EQUILIBAR®
PRECISION FLUID CONTROL

Hydrogen Industry

¼" – 4" (DN 8 - 100) Back Pressure Regulators

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.

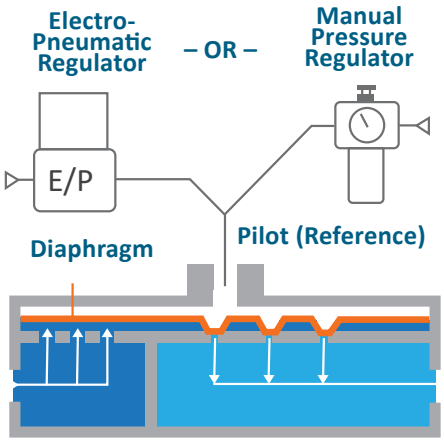
Our priorities.

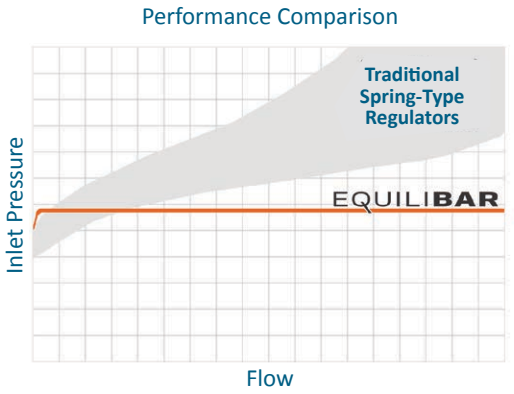
Our goal is to exceed your expectations. In an industry where delivery times frequently exceed 6 weeks, we offer many of our standard products with delivery in about a week.

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

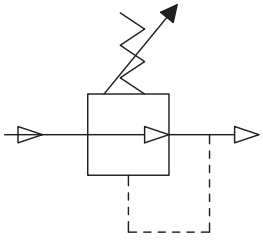
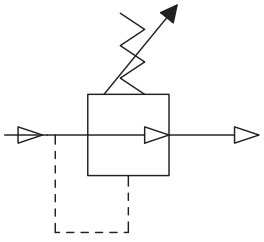
Simply load the Equilibar® back pressure regulator with a pilot pressure equal to your desired back pressure setpoint and the Equilibar does the rest. The pilot pressure forces the flexible diaphragm down onto a plate of orifices. A rise in inlet pressure lifts the diaphragm up to allow excess pressure 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.

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

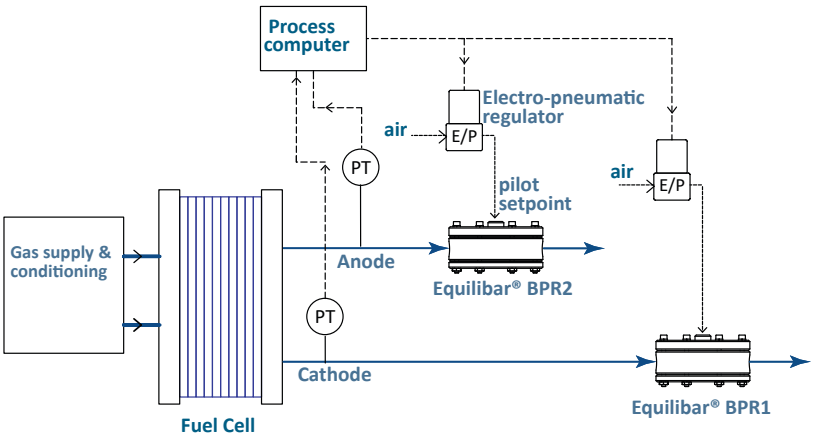
Pressure reducing regulators reduce a higher supply pressure at the inlet down to a regulated lower pressure at the outlet (downstream). Back pressure regulators work the opposite way. They regulate the inlet (upstream) pressure by opening up only as much as necessary to hold back the desired pressure at the inlet (upstream).

APPLICATION HIGHLIGHTS

Equilibar® fluid control products deliver reliable performance for some of the world's most complex process conditions. Our dome-loaded, multiple-orifice technology offers superior precision and frictionless control, especially for ultra low flow, extremely wide flow rate ranges, mixed phase fluids, corrosive media, and extreme temperatures. By using unique combinations of diaphragm and O-ring materials, Equilibar back pressure regulators (BPRs) perform brilliantly in the harshest environments.

In the hydrogen industry, Equilibar valves offer unique advantages in pressure control of fuel cell testing equipment and for differential pressure control in water electrolysis systems.

Fuel Cell Testing



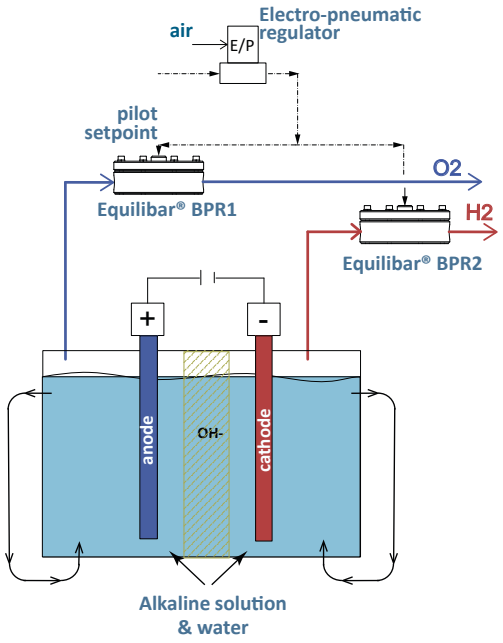
Fuel cell test stands measure the power generated from Hydrogen Fuel Cells at varying pressure and flow rates. Flow rates during testing vary widely and the reaction products are mixed phase fluid. Equilibar back pressure regulators are an excellent fit for pressure control in fuel cell testing systems.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

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

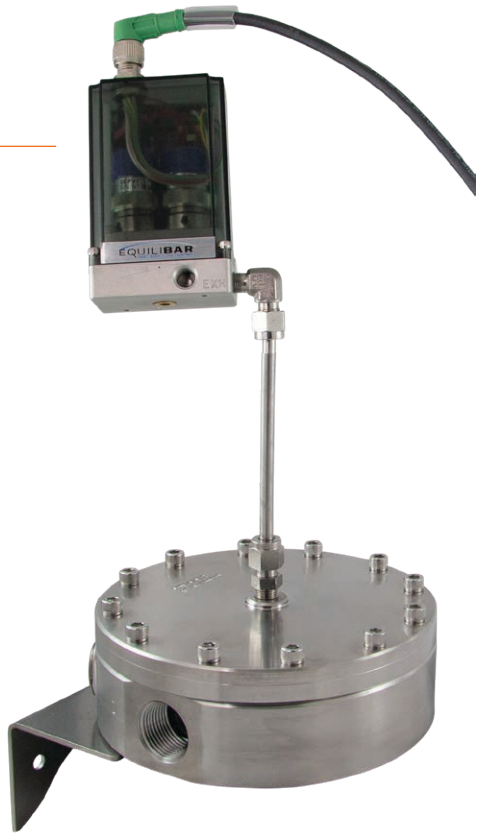
Electrolysis

The Equilibar back pressure regulator is extremely powerful in electrolyzer pressure control applications. They are used to control the outlet pressure of the H2 and O2 product streams in water electrolysis for hydrogen production.

Customers choose Equilibar valves because they accurately maintain precise differential pressure. Precision differential pressure control between the anode and cathode is a key factor in designing an efficient electrolysis system. As the electrochemical reaction takes place, the pressure differential changes, requiring active pressure control. Equilibar back pressure regulators work well because of their extreme precision and unparalleled responsiveness.



Electronic Pilot Control Options



Electronic control of Equilibar BPRs for fuel cell and electrolysis applications is easily managed using our precision electronic pressure regulators (electro-pneumatic regulators). The electronic regulators listed below will provide extremely accurate pilot setpoint pressure to Equilibar dome-loaded BPRs for easy automation.

The pilot regulator can be mounted near the process control system for easy process integration or mounted closer to the cap of the Equilibar regulator[1].

They are custom tuned at the factory to work with Equilibar BPRs for your specific application.

Contact Equilibar or visit our website for additional details about the pilot pressure control options available.

Regulator		Description	Key Features
QPV Series		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**		Precision Electronic 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		High Resolution High Pressure 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

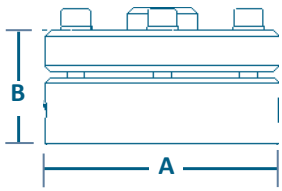
[1] For best stability, the tubing between the outlet of the electronic regulator and the dome of the BPR requires a minimum volume of 2 cubic inches / 35cc.

Hydrogen Back Pressure Regulator Specifications

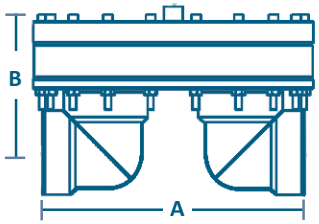
FOR LIQUID, GAS & MIXED PHASE PROCESSES

Equilibar® precision back pressure regulators for the hydrogen industry are made with 316L stainless steel standard. Specifications in this table are all for stainless steel models. Other alloys are available for special applications and process conditions. Our application engineers will work with you to identify the model best suited for your specific application.

MODEL	PROCESS PORT SIZE	MAX PRESSURE RATING	MIN CV[1]	MAX CV	REFERENCE PORT SIZE	DIM A[2]	DIM B[2]
	INCH (DN)	PSIG (BAR)			INCH (MM)		
LF2	1/4" (8)	1000 (68)	1E-08	0.07	1/8"	2.5 (64)	1.5 (39)
HF2	1/4" (8)	1000 (68)	1E-05	0.41	1/8"	2.5 (64)	1.5 (39)
H3P2	1/4" (8)	3000 (200)	1E-08	0.07	1/8"	2.8 (70)	1.7 (42)
H3PF2	1/4" (8)	3000 (200)	1E-05	0.35	1/8"	2.8 (70)	1.7 (42)
GSD2	1/4" (8)	650 (45)	1E-03	1.20	1/8"	3.00 (76)	1.34 (34)
GSDM2	1/4" (8)	850 (58)	1E-03	1.20	1/8"	3.25 (83)	1.34 (34)
GSDH2	1/4" (8)	2500 (172)	1E-03	1.20	1/8"	3.30 (84)	1.70 (43)
GSD4	1/2" (15)	350 (24)	1E-03	3.20	1/8"	4.50 (114)	1.73 (44)
GSDM4	1/2" (15)	750 (52)	1E-03	3.20	1/8"	5.00 (127)	1.85 (47)
GSDH4	1/2" (15)	1400 (97)	1E-03	3.20	1/8"	5.00 (127)	1.98 (50)
GSD6	3/4" (20)	300 (21)	1E-02	5.50	1/8"	6.00 (152)	2.01 (51)
GSDM6	3/4" (20)	700 (55)	1E-02	5.50	1/8"	6.25 (159)	2.44 (62)
GSDH6	3/4" (20)	1600 (110)	1E-02	5.50	1/8"	6.40 (163)	2.90 (74)
GSD8	1" (25)	150 (10)	1E-02	8.50	1/8"	7.00 (178)	2.50 (64)
GSDM8	1" (25)	500 (34)	1E-02	8.50	1/8"	7.25 (184)	2.76 (70)
GSDH8	1" (25)	2100 (145)	1E-02	8.50	1/8"	7.80 (198)	3.33 (85)
BD12	1.5" (40)	45 (3.1)	1E-02	13	1/4"	9.5 (241)	3.9 (99)
BDM12	1.5" (40)	120 (8.3)	1E-02	13	1/4"	9.5 (241)	4.0 (102)
BDH12	1.5" (40)	180 (12.4)	1E-02	13	1/4"	9.5 (241)	4.15 (105)
BD16	2" (50)	70 (4.8)	3E-02	28	1/4"	11 (280)	4.1 (104)
BDM16	2" (50)	150 (10.3)	3E-02	28	1/4"	11 (280)	5.7 (145)
BDH16	2" (50)	400 (27)	3E-02	28	1/4"	11 (280)	6.7 (169)
BD24	3" (80)	45 (3.1)	6E-02	60	1/4"	13 (330)	5.3 (135)
BDM24	3" (80)	85 (5.9)	6E-02	60	1/4"	13 (330)	6.2 (157)
BD32	4" (100)	20 (1.4)	1.5E-01	160	1/4"	20 (508)	8.1 (205)



DIM reference drawing[2] for LF, HF and GSD models



DIM reference drawing[2] for BD models

[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 will vary based on process port type. Please confirm take-out dimensions with Equilibar at time of order if exact measurements are needed.

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. Contact us for more information.
Proof Pressure	150% Rated Pressure [1]
Design Pressure	400% Maximum Body Pressure [2]
Temp. Rating	Up to 150°C - Metal body, PTFE/PEEK Diaphragm, Viton® O-Rings Contact an application engineer for other Temp. Ratings

[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.

WETTED MATERIALS	
Body Material	Stainless Steel 316/316L (standard) Also available: Hastelloy C276, Titanium, Zirconium
O-Rings	Viton® FKM (standard) Also available: FFKM, others on request
Diaphragm	PGL - PTFE/Glass Laminate (standard) Also available: Polyimide, PEEK

Viton® is a registered trademark of DuPont.

Hydrogen BPR 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 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																	
BDM	12	S	H	X	X	-	N	S	X	P	100	T	100	G	X	VVVV	B
1	2	3	4	5	6	-	7	8	9		10		11	12	13	14	15

1	MODEL TYPE	1	
LF	Low flow	HF	High flow
H3P	High pressure	H3PF	High pressure high flow
GSD	Standard GSD	BD	Standard BD
GSDM	Med Pressure GSD	BDM	Med Pressure BD
GSDH	High Pressure GSD	BDH	High Pressure BD

2	PORT SIZE INCH (DN)	2	
2	1/4" (DN 8)	12	1.5" (DN 40)
4	1/2" (DN 15)	16	2" (DN 50)
6	3/4" (DN 20)	24	3" (DN 80)
8	1" (DN 25)	32	4" (DN 100)

3	BODY MATERIAL	
S	Stainless Steel 316/316L	Contact us for others

4	PROCESS PORT	4	
N	NPT	B	BSPP
F	ANSI Class 150 Flange	H	3A Triclamp
G	ANSI Class 300 Flange	D	DIN EN 1092-1 Flange
			Contact us for others

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

9	BOLTS
	(Factory Selected)

10	PRESSURE RATING IN PSIG

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 IN DEG C
100	100°C
150	150°C
	Consult an application engineer for other ratings

12	DIAPHRAGM MATERIAL
G	PGL - PTFE (Glass Reinforced)
I	Polyimide
K	PEEK

13	DIAPHRAGM THICKNESS
	(Factory Selected)

14	O-RINGS (BD MODELS HAVE 4 O-RINGS. OTHERS HAVE 2)
	(Wetted)
V	Viton® Shore 75
K	FFKM Kalrez® Grade 7075
L	FFKM Kalrez® Grade 7090
Z	FFKM Markez® (# varies by grade)

15	SPECIAL OPTIONS
##	DIN Flange where ## is the PN rating
B	Mounting Bracket
O	Oxygen Cleaning

PATENTS

Equilibar regulators are subject to the patents listed at www.equilibar.com/support/patents

Equilibar stainless steel BD16 with 3A 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.

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

For information on our full line of products, please follow these links

Research Series Brochure 1/8" to 1/4" BPRs

GS Series Brochure 1/4" to 1" BPRs

BD Series Brochure 1.5" - 4" BPRs

or *Contact Us* directly.

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Made in the USA

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