# PROPORTION-AIR

PRESSURE FLOW FORCE TENSION POSITION TORQUE VACUUM

## ELECTRO-PNEUMATIC PRESSURE REGULATORS

### QBT

| | |
|---|---|
| PRESSURE | Vacuum to 175 psig |
| FLOW | Up to 1.2 scfm |
| ACCURACY | +/- 0.2% full scale |

Up to 12 bar & 34 Lit/Min

### QBS

| | |
|---|---|
| PRESSURE | Vacuum to 500 psig |
| FLOW | Up to 1.2 scfm |
| ACCURACY | +/- 0.25% full scale |

Up to 34 bar & 34 Lit/Min

### QBX

| | |
|---|---|
| PRESSURE | Vacuum to 175 psig |
| FLOW | Up to 1.2 scfm |
| ACCURACY | +/- 0.2% full scale |

Up to 12 bar & 34 Lit/Min

Accurate & Repeatable | High Pressure Control | On-Board Ethernet Option

## FUNCTIONAL DESCRIPTION of the QB-Series

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

The QBT Series is used to control pressure of inert gases from full vacuum up to 175 psig (12 bar).

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

### THEORY OF OPERATION

The QB1 is a single loop model consisting of valves, manifold, internal pressure transducer, and electronic controls. Output pressure is proportional to an electrical signal input. Pressure is controlled by two solenoid valves. 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. Accurate pressure is maintained by controlling these two valves.

The QB2 is similar to the QB1 but 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 then 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. Usually in these applications the QB2 valve functions as pilot to a slave regulator controlling the end result. With a sensor providing system feedback, the package becomes a closed loop control system.

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.

### COMMAND SIGNAL

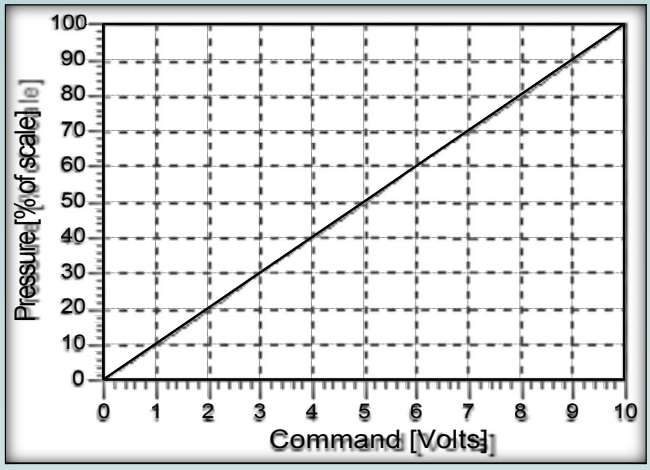
Command inputs come in a choice of either 0 to 10 Vdc, 4 to 20mA, Modbus or Ethernet (QBX only).

### MONITOR SIGNAL

All QB's come with a 0-10 volt or an optional 4-20mA monitor signal for output to a panel meter or controller for data acquisition or quality assurance needs. On a QB1, the monitor signal represents the internal pressure transducer that is measuring the work pressure. On a QB2, the monitor signal represents the signal from the external sensor that is monitoring the output downstream.

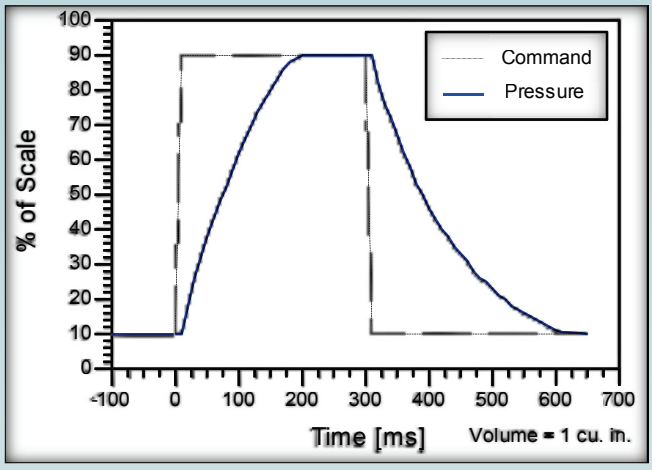
# PERFORMANCE CHARACTERISTICS

## LINEARITY



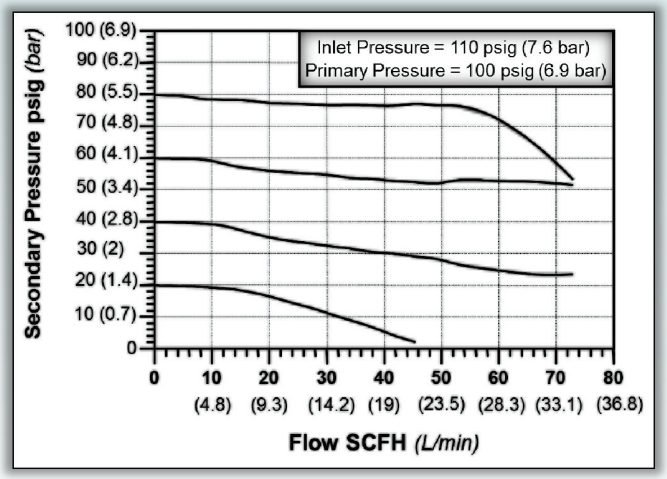

This chart shows the linear characteristics of QB products when given a ramp signal from 0 to 10 volts. Characteristics would be similar for 4 to 20 mA units.

## 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.

## GENERAL INLET PRESSURE RATING

| For valve that is ordered with maximum calibrated pressure of: | Maximum inlet pressure is: |
|---|---|
| Vacuum up to 10 psig (0.7 bar) | Consult factory |
| 11 to 20 psig (0.8 to 1.4 bar) | 35 psig (2.4 bar) |
| 21 to 44 psig (1.5 to 3 bar) | 55 psig (3.8 bar) |
| 45 to 100 psig (3.1 to 6.9 bar) | 110 psig (7.6 bar) |
| 101 to 200 psig (7 to 13.8 bar) | 220 psig (15.2 bar) |
| 201 to 300 psig (13.9 to 20.7 bar) | 330 psig (22.8 bar) |
| 301 to 500 psig (20.8 to 34 bar) | 550 psig (37.9 bar) |

**As of August 2014 Production of the BB -Series pressure regulator is discontinued. The QBX is the replacement for all BB models. Please contact the factory for assistance in crossing over your old BB units.**




**REPLACE WITH QBX**

*Pages 8 to 11*



# QBT

## ELECTRICAL

| | |
|---|---|
| Supply Voltage | 15 to 24 VDC |
| Supply Current | 100 to 250 mADC |
| Command VDC | 0 to 10 VDC |
| Command Current | 4 to 20 mADC |
| Monitor VDC | 0 to 10 VDC |
| Monitor Current | 4 to 20 mADC |
| Command Signal Impedance | Voltage=10 KΩ<br>Current=100 Ω |

## PNEUMATIC

| | |
|---|---|
| Inlet Pressure | Full Vac - 190 psig |
| Pressure Range | Full Vac - 175 psig |
| Flow Rate | See Flow Graphs |
| Filtration Required | 40 Micron |
| Accuracy (Pressure) | ±0.2% F.S. |
| Hysteresis | ±0.15% F.S. |
| Repeatability | ±0.02% F.S. |
| Port Size | 1/8" NPT Female |
| Critical Volume | 1 $in^3$ |

Wetted Parts

Fluorocarbon, Brass, Nickel-Plated Brass, Silicon and Aluminum

## PHYSICAL

| | |
|---|---|
| Operating Temp | 32°F to 158°F |
| Protection | NEMA 4/IP65 |
| Weight | 1.1 lbs. |
| Electrical Connector | 6-pin Hirschman |




*QB2 with Digital Display option shown*

## Proven Industries and Applications

*Applicable to all QB Series Regulators*

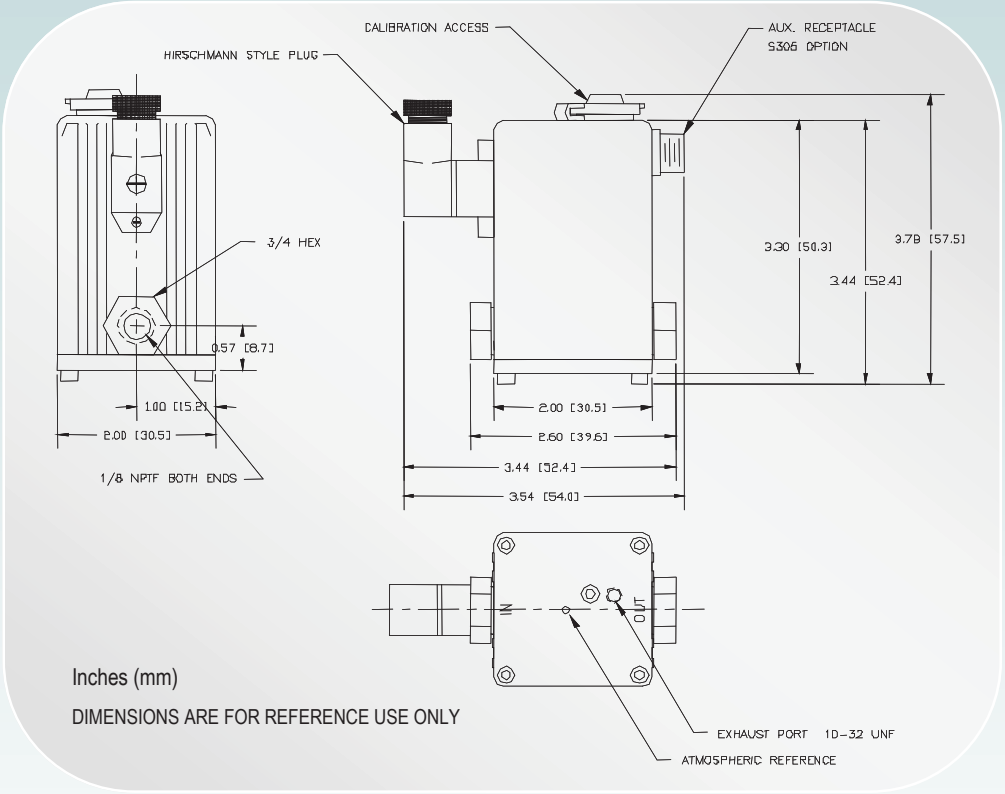
**Bread & Bakery Product Manufacturing*** *(NAICS 31181)*

- *Proof box temperature control using saturated steam*
- *Humidity control in proof box using saturated steam*
- *Bagger "force up" force control*
- *Air knife to blow moisture from dough*

**Pharmaceutical & Medicine Manufacturing*** *(NAICS 3254)*

- *Position Control - Dosing of batch using syringe*
- *Calibrate force of insulin pump motor with load cell feedback*
- *Atomizing pill coating*

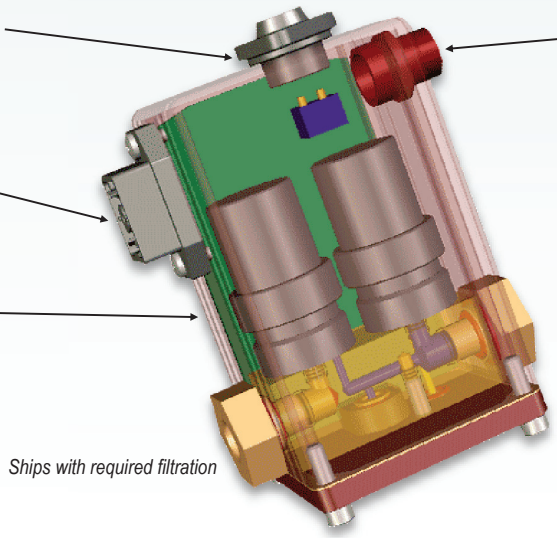
**Many applications require more flow than QB-series allows. We will pilot a mechanical regulator without sacrificing accuracy & repeatability for higher flow applications. Call us to discuss your opportunity.*




Access hole allows adjustments in the field. Easy tuning of Zero & Span calibration potentiometers

Available in a wide range of electrical control input and analog output

IP65 enclosure allows it to withstand the elements and be washed down without harm



*Ships with required filtration*

2nd loop input, QB2T valves only
Auxiliary connector (3D option)

- Precision pressure control vacuum to 175 psi (12 bar)
- Non-air consuming in steady state which reduces cost of manufacturing
- Can be mounted directly on the machine in any orientation
- Unaffected by shock or vibration *Tested to 25 Gs*
- Unaffected by supply pressure change

# QBT

| | | | |
|---|---|---|---|
| **ACCURACY** | 0.2% F.S. *(typical)* | **PRESSURE RANGE** | Full Vacuum to 175 psig *(12 bar)* |
| **PORT SIZE** | 1/8" | **MAX FLOW** | 1.2 scfm *(34 slpm)* |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Example Part Number : | **QB** | **2** | **T** | **B** | **N** | **E** | **E** | **N** | **14.7** | **P** | **150** | **PS** | **G** | **3D** | **TF** |
| YOUR PART NUMBER : | **QB** | | **T** | | | | | | | | | | | | |
| Section ——> | | 1 | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Options | |

## 1 Type

| | |
|---|---|
| 1 | Single Loop |
| 2 | Double Loop *(external feedback, Option 3D)* |

## 2 Manifold Material

| | |
|---|---|
| B | Brass *(Typical)* |
| A | 6061 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 *(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 0** - 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 Ends Below Atmosphere |
| P | 100% Pressure Ends Above Atmosphere |
| Z | 100% Pressure Ends at Zero |

## 9 Full Scale Pressure

Must be less than or equal to 175 psig

## 10 Pressure Unit

| | | | |
|---|---|---|---|
| **PS** | PSI | Inches Hg | **IH** |
| **MB** | Millibars | Inches $H_2O$ | **IW** |
| **BR** | Bar | mm $H_2O$ | **MW** |
| **KP** | Kilopascal | Kilograms/$cm^2$ | **KG** |
| **MP** | Megapascal | Torr* | **TR** |
| **MH** | mm Hg | Centimeters $H_2O$ | **CW** |

**Requires **A** for Pressure Unit of Measure*

## 11 Pressure Unit of Measure

| | |
|---|---|
| A | Absolute Pressure |
| D | Differential Pressure |
| G | Gage Pressure |

PLEASE CONSULT FACTORY FOR
MORE OPTIONS AND APPLICATION ASSISTANCE

## Recommended Accessories

| | |
|---|---|
| **QBT-C-6** | 6 ft. Power Cable |
| **QBT-01** | Wrap-Around Bracket |
| **QBT-02** | Foot-Mount Bracket *(Installed)** |

**Use Option **BR** for Foot-Mount Installed*