

DESIGN * ENGINEERING * MANUFACTURING * SALES

PRESSURE * FLOW * FORCE * TENSION * POSITION * TORQUE * VACUUM

AVS

PROPORTION AIR

THE FUTURE OF CONTROL™

New Part Number
Configurations

QPV & MPV

PROPORTIONAL PRESSURE
CONTROL VALVES

- * Ultra high resolution pressure control
- * Resolution as high as $\pm 0.005\%$ F.S.
- * Proportional inlet valve eliminates digital stepping
- * Control pressure ranges as low as 0-4"H₂O
and as high as 150 psig
- * Vacuum control available

Shown with
optional
digital display

PRESSURE RANGE	0-5 psig through 0-125 psig (8.6 Bar)
ACCURACY REPEATABILITY	±0.4% F.S. ±0.05% F.S.
MAX FLOW	25 SCFM (708 slpm)
PORTS	¼" NPT

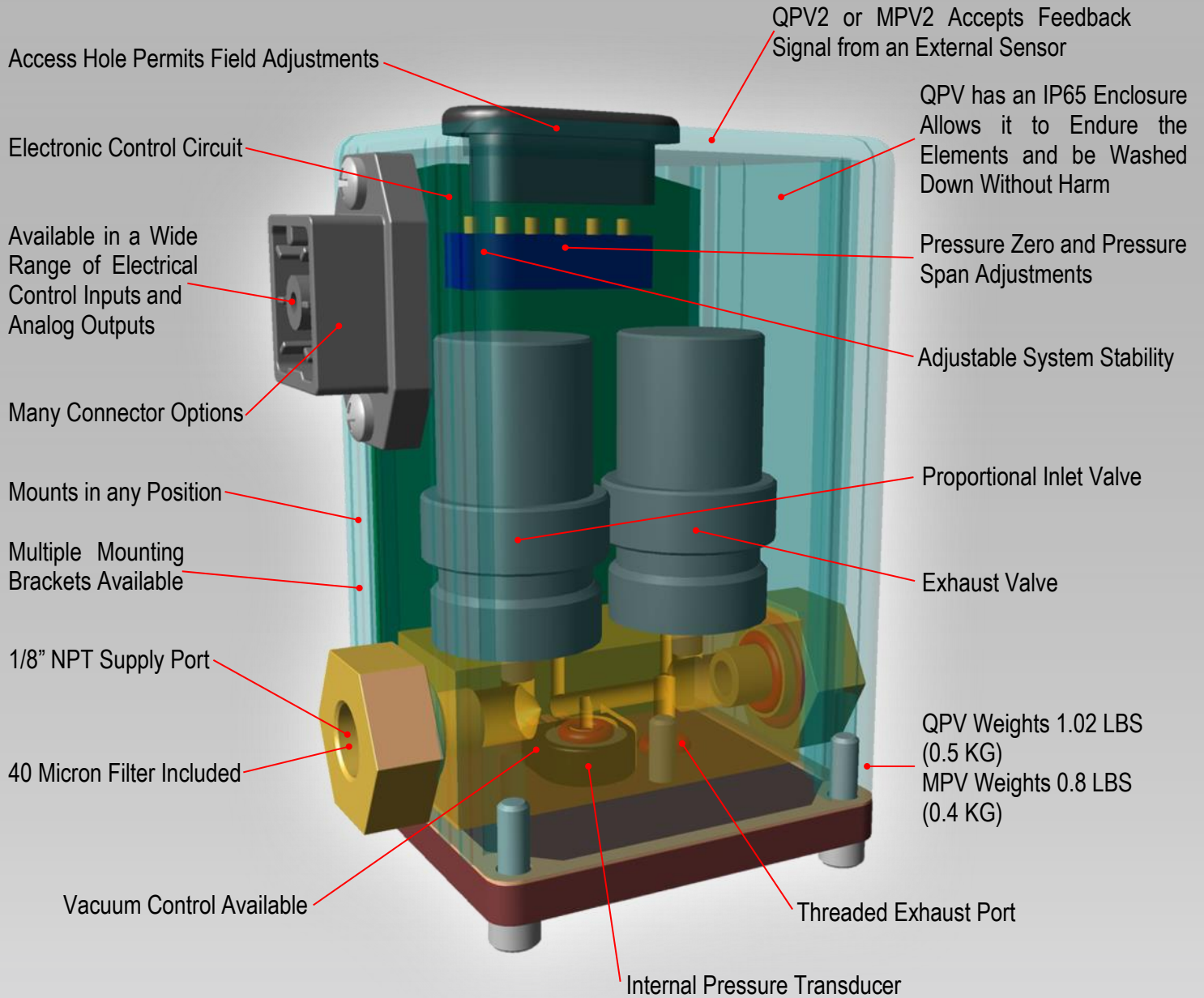
Available with Modbus RS232 & RS485

The QL3 electro-pneumatic closed loop pressure control valves are in a compact IP65 rated housing. The QL3 allows high volumes of air to move quickly and precisely using proportional solenoid valves with a unique analog PID circuit. Ideal for use with flow meters, it provides high resolution and smooth pressure control at high and low flow rates and avoids the "steps" prevalent in most feed and bleed I/Ps. The pneumatic output is proportional to the input command signal.

Analog monitor output is standard, select 0-10 VDC or 4-20 mA. Select 0-10 VDC or 4-20 mA differential command signal. Available options include digital display and manifold mount.



*Optional Digital Display Available
Oxygen Service Available*



QPV OR MPV FUNCTIONAL DESCRIPTION

At first glance the Proportion-Air family of ultra high resolution closed loop electronic pressure regulators, the QPV and MPV series products, appear to be just another electronic pressure regulator with two valves and a sensor. The advanced technology of these products, along with the resultant improvement in specifications in real world applications, provides the user with significantly improved resolution, virtually zero dead band, and longer valve life.

The Proportion-Air QPV/MPV series of ultra high resolution closed loop electronic pressure regulators incorporate two internal solenoid valves, an integrated pressure sensor, electronic controls and more. The improved electronic circuit internally, along with the inclusion of a true proportional valve on the inlet side, virtually eliminates the digital stepping, the noise and excessive valve wear seen in standard two valve/sensor devices. The QPV/MPV series products also offers resolution that exceeds even flapper nozzle/voice coil type of devices while overcoming the inherent issues that this older technology exhibits including sensitivity to shock and vibration, lack of closed loop capability, changes in pressure output due to inlet pressure changes and lack of feedback capability. In a nutshell the QPV/MPV series products offers the best operational features of both of these older technologies without the inherent shortcomings to meet the most demanding applications.

The QPV member of the ultra high resolution family is designed for applications where the environment requires that the internal components are protected. The anodized aluminum housing of the QPV offers NEMA 4 or IP65 rated protection for this fully enclosed version. Several different mounting configurations and mounting accessories are available.

The MPV version has been designed for OEM applications where protection from the environment is not necessary. The MPV incorporates extremely versatile mounting capabilities that allows for DIN rail mounting, panel mounting or manifold mounting of the units. The manifold mounted version allows for multiple unit installation in very tight areas and a full line of sub-base manifolds is available.

All QPV/MPV series of ultra high resolution control valves can be ordered to control either positive pressure or vacuum and can be ordered calibrated as gage or absolute units.

THEORY OF OPERATION

The single closed loop versions of this ultra high resolution series, the QPV1 and the MPV1, converts a variable electrical signal into a variable pneumatic output. The QPV1/MPV1 is a complete closed loop control valve that incorporates two solenoid valves, a manifold, an integral pressure sensor, and an electronic circuit. One valve functions as inlet control and the other as exhaust. The inlet valve operates proportionally to the voltage supplied by the electronic circuit. This variable orifice effect provides precise control of pressure at low flow conditions and eliminates the digital steps of traditional on/off solenoid valves. The exhaust valve is a standard two way solenoid valve that allows excess media to be vented from the system only when required.

An internal pressure transducer in the QPV1/MPV1 measures the pressure output and provides a feedback signal to the electronic circuit. This feedback signal is compared to command signal input. A difference between the two signals causes one of the valves to open. If the system requires additional pressure to achieve a satisfied condition the inlet valve opens proportionally to eliminate the difference in signals. If the system pressure is too high the exhaust valve opens and relieves pressure until a satisfied state is achieved.

The standard QPV1/MPV1 also provides an analog output that is a conditioned signal from the internal pressure transducer for output to a panel meter or controller for data acquisition or quality assurance needs. This analog monitor allows the user to continuously monitor the actual pressure in the system in real time.

The dual sensor versions of this ultra high resolution series, QPV2 and MPV2, offer the same precise pneumatic control with the availability of taking a signal from a downstream source in order to provide superior control at the actual point where it is needed. This downstream signal can be either a secondary pressure sensor or a flow sensor, as well as many other types of sensors. This downstream sensor provides the feedback and is compared to the command signal. If the downstream sensor's output is lower than the command signal the inlet valve opens proportionally to eliminate the difference in signals and allows additional pressure into the system. If the downstream sensor's output is higher than the command signal the exhaust valve opens and relieves pressure until a satisfied state is achieved.

The analog monitor of these dual closed loop versions is unique. Both devices, QPV2 and MPV2, offer the user to monitor the signal from the downstream sensor that is providing primary control as well as the signal from the on board pressure sensor. On the QPV2 these signals are available through the main electrical connector to maintain the NEMA 4/IP65 integrity of the enclosure. On the MPV2 the user has both signals available at the removable screw terminal that is connected to the circuit board. This allows the user to not only monitor the primary control signal from downstream but also the pressure required to achieve this effect.

COMMAND SIGNAL

All QPV/MPV units come standard with a 0-10 VDC command signal. The QPV1 and QPV2 can be ordered with an optional 4-20 command signal.

MONITOR SIGNAL

The QPV1 and QPV2 come standard with a 0-10 VDC monitor signal from the internal pressure sensor. The QPV2 also comes standard with a 0-10 VDC monitor signal from the downstream sensor or can be ordered with an optional 4-20 mA monitor signal.

The MPV1 and MPV2 also come standard with a 0-10 VDC monitor signal from the internal pressure sensor. Standard MPV2 units are shipped from the factory designed to accept a 0-10 VDC signal on the second sensor input as a result of this the standard analog monitor available at the removable screw terminal on the circuit board is also 0-10 VDC.

DOWNSTREAM SENSOR INPUT (QPV2 AND MPV2 ONLY)

Standard QPV2 and MPV2 series products are shipped from the factory calibrated to accept a 0-10 VDC signal. It is possible to have the units shipped from the factory to accept other inputs. It is strongly suggested that if other inputs are required that the user contact the Applications Engineering Department at Proportion-Air before ordering.

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	-	10 K 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)
Filtration Required	-	40 micron	-
Resolution	$\pm 0.2\%$ F.S.	$\pm 0.02\%$ F.S.	$\pm 0.005\%$ F.S. (3)
Accuracy (Pressure)	$\pm 0.5\%$ F.S.	$\pm 0.25\%$ F.S.	$\pm 0.1\%$ F.S.
Accuracy (Monitor)	$\pm 0.5\%$ F.S.	$\pm 0.3\%$ F.S.	-
Hysteresis (4)	-	$\pm 0.02\%$ F.S.	0.2%F.S.
Repeatability	$\pm 0.2\%$ F.S.	$\pm 0.02\%$ F.S.	-
Port Size (all)	-	1/8 inch NPT Female	-
Critical Volume (5)	1 in ³	3 in ³	-

PHYSICAL	MINIMUM	TYPICAL	MAXIMUM
Operating Temperature	32°F (0°C)	-	158°F (70°C)
Environment Protection (6)			
QPV	-	NEMA 4/IP65	-
MPV	-	Open Frame	-
Weight			
QPV	-	1.02 LBS (.5 KG)	-
Panel Mount MPV	-	0.8 LBS (0.4 KG)	-
Manifold Mount MPV	-	DEPENDS ON # OF STATIONS	-
DIN Rail Mount MPV	-	0.9 LBS (0.36 KG)	-
Electrical Connector			
QPV	-	6 pin Hirshman Connector	-
MPV	-	6 pin Din Connector	-

(1) Depends on the inlet valve orifice size.

(2) Pressure ranges are customer specified.

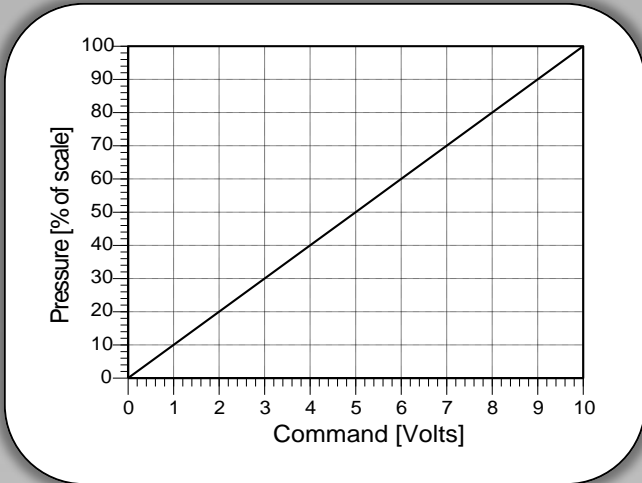
(3) At 100 psig working pressure.

(4) User adjustable

(5) 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.

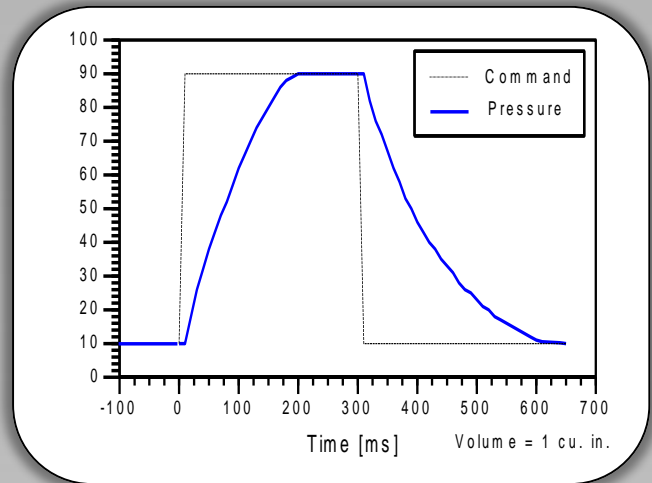
(6) CE (EMC) Compliant only for QPV1T __ EE without digital display & QPV1M __ EE without digital display

LINEARITY



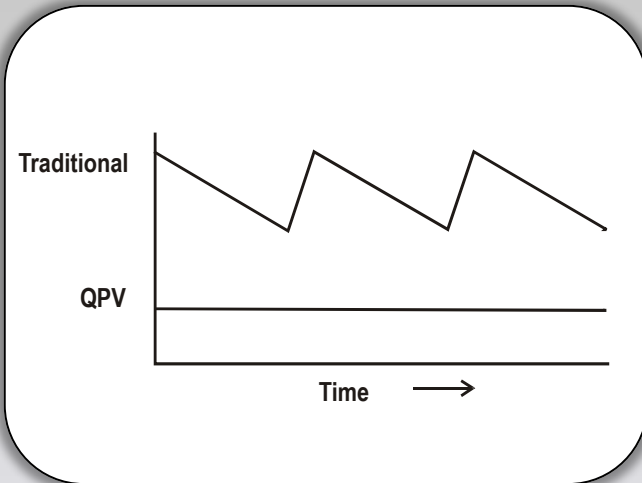
This chart shows the linear characteristics of QPV or MPV products when given a ramp signal from 0-10 volts. Characteristics would be similar for 4-20 mA units.

RESPONSE TO STEP INPUT

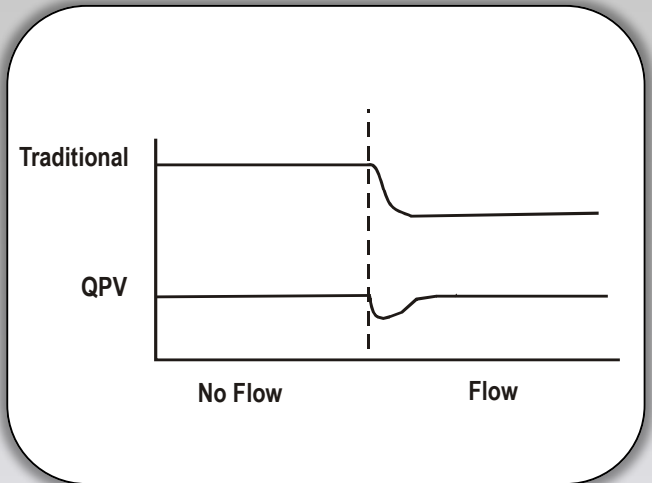


Times for QPV or MPV (0.040" valve orifice) to fill/exhaust a closed chamber. Step command signal is superimposed over pressure trace. Time is determined by difference between command signal and pressure achieved.

QPV vs. TRADITIONAL

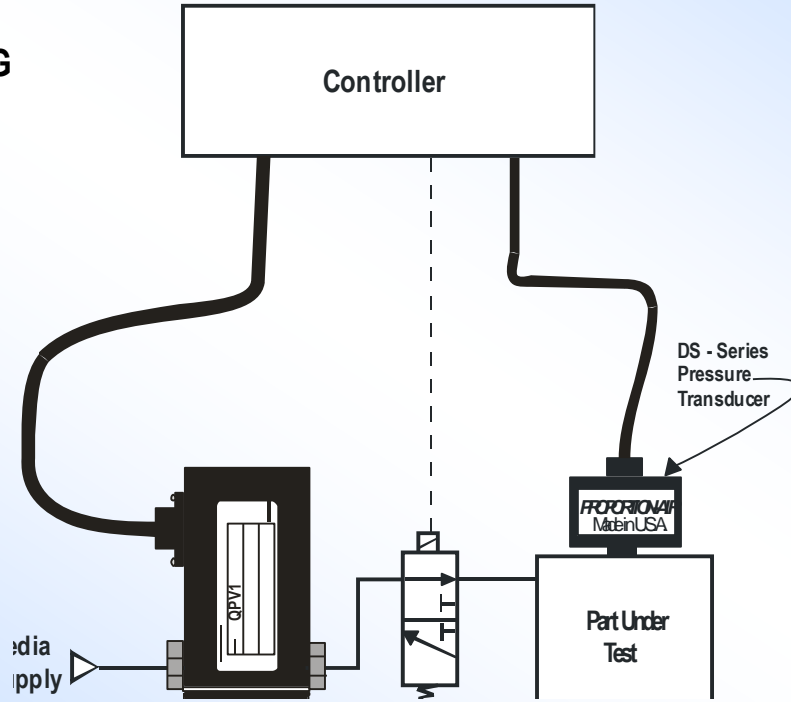


When flow or leakage is present in the system, traditional two valve I/P's bleed down and then actuate the inlet valve to compensate. This gives erratic pressure and flow. The QPV or MPV opens its inlet valve proportionally to match the system flow, resulting in steady pressure.



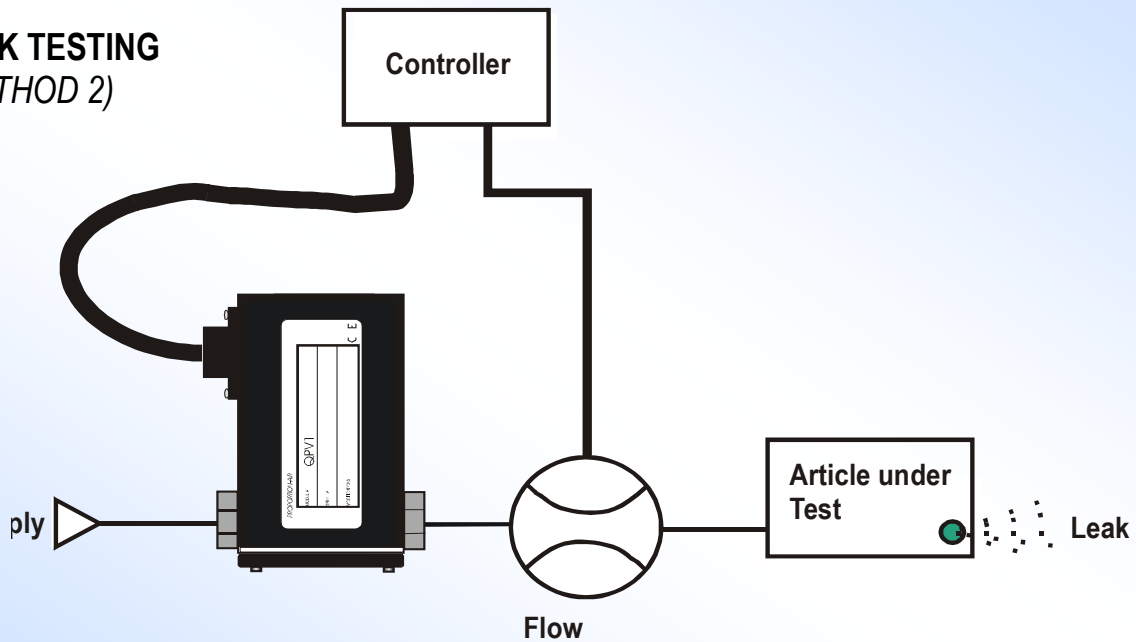
When transitioning from no flow to flow conditions, traditional I/P's experience droop and lock up errors. The QPV or MPV features an error integrator circuit that proportionally opens the inlet valve to maintain pressure as system flow changes.

**LEAK TESTING
(METHOD 1)**

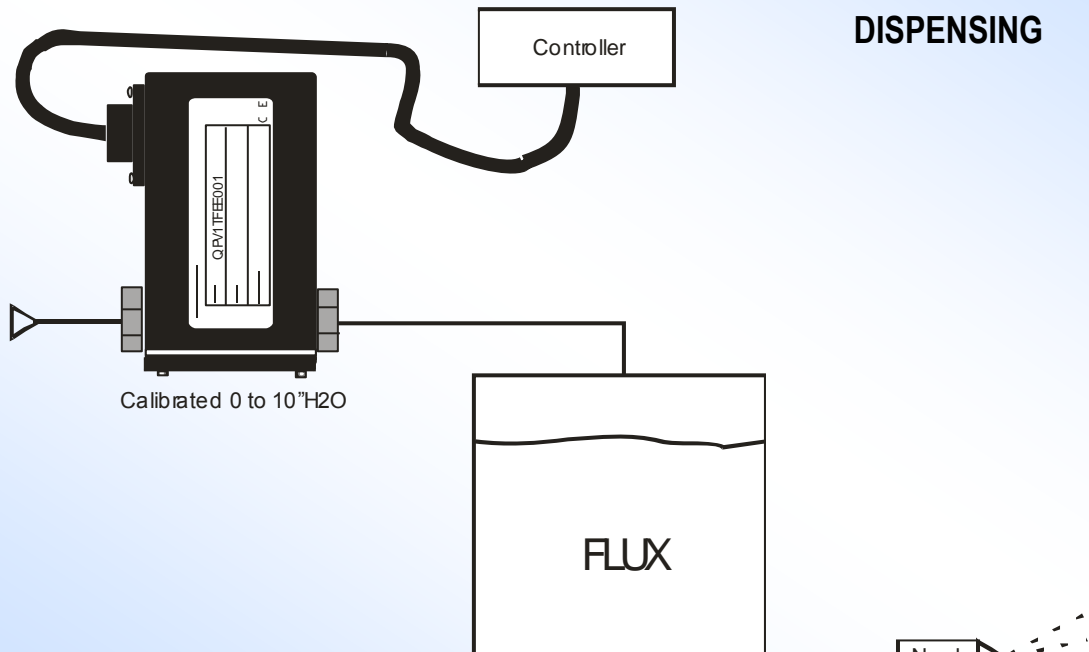


A Proportion-Air control valve can precisely control pressure to leak test parts. Once the test part is pressurized by the QPV1, the controller closes the shutoff valve. The DS-Series pressure transducer senses pressure in the part under test. Leak decay is recorded by the controller. Once the test is completed, the controller opens the shutoff valve and pressure is relieved through the QPV1.

**LEAK TESTING
(METHOD 2)**

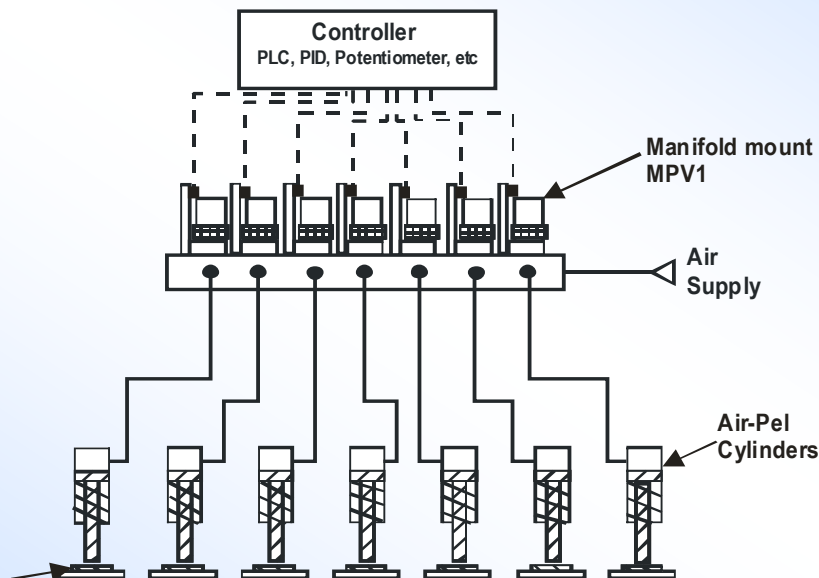


Pressure in the article under test is held to extremely tight tolerances by the QPV. The leakage at that pressure is measured by the flow transducer. The smooth, steady control of the proportional solenoid results in an error free flow transducer output.



In this application, a QPV1 Electro-pneumatic control valve is controlling pressure of air over flux, thus controlling the amount of flux which is being dispensed. Why a QPV1? Because this is a low flow, low pressure application that can be maintained using the QPV1

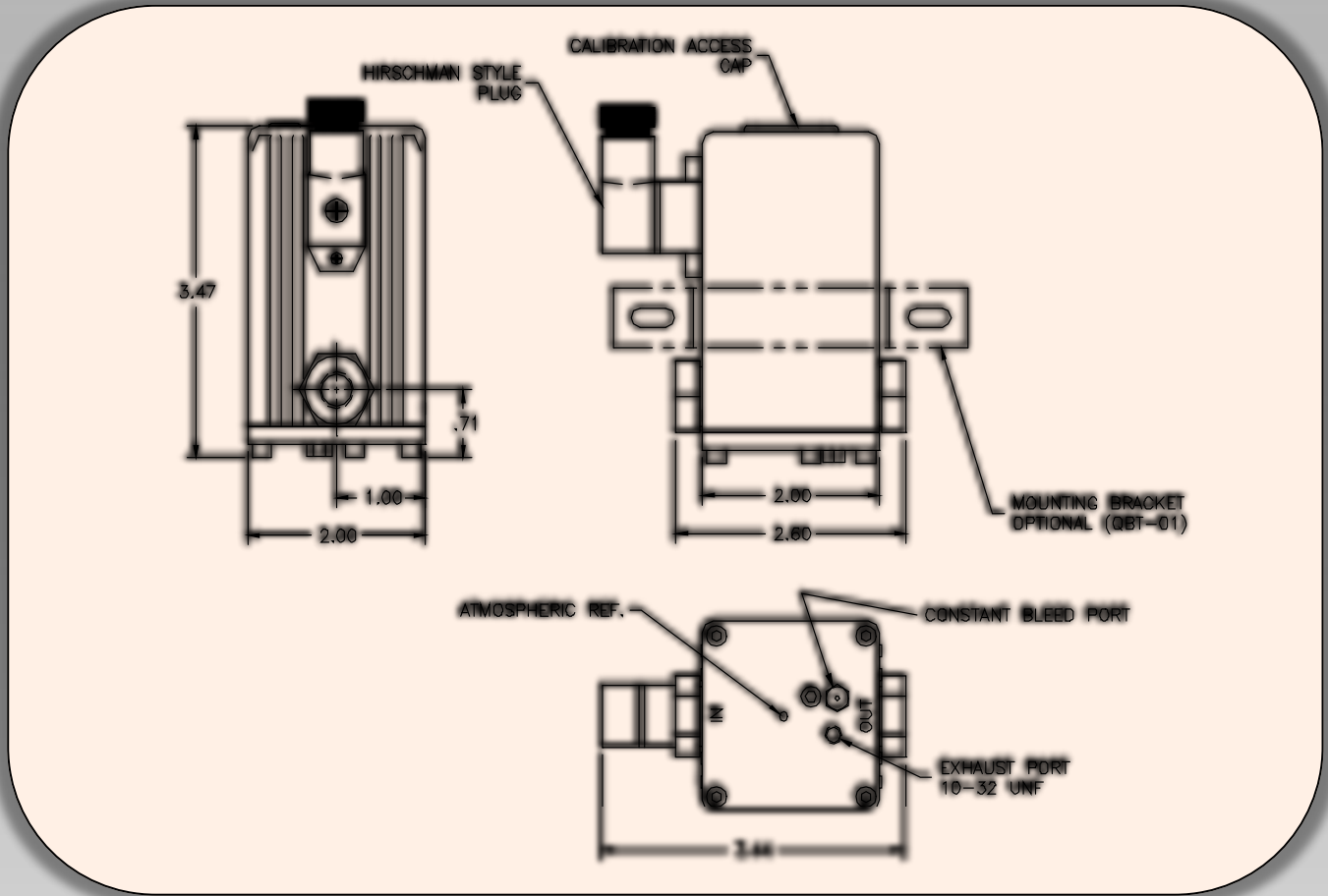
HIGH RESOLUTION FORCE CONTROL USING AIR-PEL CYLINDERS



In this application, 7-MPVs mounted on an SBM-7 sub-base manifold are controlling the force on spring loaded Air-Pel cylinders, in order to test the breaking point of small automotive parts. The sub-base has a common air supply port and a common exhaust port. The MPV units can all work independently and have a high resolution control to apply precise force using frictionless Air-Pel cylinders and readily compensate for the steady leakage of the Air-Pel air bearing. Use of these is especially advantageous when many control valves are required for an application with little mounting space.

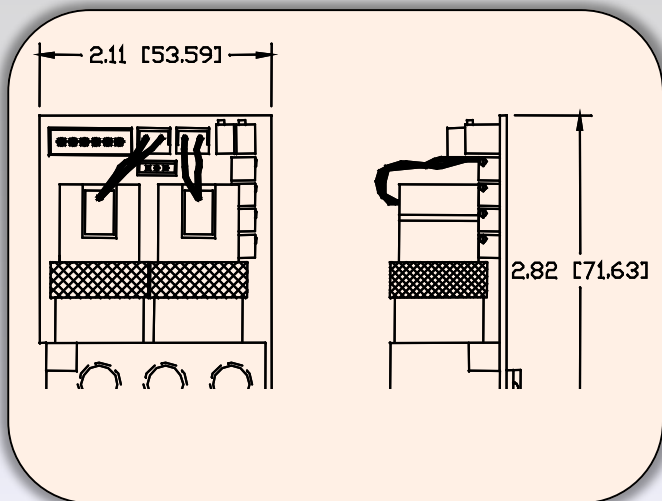
QPV DIMENSIONS

DIMENSIONS ARE FOR REFERENCE USE ONLY. DIMENSIONS ARE IN INCHES (MILLIMETERS)

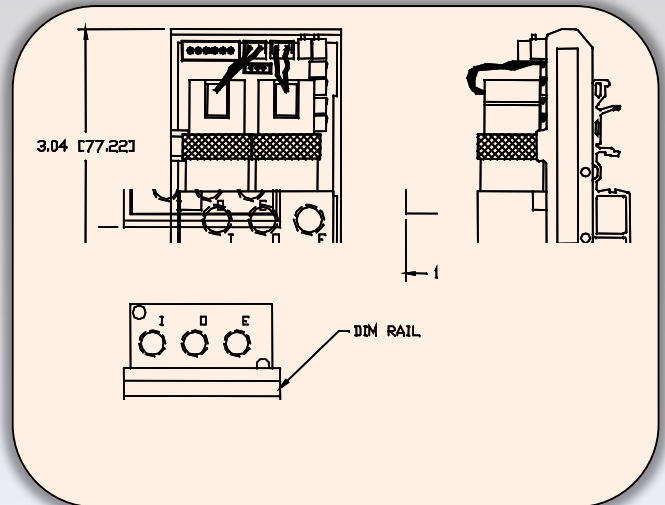


MPV DIMENSIONS

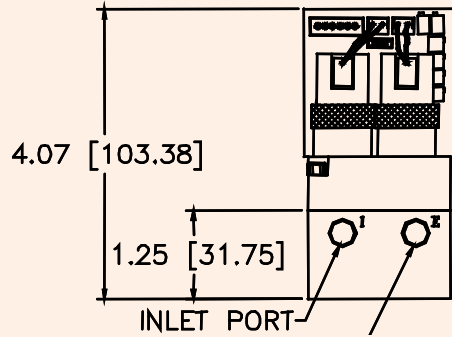
PANEL MOUNT MPV



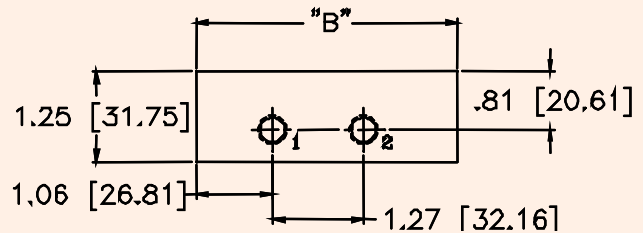
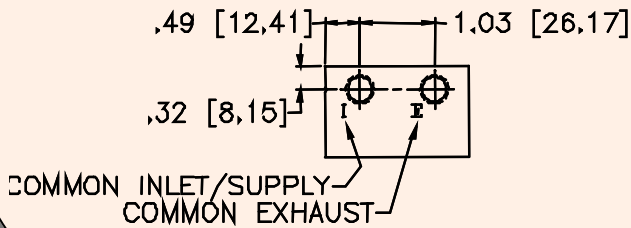
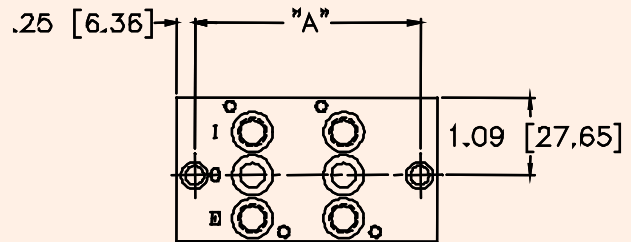
DIN RAIL MOUNT MPV



MANIFOLD MOUNT MPV



DIMENSIONS		
STATIONS	DIM "A"	DIM "B"
2	3.13(79.40)	3.63(92.13)
3	4.39(111.50)	4.89(124.21)
4	5.66(143.76)	6.16(156.46)
5	6.92(175.72)	7.43(188.72)
6	8.19(208.03)	8.69(220.73)
7	9.46(252.99)	9.95(252.98)
8	10.72(272.29)	11.22(284.99)
9	11.99(304.55)	12.49(317.25)
10	13.25(336.55)	13.76(349.50)



MPV MOUNTING PART NUMBERS

Mounting Kits	Part#
DIN Rail	DRMKT-01
Panel Mount	PMK-MM
Manifold Mount	See HARDWARE KIT

SUB BASE MANIFOLD*	
SBM-	2
2	2 Stations
3	3 Stations
4	4 Stations
5	5 Stations
6	6 Stations
7	7 Stations
8	8 Stations
9	9 Stations
10-16	10-16 Stations

HARDWARE KIT	
HK-	2
2	2 Stations
3	3 Stations
4	4 Stations
5	5 Stations
6	6 Stations
7	7 Stations
8	8 Stations
9	9 Stations
10-16	10-16 Stations

QPV PART CONFIGURATION

Example Part Number : **QPV 2 T B N E E Z O P 150 PS G A X L**

YOUR PART NUMBER : QPV T
 Section —> 1 2 3 4 5 6 7 8 9 10 11 12 13 14

1 Type	
1	Single Loop
2	Double Loop (<i>external feedback, Requires Option 3D</i>)

2 Manifold Material	
B	Brass (<i>Typical</i>)
A	Aluminum

3 Thread Type	
N	NPT
P	BSPP

4 Input Signal Range	
E	0 to 10 Vdc
I	4 to 20 mADC
K	0 to 5 Vdc
V	1 to 5 Vdc
A	RS 232 Serial Input*
B	RS 485 Serial Input*

**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 (<i>Sinking</i>)
S	4 to 20 mADC (<i>Sourcing</i>)

**Requires E, I, or K for Input Signal Range ¹Requires 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 (<i>Typical</i>)

7 Zero Offset Pressure	
<i>Typical is 0* - If Greater than 30% of Full Scale Pressure (#9 below) Please Consult Factory.</i>	
<i>*If Z for Zero Offset (#6), please leave blank</i>	

8 Full Scale Pressure Type	
N	0% Pressure Ends Below Atmosphere
P	0% Pressure Ends Above Atmosphere
Z	0% Pressure Ends at Zero

9 Full Scale Pressure	
Must be less than or equal to 150 psig	

10 Pressure Unit			
PS	PSI	Inches Hg	IH
MB	Millibars	Inches H ₂ O	IW
BR	Bar	mm H ₂ O	MW
KP	Kilopascal	Kilograms/cm ²	KG
MP	Megapascal	Torr*	TR
MH	mm Hg	Centimeters H ₂ O	CW

**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	
A	0.013"
B	0.025"
C	0.040"
D	0.060"
E	0.089"
N	No Inlet Valve*
X	0.040"*

**Vacuum Pressure Units Only*

13 Exhaust Valve ¹	
A	0.013"*
B	0.025"*
C	0.040"*
D	0.060"*
E	0.089"*
N	No Exhaust Valve
X	0.040" (<i>Typical</i>)

14 Bleed Orifice ²	
N	No Bleed Orifice
L	Include Bleed Orifice

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.**

MPV PART CONFIGURATION

Example Part Number : **MPV 1 D B N E E Z O P 150 PS G A X L**

YOUR PART NUMBER : MPV

Section —> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1 Type

1	Single Loop
2	Double Loop (<i>external feedback, Requires Option 3D</i>)

2 Mounting Type

D	DIN Rail Mount (<i>Ports on Face</i>)
M	Manifold Mount (<i>Ports on Bottom</i>)
P	Panel Mount (<i>Ports on Face</i>)

3 Manifold Material

B	Brass (<i>Typical</i>)
A	Aluminum

4 Thread Type

N	NPT
P	BSPP
H	Manifold Mount (<i>No Threads</i>)

5 Input Signal Range

E	0 to 10 Vdc
I	4 to 20 mA DC
K	0 to 5 Vdc
V	1 to 5 Vdc

6 Monitor Signal Range

X	No Monitor
E	0 to 10 Vdc
K	0 to 5 Vdc*
V	1 to 5 Vdc* ¹

*Requires E, I, or K for Input Signal Range *¹Requires V for Input Signal Range

7 Zero Offset

N	0% Pressure Starts Below Atmosphere
P	0% Pressure Starts Above Atmosphere
Z	0% Pressure Starts at Zero (<i>Typical</i>)

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.**

8 Zero Offset Pressure

Typical is 0 - If Greater than 30% of Full Scale Pressure (#9 below) Please Consult Factory.*
*If Z for Zero Offset (#6), please leave blank

9 Full Scale Pressure Type

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

10 Full Scale Pressure

Must be less than or equal to 150 psig*

11 Pressure Unit

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

*Requires A for Pressure Unit of Measure

12 Pressure Unit of Measure

A	Absolute Pressure
G	Gage Pressure

13 Inlet Valve¹

A	0.013"
B	0.025"
C	0.040"
D	0.060"
E	0.089"
N	No Inlet Valve*
X	0.040"*

*Vacuum Pressure Units Only

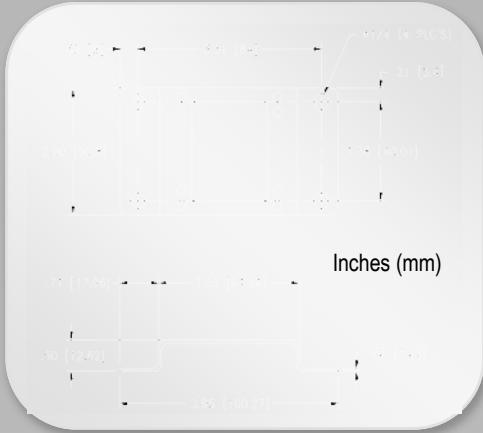
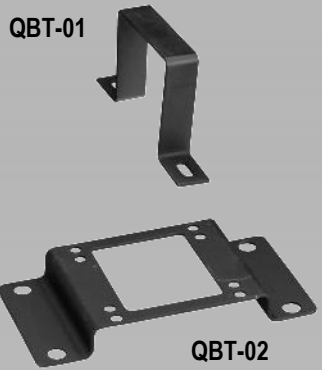
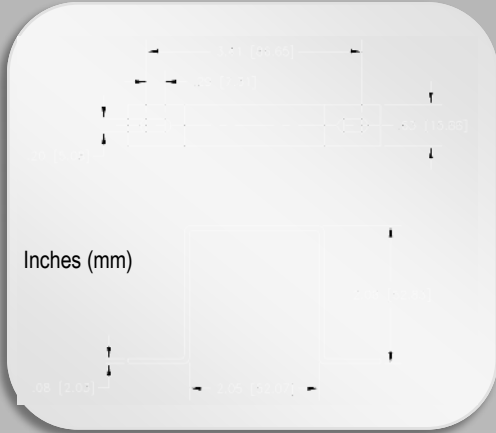
14 Exhaust Valve¹

A	0.013"*
B	0.025"*
C	0.040"*
D	0.060"*
E	0.089"*
N	No Exhaust Valve
X	0.040" (<i>Typical</i>)

15 Bleed Orifice²

N	No Bleed Orifice
L	Include Bleed Orifice

ACCESSORIES



DIMENSIONS ARE FOR REFERENCE USE ONLY



Pre-Assembled 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)

*PROPORTION-AIR, INC. 8250 N. 600 West, P.O. BOX 218
 McCORDSVILLE, INDIANA USA 46055
 PHONE 317-335-2602 FAX 317-335-3853
 www.proportionair.com info@proportionair.com*

ONE PRODUCT THOUSANDS OF WAYS



ISO 9001-2008 Certified

Proportion-Air 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 Proportion-Air's liability under this warranty is limited to repair or replacement of the defective unit at Proportion-Air's option. Proportion-Air 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 PROPORTION-AIR WITH REGARD TO CONSEQUENTIAL DAMAGES, WARRANTIES OF MERCHANTABILITY, DESCRIPTION, AND FITNESS FOR A PARTICULAR PURPOSE.**

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.