EQUILIBAR®
PRECISION FLUID CONTROL

5X MORE PRECISE than standard valves

IC Series

1.5” – 3” (DN40-80) Industrial Valves- Pressure, Flow, Vacuum

FOR GAS, LIQUID AND MIXED PHASE FLUID APPLICATIONS

5X MORE PRECISE than standard regulators

The Equilibar Difference

Our performance.

Equilibar® valves 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 valve 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.

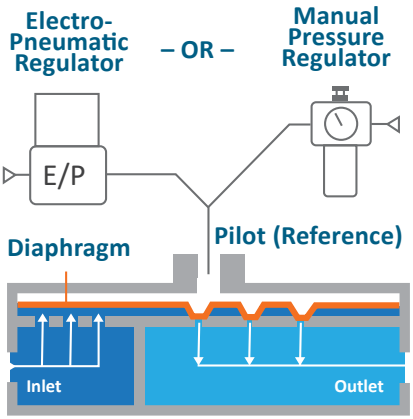
Traditional back pressure regulators set the upstream pressure with a spring. These designs utilize sliding seals and other moving parts that can introduce hysteresis and other undesired effects into a process. The Equilibar® back pressure regulator uses a thin, supple diaphragm as the only moving part. This allows frictionless operation without cracking pressure or hysteresis. Equilibar valves are dome-loaded and pilot operated. The accuracy of the Equilibar® valve is determined by the accuracy of the pilot setpoint.

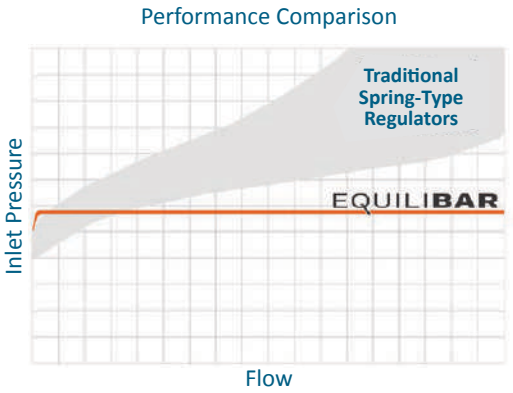
How It Works

Simply load the Equilibar® back pressure regulator with a pilot pressure equal to your desired setpoint 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.

The dome-loaded design allows for flexibility in pressure control range from vacuum through positive pressure. Just set the pilot regulator up in a vacuum range or a positive pressure range depending on your process needs. The Equilibar valve adjusts accordingly.

If you want flow control, set up a closed loop feedback with a flow meter.

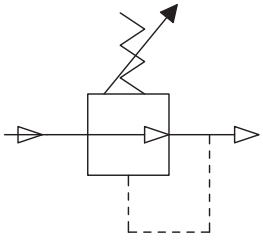
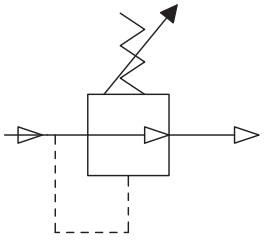




Pilot operate your Equilibar® back pressure valve with a precision pressure reducing regulator for manual back pressure control.

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).

Equilibar valves control pressure at their inlet port.

Key Performance Advantages

IMPROVED EQUILIBAR TECHNOLOGY

Featuring Equilibar's revolutionary dome-loaded multiple-orifice technology, the IC valves and regulators provide best-in-class performance in a practical, compact size and are easily customized. The new design is compact, rated to high pressures, uses premium materials and is available in a variety of process connections.

FRICTIONLESS OPERATION

Traditional back pressure regulators and control valves use springs and sliding seals that develop overpressure with increasing flow as the spring is gradually compressed.

The Equilibar® IC Valve uses a single frictionless flexible diaphragm to modulate the pressure or flow. It is free of springs and valve seats that add friction and reduce precision. The supple diaphragm adjusts immediately, opens fully with minimal overpressure, is highly sensitive, and exhibits virtually no dead-band or hysteresis.

INSTANT RESPONSE TIME

Equilibar dome-loaded regulators respond instantaneously to changes in setpoint pressure or process fluctuations.

PRECISION OVER WIDE FLOW RANGES

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

The IC Series regulator, however, provides stable pressure control across flow ranges on the order of 100:1 in many applications. Because of this wide turn-down ratio, it is possible to size the IC Series for a wide range of process conditions with just one size valve.

Equilibar IC16 valve with an electronic vacuum pilot regulator for use in automated vacuum control applications such as precision vacuum table and vacuum picking control

Equilibar IC16 valve with manual pilot regulator for use in a variety of precision back pressure control applications such as tank blanketing

LIQUID OR GAS APPLICATIONS

The IC Series valves are equally well suited for liquid and gas applications.

MIXED PHASE APPLICATIONS

Mixed phase applications often cause problems for traditional valves due to the single valve seat design and the wide variation in density between liquid and gas. However, the Equilibar valves have multiple orifices in parallel, enabling them to easily process these density changes with minimal pressure disruption.

VISCOUS FLUIDS AND SLURRIES

Engineers often turn to Equilibar valves for processing viscous fluids, where Equilibar valves have been used to process glycerin, polymers, adhesives, lubricants, viscous personal care products and foods to name a few. Customers have also found that the design of the Equilibar valves is useful for processing fluids containing particles such as biomass slurries.

EASY COMPUTER AUTOMATION

All Equilibar back pressure regulators can be controlled both manually and electronically. It's easy to verify the system design with manual control, then automate it later by adding an electronic pilot regulator.

EASE OF MAINTENANCE

Equilibar IC Series Valves have a small footprint and simple design. A valve can be completely cleaned and rebuilt in minutes. Rebuild kits are in stock and ready to ship.

Versatility of Equilibar® Valves

EQUILIBAR'S UNIQUE TECHNOLOGY

Equilibar's revolutionary fluid control valves—including the IC Series—are well suited to provide back pressure control, flow control and vacuum control.

Because they are dome-loaded, the setpoint is controlled on the dome of the Equilibar regulator by a secondary "pilot" pressure regulator, either electronic or manual (sold separately). The Equilibar valve regulates its inlet pressure at a 1:1 ratio with the dome pilot setpoint pressure. The dome pressure is typically set using compressed air or nitrogen.

The type of pilot pressure regulator is chosen based on whether pressure, vacuum or flow are to be controlled. The same Equilibar IC valve can be used for back pressure, vacuum pressure or flow control by choosing a pilot regulator and control loop if flow control is required.

BACK PRESSURE CONTROL

The Equilibar valves are designed as back pressure regulators that control the pressure at their inlet. Equilibar's direct diaphragm sealing technology controls down to 0.5 in WC and the IC Series controls up to 19-26 bar(g) / 280 - 380 psig. See page 3 for a schematic of how it works.

VACUUM CONTROL

Equilibar IC regulators function as vacuum regulators by using a vacuum pilot regulator with a vacuum supply from the process vacuum.

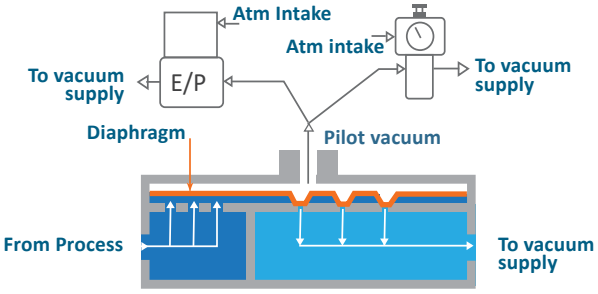


Fig. 1 IC Series set up for vacuum control. Schematic shows choice of electro-pneumatic pilot regulator (E/P) or manual regulator

Equilibar IC12 valve with a vacuum pilot regulator for use in vacuum control system

FLOW CONTROL

While Equilibar valves inherently function as back pressure regulators controlling pressure upstream of their inlet, our innovative customers have found that replacing control valves with Equilibar technology has many benefits. In a flow control configuration, the Equilibar valve works with an electronic pilot pressure controller and a flow meter in a control loop. A proportional-integral-derivative (PID) controller monitors input from a flow transmitter (FT) and adjusts the pilot pressure to bring flow under control. An electronic pressure controller translates the electronic signal from the PID into a pressure signal for the pilot pressure. Flow is decreased by raising the pilot pressure and increased by lowering the pilot pressure.

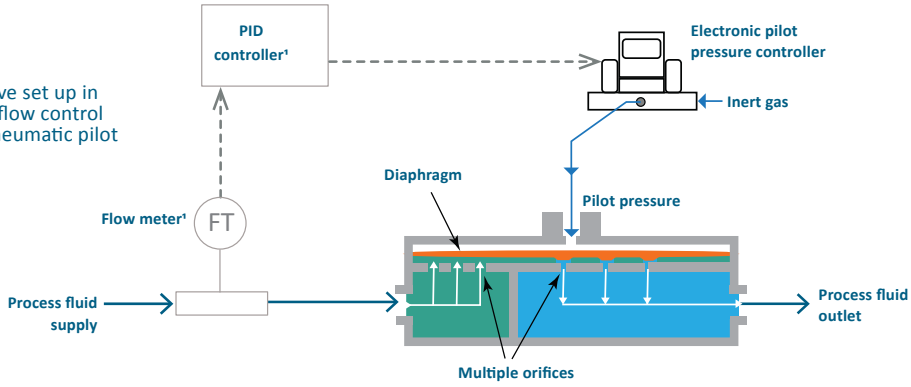


Fig. 2 IC Series valve set up in a control loop for flow control with an electro-pneumatic pilot regulator.

Equilibar IC12 valve with an electronic pilot regulator for use in a flow control loop

APPLICATION HIGHLIGHTS

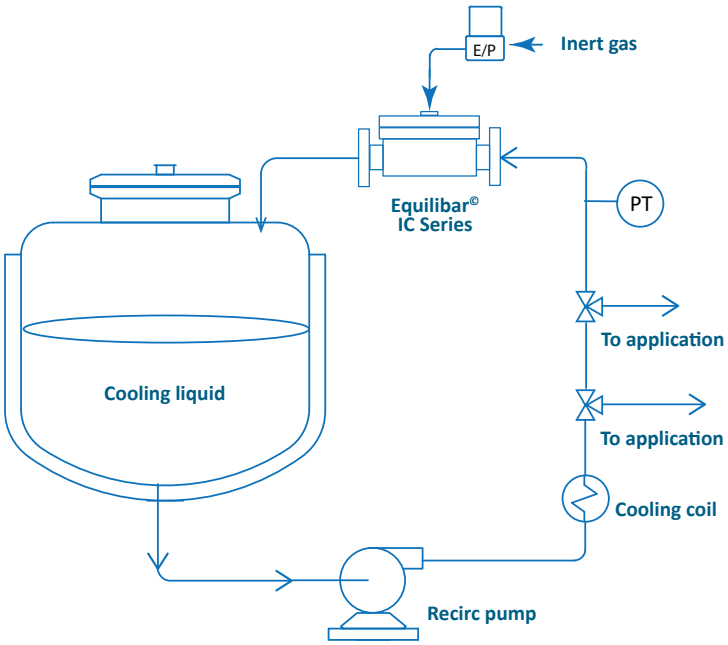
There are hundreds of potential applications for the unique capabilities of an Equilibar® Back Pressure Regulator (BPR). Equilibar back pressure regulators are designed for use in liquid, gas, and mixed phase spanning from ultra low flow rates to extreme high pressures. By using unique combinations of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

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

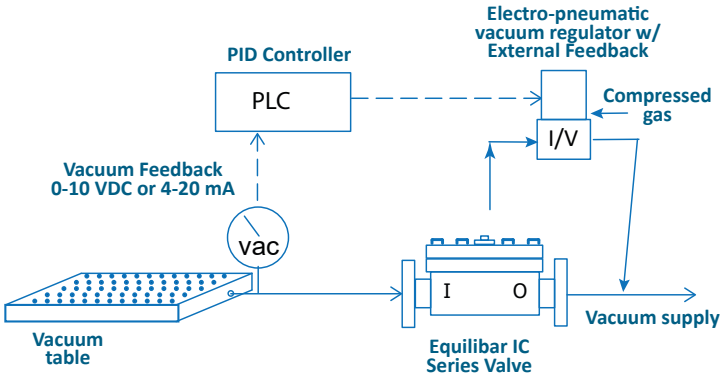
Liquid Cooling Loops

Why Equilibar valves for liquid cooling loops?

- Wide operating flow range – Equilibar valves have extremely wide turndown ranges spanning 100:1 Cv range or greater. When used in a recirculation setup, the coolant flow may be very little when all applications are active, or at full capacity if no applications are active. The wide rangeability of the IC valve allows precise pressure control within the entire operating range of the pump.
- Ease of automation – With an electronic pilot, Equilibar regulators can be easily integrated into automated controls systems.
- Flexibility of control inputs – While Equilibar valves inherently function as back pressure regulators, they are easily driven like control valves and used to control flow or even temperature if paired with feedback from the a flow or temperature sensor.



Precision Closed Loop Vacuum Control



Vacuum table applications pose a difficult pressure control challenge, especially when they involve thin membranes or silicon wafers being placed on and off the table. Flow rate fluctuates rapidly as the number of open holes in the table vary as membranes or wafers are placed on and off the table during processing. Suction variations can have adverse quality control issues, especially if the parts can be damaged from over-pressurization exposure to high vacuum.

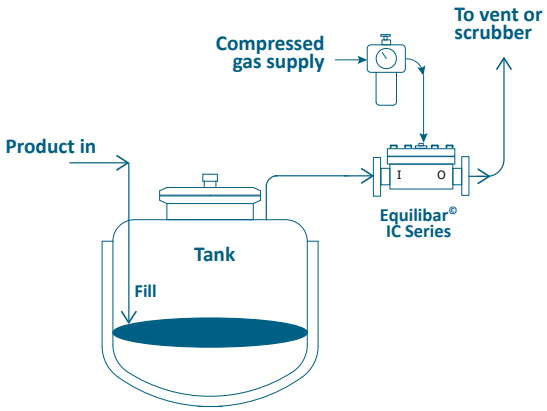
The solution is to use an IC series vacuum regulator that is quick to respond to rapid system changes during parts loading and unloading. The IC vacuum regulator is the perfect solution with its ability to immediately open and close when it senses a disturbance in order to maintain precise vacuum table pressure control.

The IC vacuum is capable of providing stable pressure across the vacuum table even when the flow rate varies by 100:1 ratio.

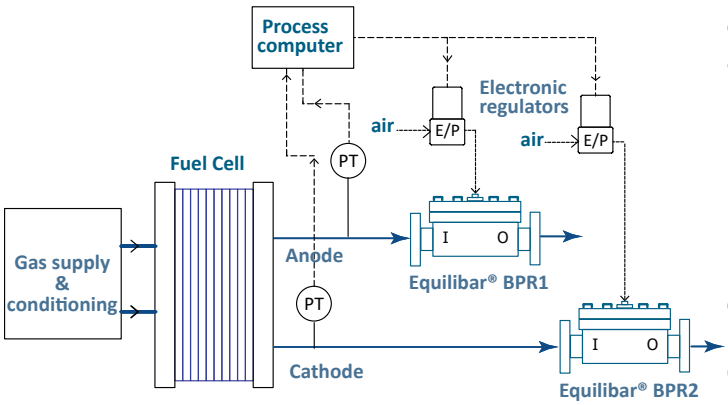
Tank Padding / Nitrogen Blanketing Control

Tank padding or nitrogen blanketing is a common way to protect contents of a storage or process tank from oxidation and deterioration. During tank filling, process operations, or removing product, valves are needed to maintain vapour pressure in the tank.

When filling a tank with product, the blanketing gas or vapours in the head space must be vented to a proper disposal process to meet air quality and safety codes. Connecting the tank to the disposal system though an Equilibar® back pressure regulator (BPR) achieves the goal of retaining a slight pressure on the product container while relieving the pressure as the container fills. Equilibar IC series BPRs are ideal for this application because they respond immediately to pressure changes. The IC Series regulator also easily maintains head space pressure during process operations if temperature and volume change during the process.



Fuel Cell and Electrolyzer Testing



Fuel cell test stands measure the power generated from Hydrogen Fuel Cells at varying pressure and flow rates. Electrolyzer test stands operate with a very similar layout, testing the output of hydrogen and oxygen as variable power is delivered to the cell.

In both cases, flow rates during testing vary widely and the reaction products are mixed phase fluid. The wide operating range of the Equilibar® IC Series back pressure regulator is an excellent fit for both electrolyzer and fuel cell test systems. Equilibar IC valves are used to control the outlet pressures of the anode and cathode of the cell while it is being performance tested.

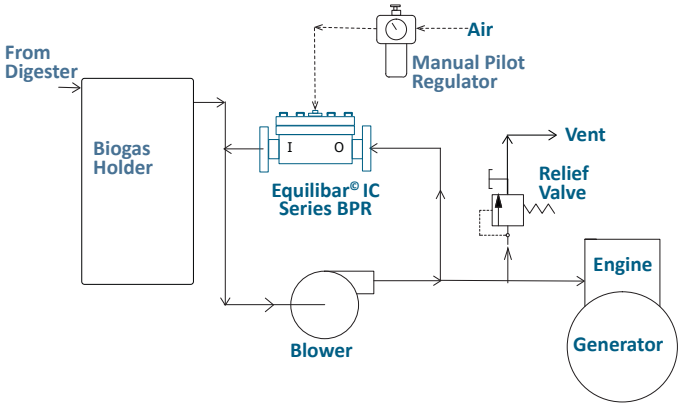
Customers choose Equilibar valves because they precisely maintain pressure from really low flow rates up to very high flow rates; they can work across a wide range of pressures; and they can easily handle wet, hot, corrosive exhaust gasses output by the cells.

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 IC Series valves 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.

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 IC12 regulator with an EPC electronic pilot

Regulator		Description	Key Features
QPV Series Technical 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 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 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.

IC Series Specifications

FOR LIQUID, GAS & MIXED PHASE PROCESSES

SEE FIGURE 1

MODEL	PROCESS PORT SIZE	REFERENCE PORT SIZE	BODY MATERIAL	CAP MATERIAL	MAX PRESSURE RATING[1]	MIN CV[2]	MAX CV	PORT TYPE	DIM A[3]	DIM B[3]
	IN (DN)		PSIG (BAR)						INCH (MM)	
IC12	1.5" (40)	1/4"	CF3M/1.4409 dual certified stainless steel	Stainless steel 316/316L	300 (20.6)	1E-2	15	NPT	8.0 (203)	4.8 (122)
								Class 150 Flange	13.5 (343)	5.8 (147)
								Class 300 Flange	13.6 (345)	6.3 (160)
								Triclamp	10.8 (274)	4.8 (122)
IC16	2" (50)	1/4"	CF3M/1.4409 dual certified stainless steel	Stainless steel 316/316L	300 (20.6)	3E-2	30	NPT	8.0 (203)	4.8 (122)
								Class 150 Flange	13.6 (345)	6.3 (160)
								Class 300 Flange	13.7 (347)	6.5 (165)
								Triclamp	10.8 (274)	4.8 (122)
IC24	3" (80)	1/4"	CF3M/1.4409 dual certified stainless steel	Stainless steel 316/316L	230 (15.8)	6E-2	60	NPT	11.0 (279)	6.6 (168)
								Class 150 Flange	16.8 (427)	8.2 (208)
								Triclamp	14.2 (360)	6.6 (138)

[1] Max Pressure Rating listed in table is at 327°C. Max P at 22°C is 380 psig/26 bar(g) for IC12 and IC16. Max P at 22°C is 280 psig/19 bar(g)
[2] Min Cv is dependent on diaphragm option. Values indicated are conservative. Contact an application engineer for specific details.
[3] Dim A and Dim B dimensions vary based on process port type. Please confirm take-out dimensions with Equilibar at time of order if exact measurements are needed.

PROCESS PORT OPTIONS	
NOTATION	TYPE
N	NPT (Standard)
F	ANSI Class 150 Flange
G	ANSI Class 300 Flange
H	3A Triclamp
Custom port options are available on request - guessing this is not correct	

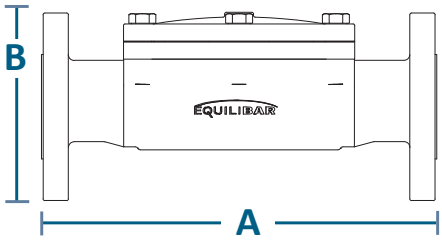


Figure 1 Dimension reference drawing*

DIM A - Valve takeout - depends on type of port (NPT, Tri-clamp, ANSI Flange)

DIM B - Overall height - depends on type of port (NPT, Tri-clamp, ANSI Flange)

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

WETTED MATERIALS	
Body Material	Stainless Steel 316/316L (standard)
O-Rings	Viton® (FKM) (standard) Also available: FFKM, PTFE, EPDM, Buna-N
Diaphragm	**Standard:** PTFE Glass-Reinforced **Also available:** Buna-N, FKM, EPDM, Jorlon, Stainless Steel SS316/316L, Hastelloy C276, Virgin PTFE, Polyimide, PEEK, Conductive PTFE-Glass Reinforced

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 150°C - Metal Body, PTFE-Glass reinforced Diaphragm, Viton® O-Rings Up to 200°C - Metal Body, Metal Diaphragm, Viton® O-Rings Up to 327°C - 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 recommended for compressible gas applications.

PATENTS

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

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

1	MODEL TYPE
IC	IC

2	PORT SIZE INCH (DN)
12	1.5" (DN40)
16	2" (DN50)
24	3" (DN80)

3	BODY MATERIAL
S	CF3M/1.4409 dual certified stainless steel
	Others available. Consult an application engineer

4	PROCESS PORT [1]
N	NPT
F	ANSI Class 150 Flange
G	ANSI Class 300 Flange
H	3A Triclamp
	[1]Contact us for other options

5	RECESS
	(Factory Selected)

6	MOD #
	(Factory Selected)

7	REFERENCE PORT THREADS
N	NPT

8	CAP MATERIAL (NON WETTED)
S	Stainless Steel 316/316L

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 °C
60	for most polyethylene and virgin PTFE diaphragms
150	for glass reinforced PTFE and PEEK diaphragms
200	for Viton® O-rings
300	for Kalrez® and polyimide O-rings
	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
J	Jorlon
K	PEEK
I	Polyimide
Z	Conductive PTFE - Glass Reinforced
	[1]Contact us for other options

13	DIAPHRAGM THICKNESS
	(Factory Selected)

14	O RING
VVVV	Viton® Shore 75
KKKK	Kalrez® Grade 7075 FFKM
ZZZZ	Markez® FFKM (# varies by grade)
EEEE	EPDM
BBBB	Buna
	[1]Contact us for other options

Items marked in blue are typically in stock for fast shipment

About Equilibar

Equilibar provides innovative and robust pressure, vacuum and flow control technology for researchers and engineers worldwide. We are proud to design, manufacture, and test our unique 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, video conference or fax.

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

EQUILIBAR®
PRECISION FLUID CONTROL

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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.

Assembled in the USA

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