BD Series
1.5” – 4” Back Pressure Regulators and Valves
FOR GAS, LIQUID AND MIXED PHASE SERVICE
Traditional back pressure regulators set the upstream pressure with a spring. These designs utilize sliding seals and other moving parts that can introduce hysteresis and other undesired effects into a process. The Equilibar® back pressure regulator uses a thin, supple diaphragm as the only moving part. This allows frictionless operation without cracking pressure or hysteresis. The accuracy of the Equilibar® back pressure regulator is determined by the accuracy of the pilot setpoint.

Our performance.
Equilibar® back pressure regulators outperform the competition, particularly in applications with low flow rates, mixed phase fluids, corrosive media, or extreme temperatures.

Our people.
Every inquiry gets focused attention from our engineering team to determine the best possible product for your needs. Every back pressure regulator is hand assembled and tested to meet our stringent quality standards.

Our priorities.
Our goal is to exceed your expectations. In an industry where delivery times frequently exceed 6 weeks, we offer many of our standard products with delivery in about a week.
How It Works

Simply load the Equilibar® back pressure regulator with a pilot pressure equal to your desired back pressure and the Equilibar does the rest. This pressure forces the flexible diaphragm down onto a plate of orifices. A rise in inlet pressure lifts the diaphragm up to allow excess pressure to be relieved through the outlet orifices. Similarly, a loss of pressure at the inlet causes the diaphragm to be pushed closer to the orifices, restricting flow and rebuilding pressure upstream.

Performance Comparison

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PRESSURE REDUCING REGULATOR</th>
<th>BACK PRESSURE REGULATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMATIC</td>
<td>![Schematic Diagram]</td>
<td>![Schematic Diagram]</td>
</tr>
<tr>
<td>CONTROLS PRESSURE</td>
<td>Downstream</td>
<td>Upstream</td>
</tr>
<tr>
<td>OPENS TO</td>
<td>Increase downstream pressure</td>
<td>Decrease upstream pressure</td>
</tr>
<tr>
<td>CLOSES TO</td>
<td>Decrease downstream pressure</td>
<td>Increase upstream pressure</td>
</tr>
</tbody>
</table>

Pilot operate your Equilibar® back pressure valve with an electronic pressure regulator for automated back pressure control.

Or set the pilot pressure with a precision pressure reducing regulator for manual back pressure control.

BACK PRESSURE REGULATORS VS PRESSURE REDUCING REGULATORS

Pressure reducing regulators reduce a higher supply pressure at the inlet down to a regulated lower pressure at the outlet (downstream). Back pressure regulators work the opposite way. They regulate the inlet (upstream) pressure by opening up only as much as necessary to hold back the desired pressure at the inlet (upstream).
For most applications, the Equilibar BD meets performance expectations when controlled by a manual pressure reducing pilot regulator. 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 automatically adjust the pilot setpoint based on the feedback from the pressure transducer.

The Equilibar BD Series valve 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.
Glove Box / Ventilation Control

The Equilibar BD Series regulator is a good choice for controlling gas pressures in glove boxes or other ventilation applications. The BD can be constructed with flexible diaphragm material for high sensitivity and accuracy at low pressures, even at relatively high flow rates.

Supply gas can be provided by a blower or other flow control means. Pilot setpoint pressure can be regulated by an electro-pneumatic regulator (shown) or manual spring regulator.

Fuel Cell Testing

The Equilibar® BD Series back pressure regulator is an excellent fit for fuel cell testing systems. An Equilibar BD is used to control the outlet pressure of the fuel cell while it is being performance tested.

Customers choose Equilibar valves because they accurately maintain pressure from really low flow rates up to very high flow rates; they work accurately at very low pressures where fuel cells operate; and they can easily handle wet, hot, corrosive exhaust gasses produced by the fuel cell.

Biogas System Pressure Control

Many wastewater treatment plants use anaerobic digestion to process their biological solid wastes, reducing landfill volumes and producing valuable biogas used to generate power. Controlling the biogas pressure that feeds a combustion engine is critical, especially because the flow rate coming out of the digester fluctuates.

Customers choose the Equilibar BD valve in this application because of its ability to maintain low pressure at high flows. The multiple orifice design also delivers fast response required for this process.
MANUAL CONTROL

Equilibar Precision Back Pressure Regulators get a pilot control signal using a fluid setpoint pressure (also called ‘reference’ or ‘pilot’ pressure) on the top port. This pilot fluid is typically compressed air or nitrogen.

Below are some popular pressure reducing regulators used to control the pilot signal for Equilibar back pressure regulators.

<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>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIUM PRESSURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 10</td>
<td>Max 500 psig</td>
<td>1/4” NPT</td>
<td>10212</td>
<td>0 - 2 psig</td>
<td>Less than 0.125 in H₂O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10222</td>
<td>0 - 10 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10202</td>
<td>0 - 20 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10232</td>
<td>0.5 - 30 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10242</td>
<td>1 - 60 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10262</td>
<td>2 - 150 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10272</td>
<td>3 - 200 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10282</td>
<td>5 - 300 psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10292</td>
<td>5 - 400 psig</td>
<td></td>
</tr>
<tr>
<td>ULTRA LOW PRESSURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPR2 Ultra Low Pressure Regulator</td>
<td>5 - 30 psig (Stable Regulated)</td>
<td>1/4” Inlet Outlet (No Gauge)</td>
<td>LPR2-B-7</td>
<td>.25-.7 in H₂O</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LPR2-B-10</td>
<td>1-10 in H₂O</td>
<td>Sensitivity: 0.02 in H₂O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LPR2-B-28</td>
<td>1-28 in H₂O</td>
<td>Stability: 0.06 in H₂O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LPR2-NB-7</td>
<td>.25-7 in H₂O</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LPR2-NB-10</td>
<td>1-10 in H₂O</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>LPR2-NB-28</td>
<td>1-28 in H₂O</td>
<td></td>
</tr>
</tbody>
</table>
Electronic Pilot Control

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

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 assistance in choosing a pilot control system for your application.

<table>
<thead>
<tr>
<th>REGULATOR</th>
<th>DESCRIPTION</th>
<th>KEY FEATURES</th>
</tr>
</thead>
</table>
| QPV Series      | Control Pressures up to 150psig (10 Bar) with high resolution | • Min range: 0-0.3 in H2O  
• Max range: 0-150 psig  
• Available in gauge, absolute, vacuum and vacuum-positive ranges  
• True proportional valve action  
• Resolution: 0.005% - 0.2% FS  
• 4-20mA and 0-10VDC analog I/O  
• Optional DeviceNet or Serial Digital RS232/485 |

Equilibar PVC BD16 pilot operated by a Model 10 manual setpoint regulator.

Equilibar stainless steel BD12 pilot operated by a QPV1 electronic pressure regulator.
BD Series Specifications

FOR LIQUID, GAS & MIXED PHASE PROCESSES

<table>
<thead>
<tr>
<th>MODEL</th>
<th>PROCESS PORT SIZE</th>
<th>REFERENCE PORT SIZE</th>
<th>BODY MATERIAL</th>
<th>MAX PRESSURE RATING</th>
<th>MIN CV</th>
<th>MAX CV</th>
<th>DIM A</th>
<th>DIM B</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD12S</td>
<td>1.5&quot;</td>
<td>1/8&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>45 (3.1)</td>
<td>1E-02</td>
<td>14.3</td>
<td>9.5 (241)</td>
<td>3.9 (99)</td>
</tr>
<tr>
<td>BDM12S</td>
<td>1.5&quot;</td>
<td>1/8&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>120 (8.3)</td>
<td>1E-02</td>
<td>14.3</td>
<td>9.5 (241)</td>
<td>4.0 (102)</td>
</tr>
<tr>
<td>BD12A</td>
<td>1.5&quot;</td>
<td>1/8&quot;</td>
<td>Anodized Aluminum</td>
<td>75 (5.2)</td>
<td>1E-02</td>
<td>14.3</td>
<td>7.6 (193)</td>
<td>3.7 (94)</td>
</tr>
<tr>
<td>BD12P</td>
<td>1.5&quot;</td>
<td>1/8&quot;</td>
<td>PVC</td>
<td>50 (3.4)</td>
<td>1E-02</td>
<td>14.3</td>
<td>9 (228)</td>
<td>4.3 (109)</td>
</tr>
<tr>
<td>BD16S</td>
<td>2&quot;</td>
<td>1/8&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>70 (4.8)</td>
<td>3E-02</td>
<td>30.2</td>
<td>11 (280)</td>
<td>4.1 (104)</td>
</tr>
<tr>
<td>BDM16S</td>
<td>2&quot;</td>
<td>1/8&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>150 (10.3)</td>
<td>3E-02</td>
<td>30.2</td>
<td>11 (280)</td>
<td>5.7 (145)</td>
</tr>
<tr>
<td>BD16A</td>
<td>2&quot;</td>
<td>1/8&quot;</td>
<td>Anodized Aluminum</td>
<td>50 (3.4)</td>
<td>3E-02</td>
<td>30.2</td>
<td>9 (228)</td>
<td>4.3 (109)</td>
</tr>
<tr>
<td>BD16P</td>
<td>2&quot;</td>
<td>1/8&quot;</td>
<td>PVC</td>
<td>30 (2.1)</td>
<td>3E-02</td>
<td>30.2</td>
<td>11 (280)</td>
<td>5.1 (130)</td>
</tr>
<tr>
<td>BD24S</td>
<td>3&quot;</td>
<td>1/4&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>45 (3.1)</td>
<td>6E-02</td>
<td>60</td>
<td>13 (330)</td>
<td>5.3 (135)</td>
</tr>
<tr>
<td>BDM24S</td>
<td>3&quot;</td>
<td>1/4&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>85 (5.9)</td>
<td>6E-02</td>
<td>60</td>
<td>13 (330)</td>
<td>6.2 (157)</td>
</tr>
<tr>
<td>BD24A</td>
<td>3&quot;</td>
<td>1/4&quot;</td>
<td>Anodized Aluminum</td>
<td>30 (2.1)</td>
<td>6E-02</td>
<td>60</td>
<td>12.5 (317)</td>
<td>5.9 (150)</td>
</tr>
<tr>
<td>BD24P</td>
<td>3&quot;</td>
<td>1/4&quot;</td>
<td>PVC</td>
<td>20 (1.4)</td>
<td>6E-02</td>
<td>60</td>
<td>15 (381)</td>
<td>8.8 (224)</td>
</tr>
<tr>
<td>BD32S</td>
<td>4&quot;</td>
<td>1/4&quot;</td>
<td>Stainless Steel 316/316L</td>
<td>20 (1.4)</td>
<td>1.5E-01</td>
<td>160</td>
<td>20 (508)</td>
<td>8.1 (205)</td>
</tr>
<tr>
<td>BD32A</td>
<td>4&quot;</td>
<td>1/4&quot;</td>
<td>Anodized Aluminum</td>
<td>20 (1.4)</td>
<td>1.5E-01</td>
<td>160</td>
<td>20 (508)</td>
<td>8.1 (205)</td>
</tr>
<tr>
<td>BD32P</td>
<td>4&quot;</td>
<td>1/4&quot;</td>
<td>PVC</td>
<td>20 (1.4)</td>
<td>1.5E-01</td>
<td>160</td>
<td>20 (508)</td>
<td>9.6 (244)</td>
</tr>
</tbody>
</table>

Max Operating Pressure

Pressure ratings listed in the table are the maximum possible pressure to which a unit may be configured. Units can be configured for optimum performance at lower pressures. Speak with an application engineer for more information.

Proof Pressure

150% Rated Pressure

Design Pressure

400% Maximum Body Pressure

Temperature Rating

Up to 150C (Metallic Body, PTFE Diaphragm, Viton® O Rings)
Up to 200C (Metallic Body, Metallic Diaphragm, Viton® O Rings)
Up to 300C (Metallic Body, Metallic Diaphragm, Kalrez® O Rings)

Body Material Stainless Steel 316/316L (standard)
Also available: Hastelloy C276, Titanium, Zirconium

O-Rings Viton® (FKM) (standard)
Also available: Kalrez® (FFKM), PTFE, EPDM, Buna-N

Diaphragm PTFE/Glass Laminate (standard)
Also available: Stainless Steel SS316/316L, Hastelloy C276, Virgin PTFE, FKM, Polyimide, Buna-N, PEEK, EPDM

Min Cv is dependent on diaphragm option. Values indicated are conservative. Contact an application engineer for specific details.

Aluminum elbows are square. Tabulated dimensions are for guidance. Contact an application engineer for specific details.

Figure 1 Dimension reference drawing

DIM A - valve takeout
DIM B - height from center of inlet/outlet port
## Ordering Information

<table>
<thead>
<tr>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD</td>
</tr>
<tr>
<td>BD</td>
</tr>
</tbody>
</table>

### 1. MODEL TYPE
BD BD

### 2. PORT SIZE
12 1.5”
16 2”
24 3”
32 4”

### 3. BODY MATERIAL
S Stainless Steel 316/316L
P PVC
A Anodized Aluminum

### 4. PORT THREADS
N NPT
H Triclamp
B BSP
F 150# Flanges

### 5. RECESS
(Factory Selected)

### 6. MOD #
(Factory Selected)

### 7. REFERENCE PORT THREADS
N NPT
B BSP

### 8. CAP MATERIAL (NON WETTED)
S Stainless Steel 316/316L
P PVC
A Anodized Aluminum

### 9. BOLTS
(Factory Selected)

### 10. PRESSURE RATING
This is the maximum pressure you would like your unit to be configured to accept. Must be equal to or less than the maximum rated pressure (in psig).

### 11. TEMPERATURE RATING
40 40C (Polymer Units)
60 60C (Metallic Units)

### 12. DIAPHRAGM MATERIAL
G PTFE (Glass Reinforced)
B Buna-N (Nitrile)
V FKM Fluoroelastomer
M EPDM
E Polyethylene
F PTFE (Virgin)
I Polyimide

### 13. DIAPHRAGM THICKNESS
(Factory Selected)

### 14. O RING
(Wetted)
VVVV Viton® Shore 75
KKKK Kalrez® Grade 7075
FFFF PTFE
EEEE EPDM
BBBB Buna

Items marked in blue are typically in stock for fast shipment.

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**PATENTS**

These regulators are subject to one or more of these patents: US6,886,591, US7,080,660, US7,673,650, US8,215,336, DE60322443D1, GB1639282, FR1639282

Equilibar stainless steel BD16 with triclamp flanges.
About Equilibar

Equilibar provides innovative and robust pressure and flow control technology for researchers and engineers worldwide. We are proud to design, manufacture, and test our patented back pressure regulators in our factory overlooking the Blue Ridge Mountains near Asheville, NC, and we are equally proud to work with clients around the world each and every day.

APPLICATION ENGINEERING—WHAT SETS US APART

Unlike mass-market regulator distributors, we focus on working with you, the scientist or engineer with a complex pressure control scenario.

Our application engineers work collaboratively with clients to identify the optimal model, trim, and diaphragm for each application’s unique challenges. No matter where you are on the globe, you can stay in close contact with your engineer by email, telephone, videoconferencing, or fax.

After installation, your application engineer will support you with start-up information and fine-tuning as needed.

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Made in the USA

Equilibar’s quality system is ISO 9001:2015 certified.