



# GP1 & GP2

Electropneumatic Regulators

FOR PRESSURE CONTROL TO 1,000 PSI

# GP1 & GP2 Functional Description

The Equibar GP series control valve is an electronic pressure regulator designed to precisely control the pressure of gaseous media proportional to an electronic signal in pressure ranges up to 1000 psig (69 bar(g)).

The GP1 consists of two normally closed solenoid valves, a pressure sensor, and a control circuit. One valve is actuated to allow supply media into the system. The second valve is actuated to allow working media to vent to atmosphere. An electronic circuit compares the internal pressure sensor feedback to the user supplied electronic command signal and actuates the appropriate valve until the two signals match.

The GP2 is similar to the GP1, but uses a double loop control scheme. In addition to the internal pressure transducer, the GP2 also receives a 0-10Vdc feedback signal from an external sensing device. The external signal functions as the primary feedback and is compared to the command signal. A difference between the two comparisons causes one of the two solenoid valves to open allowing flow in or out of the system.

A DS Series downstream pressure sensor will work as a second loop feedback to the GP2 (See ordering information).

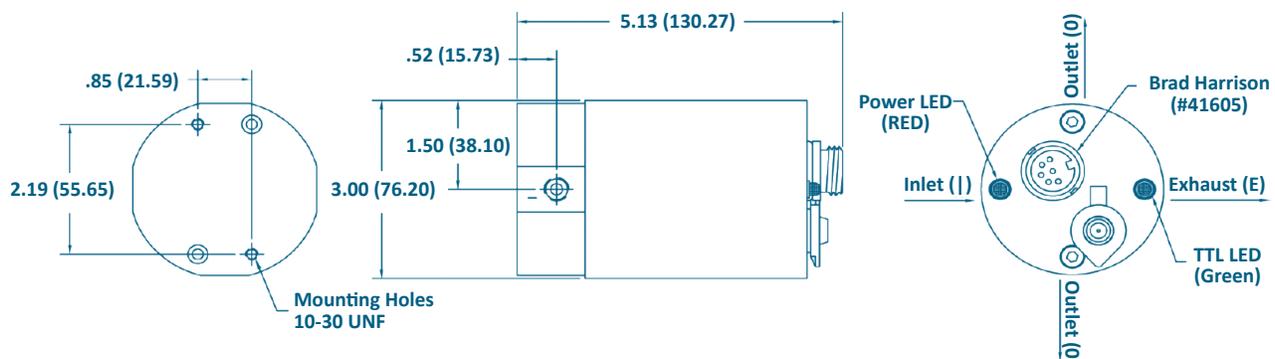
The GP series can be teamed with a variety of one-to-one ratio high pressure volume boosters for even greater flow. When using a volume booster, the GP2 can be used to achieve higher accuracy by compensating for the hysteresis of the mechanical pilot operated regulator.

GP series product comes with a monitor output signal. This output is an electrical signal originating from the internal sensor used in the control circuit of the GP1 valve. On GP2 units, this signal originates from the external transducer. This allows the system parameters to be monitored and provides a signal for data acquisition needs. The output of this signal can be configured to either 0-10Vdc or 4-20mA.



- Precision pressure control from vacuum to 1000 psig without the need for a ratio amplifier
- Consumes no air in steady state
- External sensor closed loop option available
- Fast, accurate, and precise high pressure control of media
- Mounts in any position

Note: The GP2 requires an external feedback loop. The external loop is more difficult to control. The speed of response of the external sensor, the length and volume of the piping between the GP2 and the external sensor, and any restrictions between the external sensor and GP2 all act to create delay in the system. This delay can cause the GP2 output pressure to oscillate in an overshoot-then-undershoot cycle. The tuning of the GP2 PID circuit becomes more critical. Because this tuning must be achieved in the actual application and may not be adequate to handle all situations, there is some risk in specifying a GP2. For applications that only require a few regulators to be installed, using a GP1 in conjunction with an external PID controller and an external sensor feeding the external controller is a more reliable solution. The GP2 is most useful when large numbers of electronic regulators need to be installed as the risk versus reward is a better balance. While there is risk the GP2 will not work, the potential reward is that the GP2 will act as both the controller and the pressure regulator, resulting in a smaller, simpler system.



# Application Highlight

## BACK PRESSURE CONTROL UP TO 1000 PSI WITH GP1 AND LF SERIES BPR

A common way to achieve automated back pressure control is with a pilot operated back pressure regulator. Other manufacturers would recommend that you do this by using a low pressure electro-pneumatic regulator (0 – 100 psig for example) to provide a pilot pressure to a ratio operated back pressure regulator with a high ratio (often 8:1 or higher for high pressures). These installations are often inaccurate, due to the high ratio required to operate, and often require a secondary pressure transducer and extensive PID tuning, in order to get acceptable control.

By contrast, the GP1 electronic regulator can be used to pilot operate an Equilibar® LF Series back pressure regulator to get true 1:1 ratio control without any PID tuning or complicated installations (See Fig. 1). The Equilibar LF Series dome-loaded back pressure regulator accepts a pilot pressure equal to the desired upstream pressure and works to match that setpoint. The LF series has near infinite resolution, so the only limitation is the resolution of the pilot regulator, making fine adjustments very simple. The GP1 and the LF Series both operate in a range up to 1000 psig, making them an ideal match for high pressure control.

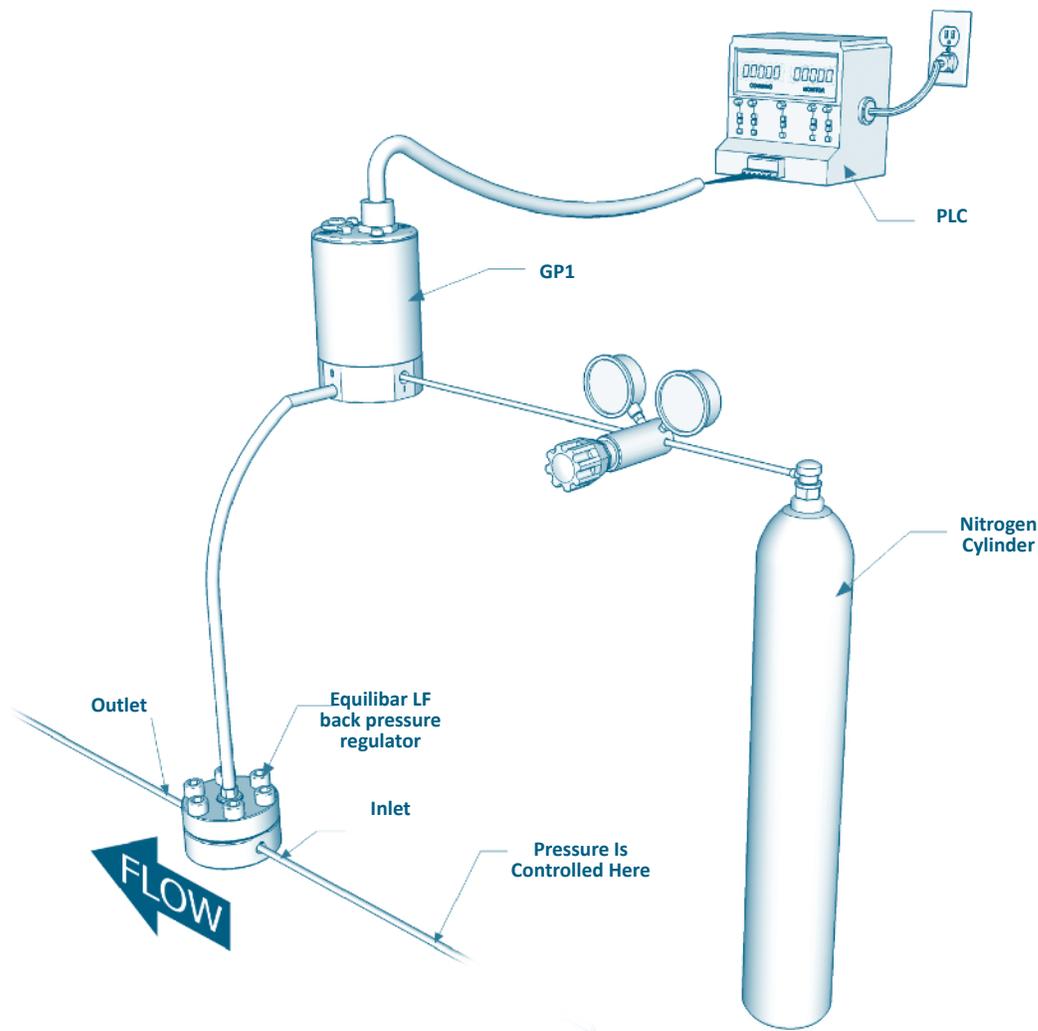


Fig. 1 GP1 electronic regulator used to pilot operate an Equilibar® LF Series back pressure regulator

# General Specifications & Performance Characteristics

ELECTRICAL	MINIMUM	TYPICAL	MAXIMUM
Supply Voltage	15VDC	-	24VDC
Supply Current	100mADC	-	950mADC
Command Signal			
Voltage	0VDC	-	10VDC
Current	4mADC	-	20mADC
Analog Monitor Output			
Voltage	0VDC	-	10VDC
Current	4mADC	-	20mADC
TTL			
Satisfied	-	0VDC	-
Not-Satisfied	-	5VDC	-
2nd Loop Input	0VDC	-	10VDC
PNEUMATIC	MINIMUM	TYPICAL	MAXIMUM
Inlet Pressure <sup>1</sup>	Vacuum	110% of full scale calibration	1100 psig (75.8 bar(g)) <sup>2</sup>
Pressure Range <sup>1,3</sup>	Vacuum	-	1000 psig (68.9 bar(g))
Flow Rate	0	-	10 SCFM (17 m <sup>3</sup> /hr)
Filtration Required	40 micron	20 micron (supplied with unit)	-
Accuracy (Pressure)	±0.1%F.S.	±0.25%F.S.	±0.5%F.S.
Accuracy (Monitor)	-	±0.3%F.S.	±0.5%F.S.
Hysteresis <sup>4</sup>	±0.2%F.S.	±0.02%F.S.	±0.5%F.S.
Port Size (all)	-	1/8 inch NPT female (1/8 inch BSPP optional)	-
Critical Volume <sup>5</sup>	-	3 in <sup>3</sup>	-
PHYSICAL	MINIMUM	TYPICAL	MAXIMUM
Operating Temperature	32°F (0°C)	-	158°F (70°C)
Environment Protection <sup>6</sup>	-	-	NEMA 4 (IP65)
Weight	-	Brass 3.75 LBS (1.75 KG) S.S. 3.73 LBS (1.73 KG)	-
Electrical Connector	-	6 pin molded 16 gauge wire	-

<sup>1</sup> Pressure ranges are customer specified

<sup>2</sup> This is max inlet for valves with orifice size 1 & 2; Max inlet for orifice size 3 is 550 psig / 37.9 bar(g)

<sup>3</sup> Pressure range may be ordered as PSIG or PSIA

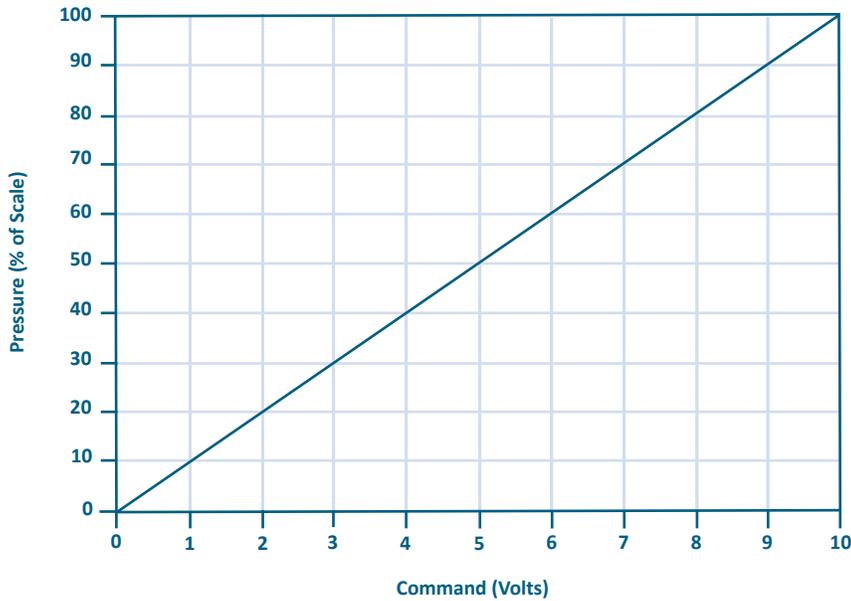
<sup>4</sup> User adjustable

<sup>5</sup> The minimum downstream closed volume is determined by the pressure range, orifice size, hysteresis window, plumbing, as well as other factors. Consult factory for small volume applications

<sup>6</sup> CE approval pending

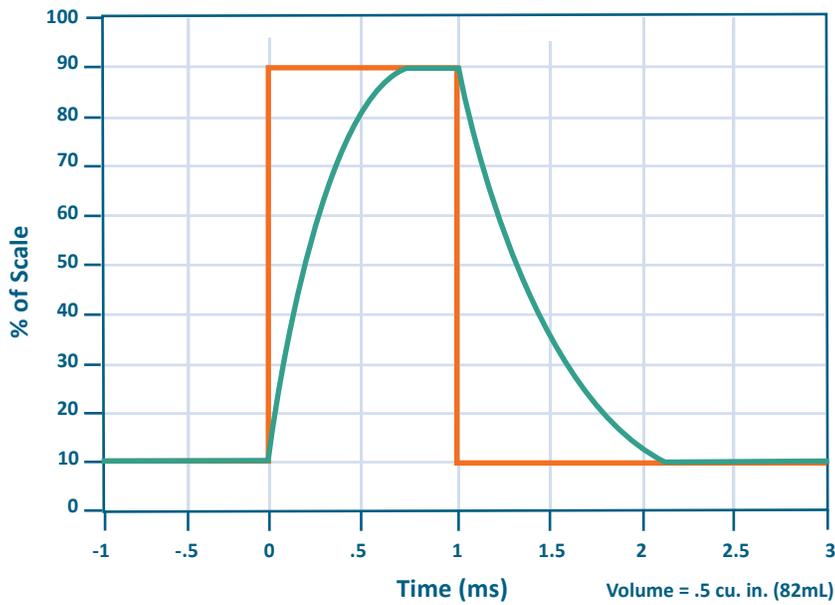
# Performance Specifications

## LINEARITY



Linear characteristics of GP Series products when given a ramp signal from 0-10 volts. Characteristics would be similar for 4-20mA units.

## RESPONSE TO STEP INPUT



Response times for the GP to fill/exhaust a closed chamber. Step command signal is superimposed over pressure trace. Time is determined by difference between command signal and pressure achieved.

— Command  
— Pressure



# GP Ordering Information

EXAMPLE PART NUMBER	GP	2	B	N	E	E	Z		P	500	PS	G	1	O2	TF
Your Part Number:	GP														
		1	2	3	4	5	6	7	8	9	10	11	12		13

## 1 TYPE

- 1 Single Loop
- 2 External Loop

## 2 MANIFOLD MATERIAL

- B Brass (Standard)
- S 303 Stainless Steel

## 3 THREAD TYPE

- N NPT (Standard)
- P BSPP (ISO-G)

## 4 INPUT SIGNAL RANGE

- E 0 to 10 Vdc (Single Ended)
- I 4 to 20 mADC (Differential)
- K 0 to 5 Vdc
- V 1 to 5 Vdc

## 5 MONITOR SIGNAL RANGE

- X No Monitor
- E 0 to 10 Vdc
- S 4 to 20 mADC (Sourcing)
- K 0 to 5 Vdc
- V 1 to 5 Vdc

## 6 ZERO OFFSET

- N 0% Pressure Starts Below Atmosphere
- P 0% Pressure Starts Above Atmosphere
- Z 0% Pressure Starts at Zero (Typical)

## 7 ZERO OFFSET PRESSURE

- 5 This is an example. Your number will be the bottom of you desired pressure range. Most often your number will be blank.

## 8 TYPE

- N 0% Pressure Ends Below Atmosphere
- P 0% Pressure Ends Above Atmosphere
- Z 0% Pressure Ends at Zero

## 9 FULL SCALE PRESSURE

- 650 This is an example. Your number will be the top of your desired pressure range.

## 10 PRESSURE UNIT

- |    |            |    |                              |
|----|------------|----|------------------------------|
| PS | PSI        | IH | Inches Hg                    |
| MB | Millibars  | IW | Inches H <sub>2</sub> O      |
| BR | Bar        | MW | mm H <sub>2</sub> O          |
| KP | Kilopascal | KG | Kilograms/cm <sup>2</sup>    |
| MP | Megapascal | TR | Torr*                        |
| MH | mm Hg      | CW | Centimeters H <sub>2</sub> O |
- \*Requires A for Pressure Unit of Measure

## 11 PRESSURE UNIT OF MEASURE

- A Absolute Pressure
- G Gage Pressure

## 12 ORIFICE DIAMETER OF THE SOLENOID VALVES

- 1 0.012"
  - 2 1/32"
  - 3 3/64"
- Please Consult Factory for Valve Sizing Assistance

## 13 POPULAR OPTIONS

- TF No Bleed Orifice
- O2 Oxygen Cleaned
- O3 Oxygen Cleaned for Non-Oxygen Use

## TYPICALLY IN STOCK PARTS<sup>1</sup>

PART NUMBER	TYPE	MANIFOLD MATERIAL	CONNECTION	INPUT SIGNAL RANGE	MONITOR SIGNAL RANGE	FULL SCALE PRESSURE	ORIFICE DIAMETER OF THE SOLENOID VALVES	AVAILABILITY
GP1BNEEZP1000PSG1	Single Loop	Brass	1/8" NPT	0-10 Vdc	0-10 Vdc	0-1000 psig	0.012"	1-2 Days
GP1BNISZP1000PSG1	Single Loop	Brass	1/8" NPT	4-20 mADC (Differential)	4-20 mADC (Sourcing)	0-1000 psig	0.012"	1-2 Days

<sup>1</sup>Usually ships in 2 - 3 days ARO

# About Equibar

Equibar provides innovative and robust pressure control technology for researchers and engineers worldwide. We are proud to design, manufacture and test our patented back pressure regulators in a facility near Asheville, NC.

## APPLICATION ENGINEERING— WHAT SETS US APART

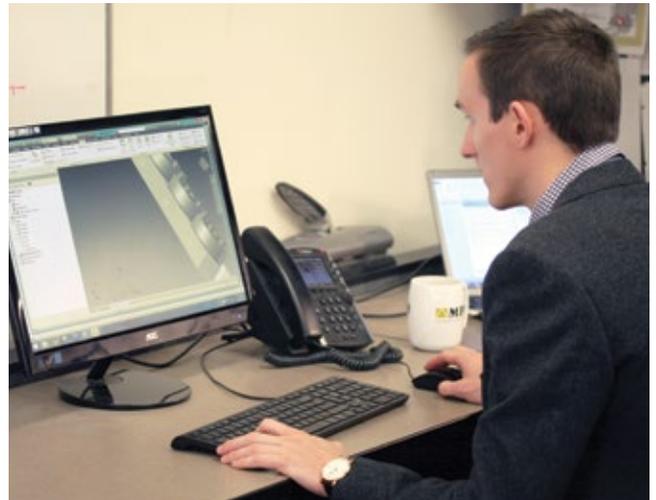
Unlike mass-market regulator distributors, we focus on working with you, the scientist or engineer with a complex pressure control scenario.

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.

