EQUILIBAR®
PRECISION FLUID CONTROL

QPV

Electronic High Resolution Pressure Control Valve

How It Works

The Equilibar QPV1 is a high resolution electronic pressure regulator designed to precisely control the pressure of inert gaseous media. It provides a regulated output pressure that is proportional to an electrical command signal input. The QPV1 is available in a wide range of calibrated pressure ranges covering vacuum through 150 psig (10 bar). It is available in 0 -10 VDC or 4-20 mA analog signal types.

The QPV1 is a complete closed loop control valve consisting of two internal solenoid valves, a manifold, an electronic control circuit board, and a pressure transducer all contained in a protective IP65/NEMA4 housing for non-ATEX use. Pressure is controlled by the use of two solenoid valves. One valve functions as inlet control and acts to allow supply media into the system to increase the controlled pressure. The other solenoid valve acts as the exhaust and will decrease the controlled pressure by venting to atmosphere. The inlet solenoid valve operates in a proportional manner to the current supplied by the QPV1's electronic control circuit. This variable orifice effect allows precise control of pressure at low flow conditions and avoids the digital steps of traditional ON/OFF solenoids. The ability to vary the inlet solenoid valve orifice opening in an analog fashion allows the QPV1 to control pressure with extremely high resolution. The exhaust solenoid is a standard ON/OFF solenoid and allows excess media to be vented from the system.

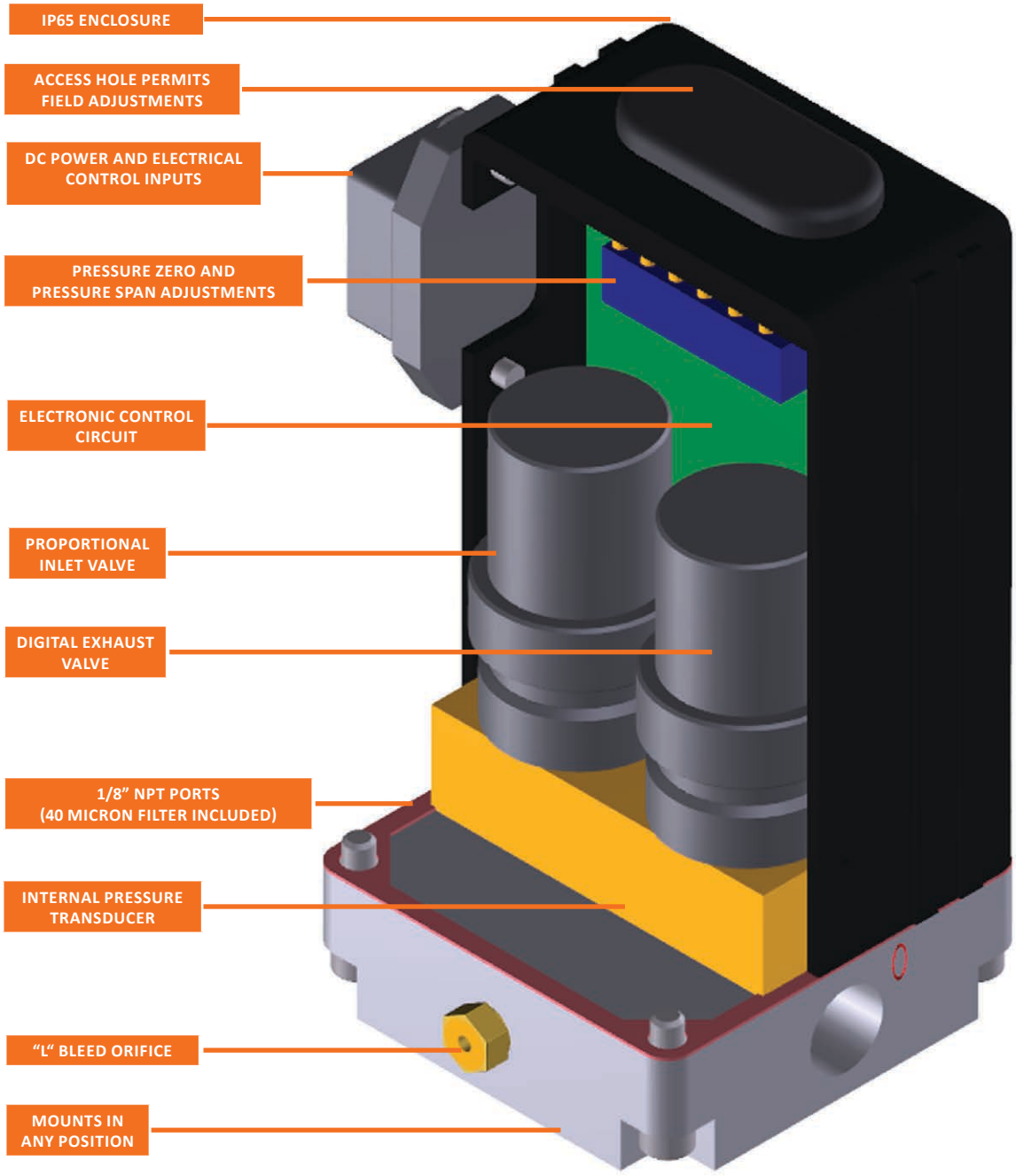
The regulated pressure output is measured by a pressure transducer internal to the QPV1. This pressure transducer provides a feedback signal to the QPV1's electronic control circuit. The control circuit compares the internal sensor feedback signal to the command signal input. Any difference between the two signals causes the appropriate solenoid valve to open, allowing flow in or out of the system. Accurate pressure is maintained by controlling these two valves.

The QPV1 is a relatively low flow regulator. This makes the QPV1 a great choice any time low flow rates or small volumes require precise pressure control. The QPV1 is often used to provide the pilot pressure signal to the dome of either an Equilibar back pressure regulator or an Equilibar vacuum regulator. The QPV1 can then be used to electronically control back pressure or vacuum pressure in line sizes from 1/8 inch through 6 inch by pilot operating the appropriately sized regulator.

An electronic monitor output signal from the internal pressure transducer is provided. All QPV1 valves come standard with an analog voltage monitor output. A 4-20mA monitor is available optionally. The QPV1 series was produced in two generations. The older 'T' models used brass hex fittings in the side of the canister for the inlet and outlet port connections. An improved 'M' series uses a solid aluminum base with integral inlet and outlet ports. Both models have identical performance and are pin-for-pin compatible. Both models use the same control circuit, solenoid valves, electrical connector, and internal pressure sensor.

Equilibar 3" BD12 back pressure regulator with a QPV1 pilot control valve.

Inside the QPV



The Equilibar QPV series electronic pressure regulator uses advanced technology circuitry to drive a true proportional response solenoid valve to provide improved resolution, near zero dead band, and longer solenoid valve life.

The Equilibar QPV series of ultra high resolution closed loop electronic pressure regulators incorporate two internal solenoid valves, an integrated pressure sensor, an electronic control circuit, a manifold, and a protective housing for non-explosive environments.

- Ultra high resolution pressure control
- Resolution as high as +/-0.005% F.S.
- Proportional inlet valve eliminates digital stepping
- Control pressure ranges as low as 0-2 inH_20 (0-5 mbar) and as high as 0-150 psig (0-10 bar)
- Positive, vacuum-through-positive, vacuum-only, and absolute-pressure options available
- For use in non-hazardous, non-ATEX environments

General Specifications & Performance Characteristics

ELECTRICAL	MINIMUM	TYPICAL	MAXIMUM
Supply Voltage	15VDC	-	24VDC
Supply Current	100mADC	-	350mADC
Command Signal			
Voltage	0VDC	-	10VDC
Current	4mADC	-	20mADC
Analog Monitor Output			
Voltage	0VDC	-	10VDC
Current	4mADC	-	20mADC
Command Signal Impedance			
Voltage	-	10K Ω	-
Current	-	100 Ω	-
PNEUMATIC	**MINIMUM**	**TYPICAL**	**MAXIMUM**
Inlet Pressure[1]	Full Vacuum	110% of full scale calibration	165 psig (11.37 bar)
Pressure Range[2]	Full Vacuum	-	150 psig (10.34 bar)
Flow Rate	0	-	1 SCFM (0.47 Liters/sec)[3]
Filtration Required[4]	-	40 Micron	-
Resolution	±0.2%F.S.	±0.010%F.S.	±0.005%F.S. [5]
Accuracy (Pressure)	±0.5%F.S.	±0.25%F.S.	±0.1%F.S.
Accuracy (Monitor)	±0.5%F.S.	±0.3%F.S.	-
Repeatability	±0.2%F.S.	±0.02%F.S.	-
Port Size (all)	-	1/8 inch NPT female	-
Critical Volume[6]	10 cc	20 cc	-
PHYSICAL	**MINIMUM**	**TYPICAL**	**MAXIMUM**
Operating Temperature	32°F (0°C)	-	158°F (70°C)
QPV Environment Protection[7]	-	NEMA 4 / IP65	-
QPV Weight	-	1.02 lbs (0.5kg)	-
QPV Electrical Connector	-	6 pin Hirshman Connector	-

[1] Depends on the inlet valve orifice size

[2] Pressure ranges are customer specified

[3] Maximum for 100 psig model, lower pressure models have lower maximum flow rates

[4] FPP1 sintered 40 micron filter included

[5] At 100 psig working pressure

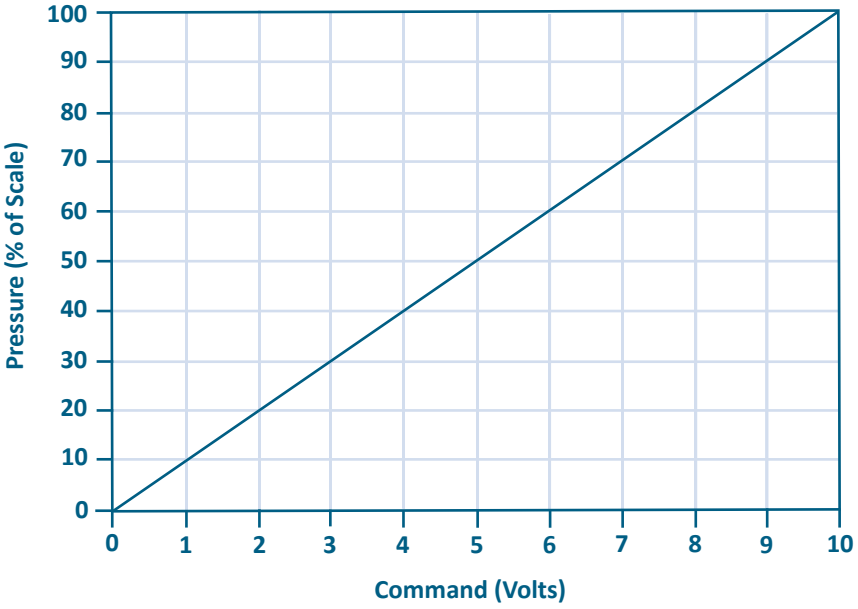
[6] The minimum downstream closed volume is determined by the pressure range, orifice size, plumbing, as well as other factors. Consult factory for applications with total volumes less than 10 ccs.

[7] CE(EMC) compliant only for voltage command and monitor signal on QPV1T_ _ EE (without LED digital display) and QPV1M_ _ EE (without LED digital display).

*Not intended for hazardous/explosive environments. *Meant for use with air or inert gases only.

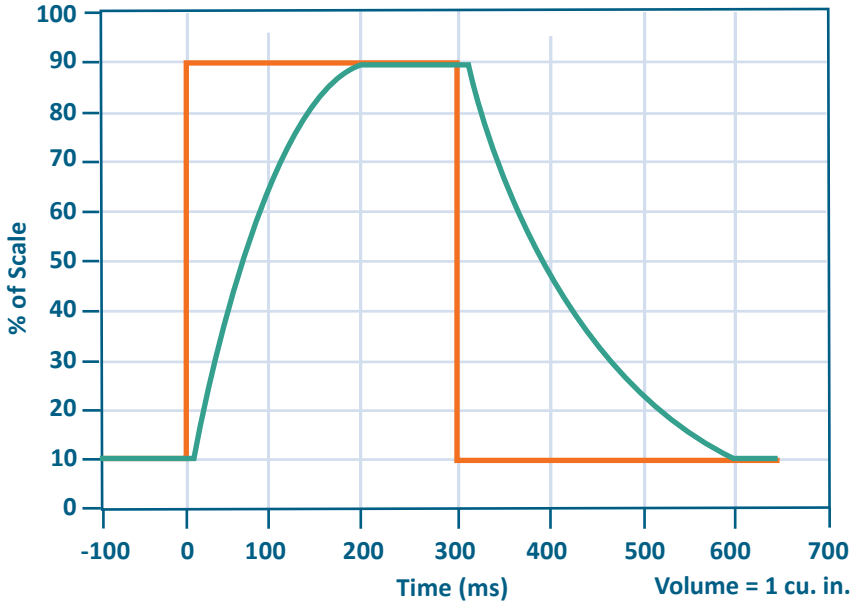
Performance (Continued)

LINEARITY



This chart shows the linear characteristics of QPV products when given a ramp signal from 0-10 volts. Characteristics would be similar for 4-20 mA units.

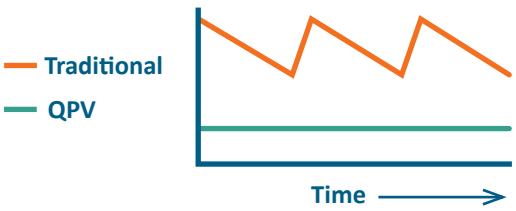
RESPONSE TO STEP INPUT



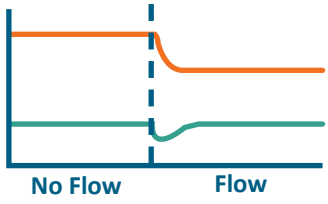
Times for QPV (0.040" valve orifice) to fill/exhaust a closed chamber. Step command signal is superimposed over pressure trace. Time is determined by difference between command signal and pressure achieved.

Command
Pressure

QPV VS. TRADITIONAL



When flow or leakage is present in the system, traditional two valve I/P's bleed down and then actuate the inlet valve to compensate. This gives erratic pressure and flow. The QPV opens its inlet valve proportionally to match the system flow, resulting in steady pressure.



When transitioning from no flow to flow conditions, traditional I/P's experience droop and lock up errors. The QPV features an error integrator circuit that proportionally opens the inlet valve to maintain pressure as system flow changes.

Application Highlight

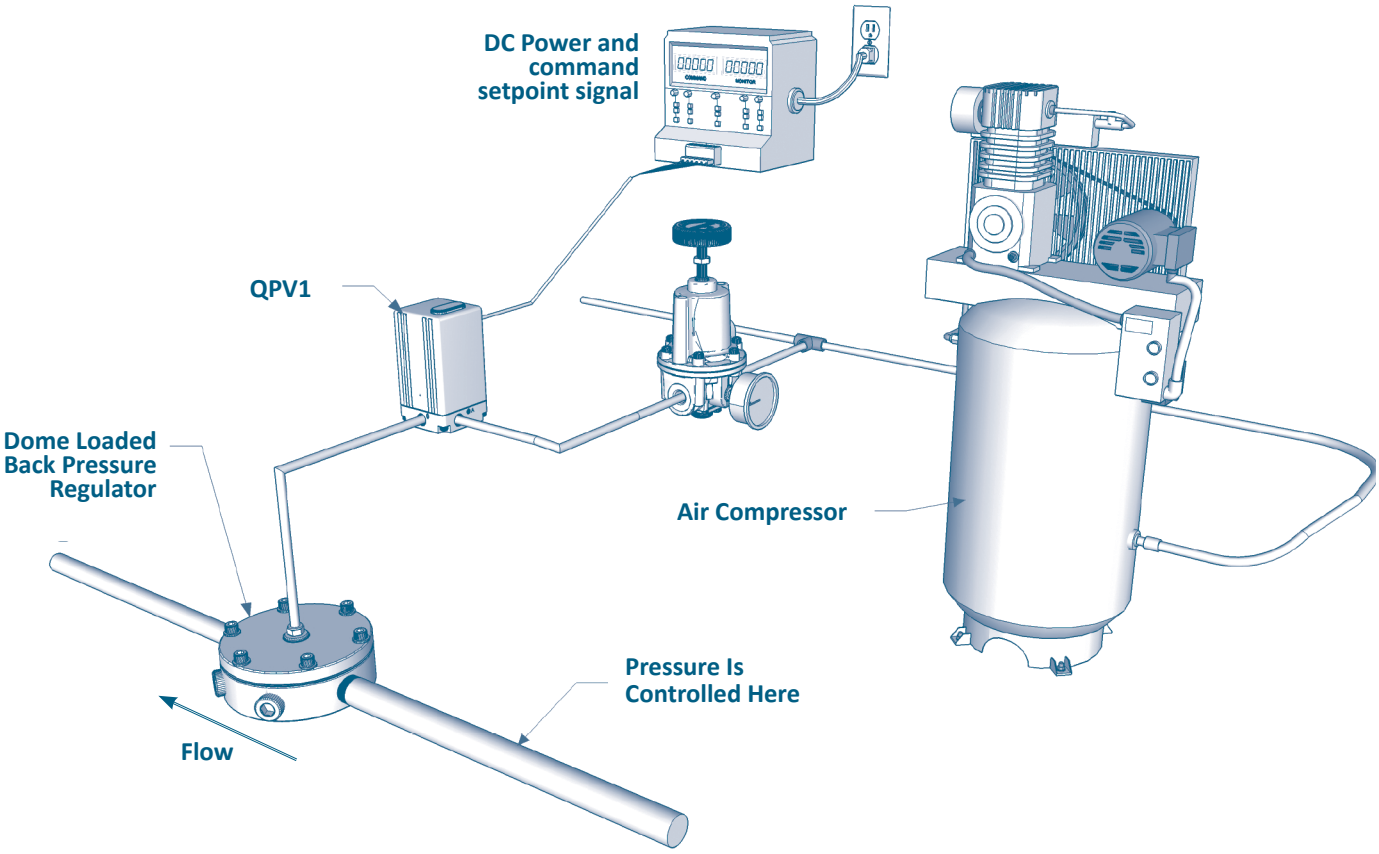
OPEN LOOP ELECTRONIC BACK PRESSURE CONTROL WITH A QPV1

A common application for the QPV1 is to pilot operate an Equilibar® Back Pressure Regulator (BPR).

Equilibar back pressure regulators are dome-loaded. In this design, gas or liquid is fed into a “dome” chamber on top of the regulator to provide the loading mechanism that determines pressure setpoint—also known as the pilot pressure. The pressure of the pilot gas or liquid is set by a second regulator called a pilot regulator. Supplying 1 unit pressure to the dome yields 1 unit pressure on the inlet of the Equilibar BPR.

Using the QPV1 as a pilot regulator to provide constant pressure of an inert gas onto the dome of an Equilibar BPR is an easy way to get electronic back pressure control. The frictionless Equilibar design allows the back pressure control to make use of the high resolution of the QPV.

QPV1 with optional digital display



QPV1 serves as pilot regulator to provide constant setpoint pressure to Equilibar GSD dome-loaded back pressure regulator

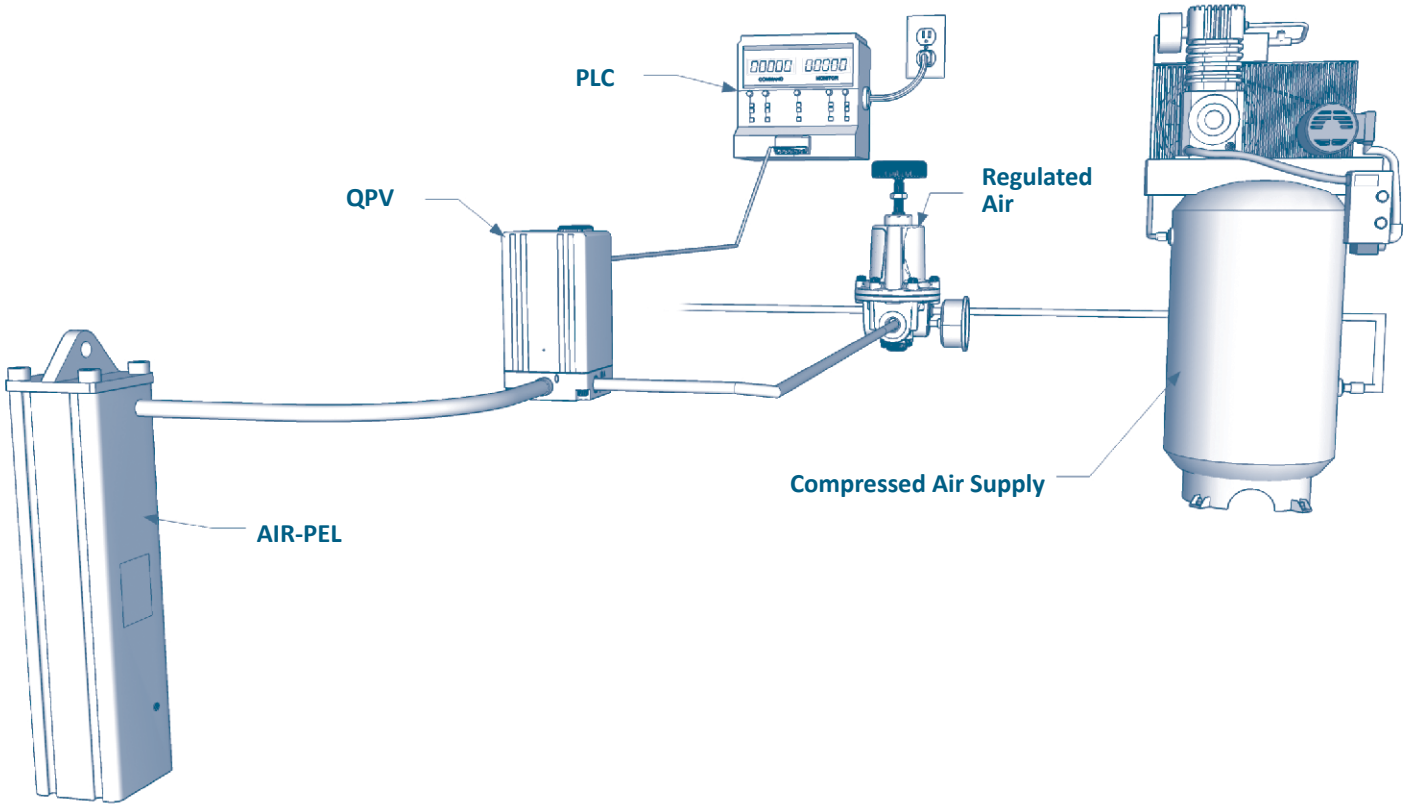
Application Highlight

HIGH RESOLUTION FORCE CONTROL USING AIR-PEL CYLINDERS

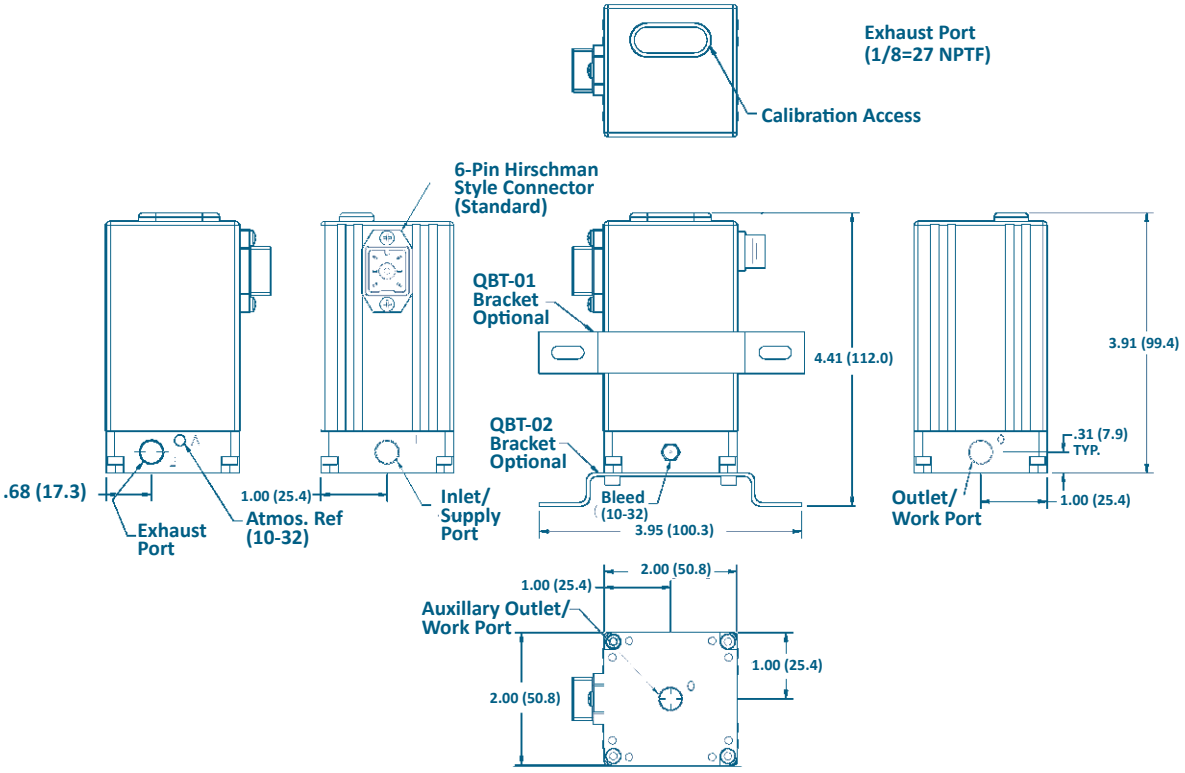
Pneumatic cylinders provide very high force output per the space occupied in a piece of equipment but are typically handicapped by high friction caused by the internal pneumatic seals. New frictionless pneumatic cylinder technologies typified by the Air Pel brand allow a pneumatic cylinder to convert a pressure directly into a force without any frictional loss. This is achieved by eliminating the internal seals altogether and relying on extremely close tolerances to minimize the resultant leakage.

The QPV series proportional solenoid valve opens to precisely match the flow rate required to keep up with the leakage from the cylinder. The ultra high resolution pressure control from the QPV combined with the frictionless cylinder technology allows small changes to be made directly in the force output without the need for expensive load cells and complicated force control feedback loops.

Standard QPV



Dimensional Drawing & Accessories



QBT-01

QBT-02

PRE-ASSEMBLED QBT POWER CORD

Part Number: QBT-C-6 (Typical)

Length in Feet

Other lengths are available

[from 1 to 25 feet (8 meters), 1 foot increments]

WARNING: Installation and use of this product should be under the supervision and control of properly qualified personnel in order to avoid the **risk of injury or death.**

QPV Ordering Information

EXAMPLE PART NUMBER	QPV	1	M	B	N	E	E	Z	0	P	150	PS	G	A	X	L	DD
Your Part Number:	QPV		M														
		1		2	3	4	5	6	7	8	9	10	11	12	13	14	15

1 TYPE

1 Single Loop (Typical)

2 MANIFOLD MATERIAL

B Brass

A Aluminum (Typical)

3 THREAD TYPE

N NPT

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

A RS 232 Serial Input*

B RS 485 Serial Input*

N Ethernet (Mod-bus TCP)

*Requires X for MONITOR SIGNAL RANGE

5 MONITOR SIGNAL RANGE

X No Monitor

E 0 to 10 Vdc

K 0 to 5 Vdc*

V 1 to 5 Vdc*[1]

C 4 to 20 mADC (Sinking)

S 4 to 20 mADC (Sourcing)

*Requires E, I, or K for INPUT SIGNAL RANGE

*[1] Requires V for INPUT SIGNAL RANGE

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

Typical is blank* - If greater than 30% of full scale Pressure (#9 below) please consult factory

*If Z for ZERO OFFSET (#6), please leave blank

8 FULL SCALE PRESSURE TYPE

N 100% Pressure Is Below Zero (Requires L option #14)

P 100% Pressure is Above Zero

Z 100% Pressure is Zero (Typical)

9 FULL SCALE PRESSURE

Must be less than or equal to 150 psig

10 PRESSURE UNIT

PS	PSI	**IH**	Inches Hg
MB	Millibars	**IW**	Inches H_20
BR	Bar	**MW**	mm H_20
KP	Kilopascal	**KG**	Kilograms/cm^2
MP	Megapascal	**TR**	Torr*
MH	mm Hg	**CW**	Centimeters H_20

*Requires A for PRESSURE UNIT OF MEASURE

11 PRESSURE UNIT OF MEASURE

A Absolute Pressure

D Differential Pressure

G Gage Pressure

12 INLET VALVE[1]		13 EXHAUST VALVE[1]	
A	0.013”	**A**	0.013”
B	0.025”	**B**	0.025”
C	0.040”	**C**	0.040”
D	0.060”	**D**	0.060”
E	0.089”	**E**	0.089”
N	No Inlet Valve	**N**	No Exhaust Valve
X	0.040”	**X**	0.040”

14 BLEED ORIFICE[2]

N No Bleed Orifice

L Include Bleed Orifice (0.0047 inch diameter typical)

15 DIGITAL DISPLAY

___ No Digital Display

DD Digital Display Included

[1] Inlet valves orifice size and the exhaust valve are factory determined based on the application’s flow and pressure specs.

[2] Bleed orifice is required when the QPV is used in an application that is static (no flow). Dynamic applications (under flow) do not need a bleed orifice to function properly. Consult our Application Engineering Department for your specific application needs. We are here to help you.

Typically In Stock QPV Configurations

PART NUMBER	PRESSURE RANGE	TYPE	MANIFOLD MATERIAL	THREAD TYPE	INPUT SIGNAL RANGE	MONITOR SIGNAL RANGE	BLEED ORIFICE[1]	DIGITAL DISPLAY[2]	TYPICAL LEAD TIME[3]
QPV1MANISZN30IHGXCL	0-30 in Hg (vacuum)	Single Loop	Aluminum	NPT	4 to 20 mADC	4 to 20 mADC (Sourcing)	Y	No	2-3 Days
QPV1MANEEZN30IHGXCL	0-30 in Hg (vacuum)	Single Loop	Aluminum	NPT	0 to 10 VDC	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP760TRACXL	0-760 torr (absolute)	Single Loop	Aluminum	NPT	0 to 10 VDC	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP10IWGAXL	0-10 in H20 (gauge)	Single Loop	Aluminum	NPT	0 to 10 Vdc	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP1PSGAXL	0-1 PSI (gauge)	Single Loop	Aluminum	NPT	0 to 10 Vdc	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP10PSGAXL	0-10 PSI (gauge)	Single Loop	Aluminum	NPT	0 to 10 VDC	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP50PSGAXL	0-50 PSI (gauge)	Single Loop	Aluminum	NPT	0 to 10 VDC	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP100PSGAXL	0-100 PSI (gauge)	Single Loop	Aluminum	NPT	0 to 10 VDC	0 to 10 VDC	Y	No	2-3 Days
QPV1MANEEZP150PSGAXL	0-150 PSI (gauge)	Single Loop	Aluminum	NPT	0 to 10 VDC	0 to 10 VDC	Y	No	2-3 Days

[1] Bleed orifice recommended for maximum stability
[2] Digital Display available on any model at 4-6 week lead time
[3] Custom part numbers available on any model at 4-6 week lead time

QPV with optional digital display

Standard QPV

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.

THIS WARRANTY IS GIVEN IN LIEU OF, AND BUYER HEREBY EXPRESSLY WAIVES, WARRANTIES OR LIABILITIES, EXPRESS, IMPLIED OR STATUTORY, INCLUDING WITHOUT LIMITATION ANY OBLIGATION OF Equilibar, LLC WITH REGARD TO CONSEQUENTIAL DAMAGES, WARRANTIES OF MERCHANTABILITY, DESCRIPTION, AND FITNESS FOR A PARTICULAR PURPOSE.

About Equilibar

Equilibar 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 our factory overlooking the Blue Ridge Mountains near Asheville, NC.

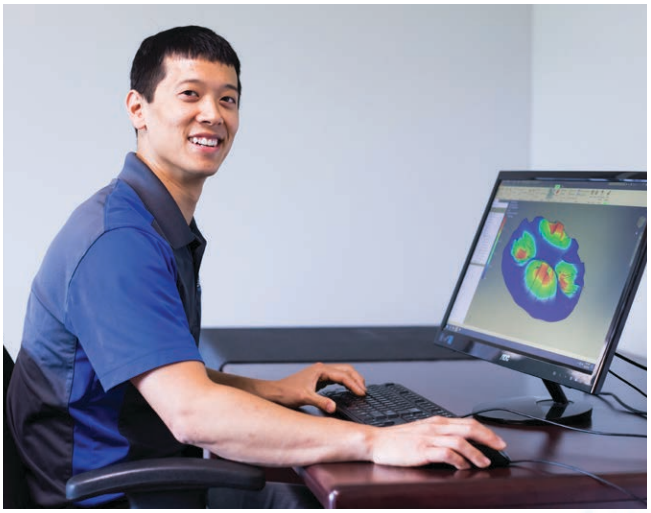
APPLICATION ENGINEERING– WHAT SETS US APART

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.

EQUILIBAR®
PRECISION PRESSURE CONTROL

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Made in the USA

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