



## PRA Proportional Ratio Assembly High Pressure Electronic Pressure Controller

The PRA Proportional Ratio Assembly provides a solution for applications requiring inert gas pressure control greater than 1000 psig (up to 6000 psig) using electro pneumatic controls. Electro pneumatics applications for pressures less than 1000 psig can make use of the GP1, the QB1 or the QPV1 electronic pressure regulators instead.

The PRA assembly has a limited flow coefficient ( $C_v$ ) of 0.05 and is typically used for dead-headed or low-flow applications. The most common application for the PRA is pilot operating a high pressure dome-loaded regulator such as an Equilibar back pressure regulator.

The PRA assembly consists of 3 basic components:

- 1) A pilot operated ratio regulator to control the high pressure gas outlet.
- 2) A low pressure QB2 electro pneumatic regulator with closed loop control to pilot operate the high pressure ratio regulator.
- 3) A DS down-stream pressure transducer to sense the high pressure outlet and provide feedback to the QB2 regulator's closed loop controller.



*Figure 1: The PRA Proportional Ratio assembly, labeled corresponding to the components list on the left.*

The PRA Proportional Ratio Assembly is available in two ratios—a 15:1 outlet to pilot pressure ratio for low pressures and a 45:1 outlet to pilot pressure ratio for higher pressures.

The 15:1 ratio regulators have an accuracy of roughly  $\pm 1.5\%$  of full scale. 45:1 ratio regulators have an accuracy of roughly  $\pm 2.5\%$  of full scale.

All PRA assemblies come pre-assembled and calibrated, ready for use. Additional details regarding each of these components individually are available in the latter pages of this information packet.

It is important to note that this assembly does not generate high pressures but regulates a higher source pressure to a lower more useful pressure. The advantage of this assembly is that it is able to use a more economical low pressure electro-pneumatic regulator and avoids the high cost of high pressure gas controls.

The PRA Proportional Ratio Assembly requires **two gas supplies**—a low pressure supply for the QB2 regulator and a high pressure supply for the ratio regulator. The below schematic details this configuration. For best results: provide a supply pressure of 110% of the maximum control range for each device.

Example: A 2500 psig unit with a 45:1 ratio requires a  $2500 * 110\% = 2750$  psig supply for the ratio regulator and a  $2500 / 45 * 110\% = 61$  psig supply for the QB2 regulator.

There are some limitations with this assembly one should understand. The ratio regulator uses sliding seals and springs which can cause hysteresis and other forms of inaccuracy (i.e. friction). The assembly responds to changes instantly but may sometimes require extra time (on the order of a few seconds) to drift to its final stable pressure.

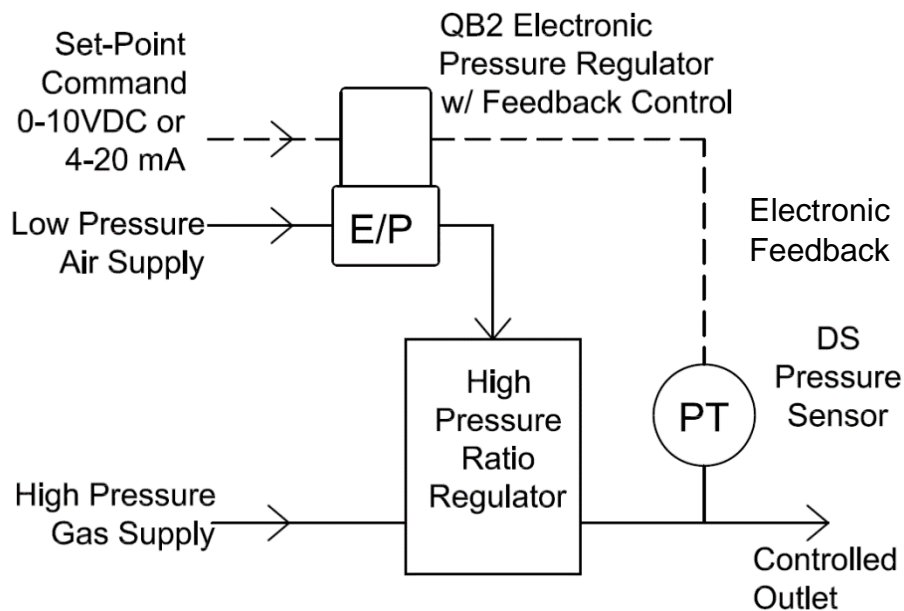
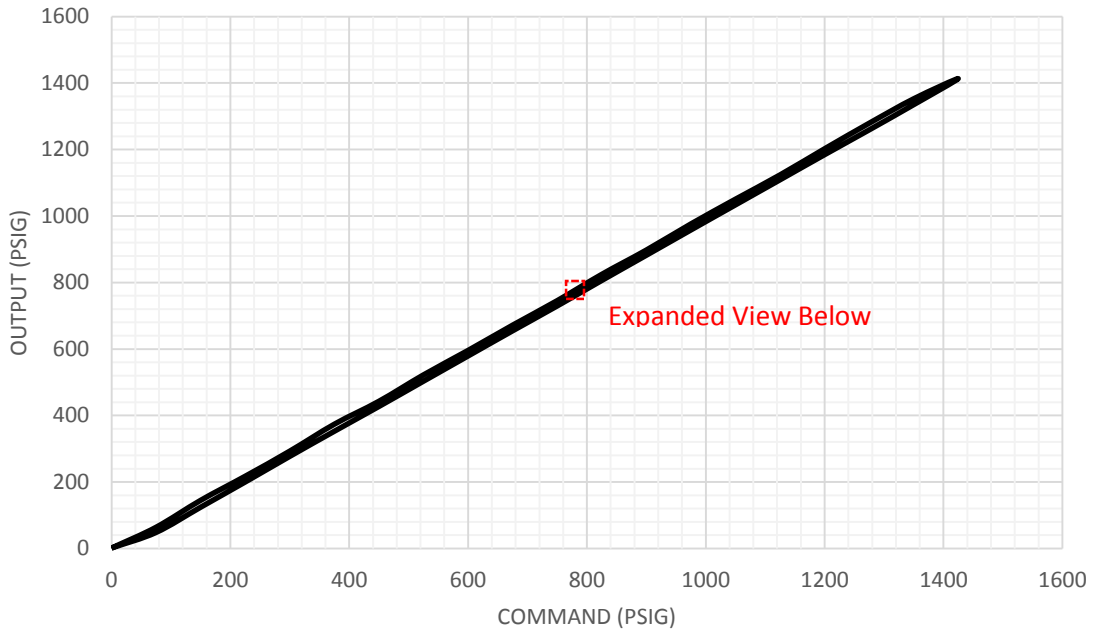
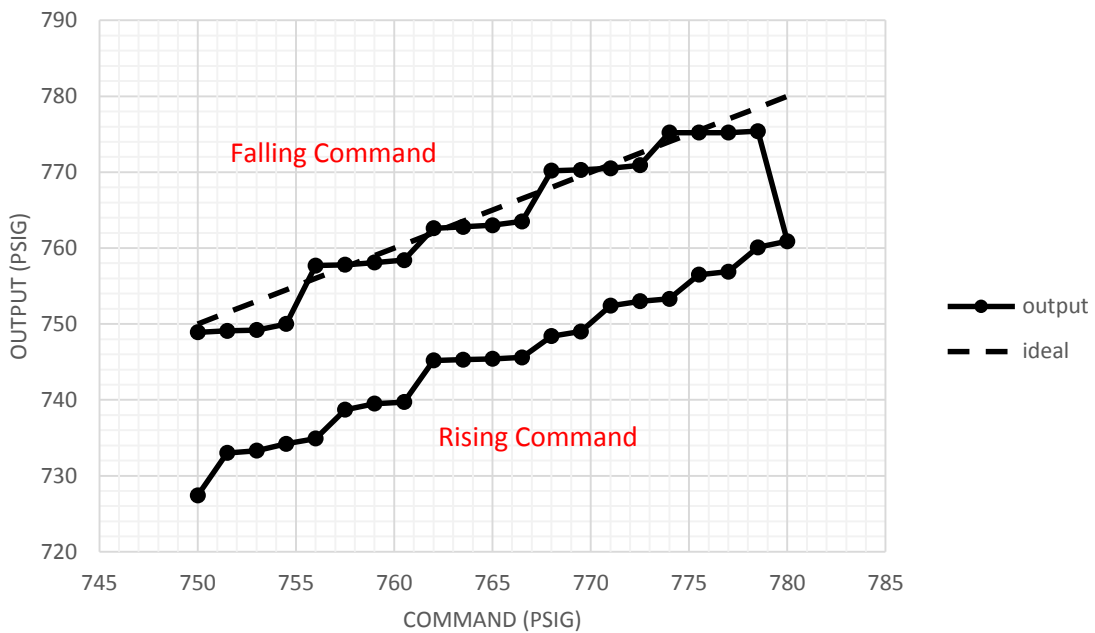


Figure 2: A schematic detailing the configuration and use of the PRA Proportional Ratio Assembly. Many applications will have the controlled outlet going to the reference port of an Equilibar Back Pressure Regulator.

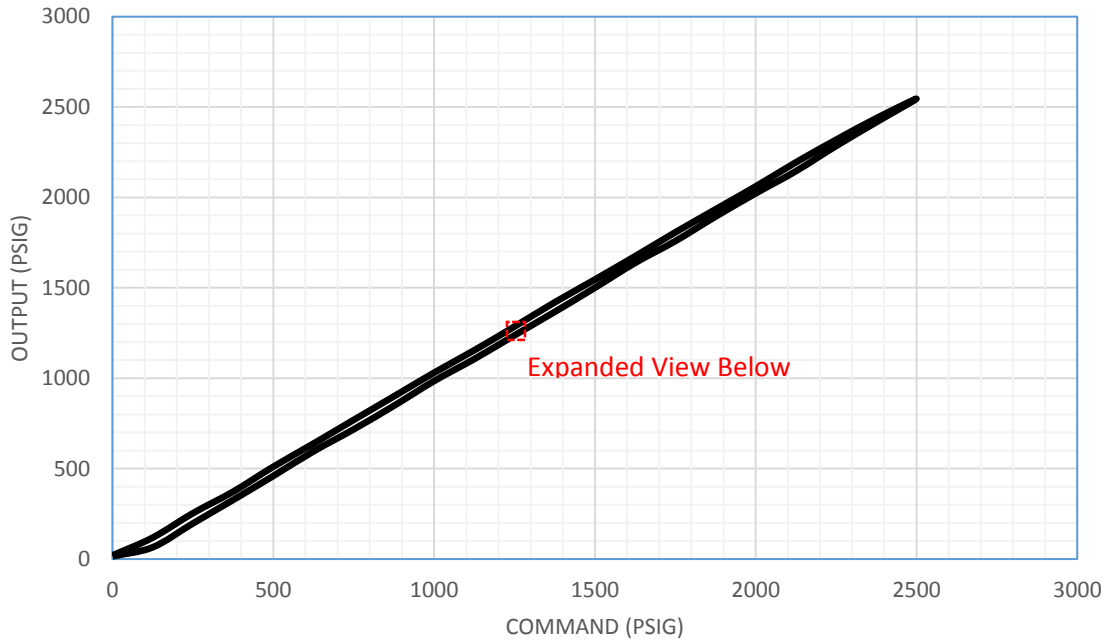
# PRA-15-1500-E Command vs Output



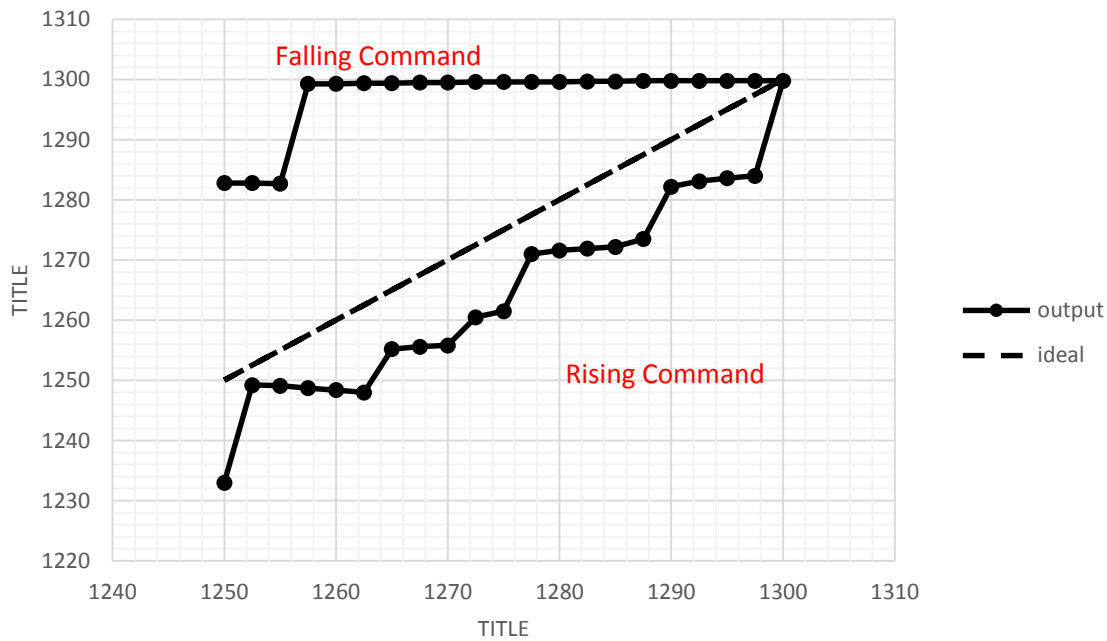
# PRA-15-1500-E 50-52% command



## PRA-45-2500-E Command vs Output



## PRA-45-2500-E 50-52% command



# Ordering Information

Example P/N:	PRA	-	45	-	2500	-	E
Your P/N:	PRA	-		-		-	
			1		2		3

## Typically In Stock Configurations:

PRA - 15 - 1500 - E  
 PRA - 45 - 2500 - E  
 PRA - 45 - 5000 - E

1	Ratio	2	Max Pressure (psig)	3	Command / Monitor Signal
15	15:1*		Must be between	E	0-10 V
45	45:1		1000 and 6000 psig	I	4-20 mA

\*Units with 15:1 ratio can only be used up to 1500 psig.

**ALL UNITS REQUIRE A POWER CORD**  
**POWER CORD PART NUMBER: QBT-C-X**  
**WHERE X IS LENGTH OF POWER CORD IN FEET**

**UNITS IN STOCK HAVE A TYPICAL LEAD TIME OF 2-3 DAYS.**  
**ALLOW 4-6 WEEKS FOR DELIVERY OF CUSTOM CONFIGURATIONS.**

**THE PAGES TO FOLLOW CONTAIN RELEVANT TECHNICAL INFORMATION**  
**FOR EACH COMPONENT IN THE PRA PROPORTIONAL RATIO ASSEMBLY.**

# Pilot Operated Ratio Regulator

## Operation and Installation Guide

The model RG1262 is a reducing regulator wherein outlet pressure is controlled by lower pressure control air applied to the control port. Outlet or regulated pressure will be 45 times or 15 times (depending on the version) the control pressure used. This permits using shop air or other low pressure source to provide an accurately controlled high pressure regulator. By using air rather than a spring to set pressure the regulator can be controlled remotely and pressure changes can be made much more rapidly.

### OPERATION

Outlet pressure can be adjusted by varying control pressure at the control port. The outlet pressure will be 15 or 45 times the control pressure, depending on the unit.

### SPECIFICATIONS

#### Maximum inlet pressure

6000 psi

#### Outlet pressure

0 to 6000 psi (45:1 Model)

0 to 1500 psi (15:1 Model)

#### Flow coefficient

0.05

#### Supply Pressure Dependency

Outlet rises 50 psi with  
1000 psi drop in supply

#### Materials of Construction

##### Body and Cap

Aluminum

##### Internals

Brass, Aluminum

##### Seals

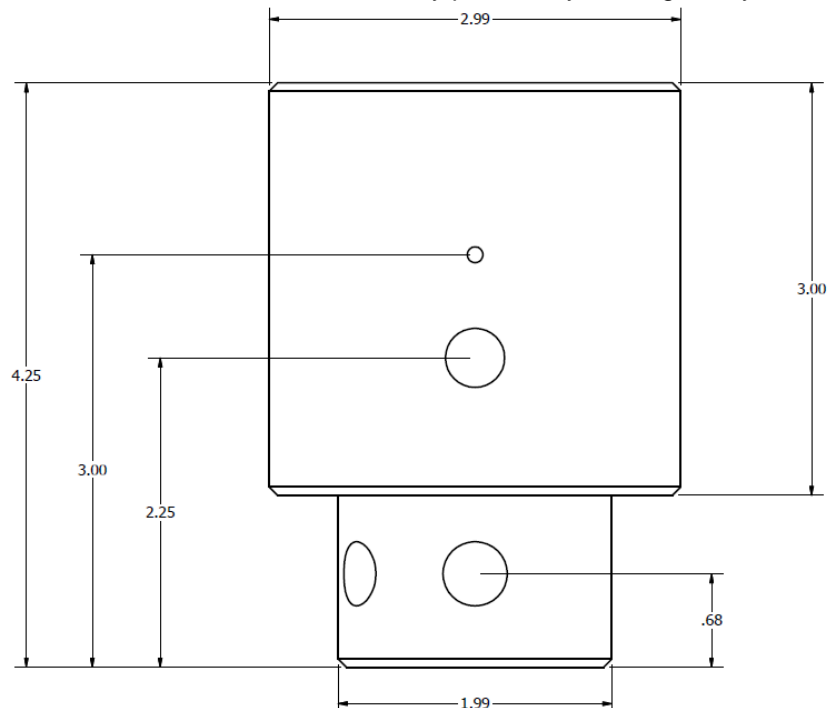
Delrin, Buna N, Viton

#### Fittings

1/4" FNPT inlet, outlet, gauge.

### INSTALLATION

Use a suitable pipe thread sealant. Preferably liquid Instead of Teflon tape on the 1/4" inlet and 1/4" outlet connections. Connect the inlet to the source gas such as a high pressure storage tank. An outlet gauge and relief valve set slightly higher than the desired outlet pressure should be connected to the outlet. If the inlet pressure can exceed 6000 psi a relief valve should also be installed at the inlet to prevent exceeding 6000 psi. Avoid over torque of pipe threads. Normal torque with a 6 or 8 inch wrench is ample. The regulator is NOT shipped oxygen clean and should NOT be used for oxygen service as provided. Consult the factory for details. Mounting can be done by clamping to inlet and outlet piping or by providing threaded mount holes in the bottom of the body. Avoid intercepting the body ports. The regulator can be mounted in any position. The vent port can be oriented in any position by rotating the cylinder.



# QB2 Electro Pneumatic Pilot Regulator

## THEORY OF OPERATION

The QB2 is a nested 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 QB2 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.

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.

## COMMAND SIGNAL

Command inputs come in a choice of either 0 to 10 Vdc, 4 to 20mA.

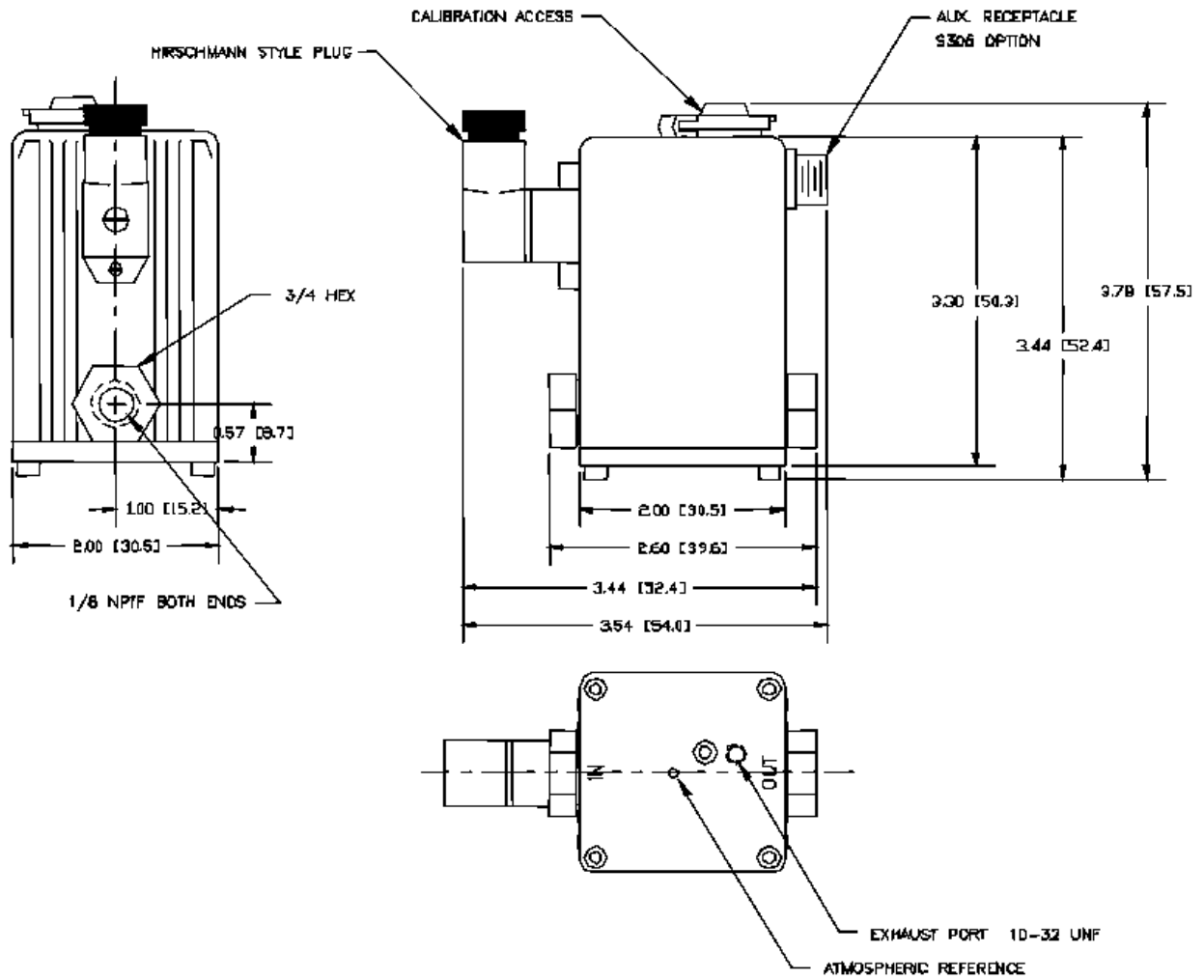
## MONITOR SIGNAL

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. The monitor signal represents the signal from the external sensor that is monitoring the output downstream.

## SPECIFICATIONS

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 K $\Omega$ Current=100 $\Omega$
PNEUMATIC	
Inlet Pressure	125 psi
Filtration Required	40 Micron
Port Size	1/8" NPT Female
Critical Volume	1 in3
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

# Dimensional Drawing of QB2





# DST Downstream Pressure Transducer

DS series pressure transducers accurately measure pressure of gases or fluids. The output is an electrical signal based on the pressure measurement.

Conditioning of the electrical signal from the strain gauge sensor gives a 0-10 VDC output. The electrical output is a linear ratio of the pressure sensed. DS series transducers are enclosed in a rugged aluminum housing. A strain relief protects the wiring from damage caused by excessive pulling force.

The stainless steel version (DST) utilizes the same silicon etched device mounted on a stainless steel diaphragm. On these units, no elastomers or o-rings contact the pressurized media. All media wetted parts are ANSI type 316L stainless steel.

## SPECIFICATIONS

ELECTRICAL	
Supply Voltage	15 to 24 VDC
Supply Current	35 to 50 mADC
PNEUMATIC	
Pressure Range	Full Vac - 7,000 psig
Response Time	100 Microseconds
Repeatability	±0.25%
Accuracy (Pressure)	±0.5% (DST)
Operation Temp	32°F to 158°F
Calibration Temp. Effect	
Zero & Span adjustable <1% over Specified temp. range (0-50°C, 122°F)	

