EQUILIBAR®
PRECISION FLUID CONTROL

5X MORE PRECISE than standard regulators

BD Series

1.5” – 4” (DN40-100) 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.

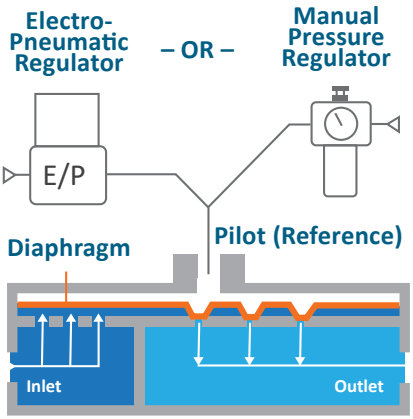
Our priorities.

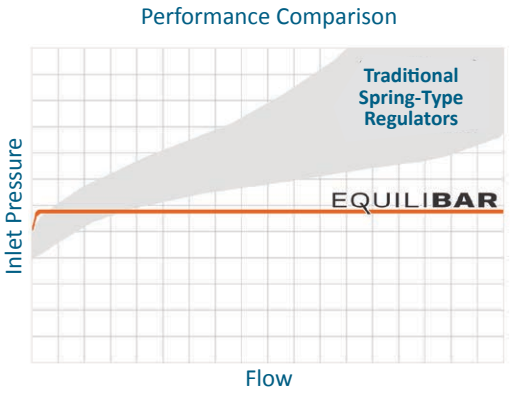
Our goal is to exceed your expectations. In an industry where delivery times frequently exceed 6 weeks, we offer many of our standard products with delivery in about a week.

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.

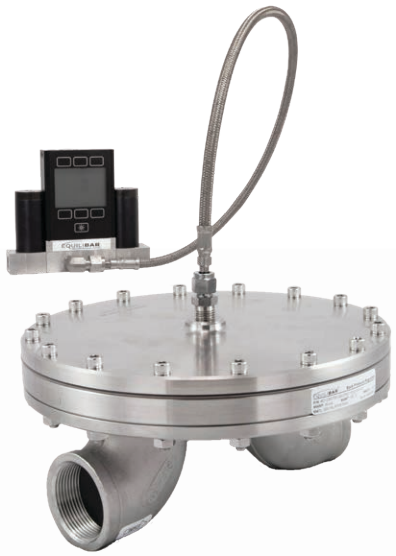
How It Works

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.



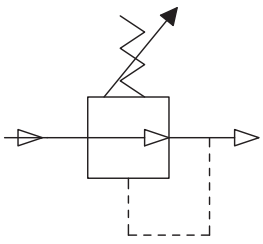
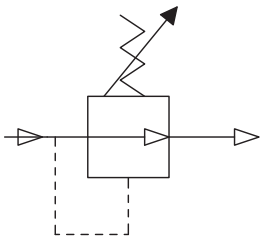


Pilot operate your Equilibar® back pressure valve with a precision pressure reducing regulator for manual back pressure control.



Or set the pilot pressure with an electronic pressure regulator for automated pressure control.

Manual and electronic pilot regulators are sold separately

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

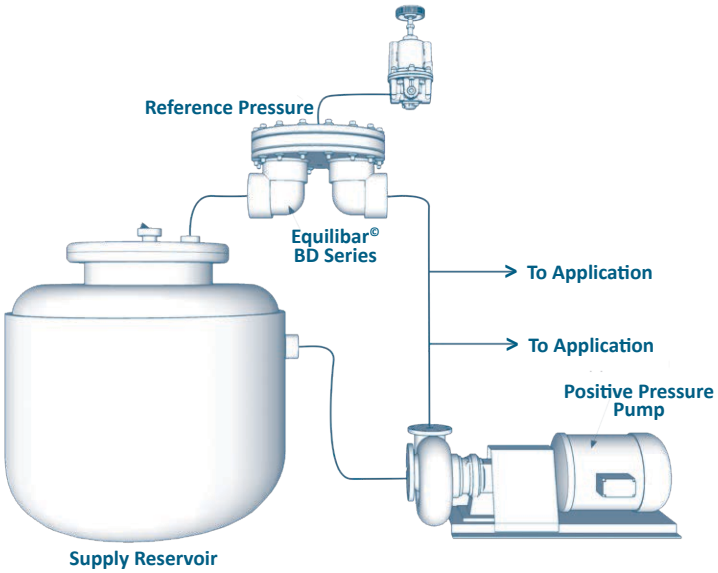
There are hundreds of potential applications for the unique capabilities of an Equilibar® Back Pressure Regulator (BPR). Equilibar back pressure regulators are designed for use in liquid, gas, and mixed phase spanning from ultra low flow rates to extreme high pressures. By using unique combinations of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

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

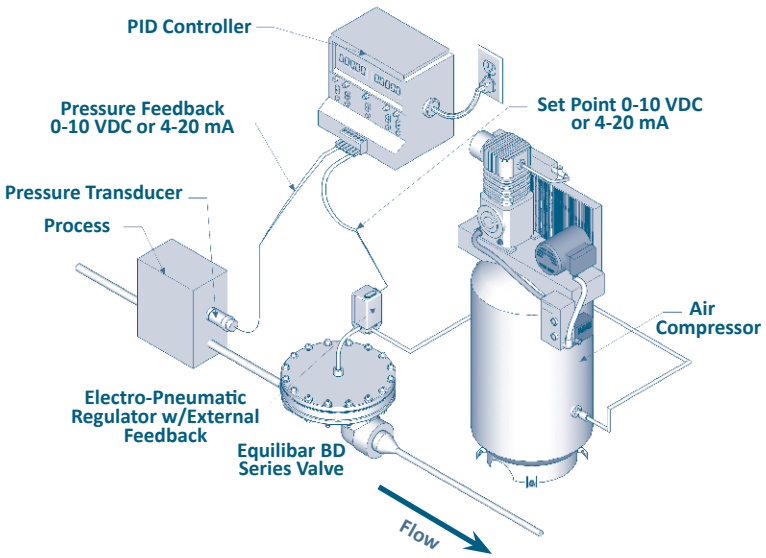
Pump Pressure Control

The Equilibar 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. Equilibar 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



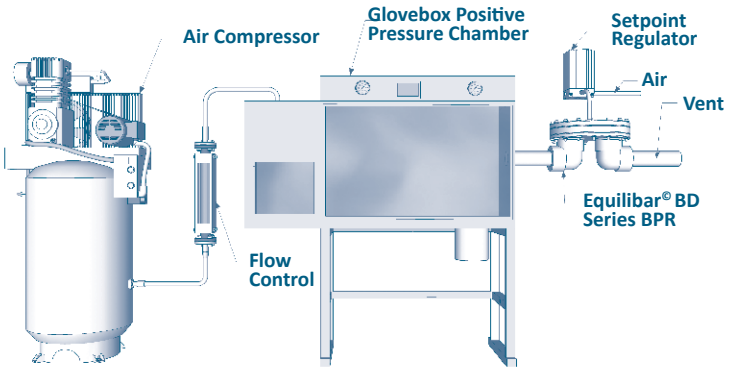
For most applications, the Equilibar BD meets performance expectations when controlled by a manual pressure reducing pilot regulator. However, for some automation applications, it is useful to have closed loop control using an external pressure transmitter. By using an electro-pneumatic regulator with 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.

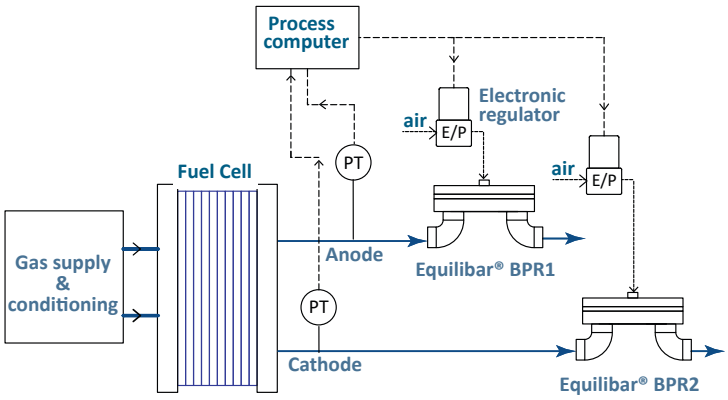
Glove Box / Ventilation Control

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



Fuel cell test stands measure the power generated from Hydrogen Fuel Cells at varying pressure and flow rates. Flow rates during testing vary widely and the reaction products are mixed phase fluid. The Equilibar® BD Series back pressure regulator is an excellent fit for fuel cell testing systems. Equilibar BD valves are used to control the outlet pressures of the anode and cathode of the fuel cell while it is being performance tested.

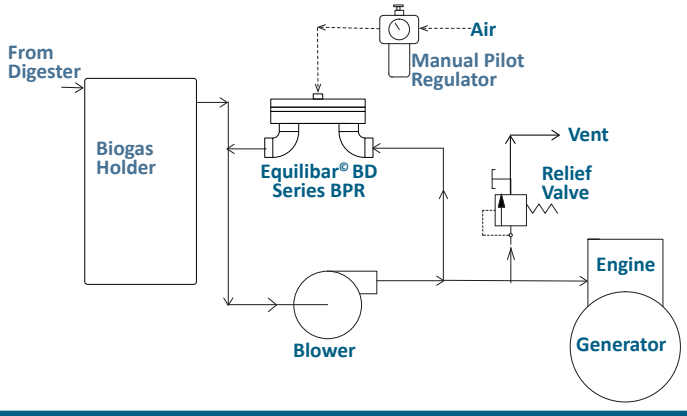
Customers choose Equilibar valves because they precisely maintain pressure from really low flow rates up to very high flow rates; they work accurately at very low pressures where fuel cells operate; and they can easily handle wet, hot, corrosive exhaust gasses produced by the fuel cell.

For lower Cv values, customers choose from our smaller GS Series.

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

Equilibar dome-loaded Back Pressure Regulators (BPRs) get a pilot control signal using a fluid setpoint pressure called ‘reference’ or ‘pilot’ pressure through a port on the cap of the BPR. This pilot fluid is typically compressed air or nitrogen.

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

Pressure reducing regulators sold separately.

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

APPLICATION		SUPPLY PRESSURE	PORTS	PART NUMBER	OUTLET PRESSURE RANGE	REPEATABILITY & SENSITIVITY
MEDIUM PRESSURE						
Model 10 Pressure Regulator Technical Page		Max 500 psig	1/4” NPT	10212	0 - 2 psig	Less than 0.125 in H_2O
				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	
ULTRA LOW PRESSURE						
LPR2 Ultra Low Pressure Regulator Technical Page		5 - 30 psig (Stable Regulated)	1/4” Inlet Outlet (No Gauge)	LPR2-B-7	.25-7 in H2O	Sensitivity: 0.02 in H_2O Stability: 0.06 in H_2O
				LPR2-B-10	1-10 in H2O	
				LPR2-B-28	1-28 in H2O	
				LPR2-NB-7	.25-7 in H2O	
				LPR2-NB-10	1-10 in H2O	
				LPR2-NB-28	1-28 in H2O	

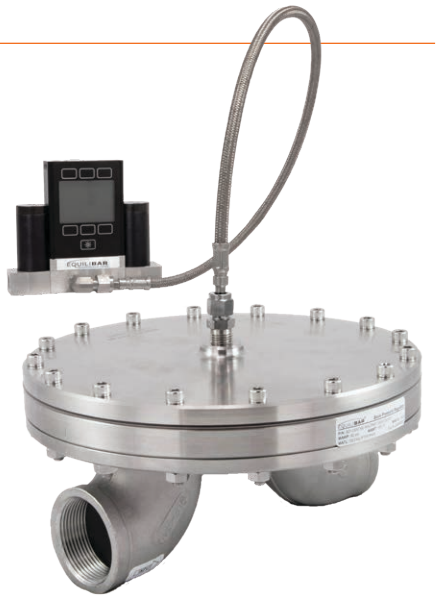
Electronic Pilot Control

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.

The electronic pressure control devices described below and on our website are custom tuned at the factory to work with our precision back pressure regulators or vacuum regulators. We recommend using one of these. The pilot regulator can be mounted near the process control system for easy process integration or mounted closer to the dome of the regulator[1].

Contact Equilibar or visit our website for assistance in choosing a pilot control system for your application. Pilot pressure regulators are sold separately.



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

Regulator		Description	Key Features
QPV Series Techical Page		High Precision Low Pressure Regulator Controls up to 150 psi (10 bar) 4-20 mA or 0-10 VDC	• Controls to 150 psig(10 bar) • Available in gauge, absolute, vacuum and vacuum-positive ranges • Superior proportional valve action • Tuned ready for setpoint pilot service • Optional DeviceNet / Serial communication • IP65 enclosure
EPC Series **EHP Series** Technical Page		Precision Electroic Pressure Controller EPC Model Controls up to 150 psig (10 bar) EHP Model controls up to 500 psig (34 bar) 4-20mA or 0-10V Analog 3.3V Serial Digital	• Models control to 150 psig (10 bar); 500 psig (34 bar); • Available in gauge, absolute,vacuum • Dual analog valve construction • Factory set for your pressure • Digital or analog communication • IP65 enclosure
EPR Series Technical Page		High Resolution Electronic Pressure Regulator Controls up to 3000 psi (200 bar) 4-20 mA or 0-5 VDC Analog RS232 or RS485 Digital	• Models control to 150 psig (10 bar); 500 psig (34 bar); 1000 psig (69 bar); 3000 psig (207 bar) • Available in gauge, absolute • Proportional inlet & outlet valves for maximum stability • No gas wasted at steady state • Factory set for your pressure • Digital or analog communication • Direct control from the keypad • IP40 enclosure

[1] For best stability, the tubing between the outlet of the electronic regulator and the dome of the BPR requires a minimum volume of 2 cubic inches / 35cc.

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[1]	MAX CV	DIM A[2]	DIM B[2]
	IN (DN)			PSIG (BAR)			INCH (MM)	
BD12S	1.5" (40)	1/4"	Stainless Steel 316/316L	45 (3.1)	1E-02	13	9.5 (241)	3.9 (99)
BDM12S	1.5" (40)	1/4"	Stainless Steel 316/316L	120 (8.3)	1E-02	13	9.5 (241)	4.0 (102)
BDH12S	1.5" (40)	1/4"	Stainless Steel 316/316L	180 (12.4)	1E-02	13	9.5 (241)	4.15 (105)
BD12A	1.5" (40)	1/4"	Anodized Aluminum	75 (5.2)	1E-02	13	7.6 (193)	3.7 (94)
BD12P	1.5" (40)	1/4"	PVC	30 (2.1)	1E-02	13	9 (228)	4.3 (109)
BD16S	2" (50)	1/4"	Stainless Steel 316/316L	70 (4.8)	3E-02	28	11 (280)	4.1 (104)
BDM16S	2" (50)	1/4"	Stainless Steel 316/316L	150 (10.3)	3E-02	28	11 (280)	5.7 (145)
BDH16S	2" (50)	1/4"	Stainless Steel 316/316L	400 (27)	3E-02	28	11 (280)	6.7 (169)
BD16A	2" (50)	1/4"	Anodized Aluminum	50 (3.4)	3E-02	28	9 (228)	4.3 (109)
BD16P	2" (50)	1/4"	PVC	30 (2.1)	3E-02	28	11 (280)	5.1 (130)
BD24S	3" (80)	1/4"	Stainless Steel 316/316L	45 (3.1)	6E-02	60	13 (330)	5.3 (135)
BDM24S	3" (80)	1/4"	Stainless Steel 316/316L	85 (5.9)	6E-02	60	13 (330)	6.2 (157)
BD24A	3" (80)	1/4"	Anodized Aluminum	30 (2.1)	6E-02	60	12.5 (317)	5.9 (150)
BD24P	3" (80)	1/4"	PVC	20 (1.4)	6E-02	60	15 (381)	8.8 (224)
BD32S	4" (100)	1/4"	Stainless Steel 316/316L	20 (1.4)	1.5E-01	160	20 (508)	8.1 (205)
BDM32S	4" (100)	1/4"	Stainless Steel 316/316L	60 (4.2)	1.5E-01	160	20 (508)	
BDH32S	4" (100)	1/4"	Stainless Steel 316/316L	100 (6.8)	1.5E-01	160	20 (508)	
BD32A	4" (100)	1/4"	Anodized Aluminum	20 (1.4)	1.5E-01	160	20 (508)	8.1 (205)
BD32P	4" (100)	1/4"	PVC	20 (1.4)	1.5E-01	160	20 (508)	9.6 (244)

[1] Min Cv is dependent on diaphragm option. Values indicated are conservative. Contact an application engineer for specific details.
[2] Dim A and Dim B are for standard NPT fittings and are for reference only. Dimensions may vary based on process port type. Please confirm take-out dimensions with Equilibar at time of order if exact measurements are needed.

WETTED MATERIALS	
Body Material	Stainless Steel 316/316L (standard) Also available: Hastelloy C276, Titanium, Zirconium
O-Rings	Viton® (FKM) (standard) Also available: 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.

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[1]
Design Pressure	400% Maximum Body Pressure[2]
Temperature Rating	Up to 150C - Metal Body, PTFE Diaphragm, Viton® O-Rings Up to 200C - Metal Body, Metal Diaphragm, Viton® O-Rings Up to 300C - Metal Body, Metal Diaphragm, FFKM O-Rings

[1] All Equilibar units are tested to 150% of their rated pressure prior to shipment.
[2] Designed according to ASME B31.3, which incorporates a 4X safety factor. Polymer models not reccommended for compressible gas applications.

PROCESS PORT OPTIONS	
NOTATION	TYPE
N	NPT (Standard)
B	BSPP
F	ANSI Class 150 Flange
G	ANSI Class 300 Flange
D	DIN EN 1092-1 Flange
H	3A Triclamp
Custom port options are available on request	

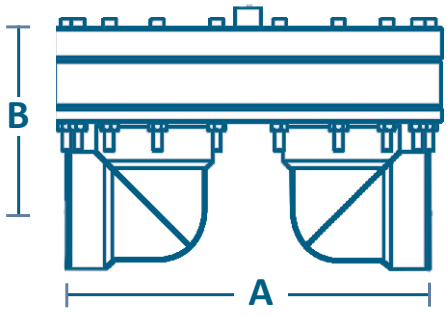


Figure 1 Dimension reference drawing*

DIM A - valve takeout with NPT elbow fittings

DIM B - height from center of port to top of valve cap

***Aluminum elbows are square. Tabulated dimensions are for guidance only. Contact an application engineer for specific dimensions and other flanged fittings.**

BD Series Part Number Key

This part number key explains our part numbering system and possible model options. All of our BPRs are custom-configured by our engineers based on the customer's specific application's parameters (process fluid, pressures, flow rates, temperature, etc.). Our engineers will request process operating parameters in order to build and quote a full part number for a suitable regulator. This chart is a reference to help understand the chosen part number.

EXAMPLE																	
BD	12	S	N	G	X	-	N	S	X	P	30	T	100	V	X	V	40
BD																	
1	2	3	4	5	6	-	7	8	9		10		11	12	13	14	**15**

1 MODEL TYPE

BD BD
BDM BDM (Medium Max Pressure)
BDH BDH (Higher Max Pressure)

2 PORT SIZE INCH (DN)

12 1.5" (DN40)
16 2" (DN50)
24 3" (DN80)
32 4" (DN100)

3 BODY MATERIAL

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

Others available. Consult an application engineer

4 PROCESS PORT [1]

N NPT
B BSPP
F ANSI Class 150 Flange
G ANSI Class 300 Flange
D DIN EN 1092-1 Flange
H 3A Triclamp

[1]Contact us for others (DIN Triclamp; etc)

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 (Metal Units)

Others available. Consult an application engineer

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 FFKM
ZZZZ Markez® FFKM (# varies by grade)
FFFF PTFE
EEEE EPDM
BBBB Buna

15 DIN FLANGE PN RATING

DIN Flange where ## is the PN rating

Equilibar stainless steel BD16 with 3A triclamp flanges

PATENTS

Equilibar regulators are subject to the patents listed at equilibar.com/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. Equilibar is a division of Richards Industrials.

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.

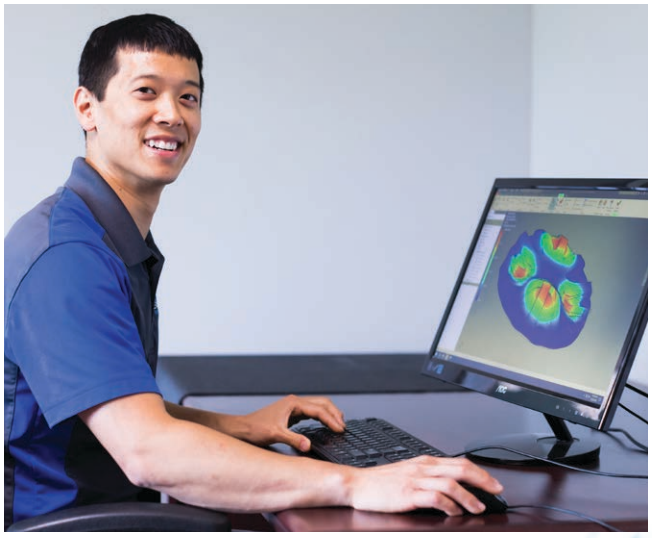
Our application engineers work collaboratively with clients to identify the optimal model, trim, and diaphragm for each application's unique challenges. No matter where you are on the globe, you can stay in close contact with your engineer by email, telephone, videoconferencing, or fax.

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

EQUILIBAR®
PRECISION FLUID CONTROL

Equilibar, LLC
320 Rutledge Rd.
Fletcher, North Carolina 28732
United States
Tel: +1-828-650-6590
Fax: +1-801-504-4439
Monday - Friday
8:00 AM - 5:00 PM EST
12:00 - 21:00 GMT
inquiry@equilibar.com

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.

Made in the USA

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

a division of Richards Industrials