

GP1/GP2 Electronic Pressure Regulator

INSTALLATION & MAINTENANCE INSTRUCTIONS

DESCRIPTION / IDENTIFICATION

The GP series is an electronic pressure regulator designed to accurately control the pressure of gaseous media proportional to an electronic signal. It is primarily used for pressures up to 1000psi (69 Bar). The GP1 is designed for controlling the pressure of a static closed volume, where constant flow is not required.

The GP1 single loop model operates using two normally closed solenoid valves, a pressure sensor, and a control circuit. One valve is actuated to allow unregulated supply media to flow in and raise the system pressure. The second valve is actuated to allow working media to vent to atmosphere and lower the pressure in the system. The internal pressure sensor provides feedback to the control circuit.

The control circuit compares the pressure sensor feedback to the user supplied electronic command signal and actuates the appropriate solenoid valve until the two signals match. The GP is most often used to provide the pilot reference pressure to an Equilibar® back pressure regulator. However, the GP is useful in any application where a relatively small closed volume requires the pressure to be either accurately or remotely controlled.

The GP1 comes with an electronic monitor output signal. This monitor output is an electrical signal originating from the internal pressure transducer used in the control circuit. The signal allows the system pressure to be remotely monitored and also provides a useful signal for data acquisition needs. The output of this signal can be configured to either 0- 10Vdc or 4-20mA. The GP is built using a rugged brass manifold and is contained within a protective NEMA4/IP65 enclosure.

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 pressure sensing device. The external pressure signal functions as the primary feedback and is compared directly to the command signal. A difference between the comparison of the two signals causes one of the solenoid valves to open and allow flow in or out of the system as required. The GP2 second loop is used in a narrow range of applications and is especially useful when pilot operating a pressure reducing regulator (also known as a volume booster). This allows the GP2 to compensate for any mechanical errors or hysteresis of the volume booster. Using a volume booster is required if the application is consuming the regulated gas pressure or if a steady flow is required. An Equilibar DSY or DSTY series pressure sensor will work as a second loop feedback to the GP2. The GP2 monitor signal mimics the external pressure sensor signal.



SPECIFICATIONS

ELECTRICAL	
SUPPLY VOLTAGE	15-24 VDC
SUPPLY CURRENT	100mADC (standby state) 985mADC (operating)
COMMAND SIGNAL	
VOLTAGE	0-10 VDC differential
CURRENT	4-20 mA differential
COMMAND SIGNAL IMPEDANCE	
VOLTAGE	10 KΩ
CURRENT	100 Ω
ANALOG MONITOR SIGNAL	
VOLTAGE	0-10 VDC @ 10mA max
CURRENT	4 - 20 mA (Sourcing @ 12 VDC)
PNEUMATIC	
INPUT PRESSURE	Vacuum - 1100 psig (75.84 bar) ¹
PRESSURE RANGE	Vacuum - 1000 psi (68.95 bar) ²
FLOW RATE	0 - 10 SCFM (17 m ³ /hr) ³
FILTRATION REQUIRED	40 micron minimum
LINEARITY/HYSTERESIS	±0.5% F.S. ³
REPEATABILITY	0.1% FS typical
ACCURACY (PRESSURE)	±0.5% F.S.
ACCURACY (MONITOR)	±0.5% F.S.
PORT SIZE	1/8" NPT female
RESOLUTION	<±0.05% F.S.
CRITICAL VOLUME	>3 cubic inches ⁴ (50cc)
PHYSICAL	
OPERATING TEMPERATURE	32-158°F [0-70C]
ENVIRONMENT PROTECTION	NEMA 4/IP65
WEIGHT	3.75 lb [1.75 Kg]
ELECTRICAL CONNECTOR	6 pin molded 16 gauge wire

¹ Pressure ranges are customer specified

² Pressure range up to 250 psi (17.24 bar) may be ordered as psig or psia
Pressure range above 251 psi (17.3 bar) may be ordered as psig or psia

³ The GP series is designed for static applications only and should not be used in applications where a steady flow rate is required.

⁴ 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.

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INSTALLING GP UNITS

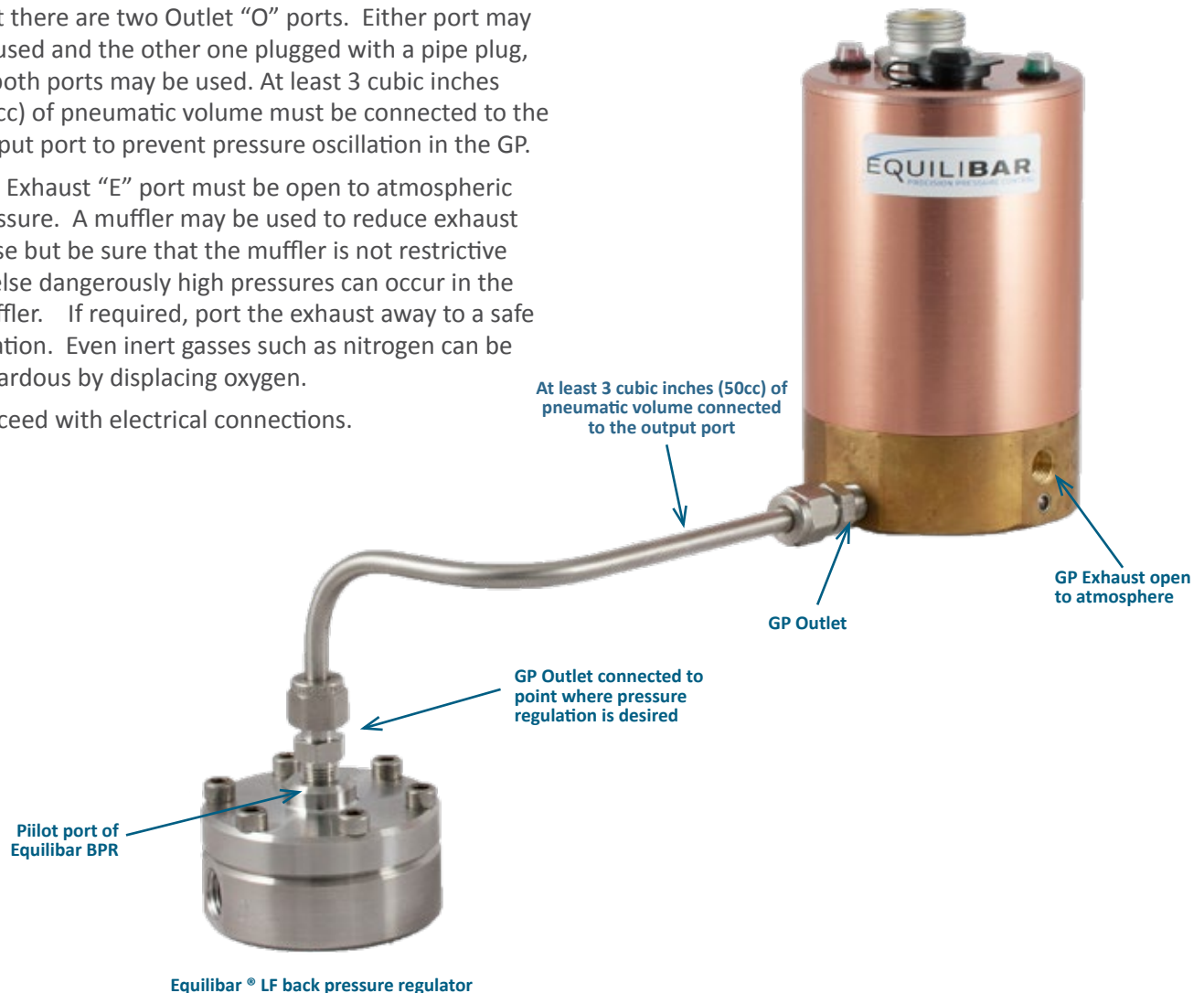
1. Make sure all electrical connections are de-energized and all compressed gasses are safely vented to zero pressure before making any plumbing connections.
2. Apply a small amount of the provided anaerobic sealant to the male threads of the FPP1 in-line filter shipped with the GP unit.
NOTE: Use only the thread sealant provided. Other sealants such as PTFE tape and pipe dope can migrate into the internal solenoid valves causing blockages and failures.
3. Install the FPP1 in-line filter into the Inlet "I" port of the GP.
4. Connect supply pressure to the FPP1 in-line filter port. See TABLE 1 for maximum inlet pressure ratings. Supply gas must be air or inert gas only and within the limits specified on TABLE 1.
5. Connect the Outlet "O" port to the point where it is desired to have controlled regulated pressure. **Note** that there are two Outlet "O" ports. Either port may be used and the other one plugged with a pipe plug, or both ports may be used. At least 3 cubic inches (50cc) of pneumatic volume must be connected to the output port to prevent pressure oscillation in the GP.
6. The Exhaust "E" port must be open to atmospheric pressure. A muffler may be used to reduce exhaust noise but be sure that the muffler is not restrictive or else dangerously high pressures can occur in the muffler. If required, port the exhaust away to a safe location. Even inert gasses such as nitrogen can be hazardous by displacing oxygen.
7. Proceed with electrical connections.

TABLE 1

RATED INLET PRESSURE FOR GP VALVES	
valves ordered with MAX calibrated pressure of:	MAX Inlet Pressure is:
Up to 500 psig (17.31 to 34.47 bar)	600 psig (41.37 bar)
501 up to 1000 psig (34.54 to 68.95 bar)	1100 psig (75.84 bar)

The GP is most often used to provide the pilot reference pressure to an Equilibar® back pressure regulator (BPR). The photo below shows how to connect the GP to the pilot port of an Equilibar BPR.

GP SET UP AS PILOT REGULATOR FOR BPR



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ELECTRICAL CONNECTIONS

1. Ensure all power is off before making any electrical connections.
2. Figure 2 shows the location of the GP electrical connector and figure 3 shows the pin locations for Analog Monitor (left figure for voltage model and right figure for current model). TABLE 2 identifies the color codes.

TABLE 2

GP PIN #	H6DC6 WIRE COLOR	FUNCTION
1	White	Command (+)
2	Red	Analog Output
3	Green	DC Common
4	Orange	TTL Out
5	Black	15-24 VDC Power
6	Blue	Command (-)

Note: Both current and voltage command units require that both the command (+) and command (-) pins be connected.

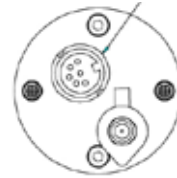
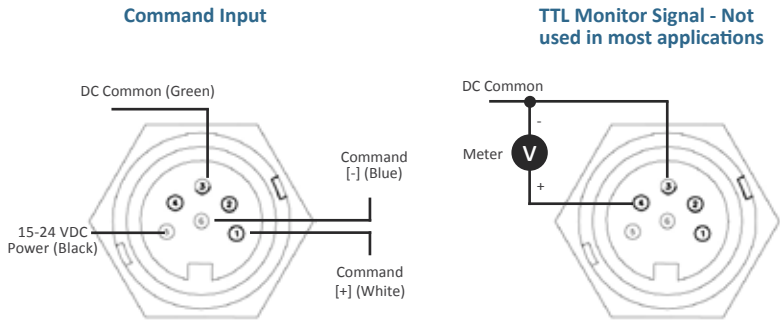


Figure 2

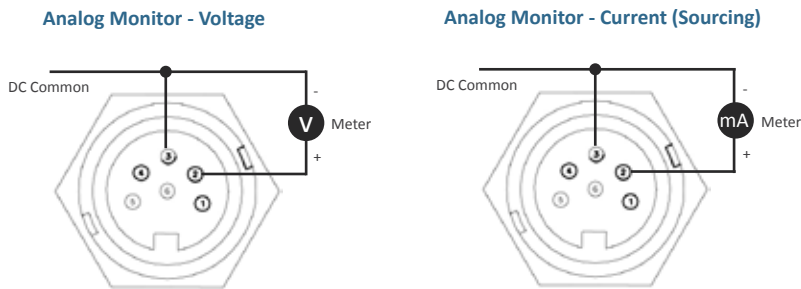


Figure 3

2ND LOOP FEEDBACK RECEPTACLE ON GP2

GP2 SECOND LOOP CONNECTIONS

For GP2 valves to work properly, a 0-10Vdc second loop input source must be connected to the GP2.

Make electrical connections according to the section titled "Voltage command valves" for a voltage command unit or "Current command valves" for a current command unit

If a DS series transducer is used as the external feedback source, attach it to the auxiliary receptacle on the GP2 unit. (Figure 4)

If another source of transducer is used, an H23 cable must be ordered to facilitate connection of that source to the GP2. (Figure 5)

NOTE: Power & common connections on the 2nd loop receptacle are fed through from the main connector and are provided to facilitate wiring of the 2nd loop sensor.

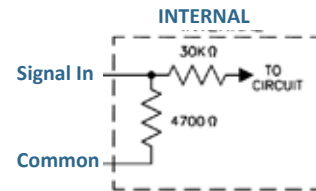


Figure 4



H23 3 Ft. Cord

H23 COLOR CODE	
Red/White	Signal In
Red/Black	Power
Green	Common

Figure 5

GP1/GP2 Electronic Pressure Regulator

RE-CALIBRATION PROCEDURE

All GP electronic pressure regulators are calibrated at the factory by trained personnel using precision calibration equipment. The GP regulators are then individually checked by an second technician using an independent equipment set. The GP regulator is a closed loop pressure control valve that uses an internal precision electronic pressure sensor as feedback. Typical drift of the GP is less than 1% over the life of the product.

If your GP regulator appears to be out of calibration by more than 1%, it is not likely to be the calibration of the GP at fault but rather another problem. Check the system for adequate supply pressure, correct wiring, and verify electronic signal levels directly with a multi-meter. Verify the operation and accuracy of your pressure measuring equipment. Please take the time to contact the Equilibar factory before attempting recalibration. If the GP regulator needs re-calibration, use the procedure described below.

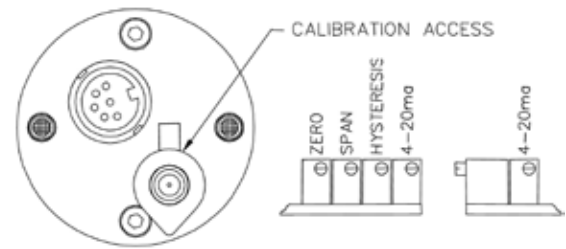


Figure 6

GP1 VALVES:

1. Wire the GP1 according to the section titled “Electrical Connections” on page 2.
2. Connect a precision measuring gage or pressure transducer to the unplugged outlet port of the GP.
NOTE: There must be a closed volume of at least 3 cu.in. (49cc) between the GP1 outlet and the measuring device for the GP1 to be stable.
3. Provide supply pressure to the inlet port of the GP, ensuring the supply pressure does not exceed the rating for the valve (see TABLE 1 on page 2).
4. Locate the calibration access cap on top of the GP valve and locate the ZERO and SPAN adjustment potentiometers (See Figure 6). The 4-20mA potentiometers should be set at the factory and do not need to be recalibrated. **NOTE:** Only use this step if your device is totally out of calibration. If it is slightly out of calibration, omit this step and move on to paragraph 5. Using a small screwdriver, turn both potentiometers 15 turns clockwise. Then turn them 7 turns counter clockwise. This will put the GP roughly at mid-scale.
5. Set the electrical command input to MAXIMUM value. Adjust the SPAN potentiometer until MAXIMUM desired pressure is reached (clockwise increases pressure).
6. Set the electrical command input to 10 percent of full value (1Vdc for 0-10Vdc unit or 5.6mA for 4-20mA unit).
7. Adjust the ZERO potentiometer until 10 percent of maximum desired pressure is reached. (clockwise increases pressure).
8. If at any time during the calibration procedure the servo oscillates or becomes unstable for more than one second, turn the hysteresis potentiometer “HW” (see figure 6 for location) clockwise until the oscillation stops, then turn it one more complete turn (same direction).
9. The ZERO and SPAN potentiometers interact slightly. Repeat steps 5-10 until no error exists.
10. Verify unit shuts off by going to zero command. Check linearity by going to at least six pressures throughout the full range.

GP2 VALVES:

This calibration procedure assumes there is a properly scaled and calibrated transducer for use as 2nd loop feedback signal. (The GP2 series accepts a 0-10Vdc 2nd loop signal.)

Follow, in order, steps 1-10 as noted in the section titled GP1 VALVES. Make sure the 2nd loop is connected before you start the calibration. This external 2nd loop transducer must be pneumatically in communication with the outlet “O” port of the GP2.

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REPAIR PROCEDURE

1. DISASSEMBLY

- Figure 7:** Remove the two 8-32 flat head screws and O-rings on the GP lid.
- Figure 8:** Unplug main connector wires and LED wires from the board.
- Figure 9:** Remove lid, lid O-ring and can assembly from manifold.
- Figure 8:** Unplug valve and sensor wires from board.
- Figure 10** Remove the two 8-32 SHCS screws and O-rings from manifold to remove both the regular tall standoff and the board standoff.
- Figure 14:** Of each valve assembly, remove hex nuts and disassemble valve tube from coil and valve housing. (Keep coil washer, valve housing and hex nut because they are not included in the repair kit and can be reused)
- Figure 11:** Using span wrench, remove valve tube from manifold cavity.
- Remove poppet and O-ring spacer from manifold. See **Figure 12** for O-ring spacer location and **Figure 14** for valve orientation
- If sensor needs to be replaced, unthread sensor from manifold. See **Figure 13** for sensor location.

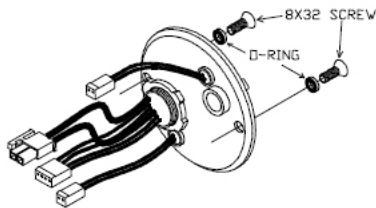
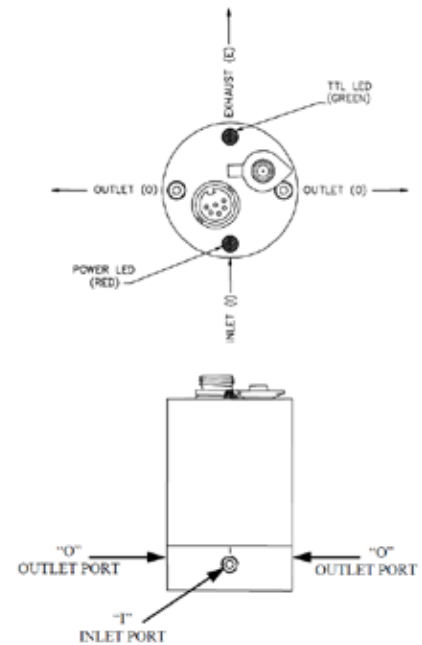


Figure 7

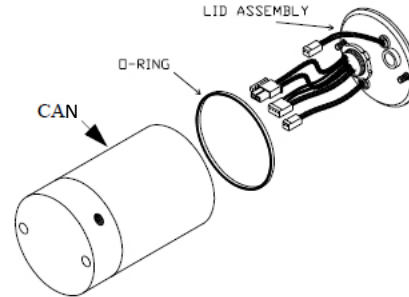


Figure 9

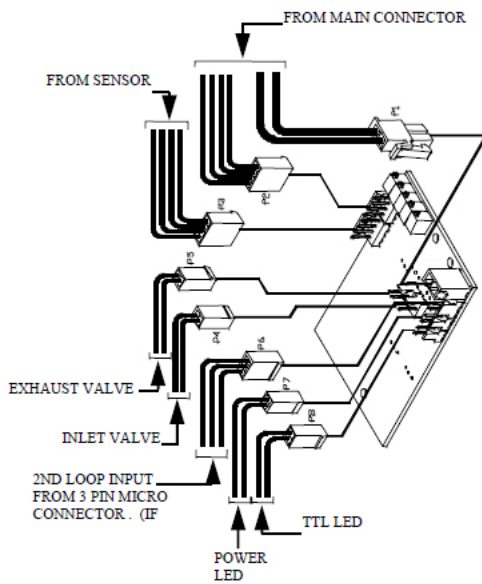


Figure 8

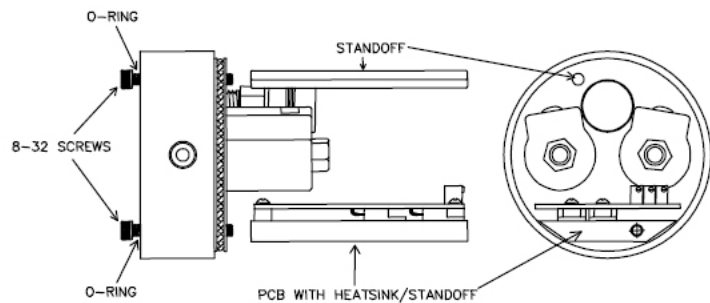


Figure 10

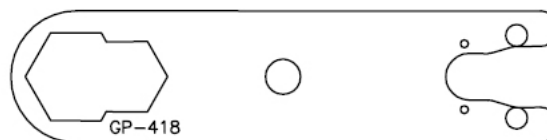


Figure 11

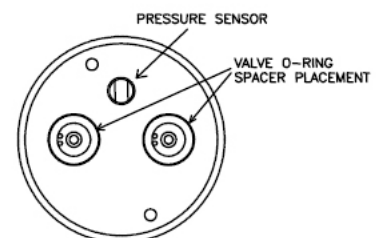


Figure 12

GP1/GP2 Electronic Pressure Regulator

2. SENSOR ASSEMBLY:

1. Install the sensor before installing the valves.
2. Place sealant compatible with media in use on the second or third full threads of the pressure sensor (exercising care not to get sealant into the manifold passages), and thread into 1/8" NPT port on top of manifold. See **Figure 13** for sensor location. **Note:** Do not use any kind of thread sealant.

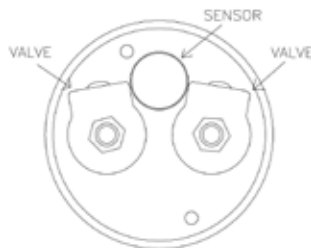


Figure 13

3. VALVE ASSEMBLY:

1. Remove repair kit "V52PAK" from box. **Figure 14**. V52PAK (repair kit includes: (2) O-ring spacers, (2) poppets, (2) valve tubes & span wrench
2. Place new O-ring spacers in valve cavity of manifold. **Figure 12**
3. With poppet installed in the valve tube, thread valve tubes into manifold cavities tightly using span wrench. See **Figure 14** for poppet orientation.
4. Check to **ensure valve tubes are tight!** Place coil washer and valve housing on valve tube, referring to **Figure 14** for assembly order. Turn square end of valves toward sensor. **Figure 13**. Tighten the hex nuts 1/8 turn past finger tight. Do not over tighten!

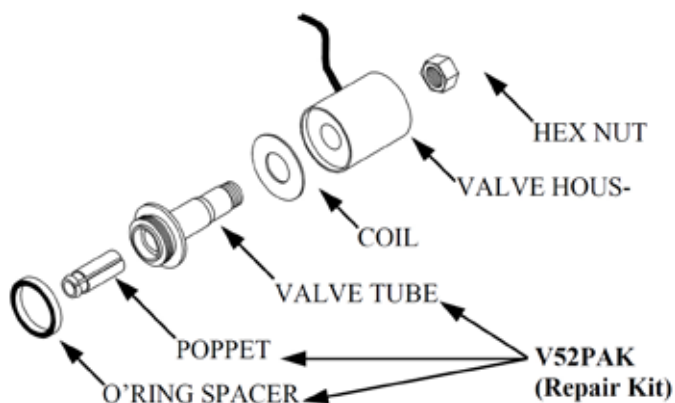


Figure 14

4. FINAL ASSEMBLY:

1. Place O-rings on two 8-32 SHCS screws line up with holes through bottom side of manifold. **Figure 10**
2. Place board standoff, pots facing up, on valve side, opposite sensor and fasten with 8-32 SHCS screw. **Figure 10**
3. Place regular tall standoff on sensor side of manifold and fasten with 8-32 SHCS screw tighten 7-8 in. lb. of torque. **Figure 10**
4. Plug valve, sensor wires into board. **Figure 8**
5. Place can on manifold until edge of can is flush with manifold. **NOTE:** Turn can while pressing downward.
6. Obtain an assembled lid and plug the main connector and LED wires to the board. **Figure 8**

5. CLOSING LID:

1. Assemble O-ring to 8-32 flat head screws. **Figure 7**
2. Place lid O-ring on inner edge of can. **Figure 9**. If not already done, plug the main connector wires and LED wires into the board. Refer to **Figure 8** **NOTE:** Make sure while fastening the lid to the can that the O-ring is flat and seals evenly with lid.
3. Orient lid so the power LED is in-line with the inlet port of the manifold. **Figure 15**
4. Fasten lid down with 8-32 flat head screws. **Figure 7**

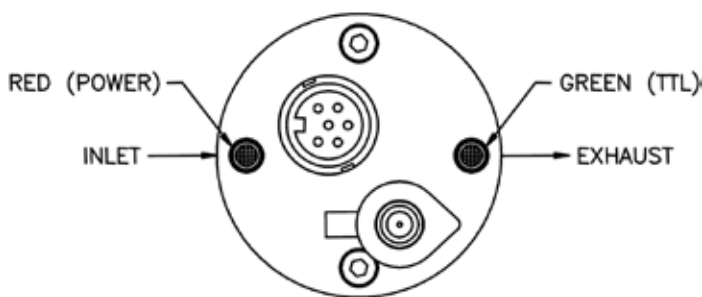
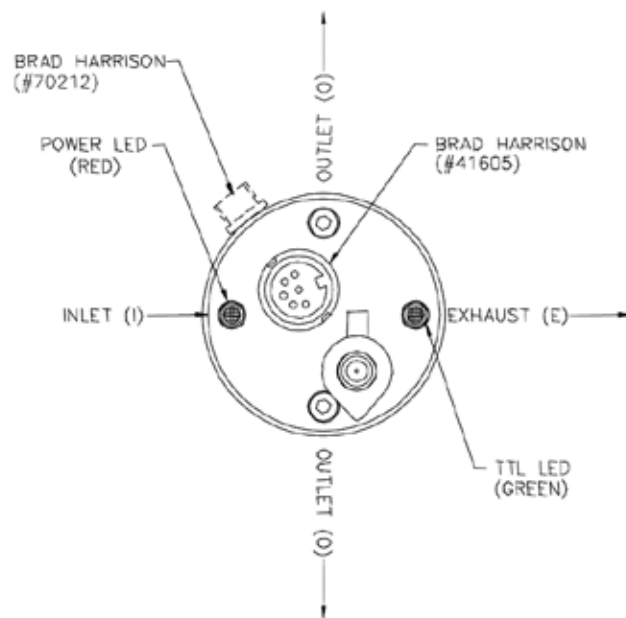
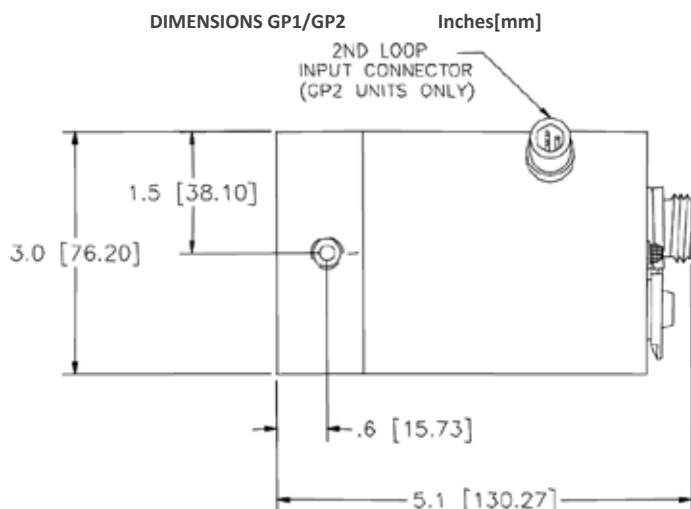


Figure 15



GP1/GP2 Electronic Pressure Regulator

MODERN GP PART CONFIGURATION

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

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
 - MB Millibars
 - BR Bar
 - KP Kilopascal
 - MP Megapascal
 - MH mm Hg
 - IH Inches Hg
 - IW Inches H₂O
 - MW mm H₂O
 - KG Kilograms/cm²
 - TR Torr*
 - CW Centimeters H₂O
- *Requires A for Pressure Unit of Measure

11 PRESSURE UNIT OF MEASURE

- A Absolute Pressure
- G Gage Pressure ¹

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
- HR Use High Resolution PCB (Valve Type '1' Only)

¹ Pressure gauges above 250 psi are sealed gauge reference

TYPICALLY IN STOCK PARTS (Most often available for faster shipment)

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

GP1/GP2 Electronic Pressure Regulator

LEGACY PART NUMBERS (FOR REFERENCE ONLY)

EXAMPLE	GP	1	0	A	1000	E	C	B	2	A	I
Your Part Number:		1								A	I
	1	2	3	4	5	6	7	8			

1 SERIES

- GP** 1/8 in NPT
- GX** 1/8 in NPT cleaned for O2 service
- GL** 1/8 in BSPT
- GN** 1/8 in BSPT cleaned for O2 service

2 MINIMUM CALIBRATED PRESSURE RANGE (PSI)

3 MEASURE

- A** Absolute
- G** Gage
- S** Sealed Gauge

4 MAXIMUM CALIBRATED PRESSURE RANGE (PSI)

5 COMMAND SIGNAL

- E** 0 to 10 Vdc (Single Ended)
- I** 4 to 20 mADC (Differential)
Both differential

6 MONITOR SIGNAL

- E** 0 to 10 Vdc
- C** 4 to 20 mADC (Sourcing)

7 MANIFOLD MATERIAL

- B** Brass
- S** 303 Stainless

8 ORIFICE SIZE

Factory determined

ACCESSORIES

H6DC6	6 Pin, 6 Foot Power Cord * Required for all GP units Consult factory for other length
H23	3 Pin Mini Connector 3 Foot Cord * Required to facilitate connection to the external sensing device (GP2). Consult Factory for other length.
V52PAK	Valve repair kit includes inlet and exhaust valve replacement parts with spanner wrench
DSY 100	External pressure transducer for range up to 500 psi (34.47 bar)
DSTY 1000	Stainless Steel External Pressure transducer For Range 0-7000 psi (82.6 bar)
BKT-01	BRACKE

SAFETY PRECAUTIONS

Please read all of the following Safety Precautions before installing or operating any Equilibar, LLC. equipment or accessories. To confirm safety, be sure to observe 'ISO 4414: Pneumatic Fluid Power - General rules relating to systems' and other safety practices. Improper operation could result in serious injury to persons or loss of life!

1. OVERPRESSURIZATION

The GP electronic pressure regulator is not a safety device and must not be relied upon to prevent dangerously high pressures. Where danger from overpressurization exists then an additional valve that is designed and marketed as a safety pressure relief valve must be used to protect the GP against excess supply pressure and to protect the system should the GP produce excess pressure on its outlet.

2. PRODUCT COMPATIBILITY

Equilibar products and accessories are for use in industrial pneumatic applications with compressed air or inert gas media. The compatibility of the equipment is the responsibility of the end user. Product performance and safety are the responsibility of the person who determined the compatibility of the system. Also, this person is responsible for continuously reviewing the suitability of the products specified for the system, referencing the latest catalog, installation manual, Safety Precautions and all materials related to the product.

3. EMERGENCY SHUTOFF

Equilibar products cannot be used as an emergency shutoff. A redundant safety system should be installed in the system to prevent serious injury or loss of life.

4. EXPLOSIVE ATMOSPHERES

The GP Series should not be used where harmful, corrosive or explosive materials or gases are present. Unless specifically certified and labeled, Equilibar, Inc. products cannot be used with flammable gases or in hazardous environments.

5. COMPRESSED GAS QUALITY

Clean, dry air is not required for Equilibar, Inc. products. However, a 40 micron particulate filter is recommended to prevent solid contamination from entering the product. Only neutral gasses should be used.

6. TEMPERATURE

Products should be used with a media and ambient environment inside of the specified temperature range of 32°F to 158°F. Consult factory for expanded temperature ranges.

7. OPERATION

Only trained and certified personnel should operate electronic and pneumatic machinery and equipment. Electronics and pneumatics are very dangerous when handled incorrectly. All industry standard safety guidelines should be observed.

8. SERVICE AND MAINTENANCE

Service and maintenance of machinery and equipment should only be handled by trained and experienced operators. Inspection should only be performed after safety has been confirmed. Ensure all supply pressure has been exhausted and residual energy (compressed gas, springs, gravity, etc.) has been released in the entire system prior to removing equipment for service or maintenance. Be sure to employ lock out / tag out procedures.



WARNING Improper operation could result in serious injury to persons or damages to equipment

1. PNEUMATIC CONNECTION

All pipes, pneumatic hose and tubing should be free of all contamination, debris and chips prior to installation. Flush pipes with compressed air to remove any loose particles.

2. THREAD SEALANT

To prevent product contamination, thread tape is not recommended. Instead, a non-migrating thread sealant is recommended for installation. Apply sealant two threads from the end of the pipe thread to prevent contamination.

3. ELECTRICAL CONNECTION

To prevent electronic damage, all electrical specifications should be reviewed and all electrical connections should be verified prior to operation.

WARRANTY

Equilibar products are warranted to the original purchaser only against defects in material or workmanship for one (1) year from the date of manufacture. The extent of Equilibar's liability under this warranty is limited to repair or replacement of the defective unit at Equilibar's option. Equilibar shall have no liability under this warranty where improper installation or filtration occurred. All specifications are subject to change without notice.

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