PROPORTION-AIR

QB4 PRESSURE CONTROL VALVE
INSTALLATION & MAINTENANCE INSTRUCTIONS

DESCRIPTION

The QB4 is a closed loop electronic pressure regulator consisting of two solenoid valves, an internal pressure transducer, and an electronic control circuit mounted to an integral volume booster. The output pressure is proportional to an electrical input (command signal). The pressure is controlled by activating the solenoid valves, which apply pressure to the pilot side of the volume booster. One valve functions as inlet control, the other as exhaust. The output pressure of the volume booster is measured by a pressure transducer, which is internally mounted, and provides a feedback signal to the electronic control circuit. This feedback signal is compared against the command signal input. Any differences between the command signal and the pressure feedback signal causes one of the solenoid valves to open to adjust the pressure in the pilot of the volume booster. Pilot pressure is adjusted so that desired output pressure is achieved and maintained. Since it is the actual desired work pressure that is being sensed and fed back to the control circuit, any mechanical hysteresis of the air piloted volume booster is automatically compensated for. This allows for our extraordinary accuracy and repeatability.

Command inputs come in a choice of either a differential 0-10 Vdc or 4-20 mA. The QB4 also provides an electrical monitor signal for output to a panel meter or controller for data acquisition or quality assurance needs. The monitor signal comes from the internal pressure transducer. All QB4's come standard with a 0-10 volt monitor signal with 4-20 mA optional. Providing this monitor signal as part of our standard package eliminates the need to purchase a separate transducer.

The uniqueness of the volume booster design is that it has no stamped gaskets or special molded diaphragm or seal parts. All of the parts related to normal maintenance are standard o-rings. Complete repair kits are available, but in case emergency repair is needed parts should be available from any fluid power distributor or even most neighborhood hardware stores. Since all sealing parts are o-rings a large variety of chemical compounds are readily available. You can select the compounds, which are most ideally suited to your process and environment.

The QB4 is used for pressures up to 150 psig.

SPECIFICATIONS

ELECTRICAL

SUPPLY VOLTAGE.....….15-24 VDC
SUPPLY CURRENT.....….250mA max.
COMMAND SIGNAL
VOLTAGE.....…..0-10 VDC differential
CURRENT.....…….4-20mA differential
COMMAND SIGNAL IMPEDANCE
VOLTAGE.....…..10 KΩ
CURRENT.....….100 Ω
ANALOG MONITOR SIGNAL
VOLTAGE.....……0-10 VDC @ 10mA max
CURRENT…….4-20mA Sinking or Sourcing

MECHANICAL

AVAILABLE PRESSURE RANGES[1]… 29.9 in. Hg (vac) - 150 psig
(760 mmHg (vac) - 10.34 BAR)
FLOW RATE
FORWARD & EXHAUST .....(See Flow Charts)
FILTRATION RECOMMENDED…40 micron actual
LINEARITY/HYSTERESIS.....….<±0.3% F.S. BFSL [2]
ACCURACY .....….<±0.4% F.S. [2]
WETTED PARTS‡ .....Elastomers - Nitrile (3)
Manifold - Aluminum Nickel Plated
Solenoid Valves - 430FR SS, 360 Brass
Seal material - Nitrile
P.Transducer - Utem 1000, Aluminum, Silicon

PHYSICAL

OPERATING TEMPERATURE....32-158ºF [0-70ºC]
DIMENSIONS…….3in. X 3in. X 6.5in.
(76.2mm X 76.2mm X 165.1mm)
PORT SIZE……. 1/2" NPTF
WEIGHT.....…...3.7 lb [1.7 Kg]
PROTECTION RATING.....…NEMA 4 / IP65
HOUSING.....….Aluminum (Anodized)
VOLUME BOOSTER.....Electroless Nickel Plated Aluminum

[1] Pressure ranges are customer specified. Custom pressure ranges are available. Vacuum through positive pressure units, positive pressure must be equal to greater than vacuum level. Consult factory for pressure range below 10 psig.
[2] Dependent on response adjustments. Valve can be field adjusted for best response for the actual application
[3] Other elastomers are available. Consult factory.

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Before you get started, please read these warnings:

- Examine the product. Ensure that you received what you ordered.
- Read this guide first before you start and save it for later use.
- You must have a good understanding of what the adjustments are on this product before using them.
- All compressed air and electric power should be shut off before installing, removing or performing maintenance on this product.
- 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.

CONNECTION PROCEDURE

Pneumatic Connections

CAUTION: USE ONLY THE THREAD SEALANT PROVIDED. OTHER SEALANTS SUCH AS PTFE TAPE AND PTFE PASTE CAN MIGRATE INTO THE FLUID SYSTEM CAUSING FAILURES.

1. The valve can be mounted in any position without affecting performance.
2. A 40 micron nominal or better in-line filter is recommended on the inlet of the QB4 valve. This is available from Proportion-Air as part number FPP-4.
3. A 1/4" plug is supplied with the valve. It can be used to plug the "Alternate Exhaust Port" if the exhaust media should be captured or when the valve is used for vacuum or vacuum through positive pressure control. See Figure 1 for port location.

Positive Pressure Units

1. Connect supply pressure to the "I" inlet port (Figure 1) not to exceed rated supply pressure. (See TABLE 1)
2. Connect the outlet "O" port (Figure 1) to the device being controlled.
3. The "E" exhaust port can be plumbed to a point outside the work area, fitted with a muffler or left open to atmosphere as the application dictates.
4. Proceed with electrical connection.

Vacuum only & Vacuum Through Positive Pressure Units

1. Connect vacuum supply to the "E" exhaust port (Figure 1). The auxiliary exhaust port must be plugged with the 1/4" NPT pipe plug provided to prevent atmospheric air from leaking in to the vacuum supply.
2. Connect supply pressure to the "I" inlet port (Figure 1) not to exceed rated supply pressure (See TABLE 1). Positive supply pressure is required on vacuum and vacuum to positive pressure QB4 units.
3. Connect the outlet "O" port (Figure 1) to the device being controlled.
4. Proceed with "Electrical Connections" section.

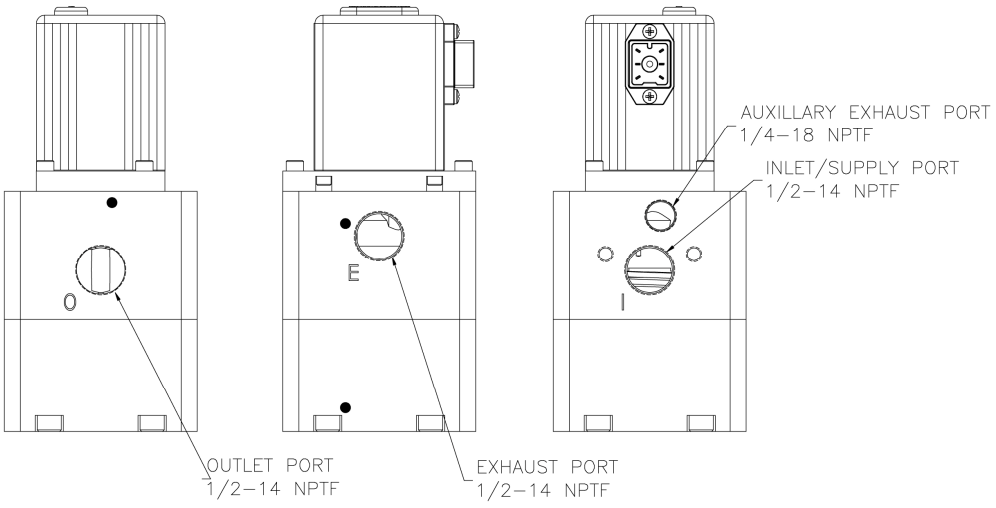


Figure 1

Electrical Connections

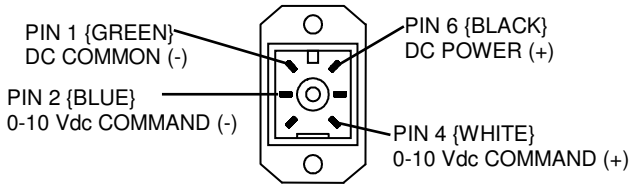
1. Turn off all electric power before making electrical connections.
2. Identify the valve's command input and analog output using the calibration card included in the package and the ordering information section on the last page of this sheet.
3. Proceed to the appropriate section corresponding to the type of valve being installed.

NOTE: ALL COLOR CODES RELATE TO QB4'S ORDERED FROM THE FACTORY WITH PRE-ASSEMBLED QBT-C-X CABLES.

Voltage Command Valves (TFE-)

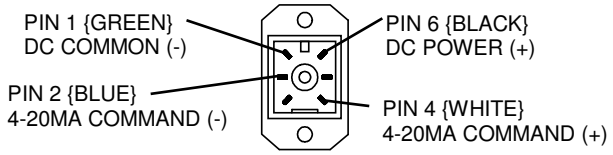
All voltage command QB4's use a differential input. If a single ended voltage source is to be used, tie the command (-) wire to the DC Common. For long wire runs, it is preferred to make this connection at the COMMAND SIGNAL SOURCE and not at the QB4 connector.

*For single ended versions of QB4 contact factory



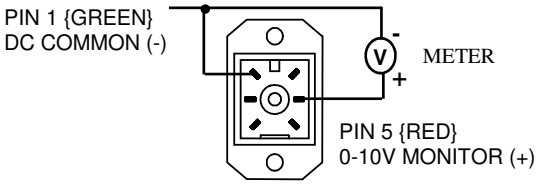
Current Command Valves (TFI-)

All current command QB4's use a differential current loop scheme (not isolated), meaning current flow is from Pin 4 to Pin 2 on the QB4 valve. Some applications may require the common of the power supply that provides loop power for the 4-20mA command to be tied to power supply common. The following diagram shows the correct connection for conventional current flow.



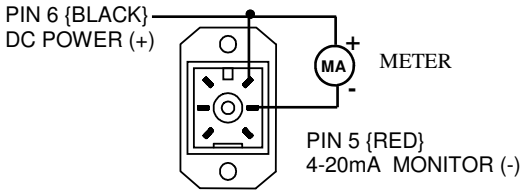
Voltage Monitor Valves (TFEE or TFIE)

Use the following wiring diagram for QB4 valves with a voltage monitor output.



Current Monitor Valves (TFEC or TFIC SINKING OUTPUT)

Use the following wiring diagram for QB4 valves with a current sinking monitor output.



Current Monitor Valves (TFES or TFIS SOURCING OUTPUT)

Use the following wiring diagram for QB4 valves with a current sourcing monitor output.

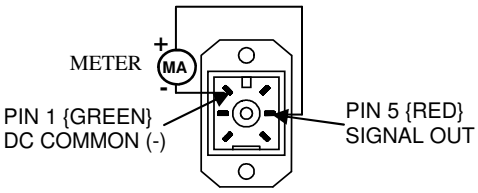


TABLE 1

RATED INLET PRESSURE FOR STANDARD QB4 VALVES

For valves ordered with MAX. calibrated pressure	Max. inlet pressure
Vacuum through 10 psi positive	15 psig (1 bar)
10.1 up to 30 psig (0.70 up to 2 bar)	35 psig (2.4 bar)
31 up to 100 psig (2.1 up to 7 bar)	110 psig (7.6 bar)
101 up to 150 psig (7 up to 10.3 bar)	165 psig (11.4 bar)

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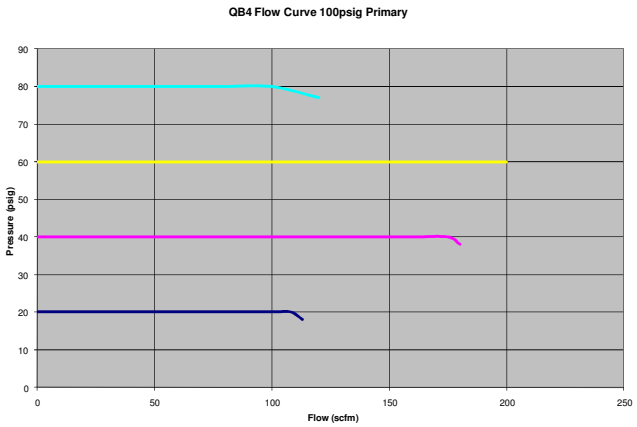
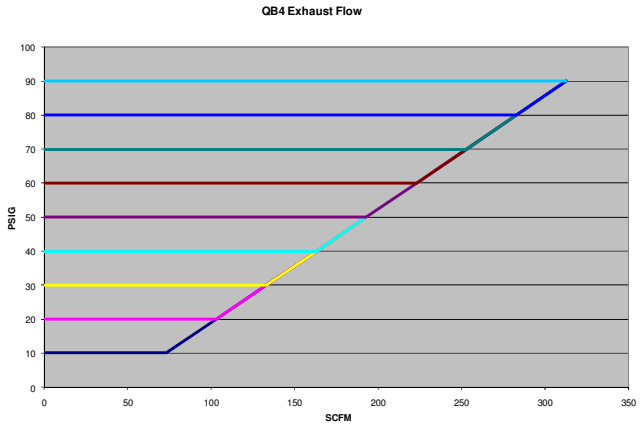




RE-CALIBRATION PROCEDURE :

All QB4 control valves come calibrated from the factory by trained personnel using precision calibration equipment. The QB4 valve is a closed loop control valve using a precision internal electronic pressure sensor. Typical drift is less than 1% over the life of the product. If your QB4 valve appears to be out of calibration by more than 1%, it is not likely to be the QB4. Check the system for plumbing leakage, wiring and electronic signal levels. Verify the accuracy of your measuring equipment before re-calibrating. Consult factory if you have any questions or require assistance. If the QB4 valve needs re-calibration, use the procedure described below:

1. Wire control valve according to the section titled "Electrical Connections."
2. Plumb QB4 according to section titled "Pneumatic Connections".
3. Connect a precision measuring gauge or transducer to the outlet port of the QB4 (Figure 1).
4. Locate the rubber oblong Calibration Access Cap on top of the QB4 valve and remove it (Figure 2)
5. Underneath access cap, locate the two adjustment potentiometers SPAN adjust ZERO adjust. (See Figure 3 for location)
6. Set the electrical command input to MAXIMUM value.

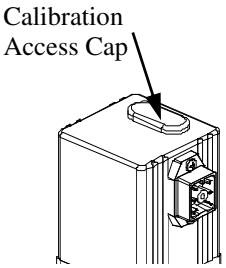


Figure 2

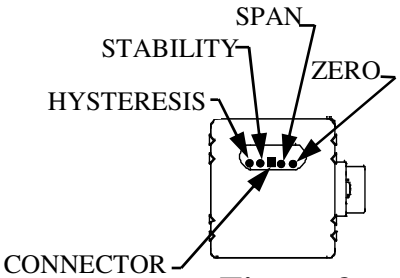


Figure 3

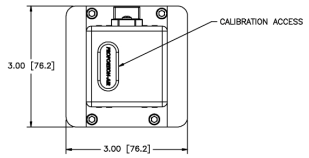
7. Adjust the SPAN potentiometer until MAXIMUM desired pressure is reached.
8. Set the electrical command input to 10 percent of full value (1Vdc for 0-10Vdc unit or 5.6mA for 4-20mA unit).
9. Adjust the ZERO potentiometer until 10 percent of maximum desired pressure is reached.
10. If at any time during the calibration procedure the servo oscillates or becomes unstable for more than one second, turn the HYSTERESIS and the STABILITY potentiometer (see Figure 3 for location) counter-clockwise in one turn increments until the oscillation stops, then turn both one more complete turn (same direction).
11. The ZERO and SPAN potentiometers interact slightly. Repeat steps 6-10 until no error exists.
12. Verify unit shuts off by going to zero command. Check linearity by going to at least six set points throughout the full range.

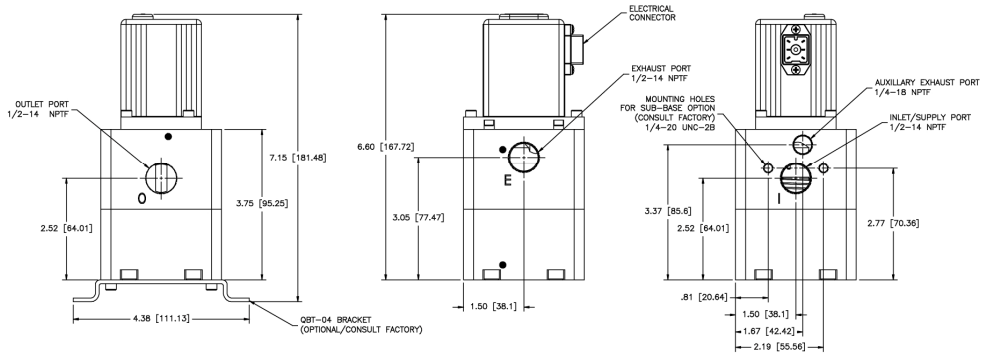
DIMENSIONS in (mm)

QB4 CONTROL VALVE

NOTES:

1.) ALL PORTS 1/2-14 NPTF
(except auxiliary exhaust)





ORDERING INFORMATION

D DIGITAL DISPLAY
- D = Digital display
- BLANK = No display

QB SERIES

4 SIZE
- 4 = 1/2" NPTF Ports

T CONTAINER
- T = IMPACT ALUM.

F MONITOR
- E = 0-10VDC
- C = 4-20 MA Sinking
- S = 4-20MA Sourcing

E COMMAND INPUT
- E = 0-10 VDC
- I = 4-20 MA

E MONITOR SIGNAL

xxx MAXIMUM CALIBRATED RANGE VAC-150 psig*

EXAMPLES
100 = 0-100 PSI
N20 = 0-20 in-Hg (vac)

* Check special options for Pressure ranges not starting at "0" psig .

Sxxx SPECIAL OPTIONS
- S = Special option
- xxx = Option number
- Blank = No option

40 MICRON FILTER 1/2 NPT
- FPP-4

REPAIR KITS
- **QB4-REPAIRKIT** (Lid O-ring, Piston, Pedestal & Inlet Valve assemblies)
- **QB4-RK-PISTON** (Piston Assembly)
- **QB4-RK-PEDESTAL** (Pedestal Assembly)
- **QB4-RK-INLET** (Inlet valve Assembly)

MOUNTING BRACKET
- QBT-04

PRE-ASSEMBLED POWER CORD
- QBT-C-6
  - Length in feet (Other length are available from 1 to 25 feet)

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