PROPORTION-AIR

INSTALLATION, OPERATION AND MAINTENANCE GUIDE

QB1X & QB2X Electro-Pneumatic Pressure Regulators

The QBX series valve uses Proportion-Air closed loop technology for pressure control. It gives an output pressure proportional to an electrical command signal input.

The QB1X is a complete closed loop system consisting of valves, manifold, housing and electronic controls. Pressure is controlled by the use of two solenoid valves. One valve functions as inlet control, the other as exhaust. The pressure output is measured by a pressure transducer internal to the QB1X and provides a feedback signal to the electronic controls. This feedback signal is compared with the command signal input. A difference between the two signals causes one of the solenoid valves to open, allowing flow in or out of the system. Accurate pressure is maintained by controlling these two valves.

The QB2X is similar to the QB1X but uses a double loop control scheme. In addition to the internal pressure transducer, the QB2X receives an electrical signal from an external sensing device. This primary feedback signal is compared against the command signal input. This comparison is then summed with the internal pressure transducer signal. The gain of the circuit is such that priority is given to the external feedback signal. A difference between the command signal and the feedback signal causes one of the solenoid valves to be activated.

A monitor output is provided for the system measurement. All QBX valves come standard with an analog voltage monitor output. QB1X monitor output is an amplified signal from the internal pressure transducer. QB2X monitor output is a buffered signal from the primary external transducer connected to the QB2X.

INSTALLATION

1. Apply a small amount of anaerobic sealant (provided) to the male threads of the in-line filter supplied with valve. *CAUTION: USE ONLY THE THREAD SEALANT PROVIDED. OTHER SEALANTS, SUCH AS PTFE TAPE OR PIPE DOPE, CAN MIGRATE INTO THE FLUID SYSTEM CAUSING FAILURES.*
2. Install the in-line filter into the port labeled I on QBX valve.
3. For vacuum or vacuum through positive pressure units, the vacuum supply should be connected to the exhaust port of the QBX.
4. Connect supply line to the in-line filter port. Connect device being controlled to port labeled O on QBX valve.
5. For QBX, there are two output ports; one on the size of the manifold and one on bottom. The working port should be determined when ordering; check to ensure that the other port is plugged.
6. Mount valve accordingly.
7. The valve can be mounted in any position without affecting performance. Mounting bracket QBT-01 (ordered separately) can be used to attach valve to a panel or wall surface.
8. Proceed with electrical connections.

SPECIFICATIONS

Electrical

Supply voltage	15-24 VDC
Supply current	250 mA
Command signal	0-10 VDC | 4-20 mA
Command signal impedance	VDC 10 kΩ | Current: 100 Ω
Monitor VDC	0-10 VDC @ 20 mA max
Monitor current	4-20 mA sinking or sourcing

Mechanical

Pressure ranges	Full vacuum - 175 PSIG
Flow rate	1.2 SCFM @100 PSIG inlet
Accuracy	±0.2% F.S.
Hysteresis	±0.15% F.S.
Repeatability	±0.02% F.S.
Port size	1/8" NPT Female
Min. closed end volume	2 in^3
Filtration required	40 micron

Wetted Parts

Elastomers	Fluorocarbon
Solenoid valves	Nickel-plated brass
Manifold	Aluminum
Pressure transducer	Silicon, aluminum

Physical

Operating temperature	32°-158° F (0°-70° C)
Weight	Aluminum: 1.02 lbs (0.50 kg) Brass: 1.6 lbs (0.75 kg)
Electrical connector	6-pin Hirschmann

WARNING

These products are intended for use in industrial compressed gas systems only. Do not use these products where pressures and temperatures exceed the specifications listed.

ELECTRICAL CONNECTIONS

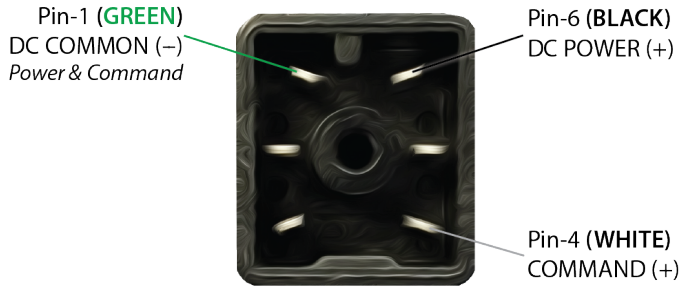
QB1X

1. Turn off all power to valve.
2. Identify the valve's command input and analog output using the calibration card included in the package and the ordering information section later in this booklet.
3. Proceed to the appropriate section corresponding to the type of valve being installed.

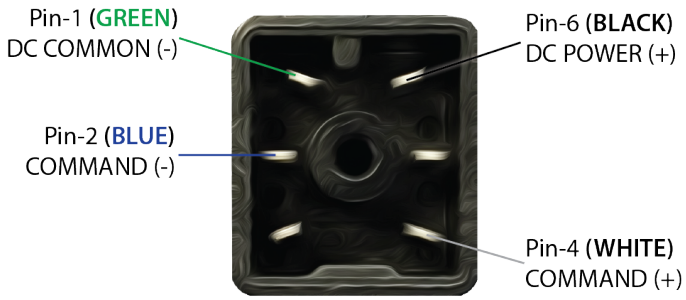
NOTE: ALL COLOR CODES RELATE TO THE FACTORY-WIRED QBT POWER CORD.

Command Signal Configurations

Voltage Command Valves (E, K, V)

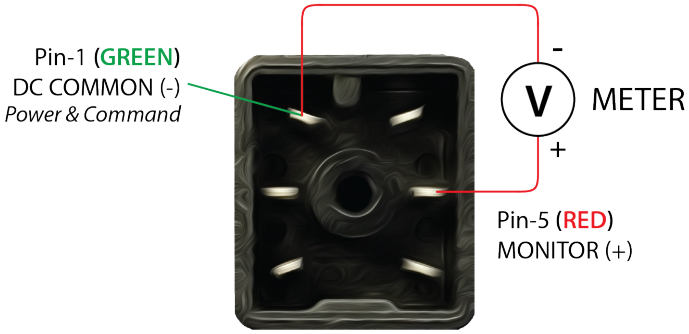


Current Command Valves (I)

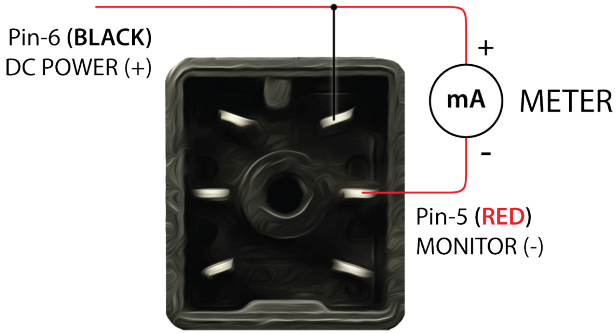


Monitor Signal Configurations

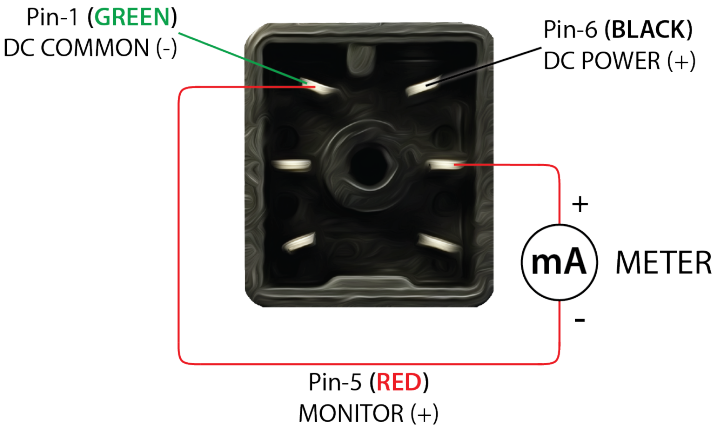
Voltage Monitor (IE or EE)



Current Sinking Monitor (EC or IC)



Current Sourcing Monitor (ES or IS)



ELECTRICAL CONNECTIONS

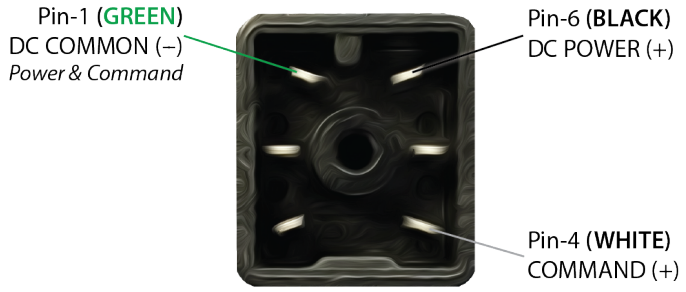
QB2X

1. Turn off all power to valve.
2. Identify the valve's command input and analog output using the calibration card included in the package and the ordering information section later in this booklet.
3. Proceed to the appropriate section corresponding to the type of valve being installed.

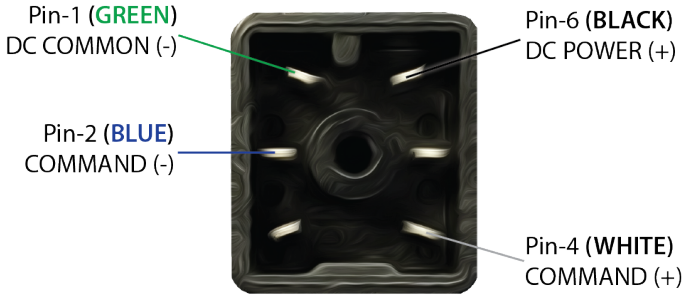
NOTE: ALL COLOR CODES RELATE TO THE FACTORY-WIRED QBT POWER CORD.

Command Signal Configurations

Voltage Command Valves (E, K, V)



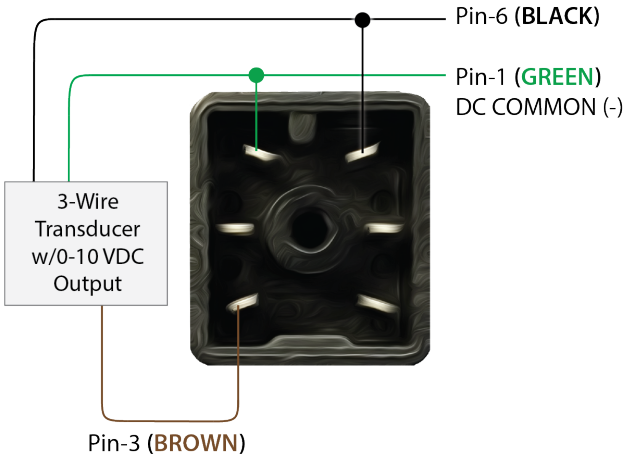
Current Command Valves (I)



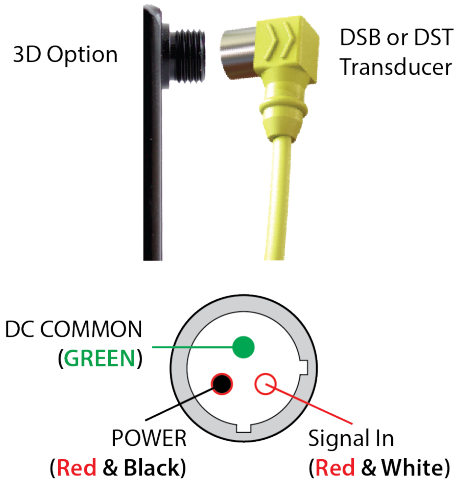
QB2X Second Loop Connections

All QB2 valves are designed to accept a 0-10 volt second loop input signal, unless ordered with special option code C2 (4-20 mA second loop input). Reference the following wiring diagrams for details.

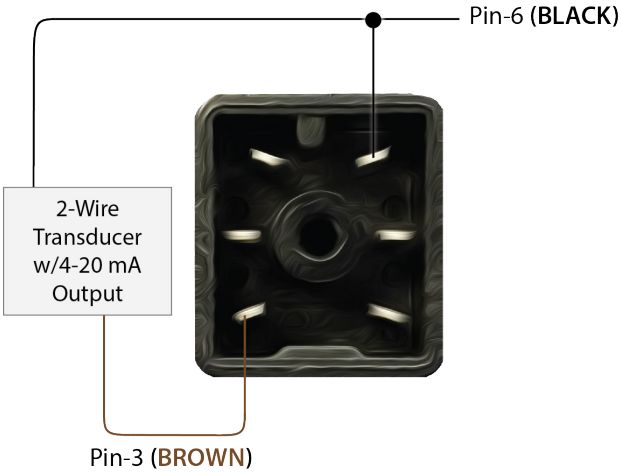
QB2X without 3D Option



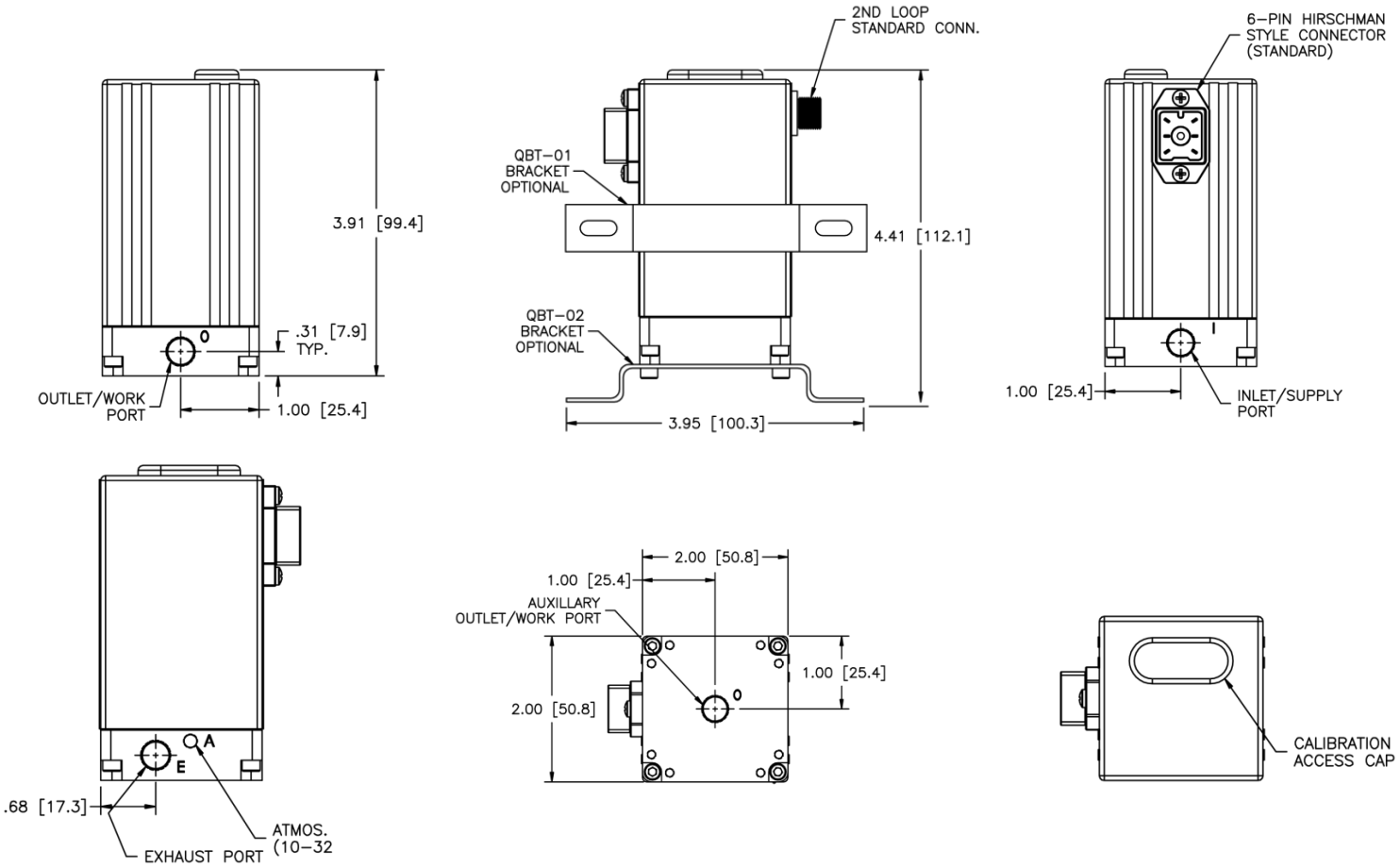
QB2X with 3D Option



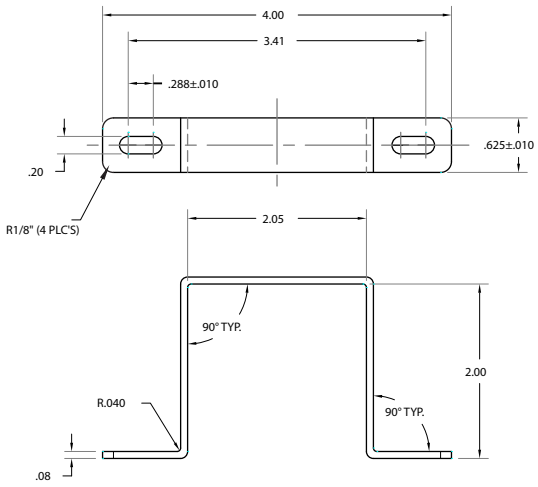
QB2X with C2 Option (mA 2nd Loop Feedback)



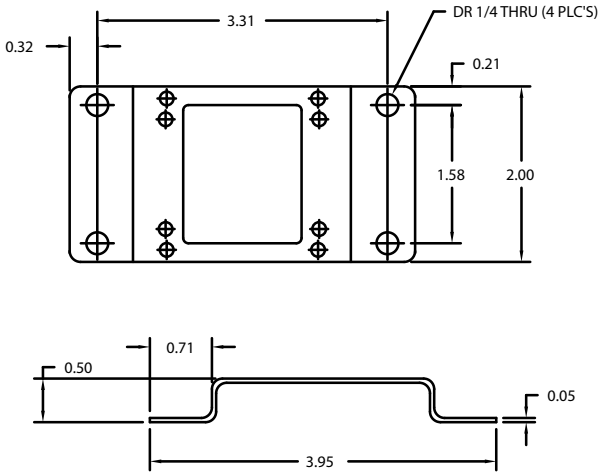
DIMENSIONS



QBT-01 Bracket



QBT-02 Bracket



Notes:
1. All dimensions are in inches
2. All dimensions are for reference only.
3. Exhaust and inlet ports are switched when configured over 150 psi.

RE-CALIBRATION PROCEDURE

All QBX control valves come calibrated from the factory by trained personnel using precision calibration equipment. The QBX valve is a closed loop control valve using a precision electronic pressure sensor. Typical drift is less than 1% over the life of the product. If your QBX valve appears to be out of calibration by more than 1%, it is not likely to be QBX. 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 QBX valve needs re-calibration, use the procedure described below:

QB1X

1. Identify the inputs and outputs of the valve using the model number of the valve, calibration card included with the valve, and the information provided in this sheet.
2. Connect a precision measuring gage or pressure transducer to the OUT port of the QBX.
   NOTE: THERE MUST BE A CLOSED VOLUME OF AT LEAST 1 CU. IN. (17 CC) BETWEEN THE VALVE OUTLET AND THE MEASURING DEVICE FOR THE VALVE TO BE STABLE.
3. Connect the correct supply source to the IN port of the QBX, making sure the pressure does not exceed the rating for the valve (See Table 1).
4. Locate the plastic calibration access cap on top of the QBX valve and completely remove it. Located underneath are two adjustment trim pots, Zero "Z" and Span "S". See figure 1 for pots location.
5. *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 step 6.* Using a small screwdriver, turn both trim pots 15 turns clockwise. Then turn both trim pots 7 turns counterclockwise. This will put the QB roughly at mid-scale.
6. Make correct electrical connections as noted. Make sure there is a proper meter in place to measure the command input to the QBX.
7. Set the electrical command input to MAXIMUM value.
8. Adjust the SPAN pot until MAXIMUM desired pressure is reached (clockwise increases pressure).
9. Set the electrical command input to MINIMUM value.
10. Adjust the ZERO pot until MINIMUM desired pressure is reached (clockwise increases pressure).
11. Repeat ZERO and SPAN adjustments, which interact slightly, until QB1 valve is calibrated back to proper range. Step 6 - 9.
12. Replace calibration access cap.

QB2X

This section assumes there is a properly scaled and calibrated transducer for use as 2nd loop feedback signal. For information on re-calibrating Proportion-Air DS series pressure transducers, see sheet DS-Installation.pdf.

1. Follow steps 1-5 as noted in the QB1X section.
2. Make correct electrical connections as noted. Make sure there is a proper meter in place to measure the command input to the QB2X. Make sure the 2nd loop signal is connected.
3. Set the electrical command input to MAXIMUM value.
4. Adjust the SPAN pot until MAXIMUM desired pressure is reached (clockwise increases pressure).
5. Set the electrical command input to MINIMUM value.
6. Adjust the ZERO pot until MINIMUM desired pressure is reached (clockwise increases pressure).
7. Repeat ZERO and SPAN adjustments, which interact slightly, until QB2X valve is calibrated back to proper range. Steps 3 - 6.
8. Replace calibration access cap.

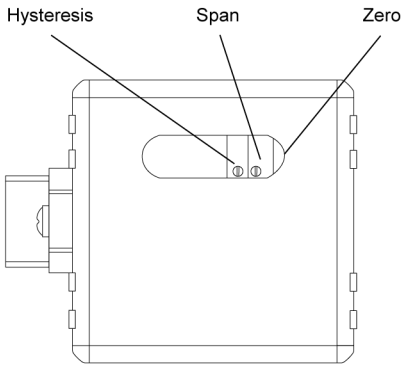


FIGURE 1

Table 1
Rated Inlet Pressure for Standard QBX Valves

Max Calibrated Pressure	Max Inlet Pressure
Vacuum to 10 psig (0.69 bar)	Contact Factory
10.1 to 30 psig (0.70 to 2 bar)	35 psig (2.4 bar)
31 to 100 psig (2.1 to 7 bar)	110 psig (7.6 bar)
101 to 150 psig (7 to 10.3 bar)	175 psig (12 bar)

QBX

ACCURACY	±0.2% F.S.	PRESSURE	Full Vac to 175 PSIG *(12 Bar)*
PORT SIZE	1/8"	MAX FLOW	1.2 SCFM *(34 SLPM)*

The QBX replaces the QBT for all new applications.

Example Part Number	QB	2	X	A	N	E	E	N	1	P	6	BR	G	3D	TF
Section Reference ->		1		2	3	4	5	6	7	8	9	10	11	Options	

1	Type
1	Single Loop
2	Dual Loop

2	Manifold Material
A	Anodized Aluminum
B	Brass

3	Thread Type
N	NPT
P	BSPP

4	Command Signal Range
E	0 to 10 VDC
I	4 to 20 mADC
K	0 to 5 VDC
V	1 to 5 VDC *(Requires **V** for Monitor Signal #5)*
D	0 to 255 Bit Digital *(Cannot Select **V** for Monitor Signal #5)*
L	0 to 255 Bit Digital Latching *(Cannot Select **V** for Monitor Signal #5)*
N	Ethernet/Proportion-Air *(Requires **X** for Monitor Signal #5)*
A	RS232 Modbus Serial Command *(Requires **X** for Monitor Signal #5)*
B	RS485 Modbus Serial Command *(Requires **X** for Monitor Signal #5)*
P	P2 Profiler *(Integrated)*

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 Command Signal Range (#4)

*[1]Requires **V** for Command Signal Range (#4)

6	Zero Offset
N	0% Pressure is Below Zero
P	0% Pressure is Above Zero
Z	0% Pressure is Zero *(Typical)*

7	Zero Offset Pressure
	Typical is 0* - If greater than 30% of full scale pressure *(#9)*, please consult factory.

*If **Z** for Zero Offset, Please Leave this Section (#7) Blank

8	Full Scale Pressure Type
N	100% Pressure is Below Zero
P	100% Pressure is Above Zero
Z	100% Pressure is Zero

9	Full Scale Pressure
	Must be less than or equal to 175 psig*

*Adder if Full Scale Pressure ≤13.5" H2O

10	Pressure Unit		
PS	PSI	Inches Hg	IH
MB	Millibars	Inches H_2O	IW
BR	Bar	Millimeters H_2O	MW
KP	Kilo-pascal	Kilograms/cm^2	KG
MP	Mega-pascal	Torr *(Requires A for Unit of Measure #11)*	TR
MH	Millimeters Hg	Centimeters H_2O	CW
PA	Pascal		

11	Pressure Unit of Measure
A	Absolute Pressure
G	Gauge Pressure
D	Differential Pressure

Options	
3D	3-Pin Connector
BF	Bottom Mount 1/4" Male Fitting
BR	Foot-Mounted Bracket + Install
DD	Digital Display
O2*	Oxygen Cleaned
P1	12-VDC Power
TF†	Test Under Flow

*O2 cleaning only available on brass manifold.
†Only on QB2X when used with a 1:1 volume booster.
Many other options are available. Please consult factory for more information.

Recommended Accessories	
QBT-C-6	6 ft. Power/Command/Monitor Cable
QBT-01	Wrap-Around Mounting Bracket
QBTS-02*	Uninstalled Foot-Mount Bracket and Screws

*Include BR option on part number for factory-installed foot mount bracket

SAFETY PRECAUTIONS

Please read the following safety information before installing or operating any Proportion-Air, Inc. equipment or accessories. To confirm safety, observe 'ISO 4414: Pneumatic Fluid Power - General rules relating to systems' and other safety practices.

WARNING

Improper operation could result in serious injury or loss of life!

1. **PRODUCT COMPATIBILITY**
Proportion-Air, Inc. products and accessories are for use in industrial pneumatic applications with compressed air 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.

2. EMERGENCY SHUTOFF
Proportion, Inc. 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.

3. EXPLOSIVE ATMOSPHERES
Products and equipment should not be used where harmful, corrosive or explosive materials or gases are present. Unless certified, Proportion-Air, Inc. products cannot be used with flammable gases or in hazardous environments.

4. AIR QUALITY
Clean, dry air is not required for Proportion-Air, Inc. products. However, a 40 micron particulate filter is recommended to prevent solid contamination from entering the product.

5. 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.

6. 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.

7. 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.

CAUTION

Improper operation could result in serious injury to people or damage 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 a couple 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.

EXEMPTION FROM LIABILITY

1. Proportion-Air, Inc. is exempted from any damages resulting from any operations not contained within the catalogs and/or instruction manuals and operations outside the range of its product specifications.
2. Proportion-Air, Inc. is exempted from any damage or loss whatsoever caused by malfunctions of its products when combined with other devices or software.
3. Proportion-Air, Inc. and its employees shall be exempted from any damage or loss resulting from earthquakes, fire, third person actions, accidents, intentional or unintentional operator error, product misapplication or irregular operating conditions.
4. Proportion-Air, Inc. and its employees shall be exempted from any damage or loss, either direct or indirect, including consequential damage or loss, claims, proceedings, demands, costs, expenses, judgments, awards, loss of profits or loss of chance and any other liability whatsoever including legal expenses and costs, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.

WARRANTY

Proportion-Air, Inc. products are warranted to the original purchaser only against defects in material or workmanship for eighteen (18) months 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.

PROPORTION-AIR

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Handcrafted in the USA
ISO 9001-2015 Certified