Unique Diaphragm Regulator Technology:
- 5X more Precise than standard Pressure Regulators
- Dome loaded: for Manual or Automated control

GS & GSD Series
Back Pressure Regulators
Gas and Mixed Phase Service

Gas and Pressure stability across widely varying flow rates

Both Series Offer
- Pressure range: 0.1 to 2500 psi
- Standard Body Materials: SS316, PVC
- Diaphragms: PTFE, Viton, Buna, PE, SS316, Polyimide
- Sizes 1/8” through 1”
- Wide Variety of Diaphragms Including PTFE, Polyimide, SS316L, Hastelloy C, Viton, PEEK
- Chemical Compatibility: Can be configured to meet your aggressive chemistry
- Temperatures to 327ºC (620ºF)

Dome Loaded Design
- Matches your process pressure 1:1 to the pressure provided on the top reference port

Manual Adjustment
- Use manual regulator to provide set-point

Computer Automated Control
- Use electronic pressure regulator to provide set-point

GS Series
- Crush Seal Design For Low Temperature and Standard Pressures

GSD Series
- Double O-ring Design For High Temperatures and Ultra High Pressures

828.650.6590  www.equilibar.com
The Equilibar® back pressure regulator is an exciting breakthrough in precision pressure control. Designed for critical and demanding processes, the patented Equilibar® offers unmatched precision across a wide range of pressures and flow rates.

**Sensitivity and Precision - Our Key Performance Advantage**

Traditional backpressure regulators use springs to gradually open up as the overpressure is used to compress the spring.

The Equilibar back pressure regulator uses only a frictionless flexible diaphragm to modulate the pressure. It fully opens in less than 1% overpressure in most applications. Our multiple orifices allow us to control over incredibly wide flow rate ratios - over 1000:1 ratios in most applications - and handle two phase flows.

Equilibar back pressure technology is protected by US and foreign patents. Learn more about our precision back pressure technology technology on our website. [Learn More](#)

**How the Equilibar Back Pressure Regulator Works**

The Equilibar® Precision Back Pressure Regulator works like a fluid transistor by forming a unique force balance on a flexible diaphragm between three separate pressures.

The fluid inlet pressure and the downstream outlet pressure exist on the wetted side of the diaphragm. The pilot set-point applies pressure on the non-wetted side.

The lower pressure of the outlet tries to hold the diaphragm in a leak-tight seal with the orifices. However, any slight excess between the fluid inlet pressure and the pilot set-point pressure quickly overwhelms these seating forces and pulls the diaphragm away from the orifices.

The pilot set-point pressure acts in a 1:1 ratio to set the pressure to be controlled on the inlet port. As shown at right, this pilot pressure can be supplied by either an electro-pneumatic regulator or a manual regulator. [More Details](#)

[Performance Comparison](#)

1/4” GS4 SS16 back pressure regulator with manual set-point regulator
Back Pressure Regulator vs. Pressure Reducing Regulator

Pressure Reducing Regulators (PRR’s) are the most common type of regulator. They reduce a higher upstream pressure into a controlled, lower downstream pressure. A PRR opens to increase downstream pressure and closes to reduce it.

A Back Pressure Regulator (BPR) works in the opposite way, controlling the upstream pressure. Just like a relief valve, a BPR closes to increase upstream pressure, and opens to reduce it.

The Equilibar GS/GSD series is a precision Back Pressure Regulator that is dome-loaded. A fluid signal commands the regulator to control with a 1:1 ratio. This signal is supplied via a manual or electronic pressure device.

Dramatic stability improvement

The Equilibar® sets a new industry standard in pressure control. This chart shows the superior flow stability of the Equilibar® over the Tescom regulator.

Note: Due to the traditional spring actuated back pressure regulation the Tescom performance shows a significantly higher amount of overpressure than the Equilibar® regulators over varying flow rates. Traditional pressure regulators hold constant pressure until you very the flow rate.

Precision over varying flow ranges

The inlet pressure of most back pressure regulators vary significantly with changes in process flow.

The chart at right shows how the Equilibar GS/GSD regulator holds a constant process pressure even through widely varying flow rates. The GS/GSD regulator can achieve as high as 10000:1 flow turn down ratios. This is extremely useful in applications where the flow consumption varies significantly. Pressure is maintained stable even with sudden spikes or drops in flow.
GS(D) Series Features
For gas & mixed phase processes
Rugged Bar Stock Design
Simpler two-piece body
Same high performance as NL and NLB Series

Metallic GS and GSD Series

<table>
<thead>
<tr>
<th>Model</th>
<th>Inlet/Outlet Port</th>
<th>Reference Port</th>
<th>Standard Body Materials</th>
<th>Dim A</th>
<th>Dim B</th>
<th>Max Std Pressure</th>
<th>Max Custom Pressure</th>
<th>Cv Range (Precision)</th>
<th>Available End Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS2/GSD2</td>
<td>1/4”</td>
<td>1/8”</td>
<td>SS316 (std)</td>
<td>3.0</td>
<td>1.40</td>
<td>475</td>
<td>2500</td>
<td>1E-3-1.2</td>
<td>NPT</td>
</tr>
<tr>
<td>GS3/GSD3</td>
<td>3/8”</td>
<td></td>
<td>Carbon steel (black oxide)</td>
<td>3.5</td>
<td>1.40</td>
<td>325</td>
<td>1450</td>
<td>1E-3-1.8</td>
<td>SAE VCO style</td>
</tr>
<tr>
<td>GS4/GSD4</td>
<td>1/2”</td>
<td></td>
<td>Hastelloy C276</td>
<td>4.5</td>
<td>1.7</td>
<td>300</td>
<td>1500</td>
<td>1E-3-3.2</td>
<td>VCR style</td>
</tr>
<tr>
<td>GS6/GSD6</td>
<td>3/4”</td>
<td></td>
<td></td>
<td>6.0</td>
<td>2.0</td>
<td>325</td>
<td>1000</td>
<td>1E-2-5.5</td>
<td></td>
</tr>
<tr>
<td>GS8/GSD8</td>
<td>1”</td>
<td></td>
<td></td>
<td>7.0</td>
<td>2.5</td>
<td>230</td>
<td>950</td>
<td>1E-2-8.5</td>
<td></td>
</tr>
</tbody>
</table>

Polymeric GS and GSD Series

<table>
<thead>
<tr>
<th>Model</th>
<th>Inlet/Outlet Port</th>
<th>Reference Port</th>
<th>Body Materials</th>
<th>Dim A</th>
<th>Dim B</th>
<th>Max Pressure psig</th>
<th>Cv Range (Precision)</th>
<th>Available End Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS2/GSD2</td>
<td>1/4”</td>
<td>1/4”</td>
<td>PVC (std) PTFE</td>
<td>3.25</td>
<td>1.6</td>
<td>120</td>
<td>50</td>
<td>1E-3-1.2</td>
</tr>
<tr>
<td>GS3/GSD3</td>
<td>3/8”</td>
<td></td>
<td>CPVC</td>
<td>3.75</td>
<td>1.6</td>
<td>100</td>
<td>50</td>
<td>1E-3-1.8</td>
</tr>
<tr>
<td>GS4/GSD4</td>
<td>1/2”</td>
<td></td>
<td>PVDF Acetal</td>
<td>4.75</td>
<td>1.8</td>
<td>75</td>
<td>50</td>
<td>1E-3-3.2</td>
</tr>
<tr>
<td>GS6/GSD6</td>
<td>3/4”</td>
<td></td>
<td></td>
<td>6.25</td>
<td>2.3</td>
<td>50</td>
<td>50</td>
<td>1E-2-5.5</td>
</tr>
<tr>
<td>GS8/GSD8</td>
<td>1”</td>
<td></td>
<td></td>
<td>7.25</td>
<td>2.9</td>
<td>50</td>
<td>50</td>
<td>1E-2-8.5</td>
</tr>
</tbody>
</table>

Available Diaphragms

<table>
<thead>
<tr>
<th>Material</th>
<th>Pressure Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTFE</td>
<td>0.2 psig to max body pressure</td>
</tr>
<tr>
<td>PTFE/Glass</td>
<td>5 psig to max body pressure</td>
</tr>
<tr>
<td>Polyethylene</td>
<td>0.02 psig to 20 psig</td>
</tr>
<tr>
<td>Viton (reinforced)</td>
<td>0.5 psig to max body pressure</td>
</tr>
<tr>
<td>Buna N (reinforced)</td>
<td>0.5 to max. body pressure</td>
</tr>
<tr>
<td>SS316</td>
<td>100 psig to max. body pressure</td>
</tr>
<tr>
<td>Polyimide</td>
<td>5 psig to max body pressure</td>
</tr>
</tbody>
</table>

- Two wetted components (Body + Diaphragm)
- No wetted o-rings
- Two plugged access ports on back side
- 1 - Contact factory for liquid applications
- 2 - Minimum Cv dependant on diaphragm and set-point pressure
- Dimensions and Cv values subject to change
Applications

There are hundreds of potential applications for the unique capabilities of the Equilibar®. The GS/GSD series is specifically designed for a variety of gas service and mixed flow applications where precision is a must.

Applications span from ultra low flow rates to extreme high pressures. By using unique combinations of diaphragms and o-ring materials, Equilibar regulators are able to perform in the harshest environments that include high temperature and aggressive chemicals.

**Gas - Precision Pressure Supply**

It is possible to use the Equilibar precision back pressure regulator as part of a precision pressure control system, replacing less precise pressure reducing regulators.

A flow control device meters a constant gas flow. The Equilibar is able to vent any excess gas not required by your application. The advantage is far greater precision across widely varying flow rates than by conventional regulators.

**Reactor Pressure Control / Nitrogen Padding**

The Equilibar® makes it easy to control reactor pressure, or to pad vessels with inert gases such as nitrogen.

Gas inflows to the vessel can be provided by any convenient means. The Equilibar’s superior flow range (up to 1000:1) and pressure window (down to .02 psi), gives the user a superior operating window.

Reference pressure set-point can be provided by the Equilibar® LPR2 for pressures below 0.5 psi, or by an electro-pneumatic regulator for easy computer

**Glove Box / Ventilation Control**

The Equilibar can control gas pressures in glove boxes or other ventilation applications.

Supply gas can be provided by a blower or other flow control means, Reference pressure can be provided by an electro-pneumatic regulator (shown) or manual spring regulator.
The GS Series regulator can be used in mixed flow and vacuum applications. For full liquid applications please contact an applications engineer.

**Precision Ultra Low Pressure Gas Supply System**

Few commercial regulators are capable of controlling gas below 0.5 psig with varying flow rates.

Combining the LPR2 with an Equilibar Precision Back Pressure Regulator and a flow control valve to provide incredible precision and responsiveness. By venting any gas flow not required by the application, this system can accommodate forward or reverse gas flow at the application without loss of accuracy.

**Precision Control with Closed Loop Control**

For most applications, the Equilibar® is precise enough to be used with a simple manual set-point pressure input. However, for some automation applications, it is useful to have closed loop control using an external pressure transmitter. By using an electro-pneumatic regulator with external feedback, it is possible to match the reading of your process pressure transmitter exactly to your desired set-point.

The Equilibar® provides numerous benefits over traditional control valves in these closed-loop applications. Such benefits include extremely wide flow range, ultra fast reaction times, and ease of PID tuning.

**Vacuum Control**

The Equilibar® can control in the vacuum range just as easily in the positive pressure range.

The reference pressure can be supplied by a sensitive manual vacuum regulator, or by an electro-pneumatic regulator (as shown).

See the Equilibar Vacuum Regulator brochure for additional details.
Air Performance Curves

Low Flow/Low Pressure Air Performance

Low flow gas applications reveal the extra-ordinary unmatched precision capable with the Equilibar.

Medium Pressure Air Performance

The chart below illustrates how the overpressure varies slightly with the increasing Set-Point pressure in the Equilibar.
**Manual Control**

Equilibar Precision Back Pressure Regulators get their pilot control signal using a fluid set-point pressure (also called ‘reference’ or ‘pilot’ pressure) on their top port.

You can supply your own fluid set point signal or choose one of the popular pilot set point regulators below.

<table>
<thead>
<tr>
<th>Application</th>
<th>Supply Pressure</th>
<th>Ports</th>
<th>Equilibar Part Number</th>
<th>Outlet Pressure Range</th>
<th>Repeatability &amp; Sensitivity</th>
<th>Suggested Pressure Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Pressure Regulators</td>
<td>Max 6000 psig</td>
<td>1/4” Inlet Outlet Gauge</td>
<td>HPR-500-B</td>
<td>0-500 psig</td>
<td>Sensitive through a wide range of pressures</td>
<td>600p-2.5b-2L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HPR-1500-B</td>
<td>0-1500 psig</td>
<td></td>
<td>1500p-2.5b-2L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HPR-2500-B</td>
<td>0-2500 psig</td>
<td></td>
<td>3000p-2.5b-2L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HPR-4000-B</td>
<td>0-4000 psig</td>
<td></td>
<td>500p-2.5b-2L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HPR-6000-B</td>
<td>0-6000 psig</td>
<td></td>
<td>6000p-2.5b-2L</td>
</tr>
<tr>
<td>High Precision</td>
<td>Max 50 psig</td>
<td>1/4” Inlet Outlet Gauge</td>
<td>T10LR-25</td>
<td>0.5 to 25 psig</td>
<td>Highly sensitive and stable</td>
<td>25p-5b-2c</td>
</tr>
<tr>
<td>Belofram Type 10 (2-stage)</td>
<td>Max 150 psig</td>
<td>1/4” Inlet Outlet Gauge</td>
<td>T10-25</td>
<td>2 to 25 psig</td>
<td>Varies 0.005 psi with 25 psi supply variation</td>
<td>60p-5b-2c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T10-60</td>
<td>2 to 60 psig</td>
<td></td>
<td>160p-5b-2c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T10-120</td>
<td>2 to 120 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compact Economical</td>
<td>Max 250 psig</td>
<td>1/4” Inlet Outlet Gauge</td>
<td>T41-2</td>
<td>0-10 psig</td>
<td>Highly sensitive and stable</td>
<td>5p-2.5b-1c</td>
</tr>
<tr>
<td>Bellofram Type 41 (1-stage)</td>
<td>Max 150 psig</td>
<td>1/4” Inlet Outlet Gauge</td>
<td>T41-10</td>
<td>0-10 psig</td>
<td>Varies 0.35 psi with 25 psi supply variation</td>
<td>10p-2.5b-1c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T41-30</td>
<td>0-30 psig</td>
<td></td>
<td>30p-2.5b-1c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T41-60</td>
<td>0-60 psig</td>
<td></td>
<td>60p-2.5b-1c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T41-100</td>
<td>0-100 psig</td>
<td></td>
<td>100p-2.5b-1c</td>
</tr>
<tr>
<td>Ultra Low Pressure</td>
<td>5 - 30 psig</td>
<td>1/4” Inlet Outlet (No Gauge)</td>
<td>LPR2-B (Bleed) &amp; LPR2-NB (Non-Bleed)</td>
<td>0.25-7 inWC (0.01 to 0.25 psig)</td>
<td>Sensitivity: 0.02 inWC</td>
<td>0-10 &quot;WC 0-30 &quot;WC</td>
</tr>
<tr>
<td>LPR2 Ultra Low Pressure Regulator</td>
<td></td>
<td></td>
<td>LPR2-NB</td>
<td>1-10 inWC</td>
<td>Stability: 0.06 inWC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-28 inWC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum</td>
<td>30&quot;hg (Vac)</td>
<td>1/8” Inlet Outlet (no gauge)</td>
<td>VPR-30</td>
<td>0.4 to 30 inHg</td>
<td>Sensitivity: 0.1 inHg</td>
<td>30h-2 5b-2</td>
</tr>
<tr>
<td>Vacuum Regulators</td>
<td></td>
<td></td>
<td>VPR-10</td>
<td>0.4 to 10 inHg</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Panel Mount Only</td>
<td>VPR-3</td>
<td></td>
<td>20-turn knob consult factory</td>
</tr>
</tbody>
</table>
Process Automation

Automating your process pressure is easily accomplished by using an electronic pressure regulator to provide the pilot set-point pressure to the Equilibar dome-loaded back pressure regulator.

Equilibar is proud to represent precision electronic regulators from Proportion-Air. These devices are custom tuned on the bench to work perfectly with the Equilibar precision back pressure regulators or vacuum regulators.

Contact Equilibar or visit our website for addition details about the many possible configuration of these products.

<table>
<thead>
<tr>
<th>Regulator</th>
<th>Description</th>
<th>Key Features</th>
</tr>
</thead>
</table>
| Low Pressure - Ultra Precision Regulator (150 psi max) | QPV Series | Aluminum IP65 enclosure | * Min range: 0-0.3 psig, vacuum  
* Max range: 0-150 psig  
* Available in gauge, absolute, vacuum and vacuum-positive ranges  
* Superior proportional valve action  
* Accuracy: 0.1% - 0.5% FS  
* Resolution: 0.005% - 0.2% FS  
* Tuned ready for set-point service  
* Optional DeviceNet / Serial communication  
* Factory set for your pressure |
| Medium Pressure - Precision Regulator (500 psi max) | QB Series | Aluminum IP65 enclosure | * Min range: vacuum; 0-1 psig  
* Max range: 0 -500 psig  
* Available in gauge, absolute, vacuum and vacuum-positive ranges  
* 0.2 to 0.5% FS accuracy  
* Tuned ready for set-point service  
* Good for most applications  
* Factory set for your pressure |
| High Pressure - Precision Regulator (1000 psi max) | GP Series | Aluminum IP65 enclosure | * Min range: Vacuum or 0-500  
* Max range: 0 -1000 psig  
* Available in gauge, absolute, vacuum and vacuum-positive ranges  
* 0.5% FS accuracy  
* Factory set for your pressure |
Contact our Engineers

At Equilibar, your application’s unique requirements will be carefully addressed by one of our trained application engineers. Please contact us if you have any questions or special requirements.

Web: www.equilobar.com  
Email: inquiry@equilibar.com  
Telephone: (828)650-6590  
Fax: (801)504-4439  
Address: Equilibar, LLC  
320 Rutledge Road  
Fletcher, NC 28732

About Equilibar

Equilibar, LLC manufacturers and markets our specialized products worldwide. Equilibar branded products are made in the USA, and protected by US and foreign patents.

All of our products are assembled, inspected and tested by trained technicians in Fletcher, NC.

Application Assistance

Application Engineering . . .  
How we are different

Unlike mass-market regulator distributors, everything about Equilibar is focused on you, the scientist or engineer with a unique pressure control challenge.

We assign an Application Engineer to you, typically within moments of your call. We work with you closely to identify the optimum model, trim, and diaphragm to best meet your challenge. You can stay in touch with your Application Engineer by email, telephone, mobile phone, or fax.

After installation, if there are any unexpected issues, your Application Engineer is still available to support you with start-up information or (if needed) expedited replacement parts.

Other products from Equilibar

Research Series BPRs

Our new Research Series dome loaded back pressure regulators offer performance up to 5000 psig and temperatures up to 327°C with the use of SS316 diaphragms and Kalrez® o-rings. More Details

NL Series Back Pressure Regulators

The NL Series has the same exact performance as the GS Series BPRs, plus an additional water hammer suppression feature, making them ideal for most liquid applications. More Details

EVR Series Vacuum Regulators

The EVR Series uses the GS(D) Series BPR, but adds a manual set-point kit to make vacuum control of processes easy and simple. More Details