.77 [171.96] |
| DPR-08-52708 |               |                  |                    | 1/2" Parbond    |           | 6.19 [157.23] |
| DPR-08-52712 |               |                  |                    | 3/4" Parbond    |           | 6.19 [157.23] |

Additional end connections available upon request.

# BR-1 Back Pressure Regulator

## Product Overview

The 1/4" PTFE Back Pressure Regulators are designed for use in high purity semiconductor applications, and are also ideally suited for ultra-pure water and aggressive chemicals. The design utilizes a PFA body with precision machined seats.



## Features

**One piece precision machined diaphragm manufactured from the latest technology modified PTFE.**

**Provides over five times the flexural life as compared to conventional PTFE.**

**Non-relieving design requires a 10 psi differential across the valve.**

**Tongue and groove diaphragm.**

## Benefits

**High cycle life.**

**Lower replacement costs.**

**Less downtime.**

**Stabilizes system pressure. Ideal for use in DI water systems.**

**Low hysteresis.**

**Seal provides protection for springs and adjusting screw.**

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE

Non Wetted Surfaces - ABS, Brass, SS, PVDF, SS Spring, Chrome Vanadium Die Spring, HDPE.

### Pressure Ranges:

Max Primary Pressure - 120 PSIG (8.3 bar)

Secondary Pressure Options - 0 to 30 PSIG and 0 to 60 PSIG

Pressure ranges above are for operation at ambient temperature.

For use at higher temperatures consult Pressure/Temperature chart on page 3.

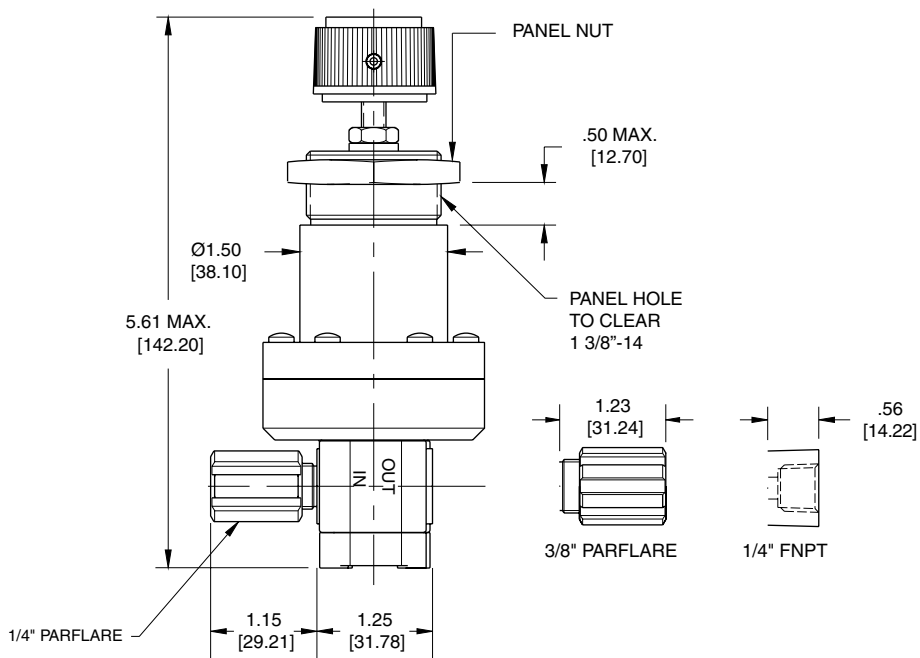
### Temperature Ranges:

0°F - 150°F (-17°C - 66°C) Ambient

0°F - 266°F (-17°C - 130°C) Fluid

# BR-1 Back Pressure Regulator

BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number | Trim Material | Port Configuration | Secondary Pressure-X                 |
|--------------|---------------|--------------------|--------------------------------------|
| BR-1-2214-X  | HDPE          | 1/4" FNPT          | 1 = 0 to 30 PSIG<br>2 = 0 to 60 PSIG |
| BR-1-2264-X  |               | 1/4" Parflare      |                                      |
| BR-1-2266-X  |               | 3/8" Parflare      |                                      |

# BR-3 Back Pressure Regulator

## Product Overview

The 1/2" and 1" PTFE Back Pressure Regulators are designed for use in high purity semiconductor applications, and are also ideally suited for use in ultra-pure water and aggressive chemicals. The design utilizes a machined PTFE body with precision machined seat and diaphragm sealing area. The larger diaphragm allows for quicker reaction time to changes upstream, preventing pressure surges from affecting and changing upstream processes.

## Features

One piece precision machined diaphragm manufactured from the latest technology modified PTFE.

Provides over five times the flexural life as compared to conventional PTFE.

Non-relieving design requires a 10 psi differential across the valve.

Tongue and groove diaphragm.

## Benefits

High cycle life.

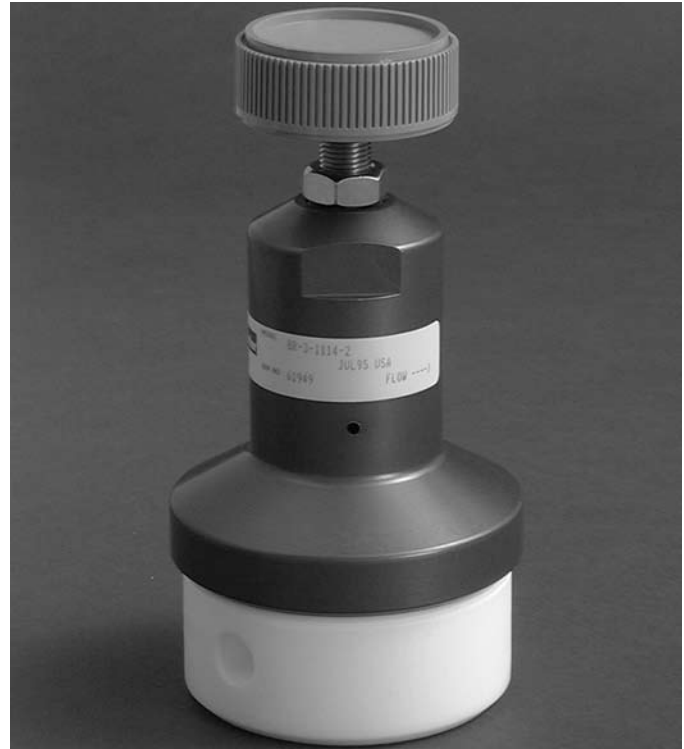
Lower replacement costs.

Less downtime.

Stabilizes system. Ideal for DI water systems.

Low Hysteresis.

Seal provides protection of springs and adjusting screw.



## Specifications

### Materials of Construction:

Wetted Surfaces - PTFE, Modified PTFE

Non Wetted Surfaces - Anodized Aluminum, ABS, Brass, SS, PVDF, SS Spring, Chrome Vanadium Die Spring, HDPE.

### Pressure Ranges:

Max Primary Pressure - 120 PSIG (8.3 bar)

Secondary Pressure Options - 0 to 30 PSIG and 0 to 60 PSIG

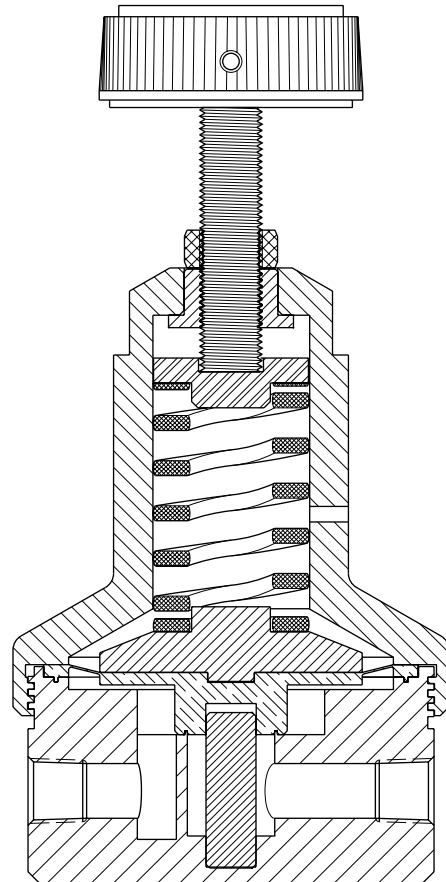
Pressure ranges above are for operation at ambient temperature.

For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

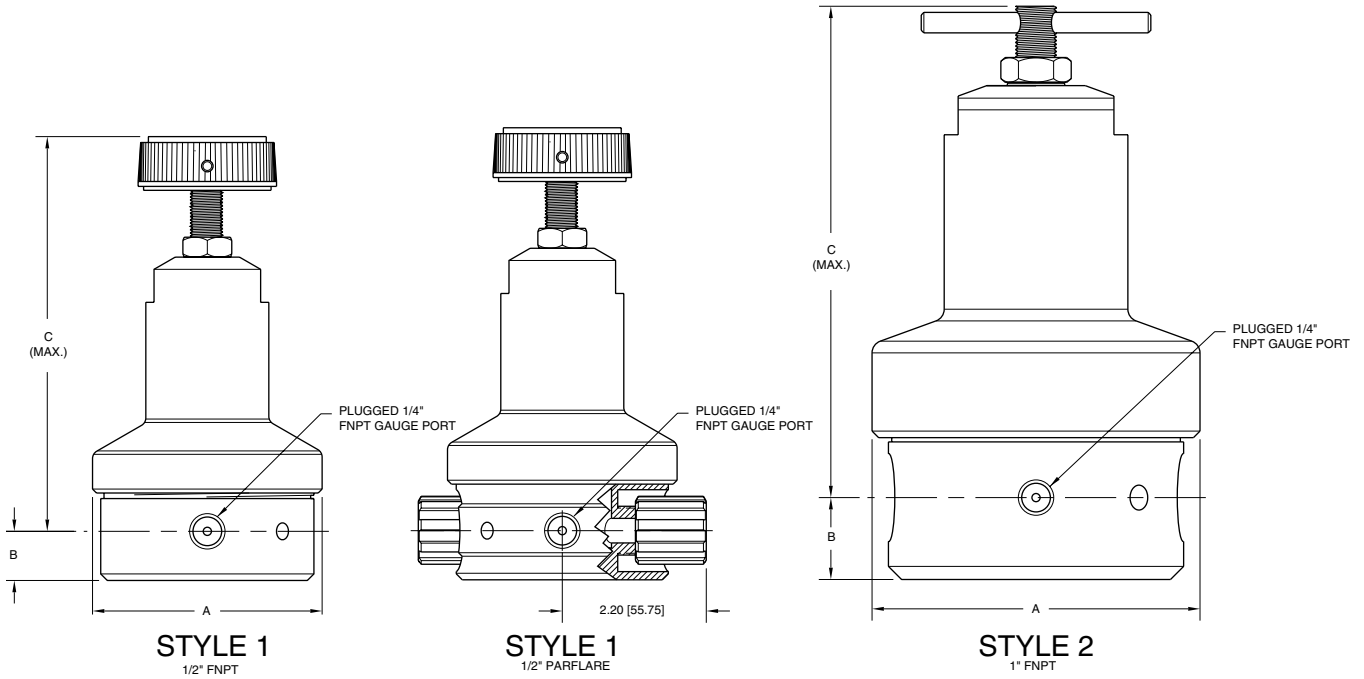
0°F - 150°F (-17°C - 66°C) Ambient

0°F - 266°F (-17°C - 130°C) Fluid



# BR-3 Back Pressure Regula-

BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number | Style | Trim Material     | Port Configuration | Secondary Pressure-X           | A               | B            | C             |
|--------------|-------|-------------------|--------------------|--------------------------------|-----------------|--------------|---------------|
| BR-3-1118-X  | 1     | Anodized Aluminum | 1/2" FNPT          | 1 = 0-30 PSIG<br>2 = 0-60 PSIG | Ø 3.50 [88.90]  | .75 [19.05]  | 6.52 [165.61] |
| BR-3-1168-X  | 1     | Anodized Aluminum | 1/2" Parflare      |                                | Ø 3.50 [88.90]  | .75 [19.05]  | 6.65 [168.91] |
| BR-3-11116-X | 2     | Anodized Aluminum | 1" FNPT            |                                | Ø 5.00 [127.00] | 1.25 [31.75] | 8.15 [207.01] |
| BR-3-3118-X  | 1     | PVDF              | 1/2" FNPT          |                                | Ø 3.50 [88.90]  | .75 [19.05]  | 6.52 [165.61] |
| BR-3-3168-X  | 1     | PVDF              | 1/2" Parflare      |                                | Ø 3.50 [88.90]  | .75 [19.05]  | 6.65 [168.91] |

# BR-08 1/2" Back Pressure Regulator

## Product Overview

The BR-08 back pressure regulator features improved performance with no exposed metals. It is designed for use in high purity fluid handling applications, including ultra-pure water, aggressive chemicals and slurry applications. The design utilizes a machined PTFE body with precision machined seat and diaphragm sealing area. The large diaphragm allows for greater sensitivity to changes downstream, preventing the effects of pressure surges being transferred upstream.

## Features

One piece precision machined diaphragm manufactured from modified PTFE (provides over five times the flexural life as compared to conventional PTFE)

Non-relieving design requires 5 psi differential across the valve

Tongue and groove diaphragm seal

Positionable mounting ring

Flow direction arrow

## Benefits

High cycle life, lower replacement cost, excellent cleanliness and less downtime

Stabilizes system pressure, better droop characteristics and low hysteresis

Ensures product reliability and contains media from atmosphere

For ease of installation and time savings

Ensures proper installation



## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE, PTFE  
Non Wetted Surfaces - Polypro, PTFE, PFA, PVDF, SS Ball, PTFE coated SS Spring, SS Spring

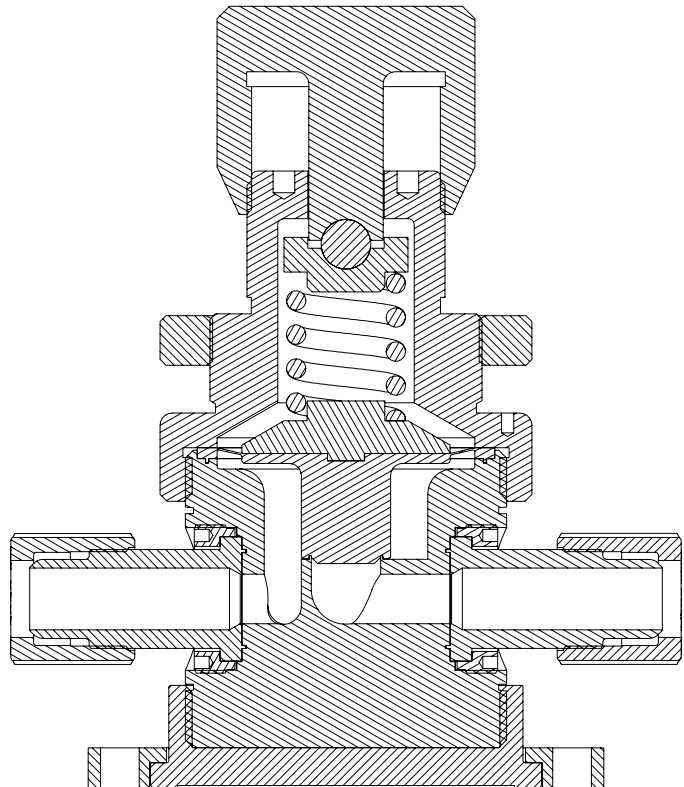
### Pressure Range:

Max Primary (Upstream) Pressure - 120 PSIG (8.3 bar)  
Max Secondary (Downstream) - 60 PSIG (4.1 bar)

Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure vs. Temperature chart on page 3.

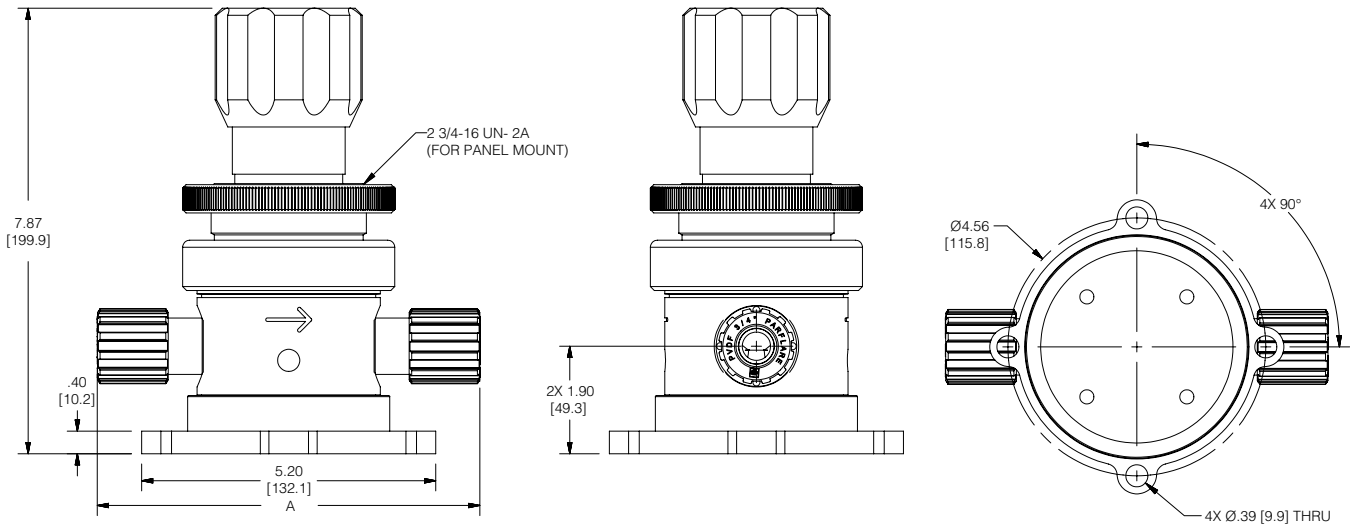
### Temperature Range:

0°F - 150°F (-17°C - 66°C) Ambient  
0°F - 266°F (-17°C - 130°C) Fluid



# BR-08 1/2" Back Pressure Regulator

BRACKETED DIMENSIONS  
ARE IN mm.



| Part Number   | Body Material | Housing Material | Secondary Pressure | Port Connection | Panel Nut | A inch [mm]   |
|---------------|---------------|------------------|--------------------|-----------------|-----------|---------------|
| BR-08-52608   | PTFE          | POLYPRO          | 0-60 PSIG          | 1/2" Parflare   | No        | 6.29 [159.77] |
| BR-08-52612   |               |                  |                    | 3/4" Parflare   |           | 6.77 [171.96] |
| BR-08-52708   |               |                  |                    | 1/2" Parbond    |           | 6.19 [157.23] |
| BR-08-52712   |               |                  |                    | 3/4" Parbond    |           | 6.19 [157.23] |
| BR-08-52608-P | PTFE          | POLYPRO          | 0-60 PSIG          | 1/2" Parflare   | Yes       | 6.29 [159.77] |
| BR-08-52612-P |               |                  |                    | 3/4" Parflare   |           | 6.77 [171.96] |
| BR-08-52708-P |               |                  |                    | 1/2" Parbond    |           | 6.19 [157.23] |
| BR-08-52712-P |               |                  |                    | 3/4" Parbond    |           | 6.19 [157.23] |

Additional end connections available upon request.

# DBR-08 Dome Loaded Back Pressure Regulator

## Product Overview

The DBR-08 dome loaded back pressure regulator features improved performance with no exposed metals. It is designed for use in high purity fluid handling applications, including ultra-pure water, aggressive chemicals and slurry applications. The design utilizes a machined PTFE body with precision machined seat and diaphragm sealing area. The large diaphragm allows for greater sensitivity to changes downstream, preventing the effects of pressure surges being transferred upstream.



## Features

One piece precision machined diaphragm manufactured from modified PTFE (provides over five times the flexural life as compared to conventional PTFE)

Non-relieving design requires 5 psi differential across the valve

Tongue and groove diaphragm seal

Positionable mounting ring

Flow direction arrow

## Benefits

High cycle life, lower replacement cost, excellent cleanliness and less downtime

Stabilizes system pressure, better droop characteristics and low hysteresis

Ensures product reliability and contains media from atmosphere

For ease of installation and time savings

Ensures proper installation

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE, PTFE  
Non Wetted Surfaces - Polypro, PTFE, PFA, PVDF

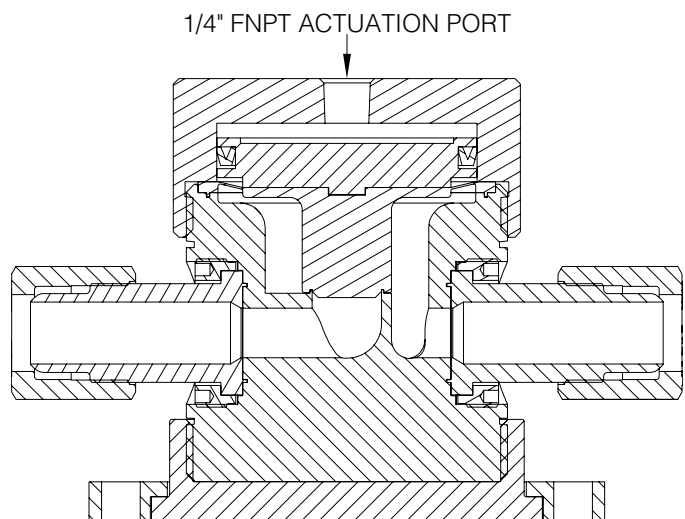
### Pressure Range:

Max Primary (Upstream) Pressure - 120 PSIG (8.3 bar)  
Max Secondary (Downstream) - 60 PSIG (4.1 bar)

Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure vs. Temperature chart on page 3 of Catalog 4183.

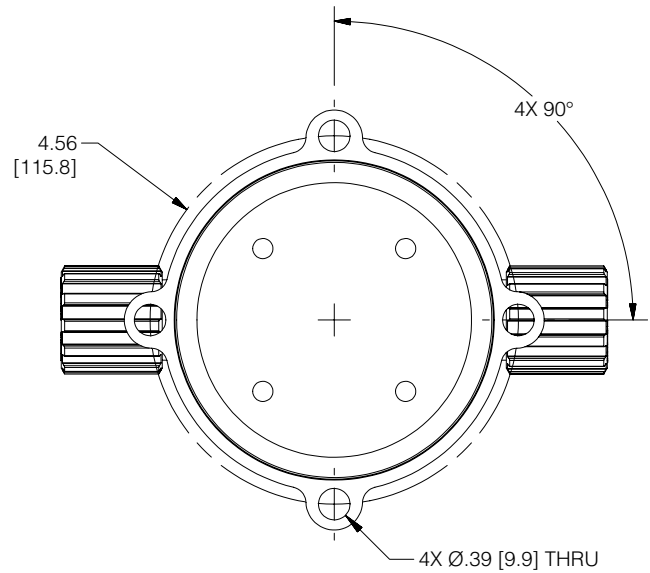
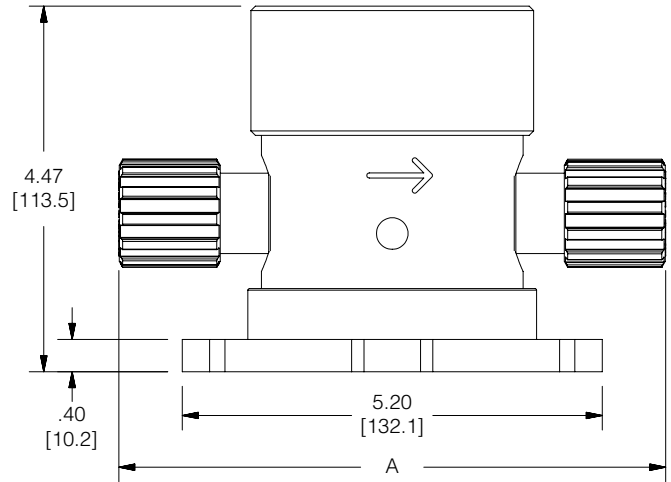
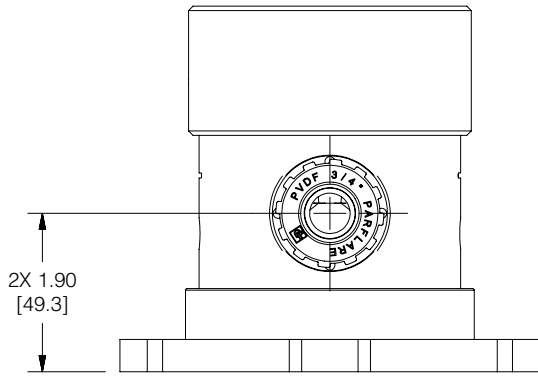
### Temperature Range:

0°F - 150°F (-17°C - 66°C) Ambient  
0°F - 266°F (-17°C - 130°C) Fluid



# DBR-08 Dome Loaded Back Pressure Regulator

BRACKETED DIMENSIONS  
ARE IN mm.



| Part Number  | Body Material | Housing Material | Secondary Pressure | Port Connection | Panel Nut | A inch [mm]   |
|--------------|---------------|------------------|--------------------|-----------------|-----------|---------------|
| DBR-08-52608 | PTFE          | POLYPRO          | 0-60 PSIG          | 1/2" Parflare   | No        | 6.29 [159.77] |
| DBR-08-52612 |               |                  |                    | 3/4" Parflare   |           | 6.77 [171.96] |
| DBR-08-52708 |               |                  |                    | 1/2" Parbond    |           | 6.19 [157.23] |
| DBR-08-52712 |               |                  |                    | 3/4" Parbond    |           | 6.19 [157.23] |

Additional end connections available upon request.

# FM-3 Flowmeter

## Product Overview

The PFA/PTFE Flowmeter is designed for all high purity applications where precise measurement and control of liquids are required. The FM-3 Flowmeter utilizes precision machined PTFE bodies and needle valve components and a molded high purity PFA barrel. Rather than typical face-to-face seals, the FM-3 utilizes tongue and groove technology to seal the barrel to the bodies, creating a more positive seal. An integral needle valve is also available. Panel nut mounting is standard regardless of the type of end connection.



## Features

Tongue and groove barrel to body seals.

Molded PFA barrel.

Numerous end connections and flow rates.

## Benefits

Zero leakage and allows 360 degree port orientation.

PFA is most chemically compatible and its translucency makes for precise flow measurement.

Versatility to provide exact model for application.

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA and PTFE  
External Surfaces - PTFE, PFA, and PVDF

### Pressure Ranges:

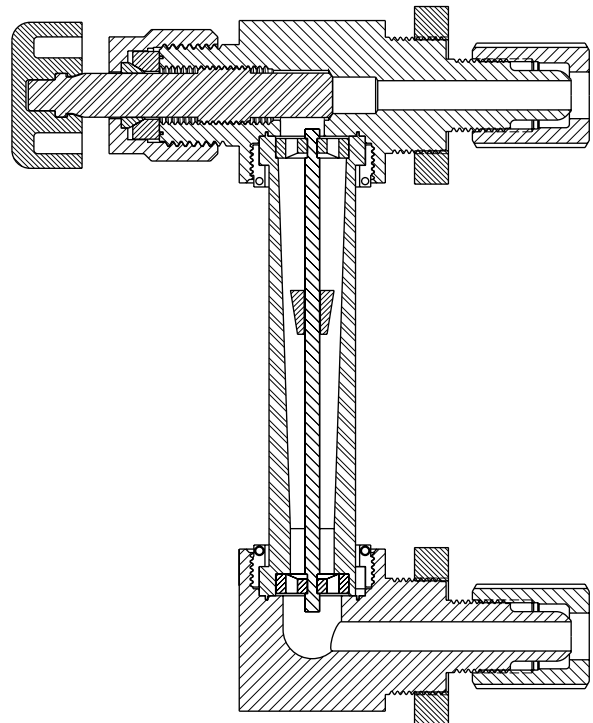
0 to 120 PSIG (8.3 bar)

Pressure range above is for operation at ambient temperatures. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

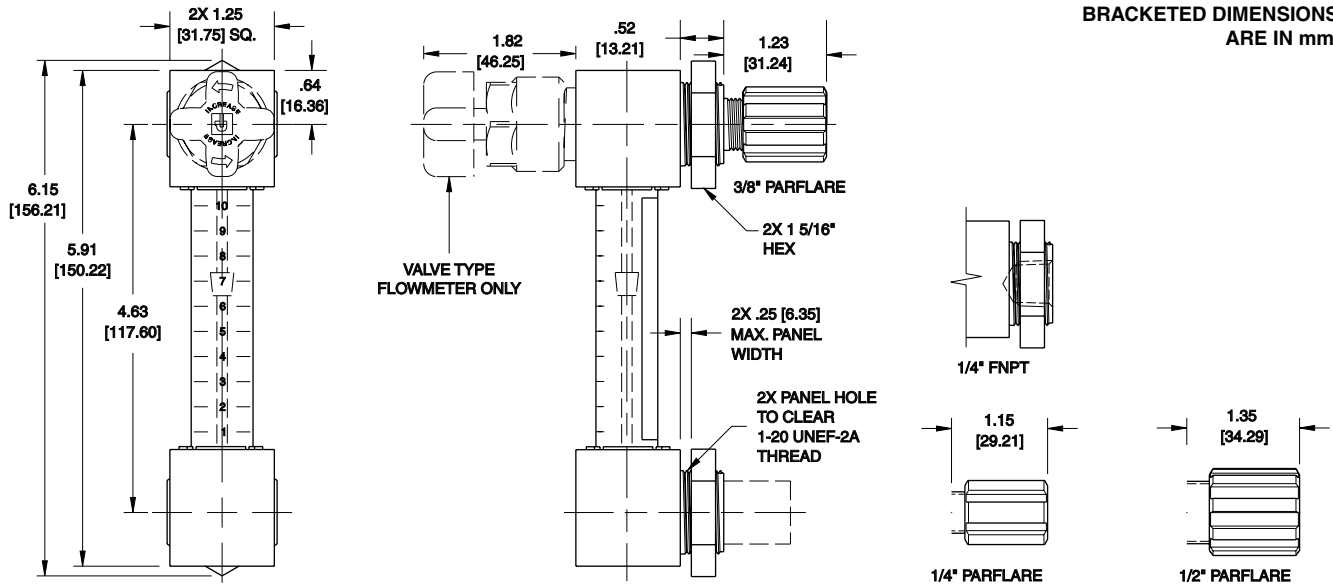
0° - 212° F (-17° - 100° C) Ambient

0° - 266° F (-17° - 130° C) Liquid



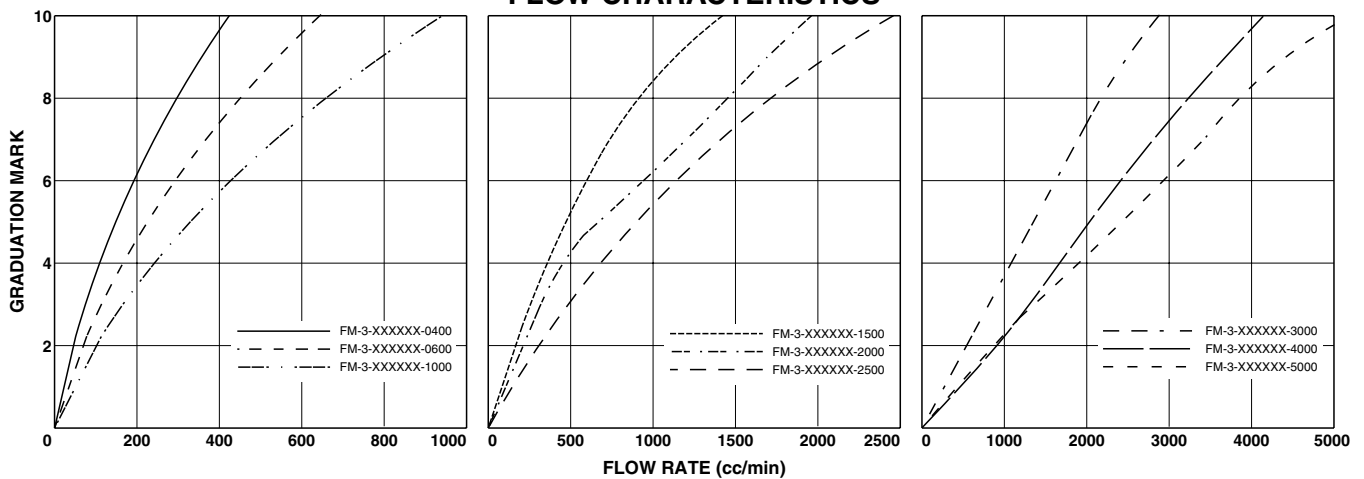
# FM-3 Flowmeter

BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number                                | Needle Valve-X <sub>1</sub> | Inlet/Outlet Connection Type | Inlet/Outlet Connection Size | Flow Range-XXXX <sub>2</sub>  |
|---|-----------------------------|------------------------------|------------------------------|---|
| FM-3-1X <sub>1</sub> 1144-XXXX <sub>2</sub> | 0 = No<br>1 = Yes           | FNPT                         | 1/4"                         | 0400 = 100 - 400 cc/min<br>0600 = 100 - 600 cc/min<br>1000 = 100 - 1,000 cc/min<br>1500 = 170 - 1,500 cc/min<br>2000 = 250 - 2,000 cc/min<br>2500 = 300 - 2,500 cc/min<br>3000 = 600 - 3,000 cc/min<br>4000 = 1,100 - 4,000 cc/min<br>5000 = 1,200 - 5,000 cc/min |
| FM-3-1X <sub>1</sub> 6644-XXXX <sub>2</sub> |                             | Parflare                     | 1/4"                         |   |
| FM-3-1X <sub>1</sub> 6666-XXXX <sub>2</sub> |                             | Parflare                     | 3/8"                         |   |
| FM-3-1X <sub>1</sub> 6688-XXXX <sub>2</sub> |                             | Parflare                     | 1/2"                         |   |

## FLOW CHARACTERISTICS



# FM-4 Flowmeter

## Product Overview

The PFA/PTFE Flowmeter is designed for all high purity applications where precise measurement and control of liquids are required. The FM-4 Flowmeter utilizes precision machined PTFE bodies and needle valve components and a high purity PFA barrel. Rather than typical face-to-face seals, the FM-4 utilizes compression technology to seal the barrel to the bodies, creating a more positive seal. Standard features are an integral needle valve for flow control and panel nuts for mounting.



## Features

Compression barrel to body seals.

PFA barrel.

Unique PTFE float design.

Zero metal.

## Benefits

Zero leakage and allows 360 degree port orientation.

PFA is most chemically compatible and its translucency makes for precise flow measurement.

Allows for consistent read out and visibility in many chemicals.

Higher resistance to deionized water and chemicals.

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA and PTFE

External Surfaces - PTFE, PFA, PolyPro and PVDF

### Pressure Ranges:

0 to 120 PSIG (8.3 bar)

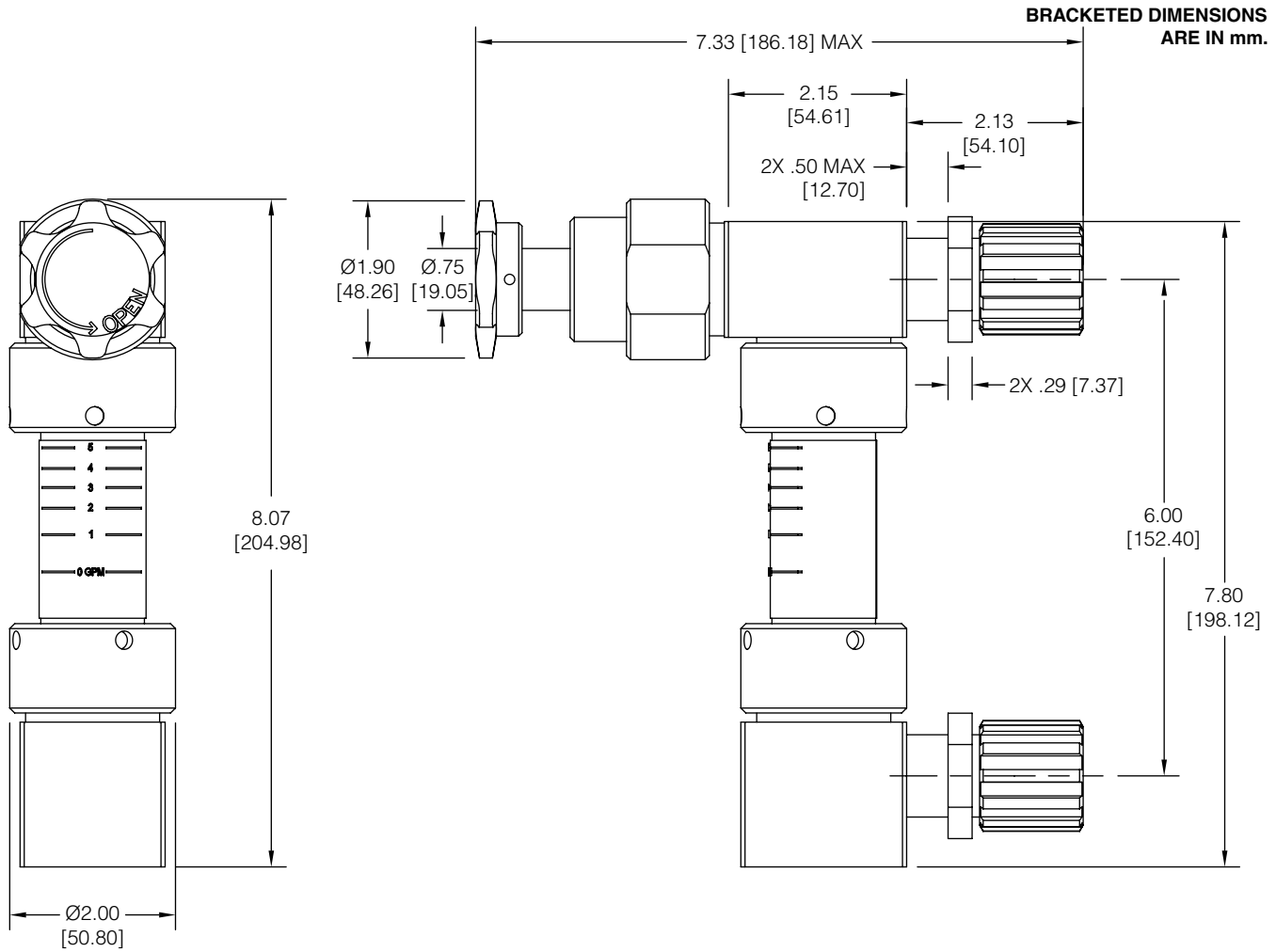
Pressure range above is for operation at ambient temperatures. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

0° - 212° F (-17° - 100° C) Ambient

0° - 266° F (-17° - 130° C) Liquid

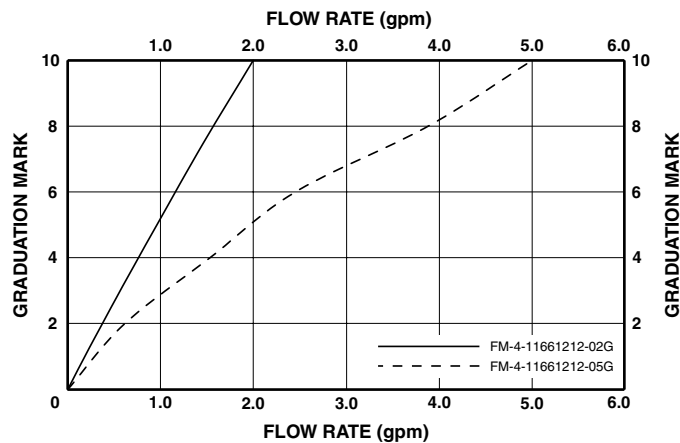
# FM-4 Flowmeter



| Model Number      | Needle Valve | Inlet/Outlet Connection Type | Inlet/Outlet Connection Size | Flow Range |
|-------------------|--------------|------------------------------|------------------------------|------------|
| FM-4-11661212-02G | Yes          | Parflare                     | 3/4"                         | 2 GPM      |
| FM-4-11661212-05G | Yes          | Parflare                     | 3/4"                         | 5 GPM      |

Direct read out labels are provided for deionized water only. 0-10 read out are provided for all other chemicals.

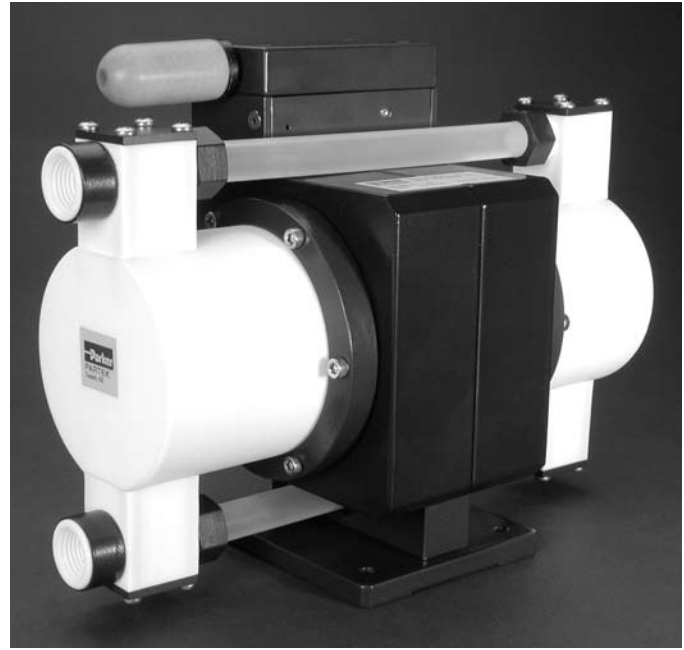
## FLOW CHARACTERISTICS



# PP Pneumatic Bellows Pump

## Product Overview

The PTFE Pneumatic Bellows Pump is designed for use in ultra-pure water and aggressive chemical applications. The design utilizes a double bellows design to provide reliable continuous or intermittent duty. The high bellows stroke rate minimizes pulsation and provides smooth more consistent delivery of media.



## Features

Precision machined bellows manufactured from the latest technology modified PTFE. Provides over five times the flexural life as compared to conventional PTFE or PFA bellows.

High bellows stroke rate.

PTFE Ball check used to cycle between bellows to provide maximum efficiency.

## Benefits

High cycle life.

Lower replacement costs.

Less downtime.

Reduces pulsation and eliminates need for dampener.

## Specifications

### Materials of Construction:

Wetted Surfaces - PTFE, PFA

Non Wetted Surfaces - Fluoroloy "A" Rod, Nitrile, PVDF Coated 6061-T6 Aluminum Trim, Stainless Steel.

### Pressure Ranges:

Max Driver Supply Pressure - 60 PSIG (4.1 bar)

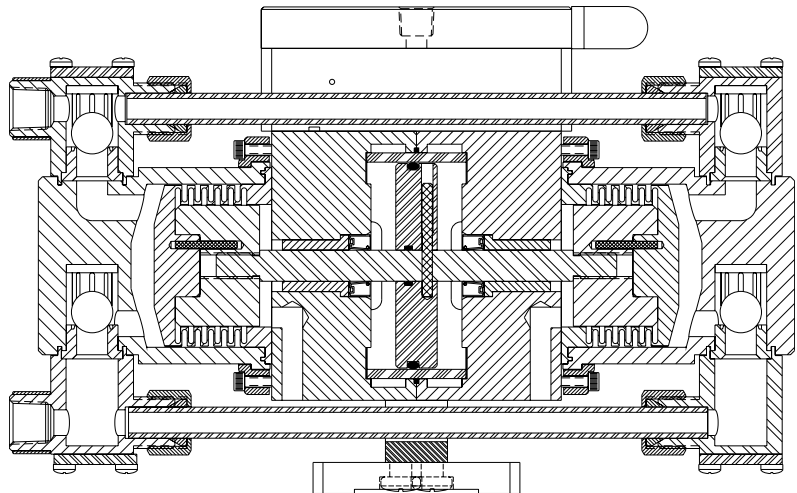
Max Operating Pressure - 60 PSIG (4.1 bar)

Pressure range above is for operation at ambient temperatures. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

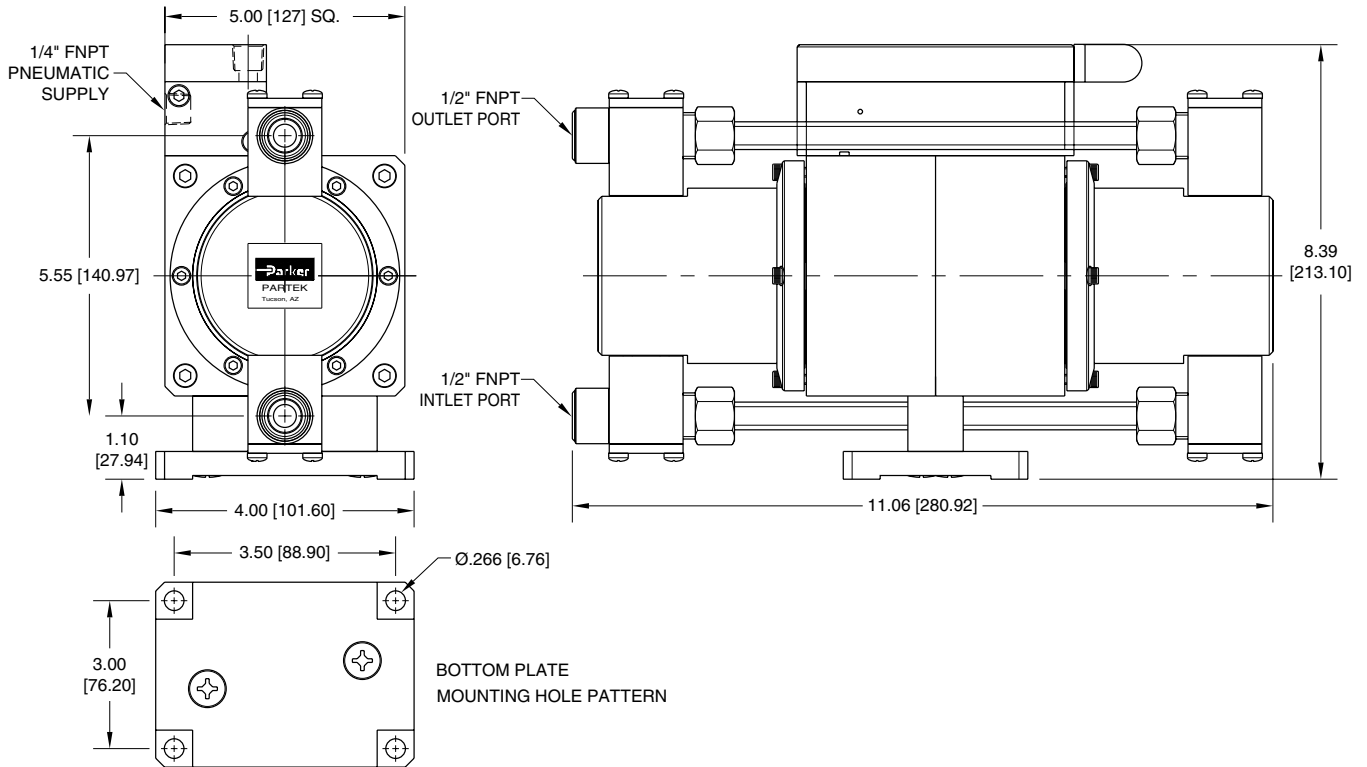
-60° - 212° F (-51° - 100° C) Ambient

-60° - 400° F (-51° - 204° C) Fluid



# PP Pneumatic Bellows Pump

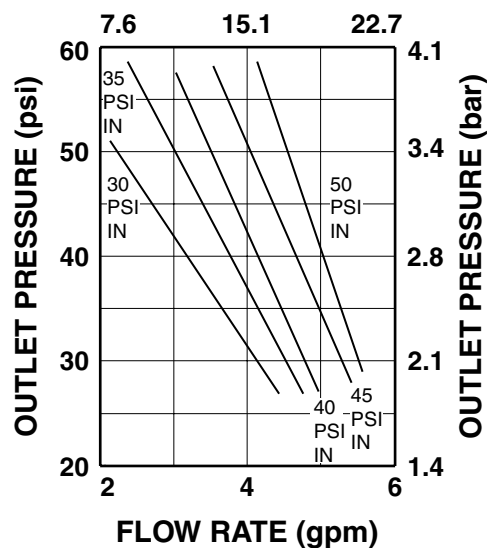
BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number | Volume   | End Connection Size |
|--------------|----------|---------------------|
| PP-20        | 20 LITER | 1/2" FNPT           |

## 20 LTR

### FLOW RATE (lpm)



# GP Gauge Protector

## Product Overview

The PFA Gauge Protectors are designed for use in high purity semiconductor applications, and are also ideally suited for use in ultra-pure water and aggressive chemicals. They protect sensitive gauges from corrosive chemicals and are offered with or without a gauge. They can be fitted with factory supplied gauges and can also be fitted with customer specified or customer supplied gauges upon request.

## Features

One piece precision machined diaphragm manufactured from the latest technology modified PTFE, provides over five times the flexural life as compared to conventional PTFE.

PTFE and PFA wetted surfaces.

Tongue and groove diaphragm to body seal.

Suitable for pressure, vacuum, and dual range operation.

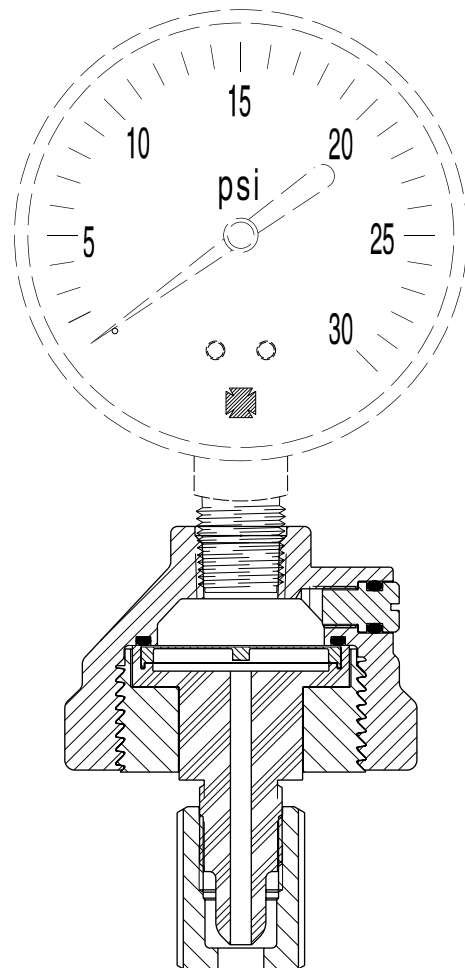
## Benefits

Higher cycle life resulting in less downtime and lower replacement costs.

Eliminates contamination and fluid compatibility issues.

Assures barrier between operating fluid and isolation media.

Reduces number of device installations for varying pressure ranges.



## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE  
External Surfaces - PFA, PVDF, EPR (Fill screw seal)

### Pressure Range:

0 to 160 PSIG (11 bar)

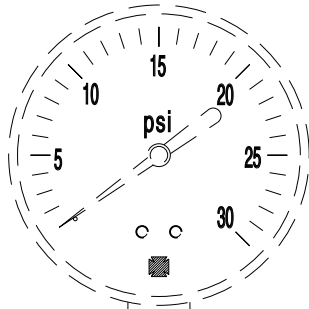
Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

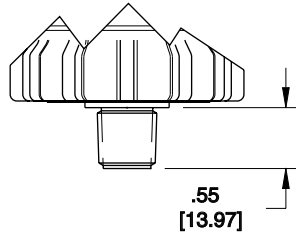
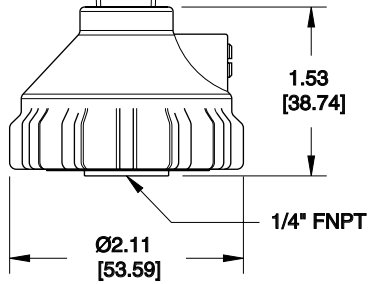
0° - 212° F (-17° - 100° C) Ambient  
0° - 400° F (-17° - 204° C) Fluid

# GP Gauge Protector

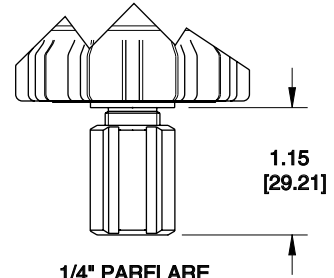
BRACKETED DIMENSIONS  
ARE IN mm.



GAUGE PORT CONNECTIONS ARE 1/4-18 FNPT



1/4" MNPT



1/4" PARFLARE

| Model Number | Process Port Configuration | Gauge Pressure (PSIG) | Model Number | Process Port Configuration | Gauge Pressure (PSIG)-XX                            |
|--------------|----------------------------|-----------------------|--------------|----------------------------|---|
| GP-130-00    | 1/4" FNPT                  | NONE                  | GP-131-XX    | 1/4" FNPT                  | 01 = 0-30 PSIG<br>02 = 0-60 PSIG<br>03 = 0-160 PSIG |
| GP-530-00    | 1/4" MNPT                  |                       | GP-531-XX    | 1/4" MNPT                  |   |
| GP-630-00    | 1/4" Parflare              |                       | GP-631-XX    | 1/4" Parflare              |   |

**Isolation Fluid:** 50/50 mix of deionized water and isopropyl alcohol (Standard unless otherwise specified.)

**Factory Gauge:** 2-1/2" dial  
Brass movement  
Painted steel case  
Glass lens  
1/4" MNPT lower mount

# GPIL In-line Gauge Protector

## Product Overview

The PFA In-line Gauge Protectors are designed for use in high purity semiconductor applications, and are also ideally suited for use in ultra-pure water and aggressive chemicals. The in-line design allows for quick cut-in installation and helps prevent entrapment of fluids. They are offered with or without a gauge. They can be fitted with factory supplied gauges and can also be fitted with customer specified or customer supplied gauges upon request.

## Features

One piece precision machined diaphragm manufactured from the latest technology modified PTFE, provides over five times the flexural life as compared to conventional PTFE.

Modified PTFE and PFA wetted surfaces.

Tongue and groove diaphragm to body seal.

Suitable for pressure, vacuum, and dual range operation.

In-line operation.

## Benefits

Higher cycle life resulting in less downtime and lower replacement costs.

Eliminates contamination and fluid compatibility issues.

Assures barrier between operating fluid and isolation media.

Reduces number of device installations for varying pressure ranges.

Reduces connections and entrapment areas.

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE  
External Surfaces - PFA, PVDF, EPR (Fill screw seal)

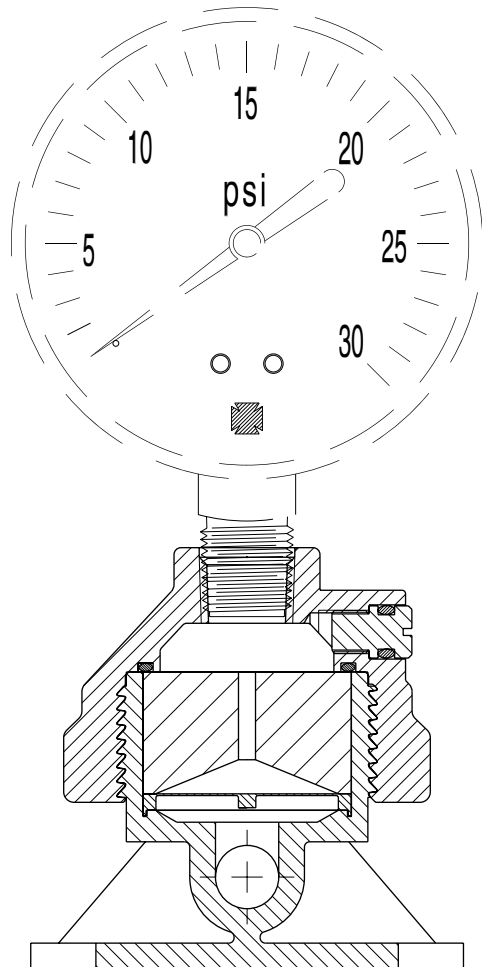
### Pressure Range:

0 to 160 PSIG (11 bar)

Pressure ranges above are for operation at ambient temperature. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

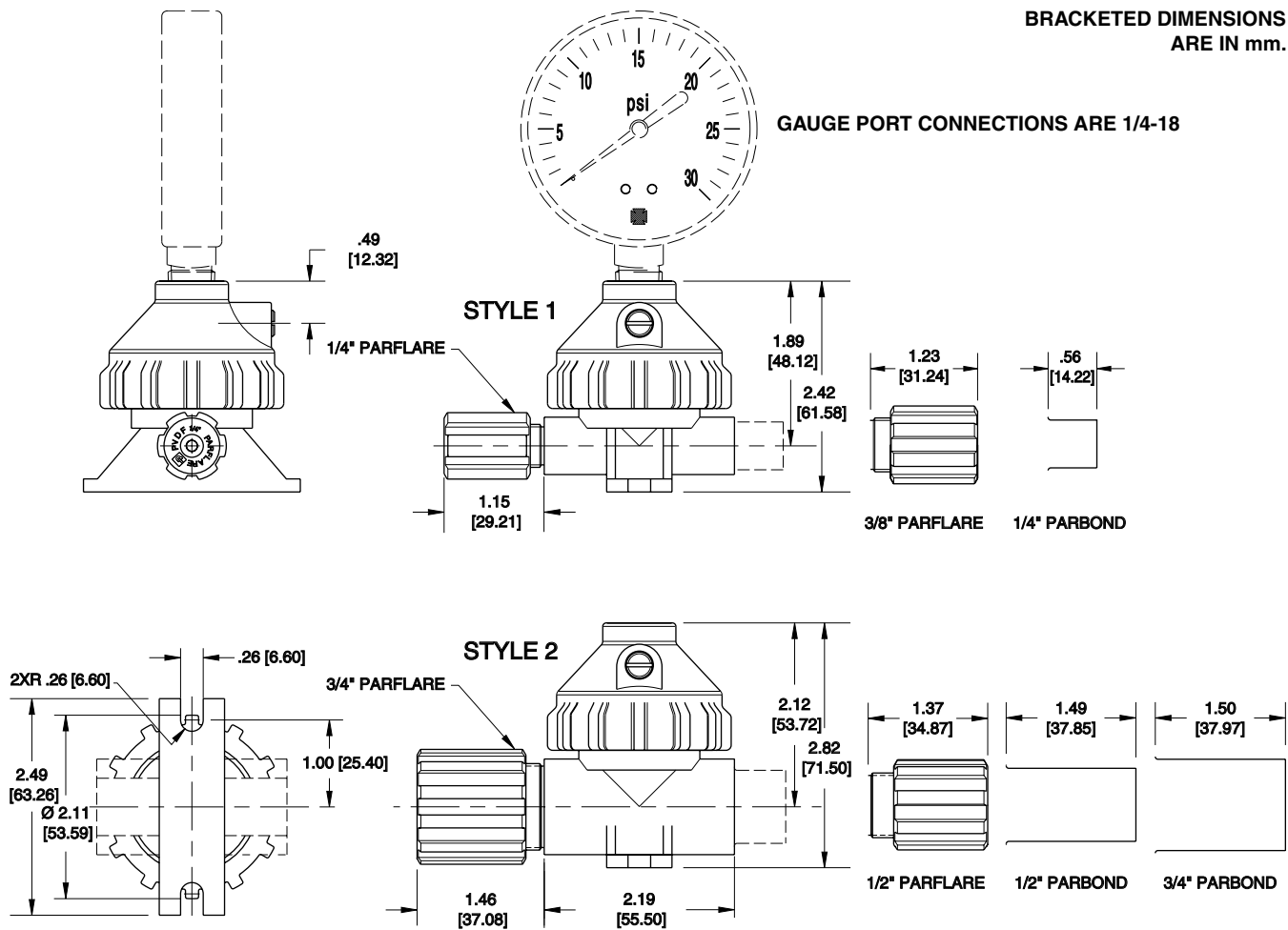
0° - 212° F (-17° - 100° C) Ambient  
0° - 400° F (-17° - 204° C) Fluid



# GPIL In-line Gauge Protector

BRACKETED DIMENSIONS  
ARE IN mm.

GAUGE PORT CONNECTIONS ARE 1/4-18



| Model Number   | Housing Style | Port Configuration | Gauge Pressure (PSIG)-XX   |
|----------------|---------------|--------------------|--|
| GPIL-6644-XX   | 1             | 1/4" Parflare      | 00 = NONE<br>01 = 0-30 PSIG<br>02 = 0-60 PSIG<br>03 = 0-160 PSIG |
| GPIL-6666-XX   | 1             | 3/8" Parflare      |  |
| GPIL-7744-XX   | 1             | 1/4" Parbond       |  |
| GPIL-6688-XX   | 2             | 1/2" Parflare      |  |
| GPIL-661212-XX | 2             | 3/4" Parflare      |  |
| GPIL-7788-XX   | 2             | 1/2" Parbond       |  |
| GPIL-771212-XX | 2             | 3/4" Parbond       |  |

**Isolation Fluid:** 50/50 mix of deionized water and isopropyl alcohol (Standard unless otherwise specified.)

**Factory Gauge:** 2-1/2" dial

- Brass movement
- Steel case
- Glass lens
- 1/4" MNPT lower mount

# SG-1 DI Water Spray Gun

## Product Overview

The PFA DI Water Spray Gun is suitable for use in high purity semiconductor applications. The design utilizes a molded high purity PFA body with precision machined sealing areas. A one piece machined modified PTFE diaphragm/poppet provides excellent flexibility and long life. Wetted surfaces are PFA and modified PTFE thus eliminating the need for elastomer seals. The SG-1 is available with either 1/4" FNPT or 3/8" Parflare connections. Optional coiled hoses, with or without recirculation feature are also available.



## Features

One piece precision machined diaphragm/poppet manufactured from the latest technology modified PTFE. Provides over five times the flexural life as compared to conventional PTFE. Wiper seat for positive through flow shut off and diaphragm to body seal.

Reversible/removable hanger.

Optional recirculation kit.

## Benefits

High cycle life.

Lower replacement costs.

Less downtime.

Allows hanging in either direction.

Provides low dead volume, purity maintaining circulation.

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE  
 External Surfaces - PFA, PVDF, and PET handle retention screw.  
 Other Materials - Stainless steel spring

### Pressure Ranges:

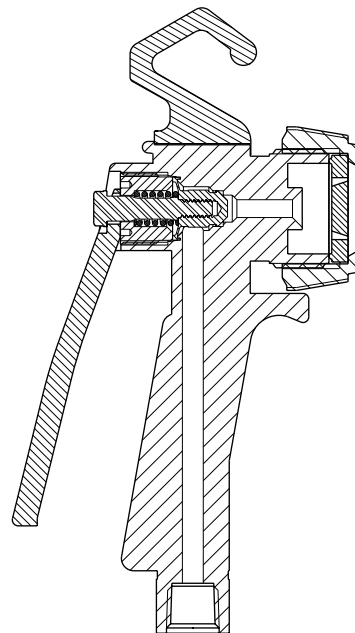
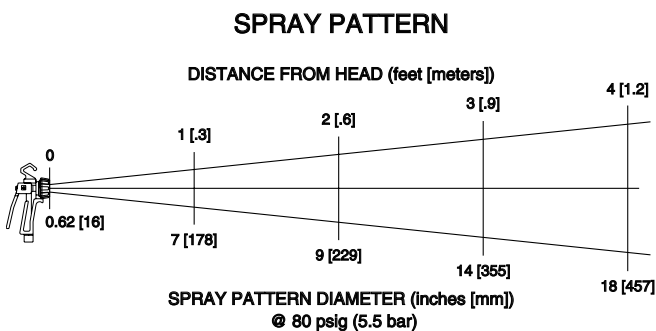
0 to 80 PSIG (5.5 bar)

Pressure range above is for operation at ambient temperature. For use at higher temperatures consult Pressure/Temperature chart on page 3.

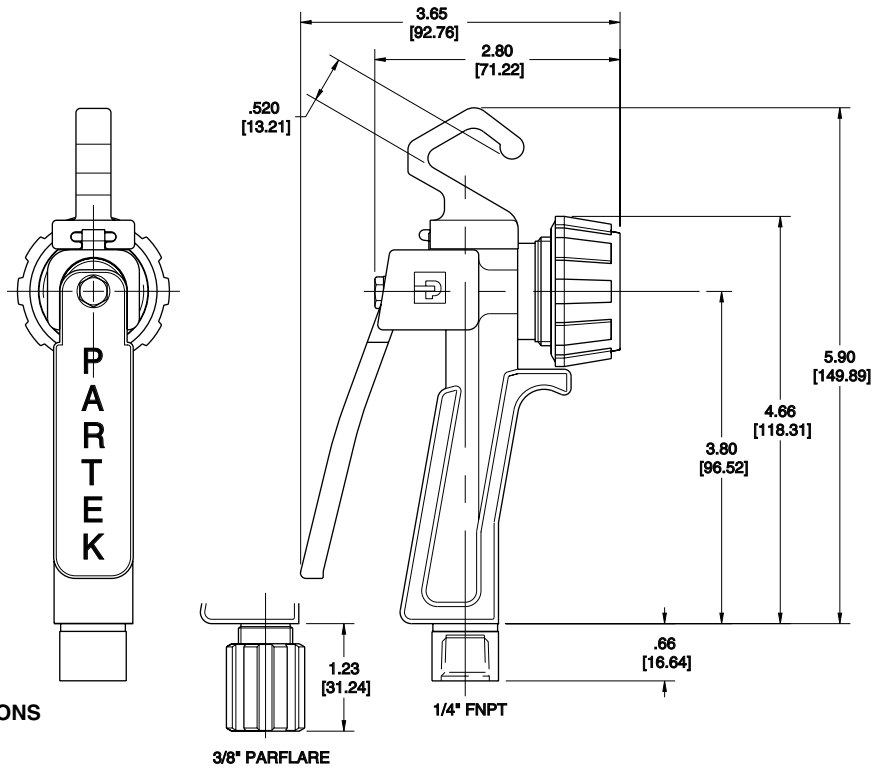
### Temperature Ranges:

0° - 150° F (-17° - 66° C) Ambient

0° - 200° F (-17° - 93° C) Fluid



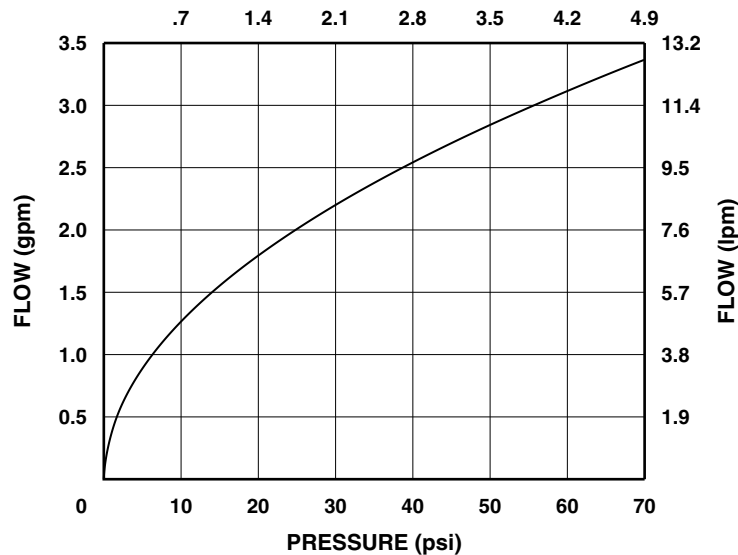
# SG-1 DI Water Spray Gun



BRACKETED DIMENSIONS ARE IN mm.

| Model Number | End Connection | Description  |
|--------------|----------------|--|
| SG-1-01      | 1/4" FNPT      | Spray Gun only   |
| SG-1-02      | 3/8" Parflare  | Spray Gun only   |
| SG-1-02-01   | 3/8" Parflare  | Spray Gun with complete 1002-0158 Recirculation Assembly   |
| FBMTR-2G64   | N/A            | Recirculating Tee Connector only                           |
| 1002-0158    | "              | Complete Recirculation Kit with FBMTR-2G64 and 8' FEP Coil |
| 1002-0161    | "              | 8' FEP Coil only   |

INLET PRESSURE VS. FLOW  
PRESSURE (bar)



# SG-1 Nitrogen Gun

## Product Overview

The PFA Nitrogen Gun is suitable for use in high purity semiconductor applications. The design utilizes a molded high purity PFA body with precision machined sealing areas. Interior surfaces are PFA and a one piece machined modified PTFE diaphragm/poppet. This design eliminates the need for elastomer seals, while providing excellent flexibility and long life. The SG-1 is available with 1/4" FNPT or 3/8" Parflare connections. Additional options include a .2, or .5 micron filter and a coiled hose assembly.



## Features

**One piece precision machined diaphragm/poppet manufactured from the latest technology modified PTFE. Provides over five times the flexural life as compared to conventional PTFE. Wiper seat for positive through flow shut off and diaphragm to body seal.**

**Reversible/removable hanger.**

## Benefits

**High cycle life.**

**Lower replacement costs.**

**Less downtime.**

**Allows hanging in either direction.**

## Specifications

### Materials of Construction:

Wetted Surfaces - PFA, Modified PTFE

External Surfaces - PFA, PVDF, and PET handle retention screw.

Other Materials - Stainless steel spring

### Pressure Ranges:

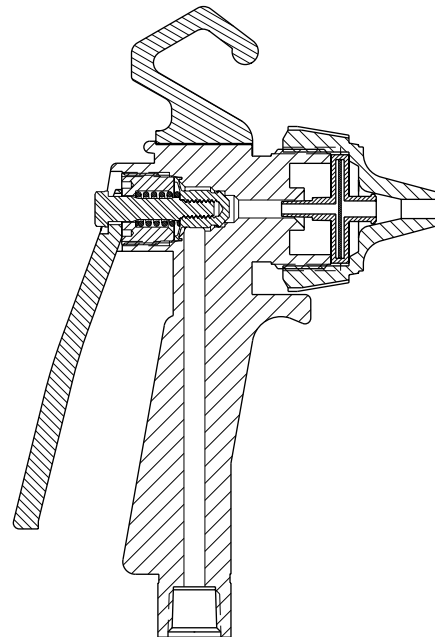
0 to 80 PSIG (5.5 bar)

Pressure range above is for operation at ambient temperature. For use at higher temperatures consult Pressure/Temperature chart on page 3.

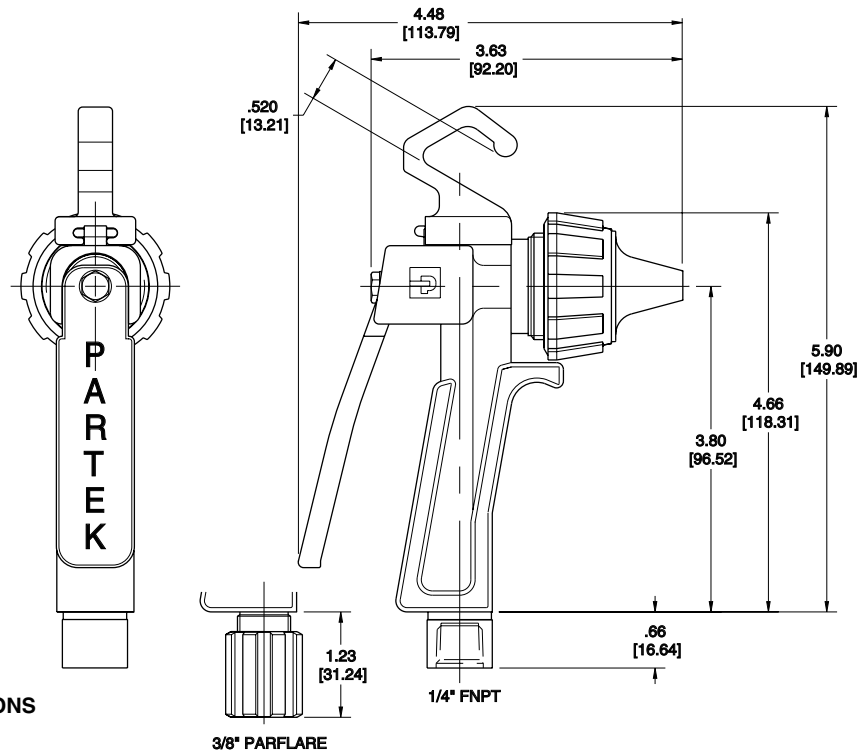
### Temperature Ranges:

0° - 150° F (-17° - 66° C) Ambient

0° - 200° F (-17° - 93° C) Fluid



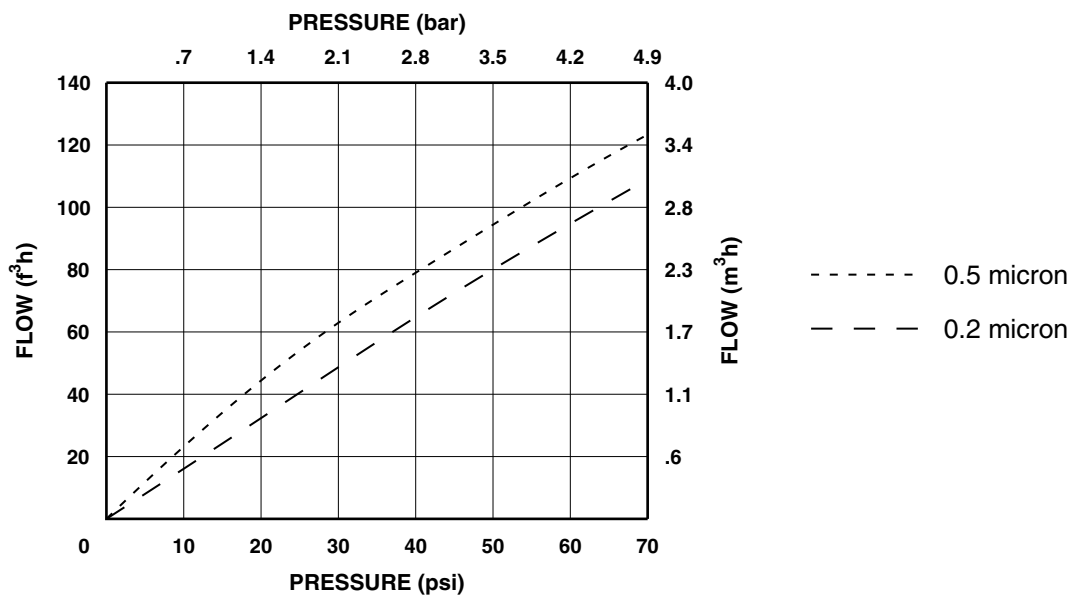
# SG-1 Nitrogen Gun



BRACKETED DIMENSIONS ARE IN mm.

| Model Number | End Connection | Description  |
|--------------|----------------|--|
| SG-1-03      | 1/4" FNPT      | Spray Gun only (No Filter)   |
| SG-1-04      | 3/8" Parflare  | Spray Gun only (No Filter)   |
| SG-1-03-X    | 1/4" FNPT      | Spray Gun with Filter (Add -2, or -5 for 0.2, or 0.5 Micron Element) |
| SG-1-04-X    | 3/8" Parflare  | Spray Gun with Filter (Add -2, or -5 for 0.2, or 0.5 Micron Element) |
| 1002-0161    | N/A            | 8' FEP Coil only   |
| 4999-0114    | "              | 0.5 Micron Replacement Element                                       |
| 4999-0115    | "              | 0.2 Micron Replacement Element                                       |

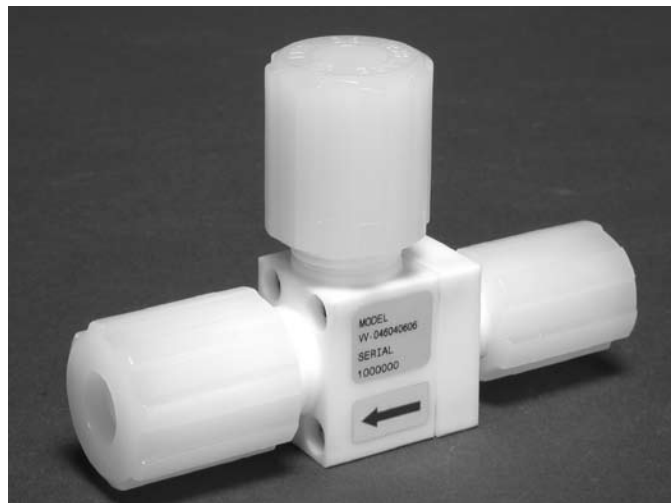
## INLET PRESSURE VS. FLOW



# VV Venturi/Vacuum Generator

## Product Overview

The PTFE Venturi/Vacuum Generator is designed for corrosive or high purity gas applications. The design consists of two machined high purity PTFE body halves attached using a tongue and groove sealing mechanism. The concept of a venturi valve is a short tube with a tapered constriction in the middle that causes an increase in the velocity of flow of a fluid and a corresponding decrease in fluid pressure. This is used in measuring flow or for creating a suction. The lack of moving parts eliminates the possibility of media contamination.



## Features

Integral nozzle on inlet body half.

PTFE wetted surfaces.

## Benefits

Eliminates the need for calibration and realignment.

Eliminates contamination and fluid compatibility issues.

## Specifications

### Materials of Construction:

Wetted Surfaces - PTFE

Non Wetted Surfaces - PVDF, 18-8 stainless steel

### Pressure Ranges:

0 to 120 PSIG (8.2 bar)

Pressure ranges above are for operation at ambient temperatures. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

0° - 150° F (-17° - 66° C) Ambient

0° - 266° F (-17° - 130° C) Fluid

### Motive Fluid:

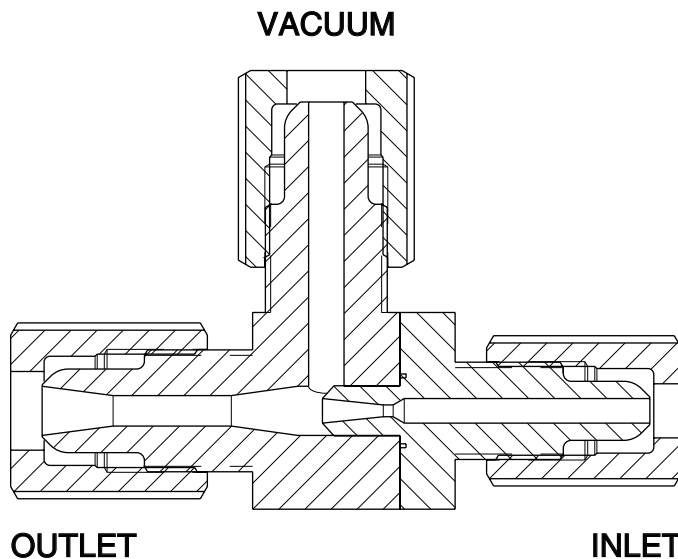
Clean Dry Air, N<sub>2</sub> or any other available gas

### Motive Consumption (Air):

At 40 PSIG: 1.60 SCFM

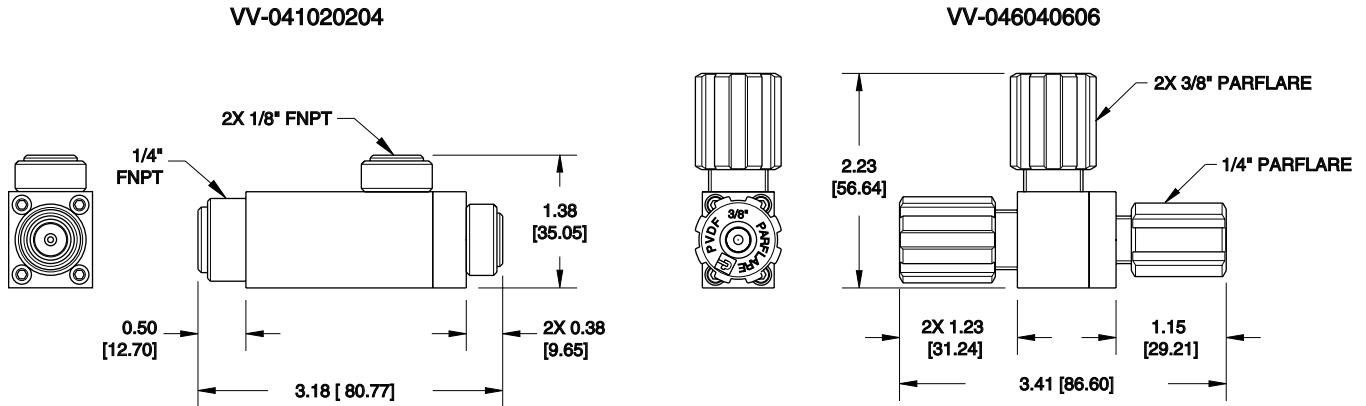
At 60 PSIG: 1.75 SCFM

At 80 PSIG: 1.80 SCFM



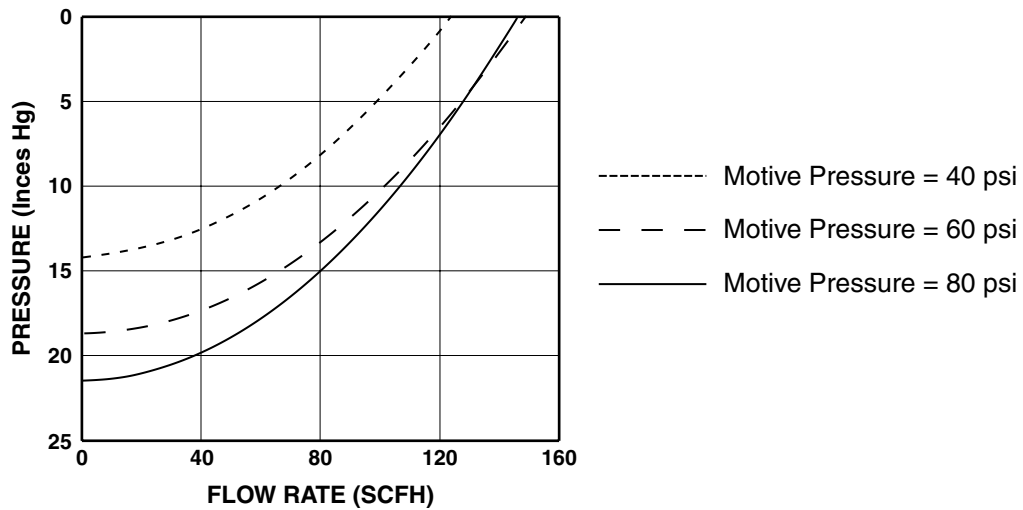
# VV Venturi/Vacuum Generator

BRACKETED DIMENSIONS  
ARE IN mm.



| Model Number | Orifice | Inlet Port    | Vacuum Port   | Outlet Port   |
|--------------|---------|---------------|---------------|---------------|
| VV-041020204 | .060    | 1/8" FNPT     | 1/8" FNPT     | 1/4" FNPT     |
| VV-046040606 | .060    | 1/4" Parflare | 3/8" Parflare | 3/8" Parflare |

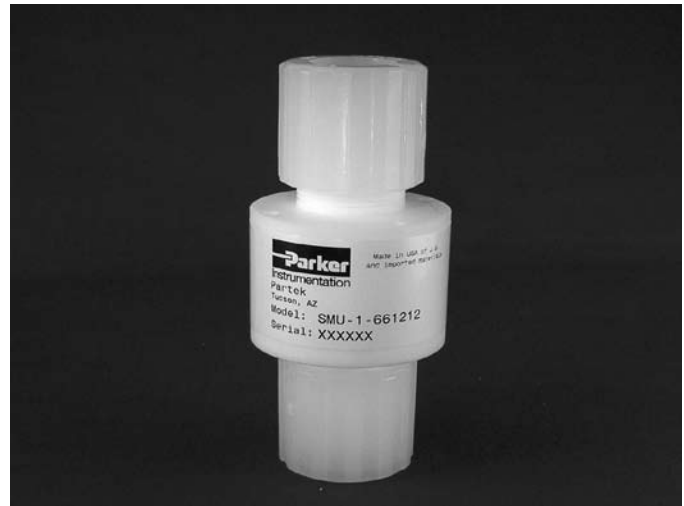
## SUCTION PRESSURE VS. FLOW RATE



# SMU-1 Inline Static Mixer

## Product Overview

The SMU-1 series of in-line static mixers are designed for use in high purity mixing applications, including aggressive chemicals, ultra-pure water, and slurry media. The patent pending SMU-1 product line includes innovative mixing technology designed at Partek Operation for improved blending techniques. The static mixers are available in 1/4", 3/8", 1/2", 3/4", and 1" port sizes. In addition, we are able to integrate the static mixers directly into our CASY manifold technologies, making an extremely compact package size with minimal dead legs and optimal internal porting for efficient blending and mixing.



## Features

**Compact overall size as compared to 12" and 18" competitive mixing technologies**

**Patent pending mixing technology**

**100% ultra-high purity PTFE materials of construction**

**No moving parts**

**\*Manifold capable**

## Benefits

**Smaller footprint offers space savings for OEM systems and compact areas in facilities**

**Improved radial mixing efficiency and consistency allows for quick, reliable, and convenient mixing of chemicals, CMP slurry, and de-ionized water**

**Provides a pure and inert material that is chemically resistant**

**Less modes of failure yielding extended product lifetime**

**Custom manifolding offers compact, point of use blending and mixing applications; allowing for less dead volume areas and gives the most efficient internal flow paths for mixing**

## Specifications

### Materials of Construction:

Wetted Surfaces - PTFE

Non Wetted Surfaces - PTFE, PVDF or PFA Nut Material

### Pressure Ranges:

27" Hg vacuum (913 mbar) to 120 PSIG (8.3 bar)

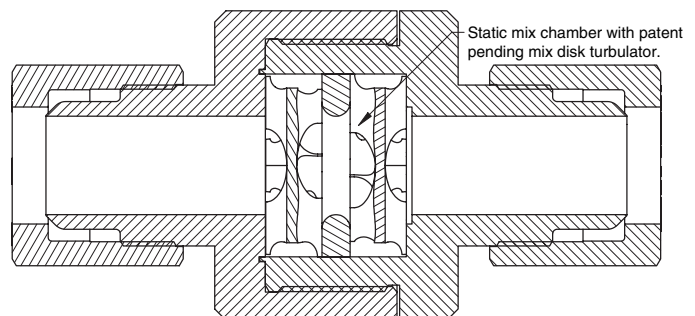
Pressure ranges above are for operation at ambient temperatures. For use at higher temperatures consult Pressure/Temperature chart on page 3.

### Temperature Ranges:

Style 1: 32° - 212° F (0° - 100° C) Ambient  
32° - 266° F (0° - 130° C) Fluid

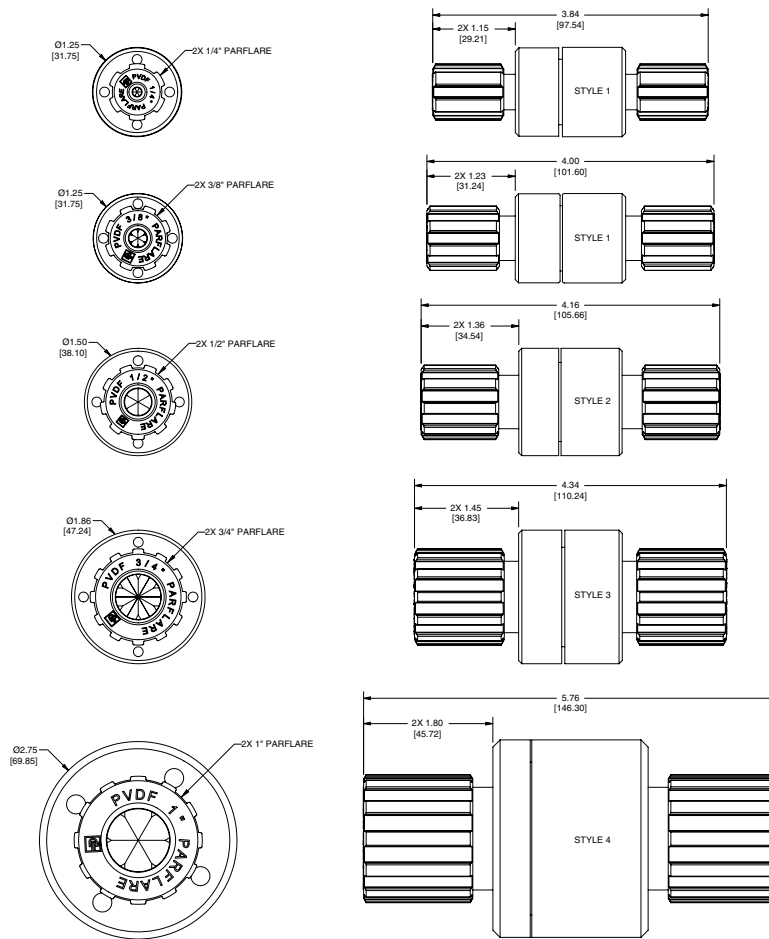
Style 2 & 3: 50° - 212° F (10° - 100° C) Ambient  
50° - 266° F (10° - 130° C) Fluid

Style 4: 60° - 212° F (15° - 100° C) Ambient  
60° - 266° F (15° - 130° C) Fluid



# SMU-1 Inline Static Mixer

BRACKETED DIMENSIONS  
ARE IN mm.

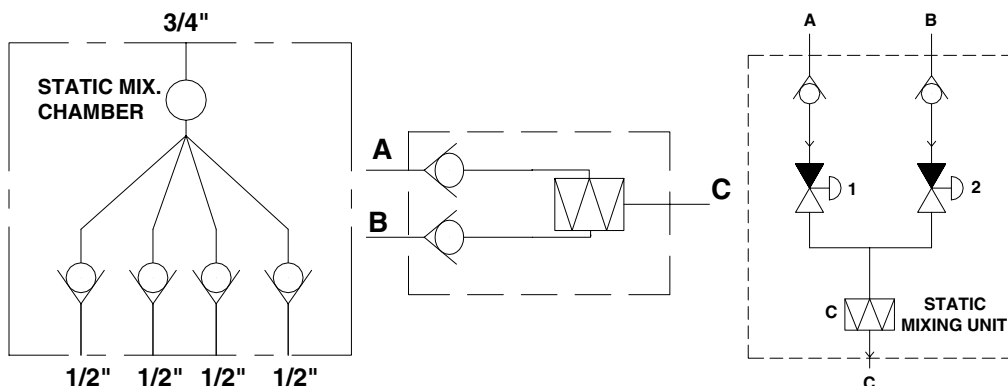


| Model Number | Cv   | Kv    | Style | Port Configuration |
|--------------|------|-------|-------|--------------------|
| SMU-1-6644   | 0.10 | 1.43  | 1     | 1/4" Parflange     |
| SMU-1-6666   | 0.72 | 10.27 | 1     | 3/8" Parflange     |
| SMU-1-6688   | 1.43 | 20.39 | 2     | 1/2" Parflange     |
| SMU-1-661212 | 2.01 | 28.66 | 3     | 3/4" Parflange     |
| SMU-1-661616 | 4.09 | 58.32 | 4     | 1" Parflange       |

Parflange models are supplied with PVDF nuts. For PFA nuts add -T to model number. Contact factory for Pillar end connections.

## \*Manifold Capable

Engineered manifolds up to 5:1 (inlet:outlet) with integrated check valves and shut off valves are available with the inline static mixers. For a quote, please fax P&ID schematic to 520-574-2700. Schematic examples below.



# Specialty and Custom

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## Overview

Partek will design custom assemblies for all your applications. Partek has a state of the art facility with dedicated, expert personnel that are focused on your design and creating a solution to your needs. All of the products pass through Partek Engineering and customer approval process before being manufactured, assembled and 100% leak tested at our ISO 9001 UHP Facility. These include, but are not limited to, such products as:

- **Manifolds**
- **Welded Assemblies**
- **Surface Mounts**
- **Valve Assemblies**
- **Special Customer Components**
- **Miscellaneous Assemblies**

We focus on fluorinated polymer flow control products for use in fluid systems where corrosion resistance or high purity is required. Materials we can manufacture your specialty product from include, but are not limited to, PTFE, Modified PTFE, PFA, FEP, PVDF, and ETFE.

Partek has over 20 years of experience in fabricating products used in applications including semiconductor manufacturing; chemical, food, and pharmaceutical processing; and biomedical and analytical instrumentation. Whatever your specialty applications needs are, Partek can provide it.

## Design and Assembly Process

### Defining Your Needs

Through thorough analysis and review, Partek will provide your custom assembly in a timely manner. Based on the analysis, our expert engineers will create your design to meet your product's specific application. Armed with the latest CAD technology, your design will include drafting, layouts, 2-dimensional and 3-dimensional drawings. Partek is committed to working closely with you to develop your concepts into a solution that will exceed all your specialty needs.

### Quotation and Approval

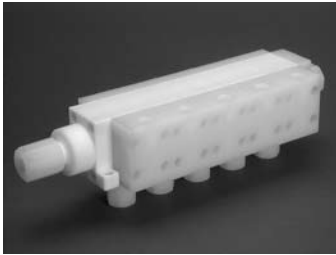
Partek will provide a quotation for your approval. The quotation will be submitted with detailed drawings for your review, and will also contain our price, delivery time, testing, packaging and prototype (if required).

### Assembly

Upon receipt of your signed approval and purchase order, we will manufacture and assemble your custom product in a controlled environment. Our experienced lab technicians will assemble your product to your exact specifications within the required lead time.

### Solution

The product you needed is ready for shipment. Remember, from your initial concepts to the delivery of your application specific product, Partek ensures only the highest quality materials and workmanship in designing and manufacturing your specialty products.



## Manifolds

Engineered manifolds combine valves and fittings onto one larger PTFE block. Due to the continuous need to reduce space in chemical cabinet environments, you will benefit from:

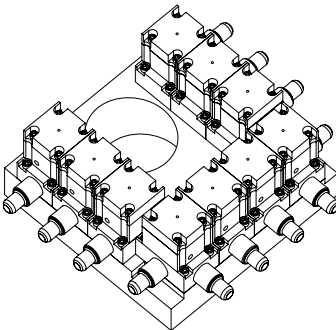
- Reduction in size to the absolute minimum.
- Reduction in the quantity of connections.



## Weld Assemblies

The use of Parbond fittings and PFA pipe provides for the most permanent and leakproof connection available on the market today. Utilizing state of the art fusion welding equipment, Partek/Atlantic can assemble a drop in unit for all permanent applications.

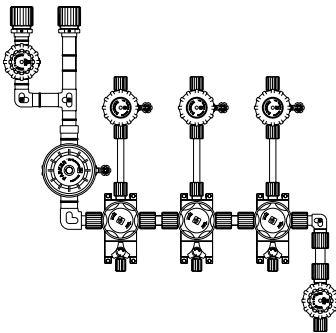
- Significantly reduces assembly time in the field.
- Small assemblies eliminate connections.
- Allows customers to modify and improve system efficiency.



## Surface Mounts

Individual bottom ported valves mounted to a substrate is a growing trend. We manufacture modular components of various sizes, Cv rates and orientations along with custom single and multi-station subbases of many diverse flow patterns.

- Assembly adaptability in the field due to modular components and blocking plates.
- Significantly reduces space and number of connections.



## Valve Assemblies

Standard and/or nonstandard valves coupled together to develop a custom product for all types of specialty applications. These are constructed, mounted and tested in a complete drop-in configuration to reduce OEM and MRO assembly, repair time, and total fitting connections.

- Provides a solution for unique flow applications.
- Reduces space to a minimum.
- Partek takes a value added approach when engineering these assemblies.



## Special Customer Components

Specially designed components not in the scope of Partek/Atlantic's standard product line, but the need falls within our manufacturing, machining and molding capabilities to fulfill the customer's requests. Designated with a CPRT number for internal identification purposes.

- Solves specific and critical customer applications.
- Value added engineering and service.



## Miscellaneous Assemblies

Your application is our challenge.

# Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

**1. Terms and Conditions of Sale:** All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

**2. Payment:** Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

**3. Delivery:** Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

**4. Warranty:** Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

**NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

**5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INC.**

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**6. Changes, Reschedules and Cancellations:** Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

**7. Special Tooling:** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

**8. Buyer's Property:** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

**9. Taxes:** Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

**10. Indemnity For Infringement of Intellectual Property Rights:** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

**11. Force Majeure:** Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

**12. Entire Agreement/Governing Law:** The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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## Parker Hannifin Corporation

### About Parker Hannifin Corporation

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electro-mechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving nearly 400,000 customers worldwide.

### Parker's Charter

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

### Product Information

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In Europe, call 00800-C-PARKER-H (00800-2727-5374).

**The Aerospace Group** is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.



**The Climate & Industrial Controls Group** designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.

**The Fluid Connectors Group** designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.



**The Seal Group** designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.

**The Hydraulics Group** designs, produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.



**The Filtration Group** designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.

**The Automation Group** is a leading supplier of pneumatic and electromechanical components and systems to automation customers worldwide.



**The Instrumentation Group** is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.

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