



# BD Series

1.5" – 4" Back Pressure Regulators and Valves  
FOR GAS, LIQUID AND MIXED PHASE SERVICE

5X MORE  
PRECISE  
than standard  
regulators

# The Equilibar Difference

## 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.

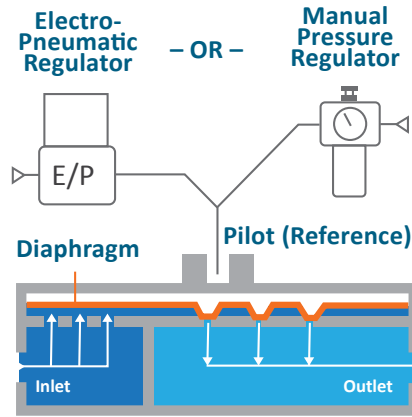
Our goal is to exceed your expectations. In an industry where delivery times frequently exceed 6 weeks, we offer many of our standard products with delivery in about a week.

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.



# 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.

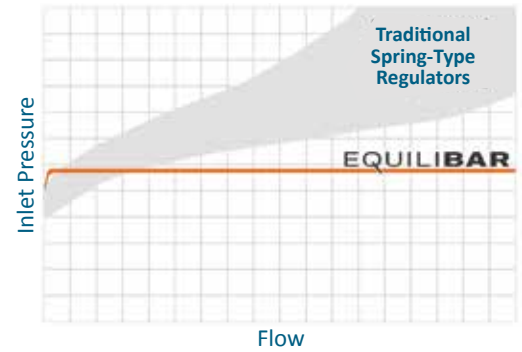


Pilot operate your Equilibar® back pressure valve with an electronic pressure regulator for automated back pressure control.



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

## Performance Comparison



TYPE	PRESSURE REDUCING REGULATOR	BACK PRESSURE REGULATOR
SCHEMATIC		
CONTROLS PRESSURE	Downstream	Upstream
OPENS TO	Increase downstream pressure	Decrease upstream pressure
CLOSES TO	Decrease downstream pressure	Increase upstream pressure

## 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).

## APPLICATION HIGHLIGHTS

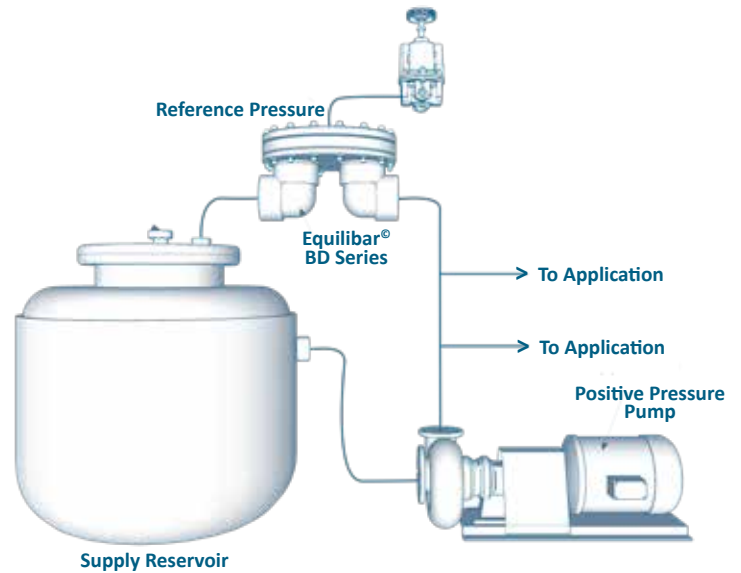
There are hundreds of potential applications for the unique capabilities of an Equilibrar® Back Pressure Regulator (BPR). Equilibrar back pressure regulators are designed for use in liquid, gas, and mixed phase spanning from ultra low flow rates to extreme high pressures. By using unique combinations of diaphragm and O-ring materials, Equilibrar back pressure regulators perform brilliantly in the harshest environments that include high temperature and aggressive chemicals.

Equilibrar BD Series is specifically designed for applications where larger sized valves are required. Following are some examples.

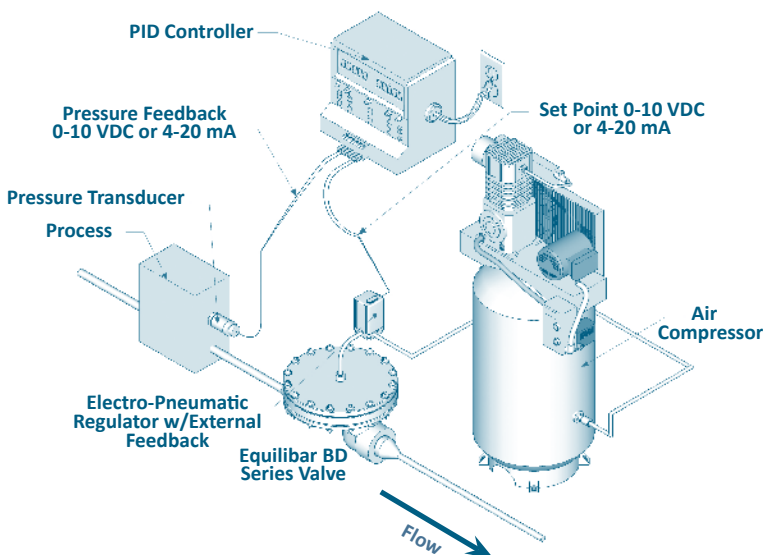
## Pump Pressure Control

The Equilibrar BD regulator can precisely control the discharge pressure of virtually any type of pump by installing the regulator in a return loop back to the supply reservoir. This **pressure bypass** setup ensures consistent pressure as the application demand rises and falls. Equilibrar customers have used this setup for spray systems, bottle filling and many other “on-demand” type applications that have variable flow.

A manual pilot setpoint regulator may be used for simplicity or an electro-pneumatic pilot regulator may be used to computer automate the system.



## Precision Control with Closed Loop



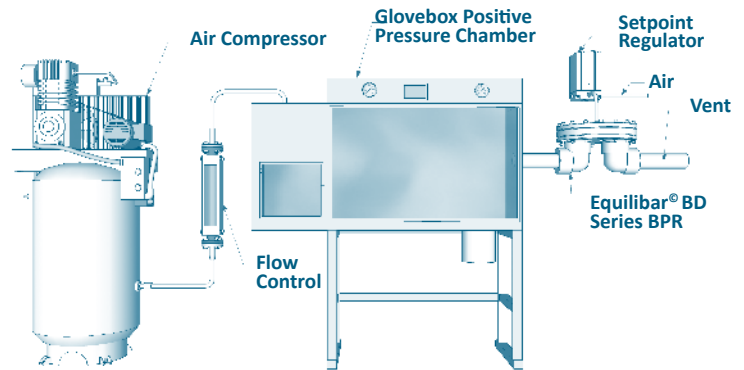
For most applications, the Equilibrar BD meets performance expectations when controlled by a manual pressure reducing pilot regulator. However, for some automation applications, it is useful to have closed loop control using an external pressure transmitter. By using an electro-pneumatic regulator with external feedback, it is possible to automatically adjust the pilot setpoint based on the feedback from the pressure transducer.

The Equilibrar 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.

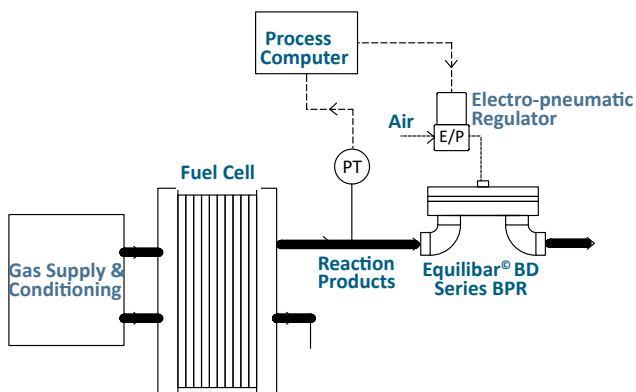
# Glove Box / Ventilation Control

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



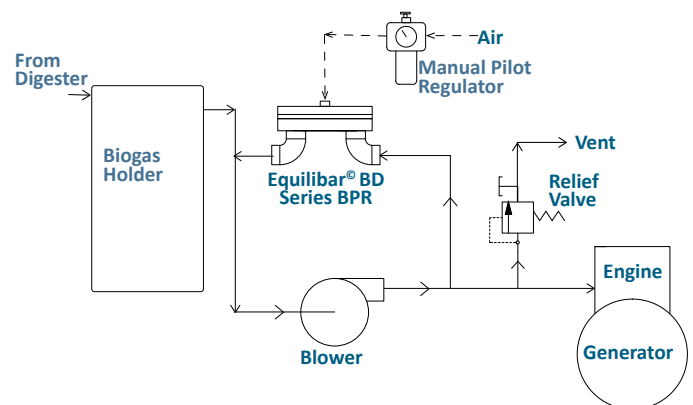
The Equilibar® BD Series back pressure regulator is an excellent fit for fuel cell testing systems. An Equilibar BD is used to control the outlet pressure of the fuel cell while it is being performance tested.

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 Pilot Control Options

## MANUAL CONTROL

Equilibr 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 Equilibr back pressure regulators

APPLICATION	SUPPLY PRESSURE	PORTS	EQUILIBAR PART NUMBER	OUTLET PRESSURE RANGE	REPEATABILITY & SENSITIVITY	
<b>MEDIUM PRESSURE</b>						
Model 10		Max 500 psig	1/4" NPT	10212	0 - 2 psig	Less than 0.125 in H <sub>2</sub> O
				10222	0 - 10 psig	
				10202	0 - 20 psig	
				10232	0.5 - 30 psig	
				10242	1 - 60 psig	
				10262	2 - 150 psig	
				10272	3 - 200 psig	
				10282	5 - 300 psig	
				10292	5 - 400 psig	
<b>ULTRA LOW PRESSURE</b>						
LPR2 Ultra Low Pressure Regulator		5 - 30 psig (Stable Regulated)	1/4" Inlet Outlet (No Gauge)	LPR2-B-7	.25-7 in H <sub>2</sub> O	Sensitivity: 0.02 in H <sub>2</sub> O Stability: 0.06 in H <sub>2</sub> O
				LPR2-B-10	1-10 in H <sub>2</sub> O	
				LPR2-B-28	1-28 in H <sub>2</sub> O	
				LPR2-NB-7	.25-7 in H <sub>2</sub> O	
				LPR2-NB-10	1-10 in H <sub>2</sub> O	
				LPR2-NB-28	1-28 in H <sub>2</sub> O	


# 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.

REGULATOR	DESCRIPTION	KEY FEATURES
<p>QPV Series</p> 	<p>Control Pressures up to 150psig (10 Bar) with high resolution</p>	<ul style="list-style-type: none"> <li>• Min range: 0-0.3 in H<sub>2</sub>O</li> <li>• Max range: 0-150 psig</li> <li>• Available in gauge, absolute, vacuum and vacuum-positive ranges</li> <li>• True proportional valve action</li> <li>• Resolution: 0.005% - 0.2% FS</li> <li>• 4-20mA and 0-10VDC analog I/O</li> <li>• Optional DeviceNet or Serial Digital RS232/485</li> </ul>



Equilibar BD12 pilot operated by a Model 10 manual setpoint regulator.



Equilibar BD24 pilot operated by a QPV1 electronic pressure regulator.

# BD Series Specifications

FOR LIQUID, GAS & MIXED PHASE PROCESSES

SEE FIGURE 1

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

<sup>1</sup> Min Cv is dependent on diaphragm option. Values indicated are conservative. Contact an application engineer for specific details.

TECHNICAL SPECIFICATIONS	
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 <sup>1</sup>
Design Pressure	400% Maximum Body Pressure <sup>2</sup>
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)

<sup>1</sup> All Equilibar units are tested to 150% of their rated pressure prior to shipment.

<sup>2</sup> Designed according to ASME B31.3, which incorporates a 4X safety factor.

Polymer models not recommended for compressible gas applications.

WETTED MATERIALS	
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

Viton® and Kalrez® are registered trademarks of DuPont. VCO® and VCR® are trademarks of Swagelok.

PORTING OPTIONS	
NOTATION	TYPE
N	NPT (Standard)
B	BSPP
C	Custom
F	150# Flange
G	300# Flange
O	Swagelok VCO®
R	Swagelok VCR®
S	SAE

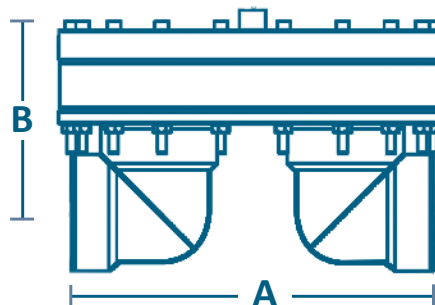


Figure 1 Dimension reference drawing\*

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

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



# Ordering Information

EXAMPLE																
BD	12	S	N	G	X	-	N	S	X	P	30	T	100	V	X	V
BD																
1	2	3	4	5	6	-	7	8	9		10		11	12	13	14

## 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

Others available. Consult an application engineer for assistance

## 4 PORT THREADS

- N NPT
- B BSPP
- F 150# Flanges

## 5 RECESS

(Factory Selected)

## 6 MOD #

(Factory Selected)

## 7 REFERENCE PORT THREADS

- N NPT
- B BSPP

## 8 CAP MATERIAL (NON WETTED)

- S Stainless Steel 316/316L
- P PVC
- A Anodized Aluminum

Items marked in blue are typically in stock for fast shipment

## 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)

Others available. Consult an application engineer for assistance

## 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

## 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, <https://www.equilibar.com/support/patents/>

# 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

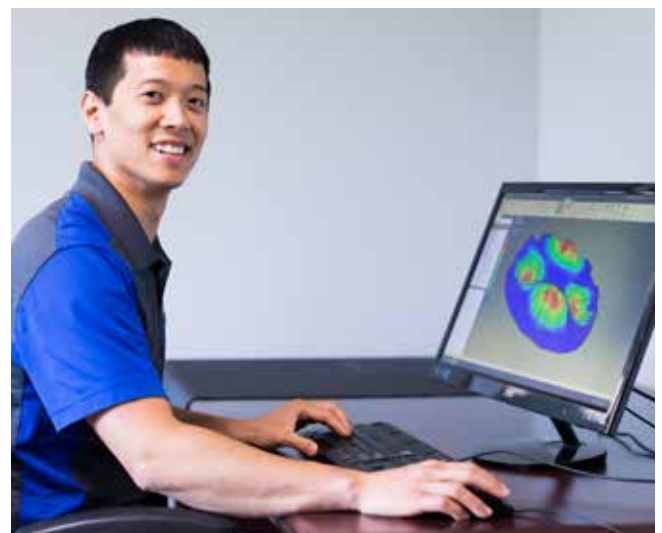
Unlike mass-market regulator distributors, we focus on working with you, the scientist or engineer with a complex pressure control scenario.

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.



Each application is reviewed by our engineering team to ensure quality performance of our products.



Our engineers offer custom designed solutions for the most difficult pressure control challenges. Feel free to contact us to discuss your situation.



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### Work Territory

The Netherlands, Germany, Austria, Sweden, Finland, Norway, Denmark, the Flemish part of Belgium and the German-speaking part of Switzerland



Made in the  
**USA**

Equilibar's quality system is  
**ISO 9001:2015** certified.