

PROPORTION *AR*



QB Series Electro-Pneumatic Pressure Regulators

**Precision closed-loop pressure control designed
to work in almost any environment.**

Accurate | Repeatable | Customizable

Theory of Operation

The QB Series uses Proportion-Air's patented technology for closed loop control. QB Series valves can be built in either a single-loop (QB1) or double-loop (QB2) control scheme.

QBX models control pressure of inert gases from full vacuum up to 175 psig (12 bar).

QBS models are used in applications where the maximum calibrated pressure ranges are between 175 and 500 psig (34 bar). The QBS can also be used when pressure ranges are below 175 psig (12 bar) if the wetted parts on the QBS are compatible with the media being controlled. The QBS uses a solid one-piece manifold for added strength, available in anodized aluminum, brass or stainless steel. Two outlet ports allow flexibility in mounting options. In all QBS models, a stainless steel pressure sensor uses dry technology instead of liquid fill for increased reliability and enhanced media compatibility.

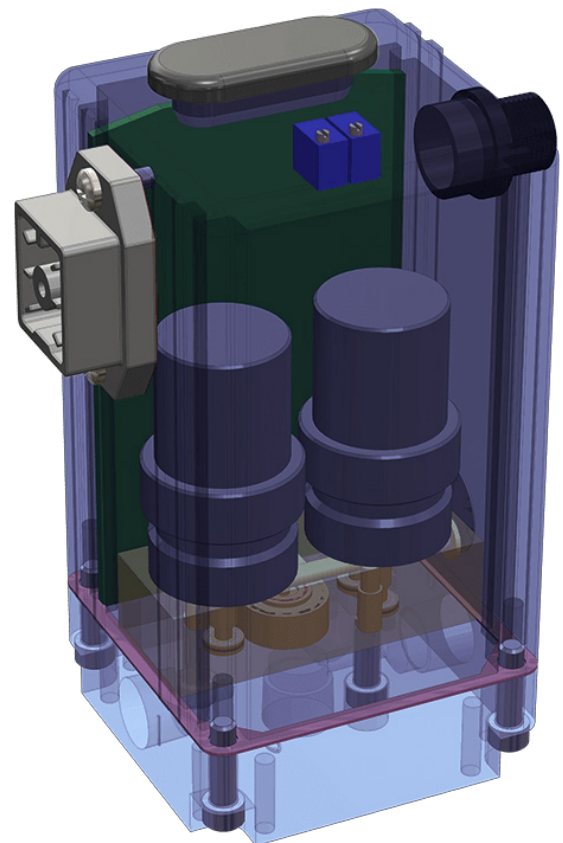
HOW IT WORKS

The QB1 is a single loop design consisting of valves, manifold, internal pressure transducer, and electronic controls. Output pressure is proportional to an electrical signal input. Two solenoid valves control pressure. One valve functions as the inlet control, the other as exhaust. The pressure output is measured by a pressure transducer internal to the QB1 and provides a feedback signal to the electronic controls. This feedback signal is compared against 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. Controlling these two valves maintains accurate pressure.

The QB2 uses a double loop control scheme. In addition to the internal pressure transducer, the QB2 also receives a feedback signal from an external sensing device. The external signal functions as the primary feedback signal, which is compared against the command signal input. This outer loop comparison is used to provide a command to the inner loop. A difference between the two comparisons causes one of the solenoid valves to open, allowing flow in or out of the system.

Since the external feedback signal is electrical, control is not limited to pressure. Using other types of sensors allows control over parameters such as force, position, flow, etc.

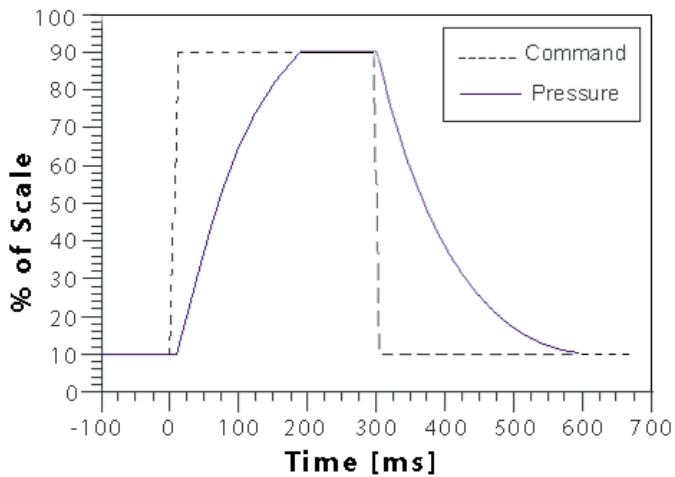
The QB control valve is specified as a stand-alone valve in static applications with low flow requirements. It can also be used as a pilot to air piloted regulators (volume boosters) in applications where the flow rate of the controlled pressure is higher than QB's flow rate. With a sensor providing system feedback, the package becomes a closed loop control system.



QB2X

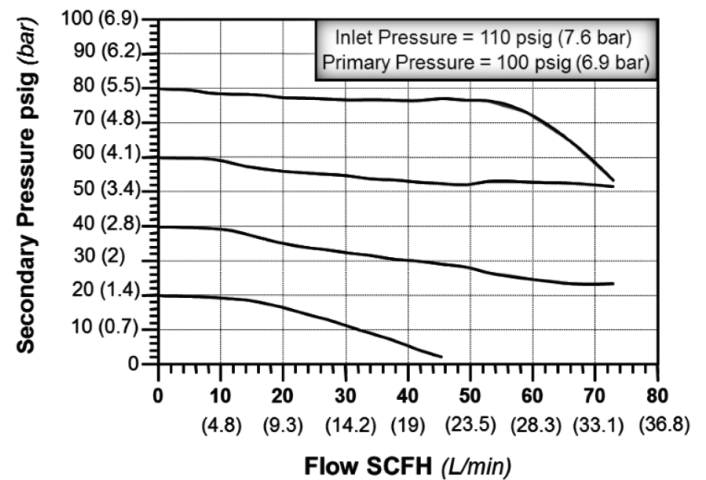
Performance Characteristics

RESPONSE TO STEP INPUT



Times for QB to fill/exhaust a closed chamber. Step command signal is superimposed over pressure trace. Time is determined by the difference between command signal and pressure achieved.

FLOW CHARACTERISTICS



Regulating characteristics of a QB from no flow condition to full flow. To use, choose pressure setting from left end of chart at no flow conditions. Follow curve out until drop begins to occur. Read flow from bottom.

Rated Inlet Pressure for Standard QBS & QBX Valves

Max Calibrated Pressure	Max Inlet Pressure
Vacuum to 10 psig (0.69 bar)	Consult 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 175 psig (7 to 12 bar)	190 psig (13 bar)
176 to 300 psig (12.1 to 20.7 bar)	330 psig (22.8 bar) *QBS only
301 to 500 psig (20.8 to 34.5 bar)	550 psig (37.9) *QBS only

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.

QBX Specifications and Dimensions



QB1X
Single loop
Vacuum-175 PSI

Electrical

Supply voltage 15-24 VDC
 Supply current 250 mADC
 Command signal 0-10 VDC | 4-20 mADC
 Voltage monitor signal 0-10 VDC @20 mA
 Command signal impedance
 Voltage 10 kΩ
 Current 100 Ω

Physical

Operating temperature 32-158° F (0-70° C)
 Overall dimensions 2" x 3.91" x 2"
 Weight
 Aluminum 1.02 lb (0.46 Kg)
 Brass 1.6 lb (0.75 Kg)
 Connector 6-pin Hirschmann

Mechanical

Inlet pressure Full vacuum-190 PSIG
 Pressure range† Full vacuum-175 PSIG
 Flow rate 1.2 SCFM @ 100 PSIG
 inlet
 Min closed end volume 1 in³
 Port size 1/8 NPT or BSPP
 female
 Filtration required 40 micron (included)
 Resolution ±0.20% FS
 Accuracy ±0.20% FS typical
 Repeatability ±0.02%
 Temperature effect ±1% per 25° C change

Wetted Parts

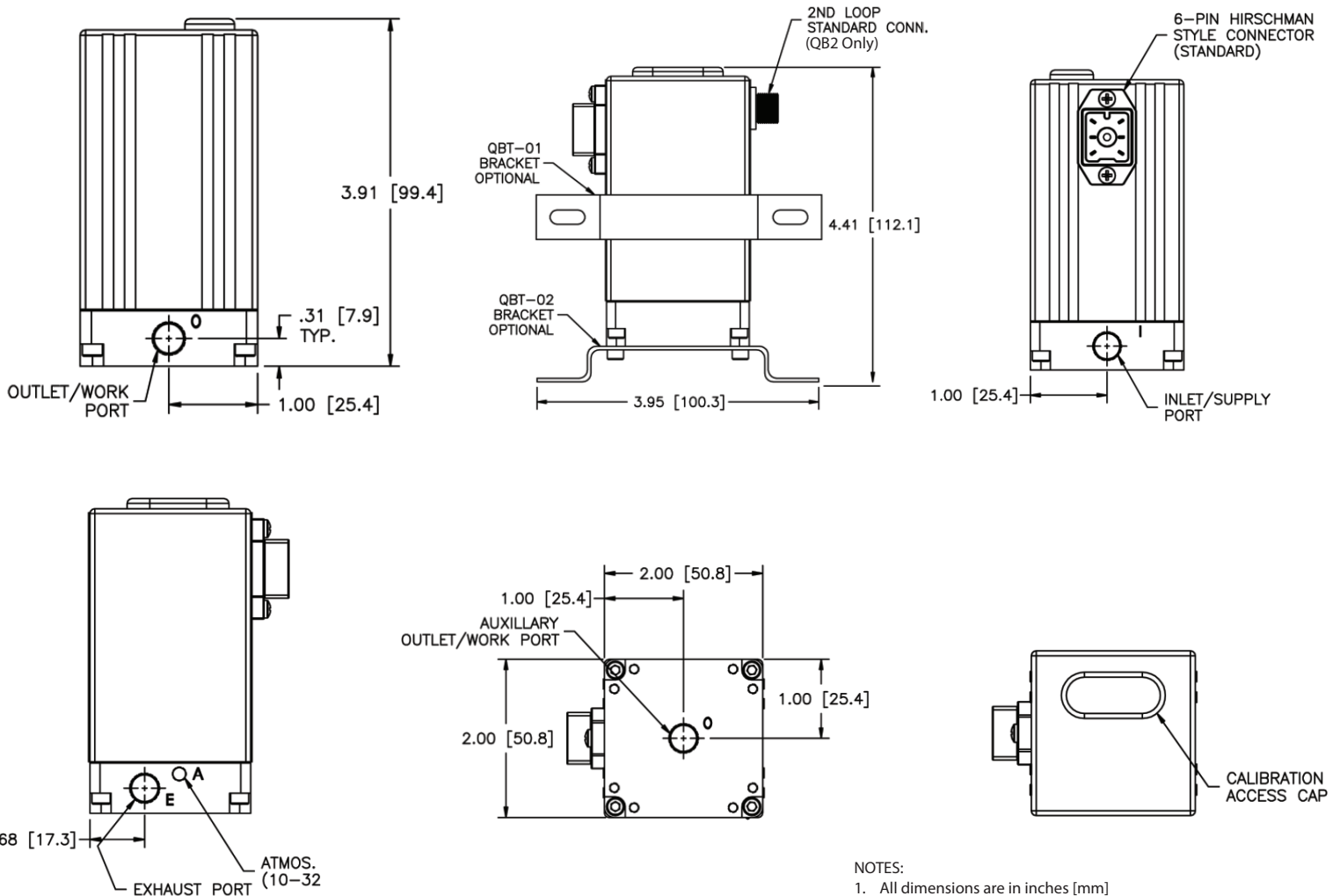
Elastomers‡ Fluororubber
 Manifold Nickel-plated brass or
 Aluminum
 Solenoid valves Nickel-plated brass
 Pressure transducer Stainless steel

†Pressure ranges are customer-specified. Output pressures other than 100% available.

‡Others available.



QB2X
Double loop
Vacuum-175 PSI



NOTES:

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

QBS Specifications and Dimensions



QB1S
Single loop
Vacuum-500 PSI

Electrical

Supply voltage	15-24 VDC
Supply current.....	250 mADC
Command signal	0-10 VDC 4-20 mADC
Voltage monitor signal	0-10 VDC @20 mA
Command signal impedance	
Voltage.....	10 kΩ
Current.....	100 Ω

Physical

Operating temperature.....	32-158° F (0-70° C)
Overall dimensions.....	2" x 4.11" x 2"
Weight	
Aluminum.....	1.00 lb (0.45 Kg)
Stainless Steel	1.38 lb (0.63 Kg)
Brass.....	1.43 lb (0.65 Kg)
Connector	6-pin Hirschmann

Mechanical

Inlet pressure	Full vacuum-550 PSIG
Pressure range†.....	Full vacuum-500 PSIG
Flow rate	1.2 SCFM @ 100 PSIG inlet
Min closed end volume.....	1 in ³
Port size.....	1/8 NPT Female or BSSPP
Filtration required	40 micron (included)
Resolution	±0.20% FS
Accuracy	±0.50% FS typical
Repeatability	±0.05% FS
Temperature effect	±1% per 50° C change

Wetted Parts

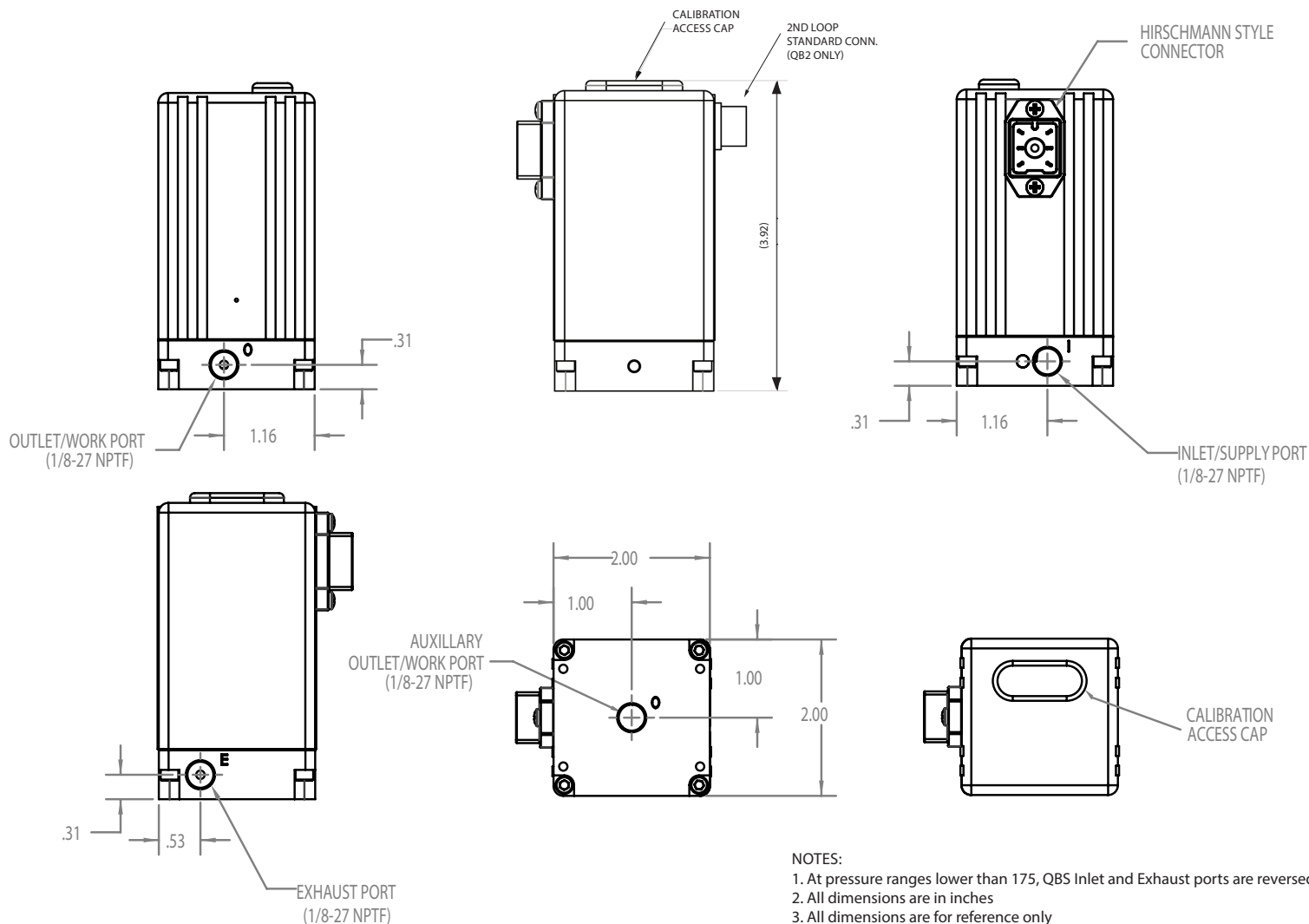
Elastomers‡	Fluororubber
Manifold.....	Nickel-Plated Brass, Aluminum or Stainless Steel
Solenoid valves	Nickel-Plated Brass
Pressure transducer.....	Stainless Steel

†Pressure ranges are customer-specified. Output pressures other than 100% available.

‡Others available.



QB2S
Double loop
Vacuum-500 PSI



- NOTES:
1. At pressure ranges lower than 175, QBS Inlet and Exhaust ports are reversed.
 2. All dimensions are in inches
 3. All dimensions are for reference only

QBX Ethernet Option Specifications and Dimensions

The Ethernet QBX receives commands and send pressure readings via an Ethernet TCP/IP connection. It contains a PC board that translates the Ethernet packets to analog signals for the analog control PC board.

The commands and data character are sent as ASCII printable characters except for the end of command terminator, which is an ASCII carriage return (0d hex). Data cannot contain an alphabetic character, data delimiter or end of command terminator.

Command Format	
CCC:n or CCC:ddd.dd:n	
C	Command string
:	Command delimiter
d	Data
\n	End of command terminator

Examples	
Set pressure command is "spc:120.70"	
Valid set pressure response is "spr:120.70"	
Read pressure command is "rpc"	
Valid read pressure response is "rpr:120.75"	

Electrical

Supply Voltage	15-24 VDC
Supply Current	400 mA
Command Signal	Digital
Command Resolution	16 Bits
Feedback Resolution	16 Bits
Electrical Connector	M12 Micro-DC, 8-pin

Network Interface

Interface	Ethernet 10 Base-T, Ethernet 100Base-TX (autosensing)
Protocols	TCP/IP, UDP/IP, DHCP, SNMP
Connector	M12, 4-pin "D" coding Ethernet connector

Physical

Operating Temperature	32-158° F (0-70° C)
Weight	1.02 lb (0.50 Kg)
Housing	Aluminum
Finish	Black Anodized

Mechanical

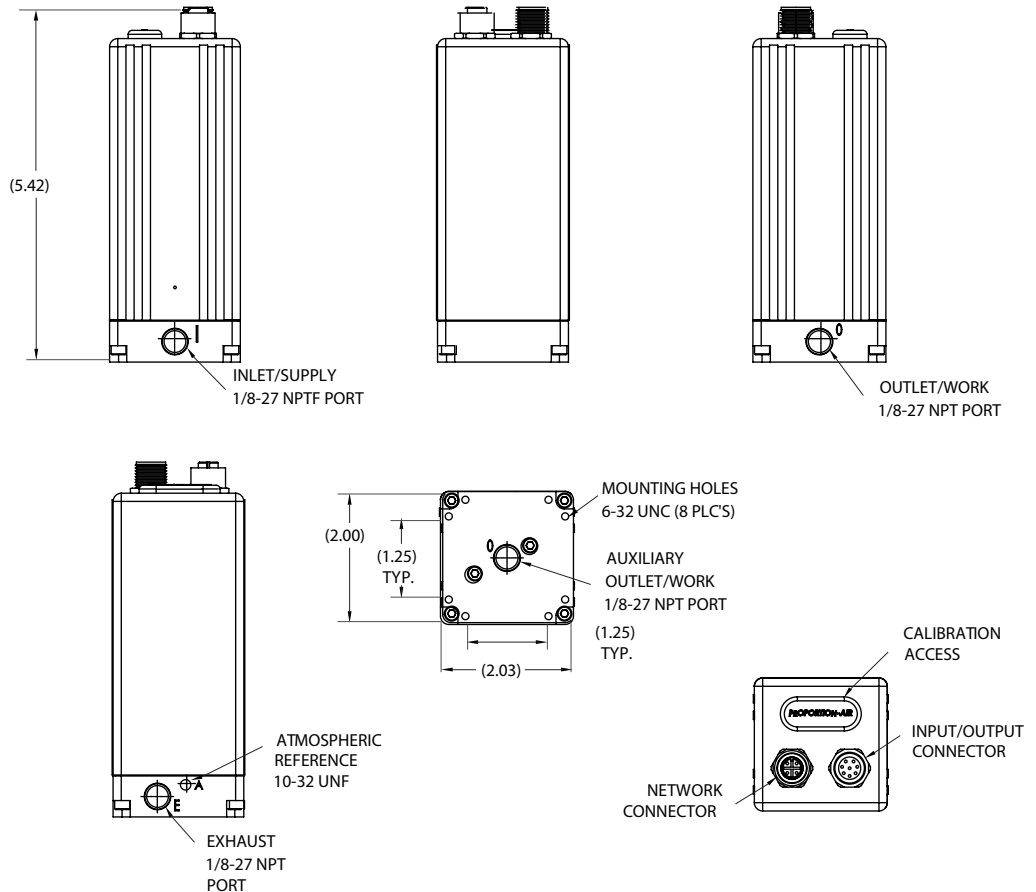
Pressure Ranges	Vacuum-175 psig (760 mmHg (vac)-12 bar)
Output Pressure†	0-100% of range
Flow Rate	1.2 SCFM @ 100 psig inlet (34 L/min @ 6.89 bar)
Cv Capacity	0.04
Min Closed End Volume	1 in ³
Port Size	1/8" NPT
Filtration required	40 micron (included)
Linearity/Hysteresis	<±0.15% F.S. BFSL
Repeatability	<±0.02% F.S.
Accuracy	<±0.2% F.S.

Wetted Parts‡

Elastomers	Fluorocarbon
Manifold	Aluminum
Valves	Nickel-plated brass
Pressure Transducer	Silicon, Aluminum

†Pressure ranges are customer-specified. Output pressures other than 100% available.

‡Others available.



- NOTES:
1. All dimensions are in inches
 2. All dimensions are for reference only

Configuration

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 mA DC
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 mA DC (Sinking)
S	4 to 20 mA DC (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" H ₂ O	

10	Pressure Unit		
PS	PSI	Inches Hg	IH
MB	Millibars	Inches H ₂ O	IW
BR	Bar	Millimeters H ₂ O	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 ₂ O	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	

Configuration

QBS

ACCURACY	±0.5% F.S.	PRESSURE	Full Vac to 500 PSIG (34 Bar)
PORT SIZE	1/8"	MAX FLOW	1.2 SCFM (34 SLPM)

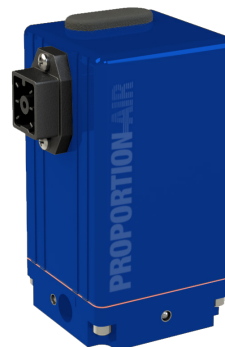
Example Part Number	QB	1	S	S	N	I	S	Z		P	435	PS	G	02
Section Reference ->		1		2	3	4	5	6	7	8	9	10	11	OPTIONS

1	Type
1	Single Loop
2	Dual Loop

2	Manifold Material
A	Anodized Aluminum
S	303 Stainless Steel
B	Brass

3	Thread Type
N	NPT
P	BSPP

4	Command Signal Range
E	0 to 10 VDC
I	4 to 20 mA DC
K	0 to 5 VDC
V	1 to 5 VDC (Requires V for Monitor Signal #5)



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 mA DC (Sinking)
S	4 to 20 mA DC (Sourcing)
*Requires E, I or K for Command Signal Range (#4)	
*1Requires 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)

8	Full Scale Pressure Type
P	100% Pressure is Above Zero

9	Full Scale Pressure
	Must be between 50 and 500 psig*

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

10	Pressure Unit		
PS	PSI	Inches Hg	IH
MB	Millibars	Inches H ₂ O	IW
BR	Bar	Millimeters H ₂ O	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 ₂ O	CW
PA	Pascal		

11	Pressure Unit of Measure
A	Absolute Pressure
G	Gauge Pressure

Options	
3D	3-Pin Connector
BF	Bottom Mount 1/4" Male Fitting
BR	Foot-Mounted Bracket + Install
O2*	Oxygen Cleaned
O3**	Oxygen Cleaned Non-O2 Use
P1	12-VDC Power
TF†	Test Under Flow

*O2 cleaning only available on brass manifold.
 **O3 cleaning for non-O2 use only available on stainless steel manifolds.
 †Only on QB2S 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.



ProportionAir.com

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Handcrafted in the USA
ISO 9001-2015 Certified