SENSOR

SYSTEMS, L.L.C.

Your Trusted Partner for Customer Precision Solutions

PRESSURE TRANSDUCER TUTORIAL

Potentiometer Type / Infinite Resolution
HIGH AC OR DC OUTPUTS

GENERAL DESCRIPTION

Sensor Systems LLC Pressure Transducers provide a precise electrical voltage output as a function of applied pressure, with an accuracy previously unattainable. Instruments are available to cover the pressure ranges of 0-0.1 psi through 0-10,000 psi gauge, absolute, and differential with linear and non-linear outputs that are tailored specifically for your application.

Sensor Systems LLC represents the highest development in the pressure potentiometer field, and while eliminating all the shortcomings of the old-fashioned wire wound types, they retain the basic advantages of simplicity, high voltage output and accuracy.

State-of-the-art technology includes a unique and proprietary conductive film resistance element that features an infinite resolution as well as outstanding life and reliability. Multiple finger wipers directly fastened to the pressure sensing element ride on the mirror-like surface of this resistance element; motion of the pressure sensing element is thereby converted into a corresponding voltage output. The elimination of intermediate linkages produces minimum sensitivity to vibration, shock, and temperature; additionally, maximum pressure sensitivity, repeatability, reliability and exceptionally long life are assured. Utilizing pre-cycled and pre-stressed pressure sensing elements considerably below their allowable stress levels reduces zero shift to a negligible factor.

WHY SENSOR SYSTEMS LLC TRANSDUCERS ARE THE MOST ACCURATE

Sensor Systems LLC was able to substantially eliminate resolution errors by utilizing the special conductive film resistance element. Thus, the output accuracy is solely determined by the linearity of the sensing element (capsule or Bourdon Tube). The resistance element is adjusted to compensate even for this error through the use of a special manufacturing technique outlined below.

A schedule of known pressure increments is fed into the sensing element; the voltage output of the transducer is compared in a special bridge circuit with that desired. Through a computer controlled mechanical milling process, the voltage field of the conductive film resistance element is shaped to correspond with the desired voltage ratio. By the same method, linear or non-linear pressure-voltage output relationship not only ensures the desired linearity or conformity but also fixes the scale factor of the unit. This allows any one of a lot of Sensor Systems LLC Pressure Transducers to be used interchangeably without further individual calibration or circuit correction by user. Pressure Switches are likewise precisely adjusted. Various models are available for use in control circuits, indicating instruments, air data computers, or telemetry. True airspeed, Mach, and Thrust data computers are also manufactured to suit.

TECHNICAL DATA

The principal features of performance of Sensor Systems LLC pressure transducers are:

1. **HIGH VOLTAGE OUTPUT**
2. **AC or DC OUTPUT** - same as input voltage, insensitive to power supply frequency.
3. **LINEAR OR FUNCTIONAL OUTPUT** - linear, square root, altitude airspeed, etc.
4. **SIMPLE INSTALLATION** - fixed calibration, insensitive to electrical line lengths.

In all these areas Sensor Systems LLC pressure transducers are superior to LVDT, strain gage, capacitor, semiconductor and other types of pressure transducers. Sensor Systems LLC pressure transducers have equivalent accuracy and stability; the response to high frequency input pressures is faster than that for the LVDT type and slower than that for the other types.

In order to assist you in the selection of the particular pressure transducers described in this catalog, there is discussed below every relevant aspect of construction, performance, and use including practical circuitry considerations. While we believe that this material is complete, we will be pleased to personally review with you any aspect of this data or your particular application.

PRESSURE TRANSDUCER CONSTRUCTION

The pressure devices described in this catalog use an elastic pressure sensing element acting as a prime mover for positioning an electromechanical transducer, thereby providing an electrical output for a pressure input. In the low pressure ranges the sensing element is a metal capsule consisting of a pair of symmetrical concentrically-corrugated diaphragms, welded together at their outer rims to form a hollow flexible member, having predictable motion when fluid or gas pressure is applied internally or externally. In the high pressure ranges the sensing element is a metal Bourbon Tube, consisting of a circular tube of oval cross-section, brazed closed at one end, so that pressure applied internally or externally causes its circular tube to partially straighten and its closed tip to move in a predictable path. In all cases, the electro-mechanical transducer is a variable resistor, in which the moveable contact or slide is driven by the motion of the capsule or Bordon Tube. When voltage is applied to the ends of the variable resistor, the moveable contact position appears at the output terminal as a proportionate fraction of the excitation voltage.

An *Absolute Pressure* transducer provides an output voltage which is proportional to the difference between the applied pressure and a perfect vacuum. In such a unit, the pressure sensing element is completely evacuated and sealed; the Hi pressure port is not present and input pressure is applied through the Lo port.

A *Gage Pressure* transducer provides an output voltage which is proportional to the difference between the applied pressure and the ambient pressure. In such a unit, the input pressure is through the Hi port and the ambient pressure is applied through the Lo port.

A *Differential Pressure* transducer provides an output voltage which is proportional to the difference between two applied pressures. In such a unit, the higher of the two pressures is applied through the Hi port and the lower through the Lo port.

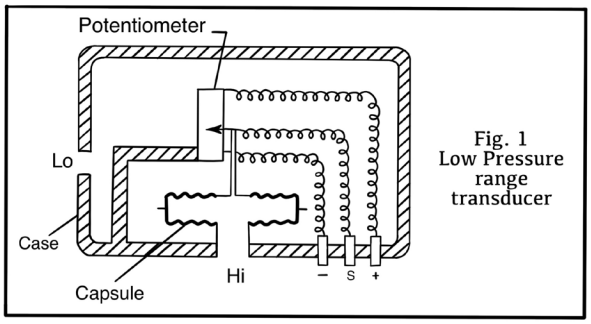

Fig. 1
Low Pressure range transducer

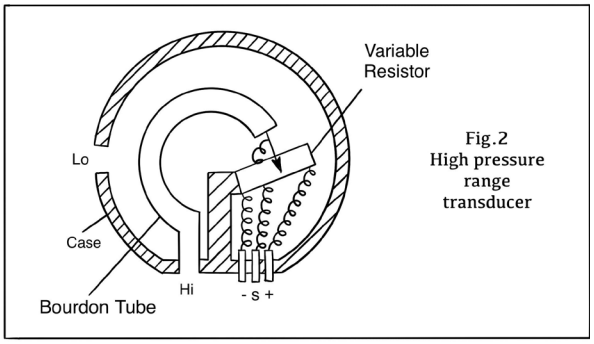

Fig.2
High pressure range transducer

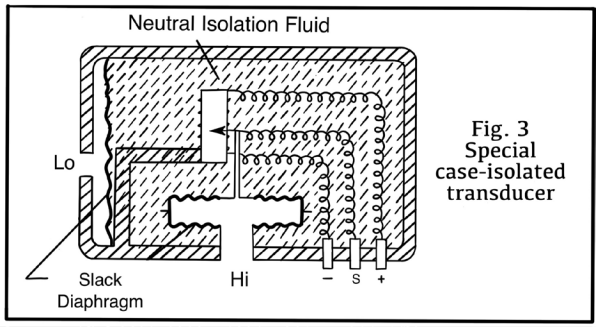

Fig. 3
Special case-isolated transducer

Where a corrosive or electrical conductive media is used and enters only into the capsule (gage or Hi side of Differential), the transducer construction is as shown in Fig. 1 and Fig. 2; where such a media enters the case, the construction is altered to provide an isolation media for the electro-mechanical transducer. Here the case volume is filled with neutral fluid and isolated from the Lo port by a slack flexible membrane as shown in Fig. 3. Pressure caused by such media entering the Lo port is transmitted to the pressure sensing element through the neutral isolation fluid.

The metal alloy and manufacturing process of the pressure capsule or Bourdon tube determine its corrosive resistance, operating temperature range, temperature sensitivity, life, accuracy, repeatability, hysteresis and long-term stability. A wide selection of alloys and close process control permits an optimization of operating characteristics in the face of a wide range of media and environments. Pressure sensors made of Inconel, phosphor bronze, beryllium copper or stainless steel are the most corrosion resistant, but generally require internal temperature compensation, in the form of a bi-metallic member, to offset the change in deflection of the sensor resulting from a change in temperature. Pressure sensors made of a nickel alloy called Ni Span “C” are relatively insensitive to temperature and generally require no internal temperature compensation.

Similarly to the dimensions of the capsule and Bourdon Tube pressure elements determine the pressure range, vibration, and shock sensitivity, as well as the quality of the operating characteristics listed above. In general, larger diameter thinner metal capsules are used at the lower pressures due to their greater flexibility; however such capsules, while more sensitive to input pressure, are also more sensitive to environmental vibration and shock; internal damping or static and dynamic balancing are provided to minimize these effects.

High pressure transducers using either relatively rigid capsules or Bourdon Tubes are less sensitive to these environmental factors. Capsules and Bourdon Tubes are available in a wide variety of sizes and configurations to

permit the optimization of transducer operating characteristics.

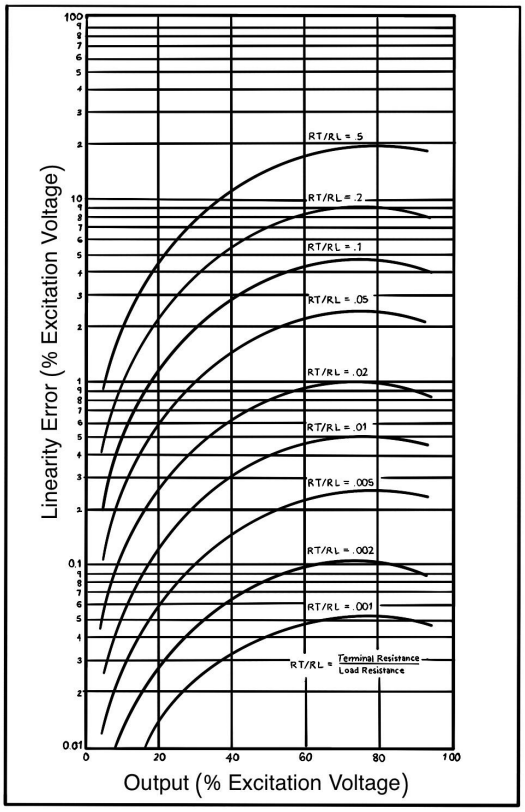

Fig. 4
Errors due to electrical loading in Vernitron Transducers

Ideally, the output of a pressure transducer can be represented by a perfect straight line relationship between input pressure and output voltage. In practice, this relationship is closely but not exactly achieved due to various inherent characteristics of the two principal components making up the transducer - the pressure sensing element and the electromechanical transducer,

PRESSURE ELEMENT PERFORMANCE CHARACTERISTICS

The metal pressure sensing element is an elastic member which, due to the crystalline structure of metals, does not behave as a perfect spring. In order of magnitude, first, its spring rate or the energy per unit deflection is not a constant but varies somewhat with temperature depending upon the particular metal alloy, and varies also with the tidal deflection range; these variations in spring rate produce what is called Temperature Error in the latter case. Second, the actual deflection at the same pressure is different depending upon whether the pressure is reached in an increasing direction from a lower pressure or in a decreasing direction from a higher pressure; the difference between “upscale” and “down-scale” deflections at the same pressure is called Hysteresis Error. Third, a certain level of input pressure is required to overcome the inherent internal friction of the metal sensing element before an initial deflection takes place. This reflects itself in the absolute deflection as an uncertainty called Resolution Error.

Likewise, the electromagnetic transducer is optimized in the manufacture of each individual transducer through a semi-automatic calibration process to compensate for pressure element non-linearity, or errors induced by electrical loading in the output and/or to provide an output which follows any desired variation with input pressure. For example, in the Altitude Transducer, Model 7000, the output is adjusted to be proportional to distance above sea level. In the Model 2000 transducer, the output is adjusted to be linearly proportional to input pressure.

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PERFORMANCE CHARACTERISTICS OF PRESSURE TRANSDUCERS

ELECTROMECHANICAL TRANSDUCER PERFORMANCE CHARACTERISTICS

The electromechanical transducer itself does not have a constant output per unit deflection over its entire deflection range, producing a Linearity Error. An effective Linearity Error is also produced by the electrical loading on the resistance element of the electromechanical transducer to which the moveable slide is connected. The amount of this error is a function of the ratio of resistance element terminal resistance to the effective load resistance. The effective load resistance should be specified when ordering the pressure transducer so that compensation for the loading error can be made during the manufacturing calibration process. Without such compensation, the errors in output of Sensor Systems LLC pressure transducers due to load ratios greater than 0.001 are shown in Fig.4. In addition, the moveable contact or slide requires a certain force level from the pressure element to overcome the friction of contact, resulting in a Friction Error. Even though the resistance element in the Sensor Systems LLC electromechanical transducer is one continuous smooth-surfaced unit, effects equivalent to Resolution Error and/or Repeatability Error are produced by the finite radius of the moveable contact, which in itself is a spring member.

PRESSURE TRANSDUCER ACCURACY

As reflected in the actual measured output of the pressure transducer in a given environment, the maximum effect of all of these errors in deviation from the perfect straight line relationship between input pressure and output voltage is called the ***Static Error Band***, expressed as a % of Excitation Voltage. The ***Dynamic Error Band*** is the same as the Static Error Band but measured while the pressure transducer is subjected to light vibration. In practice, the pressure transducer

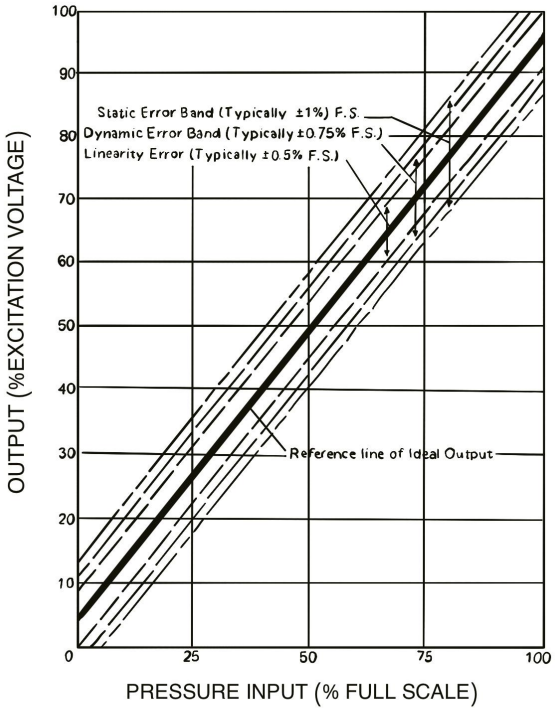


Fig. 5 - Error bands in transducer output

is frequently surrounded by vibration-producing equipment, and the Dynamic Error Band is more representative of the actual error under those circumstances.

Other than the Linearity Error, all other errors are largely inherent in the structure of the particular pressure transducer model and depend upon the particular pressure range. In specifying accuracy of a pressure transducer it is important to differentiate between *Linearity Error, Dynamic Error Band* and *Static Error Band.* The type of error specified should be determined by the needs of the actual application.

The ideal output variation can be represented by a straight line relationship between input pressure and output voltage. The various deviations from this in an actual transducer are shown in Fig. 5. With regard to establishing the error tolerances in any particular application of

the transducer, the reference straight line can be defined in four ways"

Independent Linearity: the maximum difference between plotted points of voltage output with increasing input pressure and the most favorable straight line drawn through the points. In Sensor Systems LLC, transducers at the zero pressure input value this best straight line will pass between 4% and 6% and at the 100% input pressure value will pass through the output voltage points between 94% and 96%. Each transducer has its own individual best straight line reference scale factor.

Fixed Gradient Linearity: same as Independent Linearity except the reference line at the zero pressure input value passes through the 5% output voltage point, and at the 100% input pressure value passes through the 95% output voltage point. The scale factor of transducer output (% Excitation Voltage/Unit Input Pressure) is the same for all transducers having this type of linearity.

Zero-Based Linearity: same as Independent Linearity except the reference line at the zero pressure value passes through the 0% output voltage point. Each transducer having this type of linearity has the same value output (within the linearity error) at Zero input pressure, but different scale factors.

Terminal Linearity: same as Zero-Based Linearity except the reference line at the 100% input pressure value passes through the 100% output voltage point; the error band will lie within the specified value only over output voltage values between 5% and 95%. The scale factor of transducer output is the same for all transducers having this type of linearity.

MEASURING PRESSURE TRANSDUCER ACCURACY

The magnitude of individual errors making up the output Static Error Band can be determined by applying to the individual pressure transducer a repeated series of known input pressures in both an increasing and a decreasing direction, and recording the output voltages at each 0 known pressure value; output voltages at each known pressure value; output voltages should be recorded both before and after light tapping on the transducer. Mean values of voltage output at each pressure point for the repeated runs can be calculat-ed. The Friction Error at any pressure input is the difference between a tapped and an untapped value of voltage output. The Repeatability Error at any pressure input reached in the same direction is the difference between the mean value and the extreme value in the repeated series of tapped output voltages. The Hysteresis error at any pressure input is the difference between the mean values of tapped output voltage when measured in the increasing and decreasing pressure directions. The Linearity Error at any pressure input is the difference between the mean value of tapped output measured in the increasing pressure direc-tion and the selected reference line value at that pressure. The Resolution Error at any pressure input is the smallest change in pressure input which produces an observable change in tapped voltage output, and can be measured during the course of applying the repeated series known input pressures. Static Error Band is obtained by plotting the untapped increasing and decreasing pressure values of output voltage for a single series of known input pressures, and observing the maximum deviation from the straight reference line indicated by the type of linearity.

In addition to the normal specifications such as pressure range, media, environments, etc. used to define a particular transducer for its application, other items relevant to the electromechanical transducer are important and are often defined by system requirements. These include excitation voltage, source loading, power handling, accuracy, output loading, and output signal configuration.

EXCITATION VOLTAGE, TERMINAL RESISTANCE POWER

The typical pressure transducer installation is shown schematically in Fig. 6. The power supply provides the Excitation Voltage E, either AC or DC, and the nominal scale factor of the pressure transducer becomes Excitation Voltage/Pressure Range, volts/ psi. For example, with 20 VDC Excitation Voltage, the output scale factor of a 0-20 psi pressure transducer is nominally 1 VDC/psi. When the nominal scale factor has been decided upon, the Terminal resistance RT of the transducer can be specified. From the power supply point of view only, two considerations enter into the specification of Terminal resistance, First, there is a practical limit to the ability of the resistance element in the transducer to dissipate the heat produced by the electrical energy or power fed to it by the power supply. This Power Rating is listed in the specification table of each transducer model, typically 0.2 watts. The Power applied by the power supply can be calculated from the equation P=EI=E2/RT, and must not exceed the Power Rating of the transducer to avoid damage to it. Using 20 VDC Excitation on a transducer rated at 0.2 watts, the minimum value of Terminal Resistance is calculated to be 2000 ohms. Such a resistance will draw 0.01 amperes of current from the power supply, and the second consideration is whether the power supply can deliver this current. Clearly, for a given Excitation Voltage (a given scale factor), the higher the Terminal Resistance, the cooler the transducer resistance element will run and the lower will be the current demands from the power supply. From the point of view of the input power, then, the Terminal Resistance should be specified as high as possible.

TERMINAL RESISTANCE, LOADING

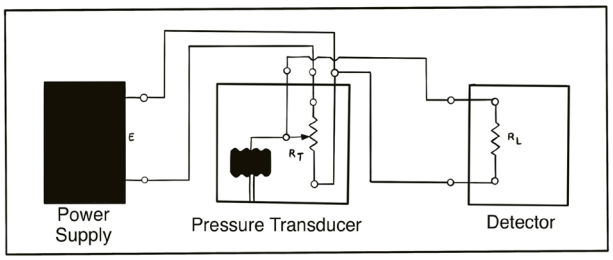


Fig. 6 - Typical pressure transducer installation

LINEARITY

While the highest Terminal Resistance improves the input power situation, the considerations of electrical loading and linearity call for the lowest Terminal Resistance; the final selection of Terminal Resistance actually becomes, therefore, a compromise between these opposing considerations. Electrical loading comes about in the Detector resistance R_L (or other following electronic equipment fed by the moveable contact of the pressure transducer) which acts as a shunt on the transducer resistance element and thereby distorts the output of the transducer to an extent determined by the ratio R_T/R_L.

Referring to the section "Electromechanical Transducer Performance Characteristics," above, it can be seen that for R_T/R_L ratios less than 0.005, there is no significant effect of electrical loading on linearity of the output. Thus, for example, when the effective electrical load resistance R_L is 100,000 ohms, any Terminal Resistance less than 500 ohms

will result in virtually no deterioration in output linearity due to electrical loading; if the RL value were 20,000 ohms, any greater Terminal Resistance than 100 ohms will introduce a significant linearity error. In the prior section it was determined in an example that the power rating indi-cates a minimum Terminal Resistance of 2000 ohms when the example transducer is excited by 20 VDC; any loading less than 400,000 ohms will produce a significant linearity error in the output.

Should it be that the power rating consideration forces the loading ratio R_T/R_L to exceed 0.005, then the expected maximum loading error on line- arity can be read off the chart shown in Fig. 4. By compensation of the transducer calibration during manufacture these loading errors can be substantially reduced, depending upon the actual application. Where the combination of unfavorable load and high accuracy prevail, provision must be made for reducing the loading ratio, in the manner discussed.

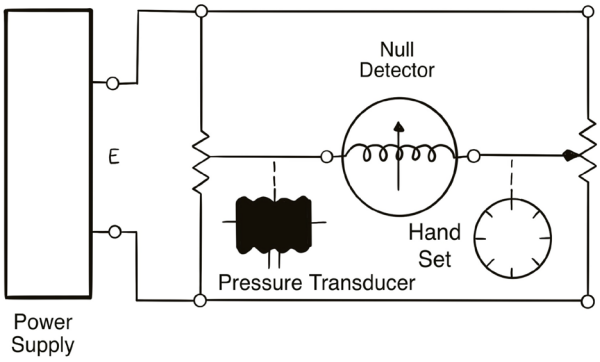


Fig. 7 - Typical pressure transducer control circuit

OUTPUT VOLTAGE AND CURRENT

When the resistance of the electrical load is infinite in value, no current flows from the pressure trans-ducer moveable contact, and the transducer out-put is purely voltage. This occurs in practice where, for example, the pressure transducer resistance element forms two legs of an electrical bridge network; perhaps the other two legs are made up of a manually set variable resistor used to establish a control set point, as in Fig. 7. When the voltage output of the pressure transducer exactly matches the voltage output of the

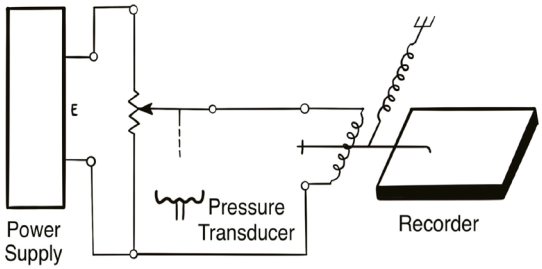


Fig. 8 - Typical pressure transducer circuit

handset resistor, at the null point, no current flows from the transducer moveable contact so that the effective load resistance is infinite value.

When off-null in the above bridge circuit or when, for example, the pressure transducer feeds the coil of a chart recorder pen motor, as in the schematic circuit of Fig. 8, current is drawn through the transducer moveable contact. In the null-seeking bridge circuit, the effect of being off-null is to produce a change in effective local scale factor due to the linearity distortion introduced by the electrical loading of the circuit; as null is approached, however, this distortion is reduced and ultimately disappears. In the case of the chart recorder circuit, current must be drawn continuously to drive the coil against the return spring; in fact, the pen deflection is a direct measure of the current in the coil, not the voltage, and for the recorder to faith- fully indicate the level of input pressure to the transducer, the transducer must be capable of delivering relatively large currents, The effective electrical loading here is- equivalent to the coil resistance of the pen motor,

frequently only several hundred ohms. The effect of electrical loading under these circumstances is great.

To perform accurately under circumstances of unfavorable electrical loading, it is necessary to interpose an electrical isolation amplifier between the pressure transducer and the electrical load.

Such an amplifier has the characteristics of high input impedance so that the transducer feeds the equivalent of a high effective load resistance, typi-cally 1 megohm, and a low output impedance so that the electrical load, be it pen motor coil, relay or any other current-driven device, is fed by a source of relatively unlimited current. The Model 4105 P/I Transmitter not shown in this catalog is a self-contained device consisting of pressure transducer, isolation amplifier power supply, which is intended to provide superior performance.

By use of modern microcircuit techniques offering precision with high reliability, isolation from burdensome electrical loads can be provided in practically every model of transducer shown in this catalog with performance characteristics to suit your particular application. Further, such internal electronic circuitry can also be incorporated to enable the generation of pressure transducer outputs proportional to Mach number, true airspeed and the like.

PRACTICAL CONSIDERATION AND PRECAUTIONS

Drawing current through the transducer moveable contact as a result of electrical loading produces distortions in the output voltage, but drawing excessive current may also permanently damage the transducer. Such excessive currents may be typically drawn in two ways when using the transducer. First, in testing or installing the pressure transducer, an ohmmeter may be connected between the moveable contact terminal and the low end terminal of the transducer variable resistance, as in A of Fig. 9. With no pressure applied when the wiper is close to the end terminal or when input pressure is applied in such a way as to drive the moveable contact towards the low-end termi-nal, the current through the moveable contact increases, to a maximum when the wiper is directly opposite this terminal. Depending upon the ohm- meter internal voltage and resistance, relatively high currents may be drawn, damaging the resistance element area close to the low end terminal. A similar result may be obtained when any form of circuit testing equipment containing its own power supply, such a circuit continuity tester, is connected to the moveable contact terminal of the pressure transducer. Second, in testing or installing the transducer, the Excitation Voltage may be inadvertently connected between the moveable contact terminal, as in B of Fig. 9.

Obviously, the full excitation current will pass through the moveable contact and damage due to excessive current flow or burnout of the resistance element will result. Such a condition of Excitation Voltage connected to the moveable contact terminal may be artificially or momentarily introduced by circuit anomalies lying outside the pressure transducer.

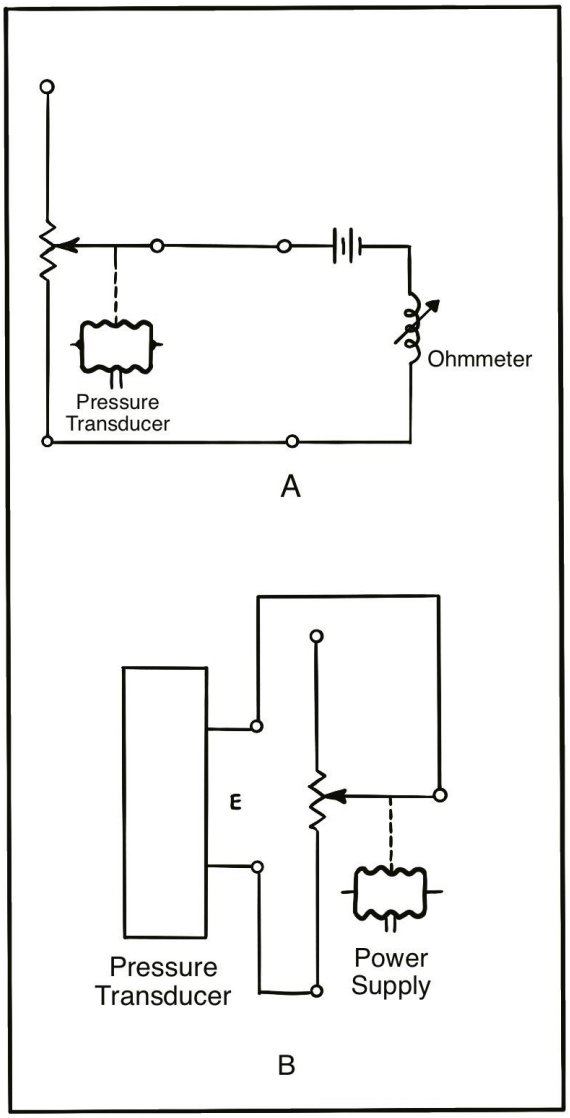


Fig.9 - Circuits capable of damaging the pressure transducer

For example, relay-connected power supplies may incorporate a circuit logic which produces such a misconnection under conditions of non simulta-neous engagement or relay chatter. Electrical grounding interruptions may produce similar cir-cuit anomalies.

Analogous to electrical overload producing damage is the effect of input overpressure. All pressure transducers shown in this catalog nominally provide for overpressures 20% greater than the speci-fied pressure range. The general effect of over- pressure beyond the allowance is usually to strain the pressure sensing element beyond its stable limit and at the same time drive the electromechan-ical transducer beyond its range. The effect on transducer output is usually the destruction of its accuracy, if not the complete disappearance of its output. A greater overpressure factor can be provided, to suit, within the limitations of dimensions and materials available. The danger of inadvertent overload is greatest in differential pressure transducers where the reversal of Hi and Lo inputs may occur by accident or failure further up the line. Likewise, in differential units, the absence of one pressure in the face of the application of the other may produce an overpressure situation. Safety provisions should be made in all pressure circuitry to minimize the possibility of overpressures.

Certain miscellaneous precautions should be observed in installing pressure transducers. Pressure transducers are precision devices and rough handling should be avoided. A 30" fall (from a bench top, for example) to a concrete floor produ-ces a shock equivalent to 1000G's, sufficient to destroy the accuracy of a transducer. Likewise, the use of the wrench flats provided on the pressure fittings when making pressure connections are preferred to wrenching on the case or base, which may produce case leakage. A controlled source of tapping which will simulate a vibration environment without damage to the transducer is the common 60 cycle bell buzzer mounted adjacent to the transducer.

To ensure reliability of pressure transducer test results, the accuracy of measuring equipment should be at least ten times greater than that of the test specimen. In making absolute pressure measurements (such as in altitude transducers) a high reference vacuum in the measuring equipment must be

maintained to avoid an offset in the calibration. Accidental pressure overload damage can be avoided by inserting a metering valve between the transducer and the test pressure or vacuum source. Care must be taken (especially during immersion-type leak tests) to prevent the inadvert-ent entry of alien fluids into the pressure transducer case volume.

ENVIRONMENTAL CONSIDERATIONS

VIBRATION: As a general rule, when Transducers are subjected to vibration levels above 500 Hz, a vibration isolator is required to maintain operational accuracy. Vibration levels under 500 Hz may not require such damping depending on the model, range and g level.

In all cases, Sensor Systems LLC Application Engineering Department should be consulted prior to selection, where vibration environments are a factor.

SHOCK: The ability to withstand shock stresses is dependent on the model, range, shock profile and g level. However most models all withstand shock levels in the order of 10 g's sinusoidal, 11 ms. without loss of continuity. Many models can withstand higher levels depending on the application. Sensor Systems LLC Applications Engineering Department will assist you in your selection for shock environments.

ACCELERATION AND POSITION ERROR: A function of range, typical values are shown for each model on the applicable data sheet.

MEDIA: In general, any media compatible with Ni-Span-C, aluminum, and stainless steel are well tolerated by Sensor Systems LLC Transducers. Other media can be accepted with material modifications.

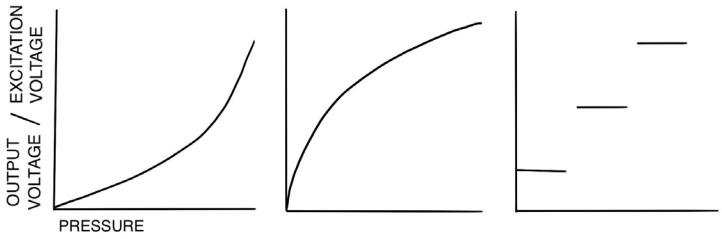
SPECIAL ELECTRICAL CHARACTERISTICS

PRESSURE TRANSDUCERS: To meet requirements of size, performance, environment and the like, special Transducers and/or custom modification of standard models can be manufactured. Practically any combination of special requirements can be met due to the versatility of the film resistance element.

LINEARITY OR CONFORMITY: Unless otherwise indicated, the linearity shown on the catalog sheets is Independent Linearity on a voltage ratio basis. Terminal, zero based and other linearity or conformity types are available to your order.

MATCHING FUNCTIONS (Tracking and/or Phasing): Dual potentiometer outputs are available in the same case size for most models. Unless otherwise indicated both elements in a Dual unit are phased for the simultaneous output of 50% of excitation voltage to an accuracy equal to the Linearity tolerance. Simultaneous conformity throughout pressure range or other output relationships are available to suit.

NON-LINEAR OUTPUTS: A wide variety of non-linear outputs are available for applications such as airspeed, flow and altitude measurements. In addition, non-continuous outputs in the form of switches can be supplied. Typical nonlinear output functions are shown at the right. It is important to note that the infinite resolution is an inherent property of the film-resistance element and does not vary with functional outputs.



LOAD COMPENSATION: Where desired, the transducer can be compensated during manufacture for the errors introduced by electrical loading of the wiper, thereby eliminating such errors from the system. If loading ration ($\frac{Transducer\ total\ resistance}{Load\ Impedance}$) is more than 0.005, Sensor Systems LLC should be contacted.

WATTAGE: The power dissipation shown in the individual specification page is the unit's rated power under ambient conditions (25°C). All units will dissipate rated power to 85°C, then derate linearly to zero power at 120°C. Special high power or high temperature units available to suit.

DEFINITIONS

1. STATIC ERROR BAND - It represents the maximum deviation from the best straight line drawn through the coordinates of 0% pressure range, 5% ±1% output voltage ratio, and 100% pressure range, 95% ±1% output voltage ratio. This band includes the effects of linearity, friction, hysteresis, resolution, and repeatability, and is expressed as a percentage of Excitation voltage.

2. DYNAMIC ERROR BAND - It's the same as the static error band but with friction eliminated by light vibration.

3. LINEARITY - The maximum deviation from the best straight line drawn through 5-95% ±1% end points taken on increasing pressure readings at a constant ambient temperature with friction error eliminated, and it is expressed as a percentage of full scale excitation.

4. FRICTION ERROR - The difference in output before and after tapping or vibrating the transducer.

5. HYSTERESIS - The difference in the value of the average tapped output measured for an input pressure, increasing from the minimum pressure, and the average tapped output, decreasing from the maximum pressure, for repeated tests.

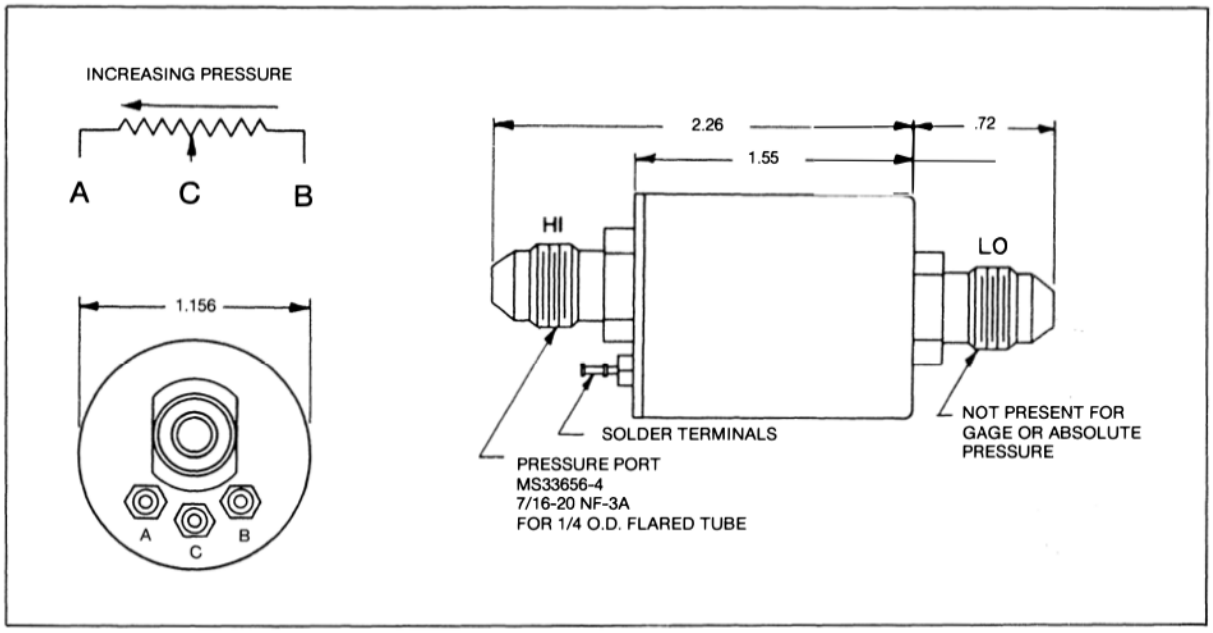
6. RESOLUTION - The minimum increment of pressure necessary to cause a change in tapped output.

7. REPEATABILITY - The difference in value of tapped output at a single point and the average value of tapped for repeated input pressures when approached from the same directions.

*Note: Insulation resistance - 50 megohms minimum at 500 VDC.
Dielectric strength - 750 VAC.

MODEL 1000

SMALL SIZE / LIGHT WEIGHT



ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-10 to 0-500 PSI Gage, Absolute, and Differential.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.5% F.S.

REPEATABILITY - ±0.1% F.S.

POWER RATING - 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 20 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 200 PSIA

WEIGHT - 2 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.05%/G to 50G

PRESSURE MEDIA - Ni-Span C & Stainless Steel

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.5% Linearity)

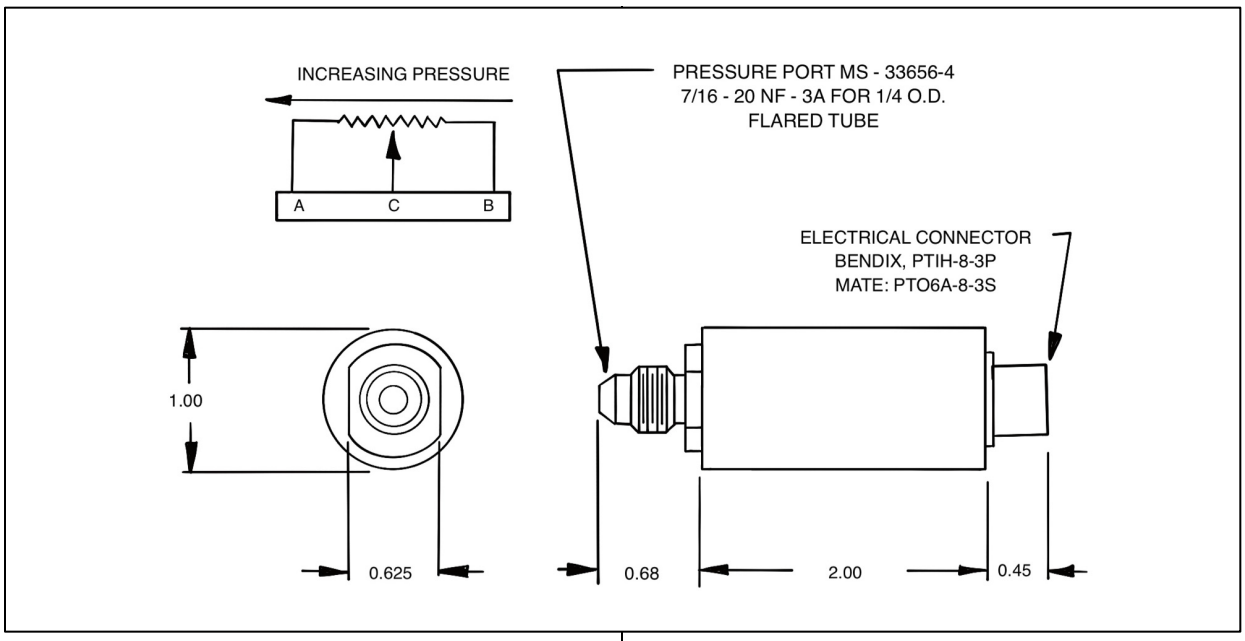
PRESSURE RANGE (PSI)	0-10 TO 0-25	0-30 TO 0-100	0-125 TO 0-500
STATIC ERROR BAND	±1.8%	±1.3%	±1.0%
DYNAMIC ERROR BAND	±0.8%	±0.7%	±0.7%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 1200

SMALL SIZE / LIGHT WEIGHT / OIL DAMPENED DESIGN / EXTREMELY RUGGED



ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-300 to 0-5000 PSI Gage or Absolute.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.5% F.S.

REPEATABILITY - ±0.1% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 20 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 200 PSIA (higher available)

WEIGHT - 4 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.05%/G to 50G

PRESSURE MEDIA - Ni-Span C & Braze

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.5% Linearity)

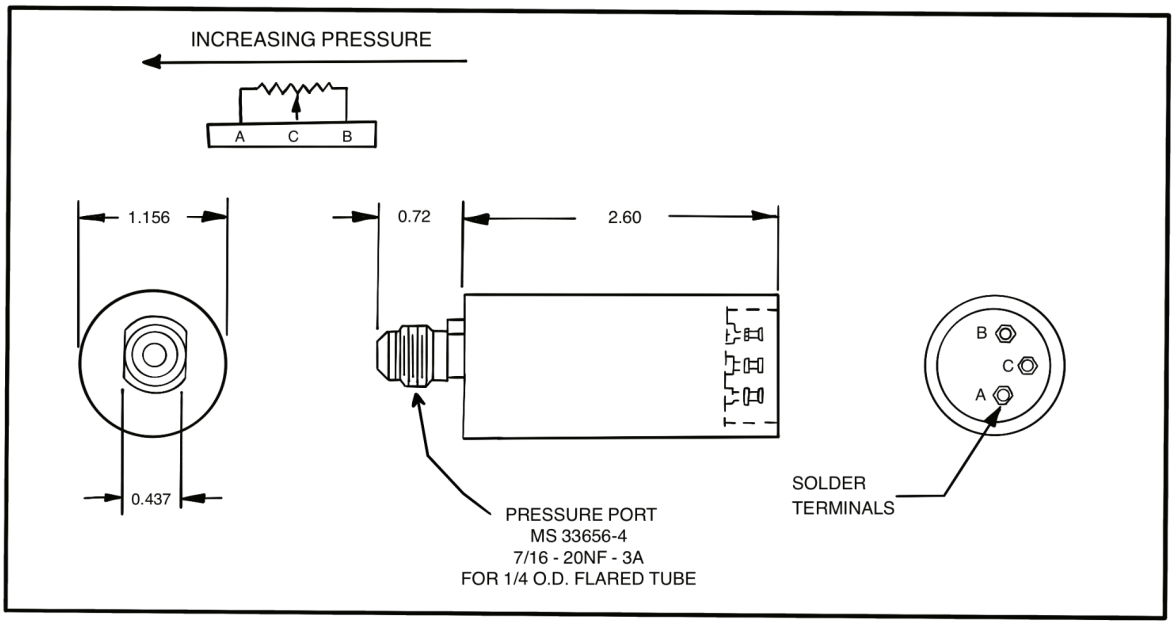
PRESSURE RANGE (PSI)	0-300 TO 0-1000	0-1000 TO 0-5000	0-5000 TO 0-10000
STATIC ERROR BAND	±0.8%	±1.0%	±1.2%
DYNAMIC ERROR BAND	±0.7%	±0.9%	±1.1%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 1300

HIGH RELIABILITY / SMALL SIZE



ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-15 to 0-350 PSI Gage.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.5% F.S.

REPEATABILITY - ±0.1% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 20 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 500 PSIA (higher available)

WEIGHT - 6 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.05%/G to 50G

PRESSURE MEDIA - Ni-Span C & Stainless Steel

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.5% Linearity)

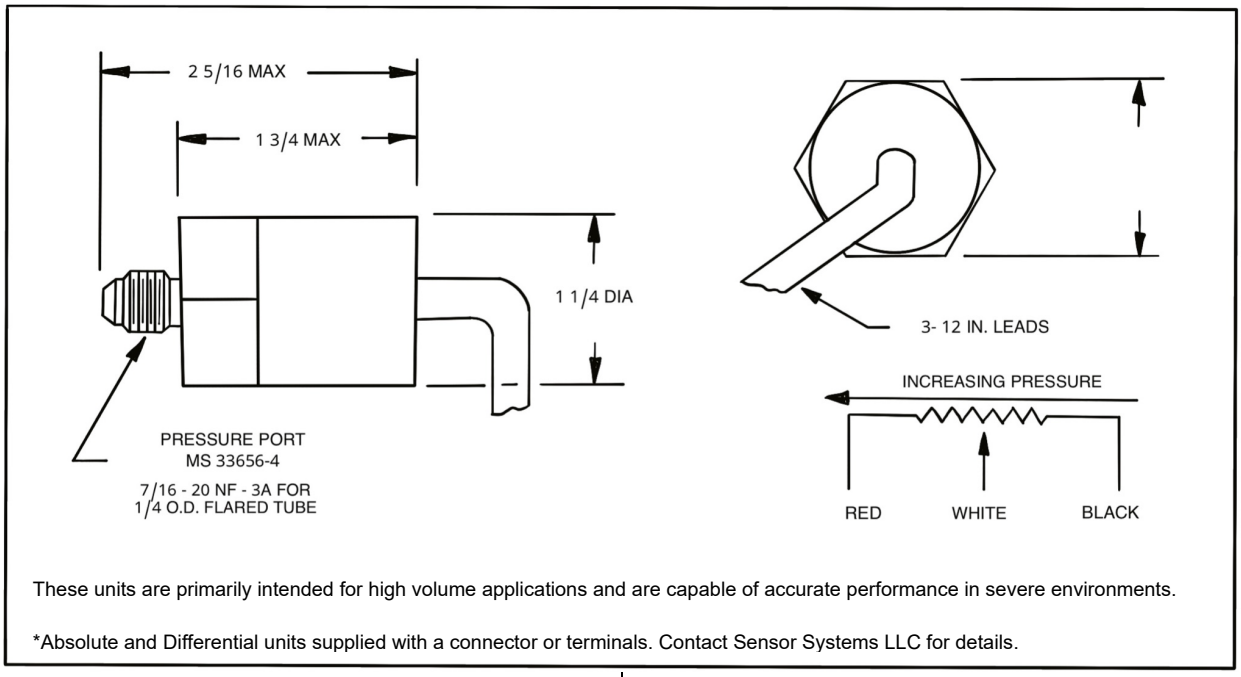
PRESSURE RANGE (PSI)	0-15 TO 0-25	0-30 TO 0-100	0-155 TO 0-350
STATIC ERROR BAND	±1.8%	±1.4%	±1.1%
DYNAMIC ERROR BAND	±0.8%	±0.8%	±0.8%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 2000

SMALL SIZE / LIGHT WEIGHT / LOW ERROR UNDER VIBRATION / HIGH VOLTAGE OUTPUT



These units are primarily intended for high volume applications and are capable of accurate performance in severe environments.

*Absolute and Differential units supplied with a connector or terminals. Contact Sensor Systems LLC for details.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-10 to 0-500 PSI Gage, Absolute, and Differential.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.5% F.S.

REPEATABILITY - ±0.1% F.S.

POWER RATING - 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 20 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 50% (higher available)

CAGE PRESSURE - 500 PSIA

WEIGHT - 3 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C
ACCELERATION ERROR - ±0.2%/G to 20G
PRESSURE MEDIA - Air or oil, non corrosive.

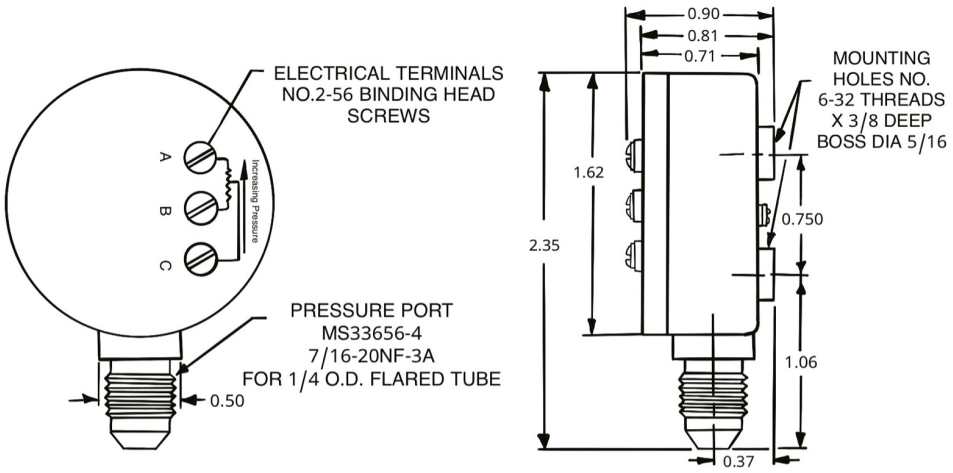
Gage - Ni Span C, Aluminum, Stainless Steel.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.5% Linearity)

PRESSURE RANGE (PSI)	0-10 TO 0-15	0-20 TO 0-100	0-125 TO 0-500
STATIC ERROR BAND	±1.8%	±1.5%	±1.2%
DYNAMIC ERROR BAND	±0.8%	±0.8%	±0.8%

MODEL 3000

LONG LIFE / HIGH VOLTAGE OUTPUT / DESIGNED FOR RUGGED INDUSTRIAL APPLICATIONS.



Designed for use in industrial and military markets. Present applications include oil process control, flow computation, pressure monitoring for Hi-red ground support equipment

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-100 to 0-5000 PSI Gage, Absolute.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.5% F.S.

REPEATABILITY - ±0.1% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 20 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

WEIGHT - 3 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.2%/G to 20G

PRESSURE MEDIA - Ni-Span C, Braze, Stainless Steel.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.5% Linearity)

PRESSURE RANGE (PSI)	0-10 TO 0-25	0-30 TO 0-100	0-125 TO 0-500
STATIC ERROR BAND	±1.8%	±1.3%	±1.0%
DYNAMIC ERROR BAND	±0.8%	±0.7%	±0.7%

MODEL 3100

CURRENT LOOP PRESSURE TRANSMITTERS

- Designed to meet ISA-S50.1 (1975) Standard, Type 2, Class L, H, and U
- These new Pressure transmitter are compatible with all 2-wire 4 to 20mA instrumentation and measuring systems
- The transmitters utilize the same High Accuracy Conductive Plastic Film Potentiometric sensors featured in our standard Pressure Transducer line.

FUNCTIONAL SPECIFICATIONS:

SERVICE - Liquid, Gas or vapor compatible with Ni-Span C, Brass and Stainless Steel.

RANGES - Any range to suit from 50 to 5000 PSI Gauge or Absolute; Overpressure 20% of Full Scale Pressure.

OUTPUT- True 2 wire 4 to 20mA with Reverse Polarity Protection.

TRIMS - Non-interacting Zero and Span Trimmers (preset at the factory to ±0.5% of FS).

DAMPING - time constant fixed at 0.1 second. Other values available.

POWER - External Loop Power Supply required, 10 to 42.5 VDC; Loop Resistance Range 0 to 1525 ohms (See chart).

INSULATION - 500 Megohms min at 50 VDC

PERFORMANCE SPECIFICATIONS

INDEPENDENT LINEARITY: to ±0.5% FS

REPEATABILITY - ±0.1% FS

SUPPLY SENSITIVITY - 0.0025% FS/VDC

TEMPERATURE SENSITIVITY: ±0.2%/°C

LIFE - to 10,000 cycles depending on application.

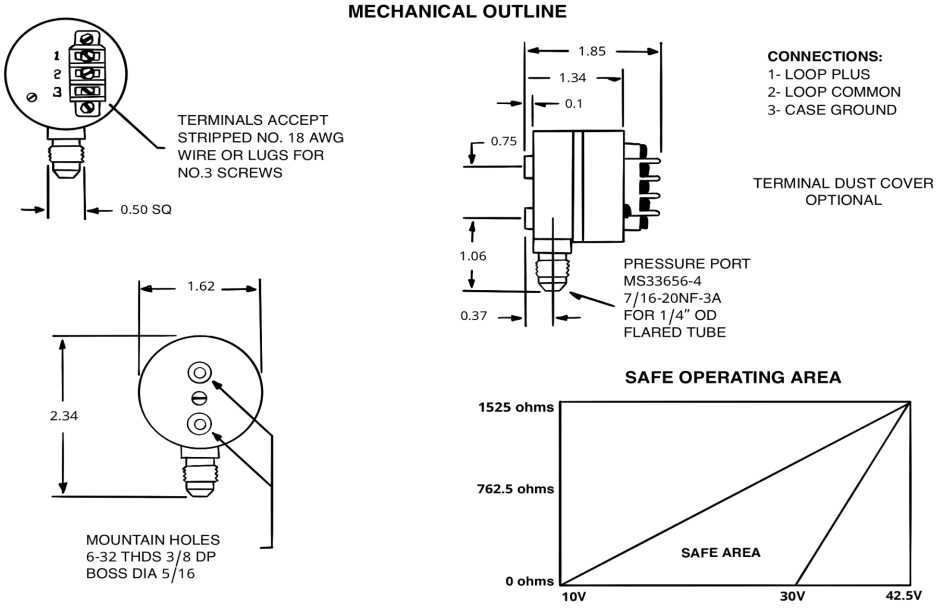
ENVIRONMENTAL

TEMPERATURE RANGE - -40°C to 85°C

ACCELERATION ERROR - ±0.1%/G to 20G

IMMUNE TO RFI NOISE

MECHANICAL OUTLINE



MODEL 3200

CURRENT LOOP PRESSURE TRANSMITTERS

- Designed to Interface with Standard Voltage Driven Instrumentation.
- The transmitters utilize the same High Accuracy Conductive Plastic Potentiometric sensors featured in our standard Pressure Transducer line.

FUNCTIONAL SPECIFICATIONS:

SERVICE - Liquid, Gas or vapor compatible with Ni-Span C, Brass and Stainless Steel.

RANGES - Any range to suit from 50 to 5000 PSI Gauge or Absolute; Overpressure 20% of Full Scale Pressure.

OUTPUT- True Non-Ratiometric Voltage Output with Reverse Polarity Protection..

TRIMS - Non-interacting Zero and Span Trimmers (preset at the factory to ±0.5% of FS).

DAMPING - time constant fixed at 0.1 second. Other values available.

POWER - External Power Supply required, 10 to 32 VDC; for 1-5V and 0-5V models, 15-32 VDC for 0-10V model. Power input is Reverse Polarity Protected.

INSULATION - 500 Megohms min at 50 VDC

PERFORMANCE SPECIFICATIONS

INDEPENDENT LINEARITY: to ±0.5% FS

REPEATABILITY - ±0.1% FS

SUPPLY SENSITIVITY - 0.0025% FS/VDC

TEMPERATURE SENSITIVITY: ±0.2%/°C

LIFE - to 10,000 cycles depending on application.

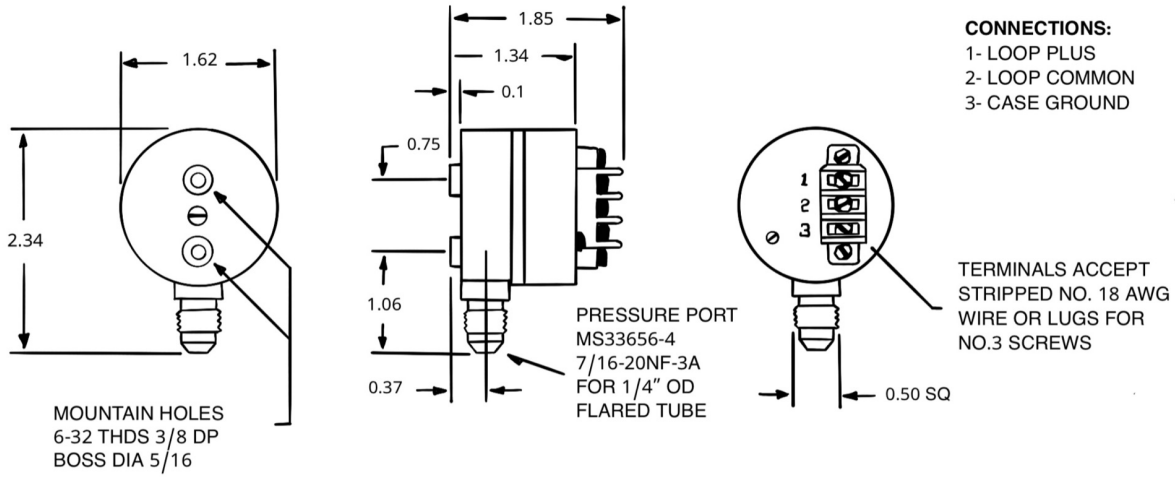
ENVIRONMENTAL

TEMPERATURE RANGE - -40°C to 85°C

ACCELERATION ERROR - ±0.1%/G to 20G

IMMUNE TO RFI NOISE

MECHANICAL OUTLINE



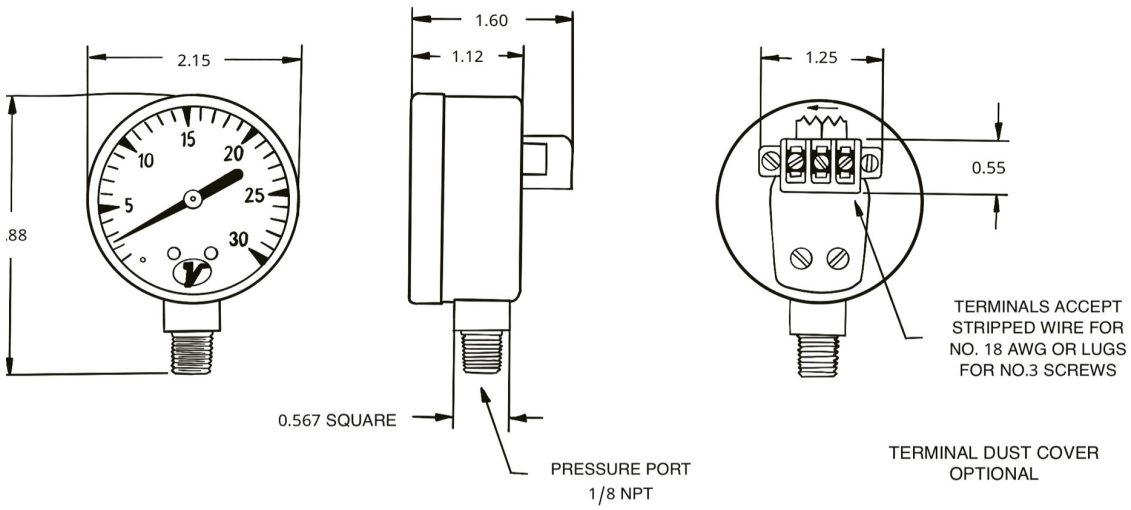
SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 3500

GAUGED PRESSURE TRANSDUCER

MECHANICAL OUTLINE



- Designed to Interface with Standard Voltage Driven Instrumentation
- The Transmitters utilize the same High Accuracy Conductive Plastic Potentiometric sensors featured in our standard Pressure Transducer Line.

FUNCTIONAL SPECIFICATIONS:

SERVICE - Liquid, Gas or vapor compatible with Brass, Phosphor Bronze Beryllium Copper (contact for specifics).

RANGES - Any range to suit from 0-30" Hg to 0-6000 PSIG; Overpressure 20% of Full Scale Pressure.

VACUUM UNIT AVAILABLE

OUTPUT- True Non-Ratiometric Voltage Output with Reverse Polarity Protection..

INSULATION - 500 Megohms min at 50 VDC

ENVIRONMENTAL

TEMPERATURE RANGE - -40°C to 85°C

WEIGHT - 6 oz Max.

PERFORMANCE SPECIFICATIONS

ACCURACY: to ±3% FS (±4% FS for Vaccum and PSI ≤15)

REPEATABILITY - ±0.5% FS

HYSTERESIS AND CONFORMITY - ±2.5% FS

TEMPERATURE SENSITIVITY: ±0.4%/°C

LIFE - 1,000,000 cycles min depending on application.

RESISTANCE - 1k, 5k, or 10k ohms ±20%

POWER RATING: 0.1 to 0.2 watts

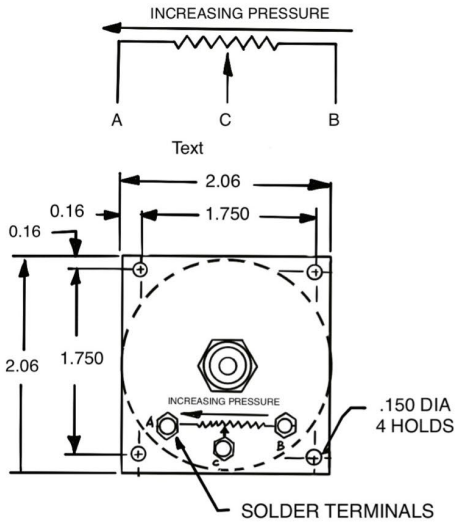
OUTPUT: to 80% of Supply Voltage.

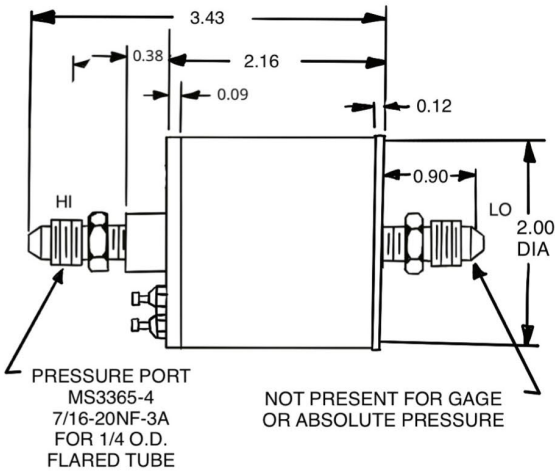
SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 4000

EXCEPTIONALLY LOW STATIC ERROR BAND / HIGH ACCURACY





Particularly suited for industrial applications where reliability and accuracy are of prime considerations, while retaining all of the important performance characteristic of the other Sensor Systems transducers.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-3 to 0-200 PSI Gage, Absolute, or differential.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.35% F.S.

REPEATABILITY - ±0.5% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 15 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 200 PSIA (higher available)

WEIGHT - 12 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.1%/G to 10G

PRESSURE MEDIA -

Absolute/ Differential: Air or oil, non-corrosive.

Gage: Ni-Span C, Aluminum, and Stainless Steel.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.3% Linearity)

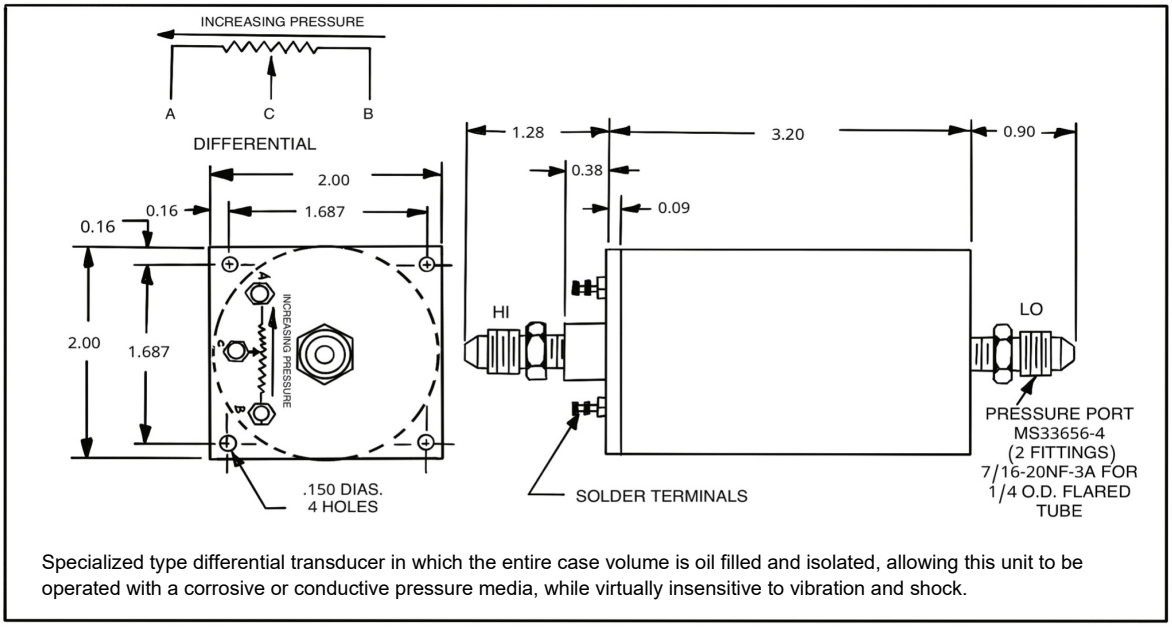
PRESSURE RANGE (PSI)	0-3 TO 0-5	0-6 TO 0-10	0-15 TO 0-200
STATIC ERROR BAND	±0.6%	±0.5%	±0.5%
DYNAMIC ERROR BAND	±0.45%	±0.4%	±0.4%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 4500

SMALL SIZE / LIGHT WEIGHT / LOW ERROR UNDER VIBRATION / HIGH VOLTAGE OUTPUT



Specialized type differential transducer in which the entire case volume is oil filled and isolated, allowing this unit to be operated with a corrosive or conductive pressure media, while virtually insensitive to vibration and shock.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-2 to 0-200 PSI Gage, Absolute, or differential.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.3% F.S.

REPEATABILITY - ±0.1% F.S.

POWER RATING - 0.2 to 0.4 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 50 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 1000 PSIA (higher available)

WEIGHT - 14 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.1%/G to 10G

PRESSURE MEDIA -

High Side: Ni-Span C, Aluminum, Stainless Steel

Low Side: Neoprene isolating Diaphragm.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.3% Linearity)

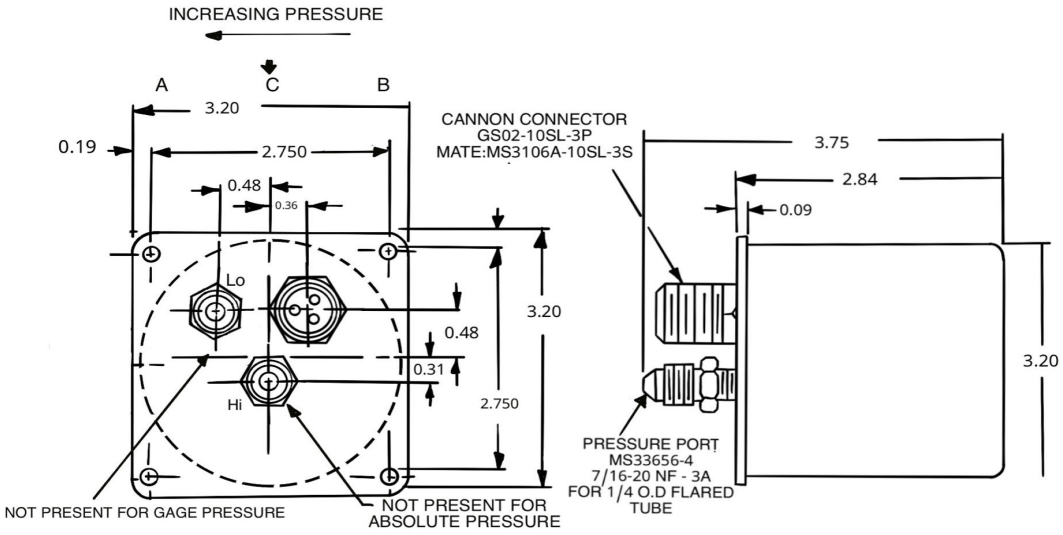
PRESSURE RANGE (PS	0-2 TO 0-5	0-6 TO 0-10	0-15 TO 0-200
STATIC ERROR BAND	±1.1%	±0.9%	±0.6%
DYNAMIC ERROR BAND	±0.6%	±0.6%	±0.5%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 6000

HIGH ACCURACY / MAXIMUM PRESSURE SENSITIVITY / EXCEPTIONAL REPEATABILITY / LOW PRESSURE RANGES



Designed for exacting measurements of very low pressure. Applications include remote control systems, direct readout, air data recording and testing applications.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-0.1 to 0-2 PSI Gage or Differential. 0-2.5 to 0-5 PSI Absolute.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.3% F.S.

REPEATABILITY - ±0.05% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 50 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 100 PSIA (higher available)

WEIGHT - 12 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.1%/G to 20G

PRESSURE MEDIA -

Differential: Air or oil, non-corrosive.

Gage: Ni-Span C.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.3% Linearity)

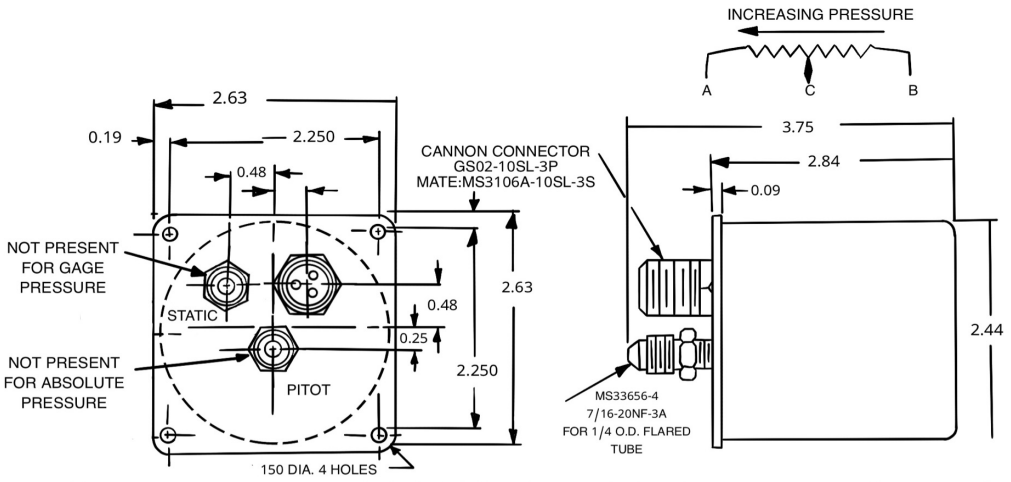
PRESSURE RANGE (PS	0-0.1 TO 0-0.2	0-0.3 TO 0-0.5	0-0.6 to 0-1	0-1.2 to 0-2	0-2.5 to 0-5 (Absolute)
STATIC ERROR BAND	±2.5%	±1.5%	±1.2%	±0.9%	±1.0%
DYNAMIC ERROR BAND	±0.8%	±0.7%	±0.6%	±0.5%	±0.5%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 6100

OUTSTANDING ACCURACY



Designed for precise pressure measurements and to high reliability military specifications, the entire pressure assembly is dynamically counter-balanced to eliminate orientation errors and provide outstanding performance under vibration and acceleration. This model is used in defense, aerospace and ground support systems including back-up air data systems where high accuracy and reliability are the primary prerequisites. A special shock mount is available to protect and reduce vibration and shock errors in severe environmental industrial applications.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-2 to 0-200 PSI Gage or Differential. 0-5 to 0-200 PSI Absolute.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.3% F.S.

REPEATABILITY - ±0.05% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 15 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 150 PSIA (higher available)

WEIGHT - 10 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.05%/G to 30G

PRESSURE MEDIA -

Absolute/Differential: Air or oil, non-corrosive.

Gage: Ni-Span C, Stainless Steel, Aluminum.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.3% Linearity)

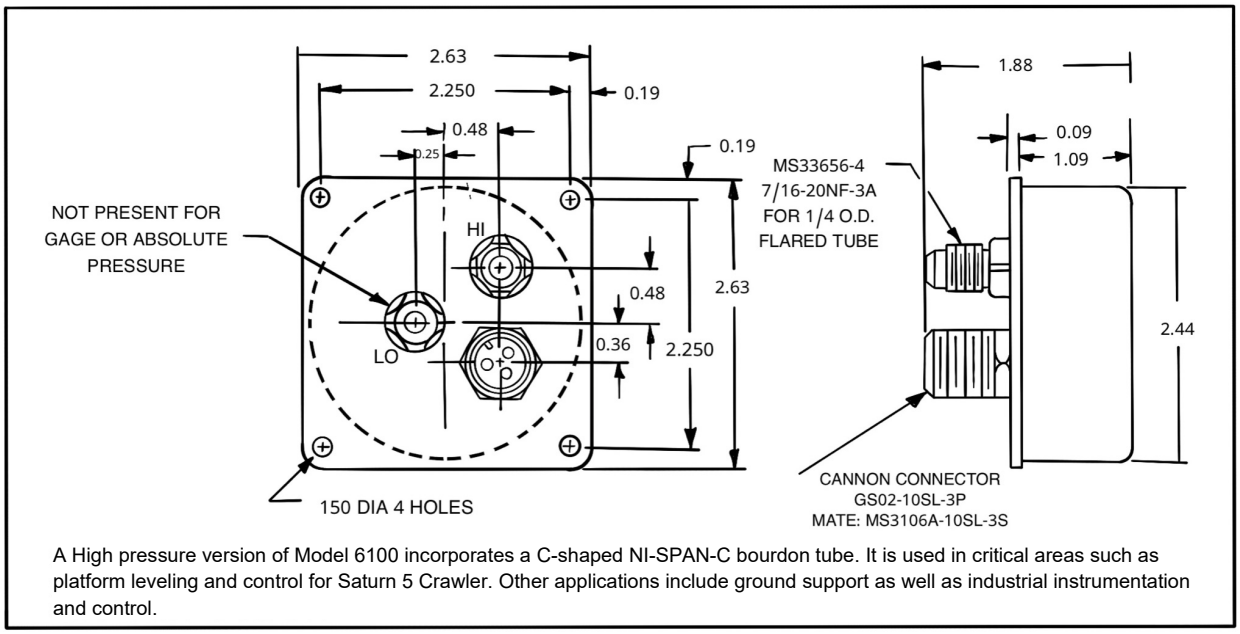
PRESSURE RANGE (PS	0-2 TO 0-5	0-6 TO 0-10	0-15 TO 0-200
STATIC ERROR BAND	±0.9%	±0.7%	±0.5%
DYNAMIC ERROR BAND	±0.4%	±0.4%	±0.4%

SENSOR SYSTEMS LLC

PRESSURE TRANSDUCER and PRESSURE SENSOR TUTORIAL

MODEL 6200

EXCEPTIONAL ACCURACY / EXCELLENT REPEATABILITY / HIGH RELIABILITY



A High pressure version of Model 6100 incorporates a C-shaped NI-SPAN-C bourdon tube. It is used in critical areas such as platform leveling and control for Saturn 5 Crawler. Other applications include ground support as well as industrial instrumentation and control.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - Any range to suit from 0-50 to 0-10,000 PSI Gage, Absolute, or Differential.

TERMINAL RESISTANCE - 50Ω to 10KΩ ±10%

INDEPENDENT LINEARITY - to ±0.3% F.S.

REPEATABILITY - ±0.05% F.S.

POWER RATING - 0.10 to 0.20 Watts.

LIFE SPAN - Up to 10 million cycles, depending upon application.

TEMPERATURE SENSITIVITY - ±0.02%/°C

RESPONSE TIME - 20 milliseconds to respond 63% of step pressure input.

MECHANICAL RESPONSE

OVER PRESSURE - 20% (higher available)

CAGE PRESSURE - 500 PSIA (higher available)

WEIGHT - 6 ounces

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.05%/G to 30G

PRESSURE MEDIA -

Differential: Air or oil, non-corrosive.

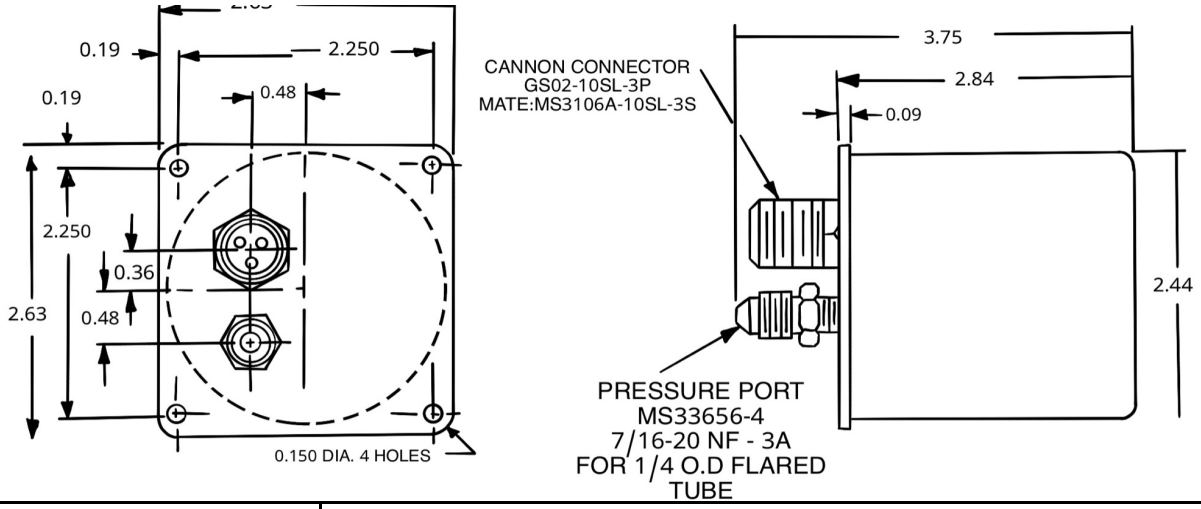
Gage/Absolute: Ni-Span C, Stainless Steel, Braze.

TYPICAL STATIC AND DYNAMIC ERROR BANDS (Based on ±0.3% Linearity)

PRESSURE RANGE (PS	0-2 TO 0-5	0-6 TO 0-10	0-15 TO 0-200
STATIC ERROR BAND	±0.9%	±0.7%	±0.5%
DYNAMIC ERROR BAND	±0.4%	±0.4%	±0.4%

MODEL 7000

ALTITUDE TRANSDUCER



ELECTRICAL SPECIFICATIONS	TYPICAL ALTITUDE RANGES			
Altitude Ranges	0-10,000	0-30,000	0-50,000	0-70,000
Conformity (Linear with Altitude)	±35	±80 (Below 20,000) ±0,4% (above 20,000)	±150 (Below 25,000) ±0,6% (above 25,000)	±200 (Below 25,000) ±0,8% (above 25,000)
Static Error Band (includes effects of friction and Hysteresis)	±55 plus conformity error	±55 plus conformity error	±55 plus conformity error	±55 plus conformity error
Dynamic Error Band (Friction eliminated by light vibration)	±55 plus conformity error	±55 plus conformity error	±55 plus conformity error	±55 plus conformity error
Effective Resolution	1.5 feet	5 feet	7 feet	10 feet
Repeatability	5 feet	20 feet	40 feet	70 feet
Power Rating (max)	0.25 watts	0.25 watts	0.25 watts	0.2 watts
Temperature Sensitivity	±0,02%/°C			
Response Time	20 milliseconds to respond to 63% of step pressure input			
End Points	Output at 0 feet is 0% input voltage. Output at maximum altitude is 90% of input voltage.			

ELECTRICAL SPECIFICATIONS:

OVER PRESSURE - 20% (higher available)

WEIGHT - 6 ounces

LIFE SPAN - Up to 10 million cycles, depending upon application.

ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

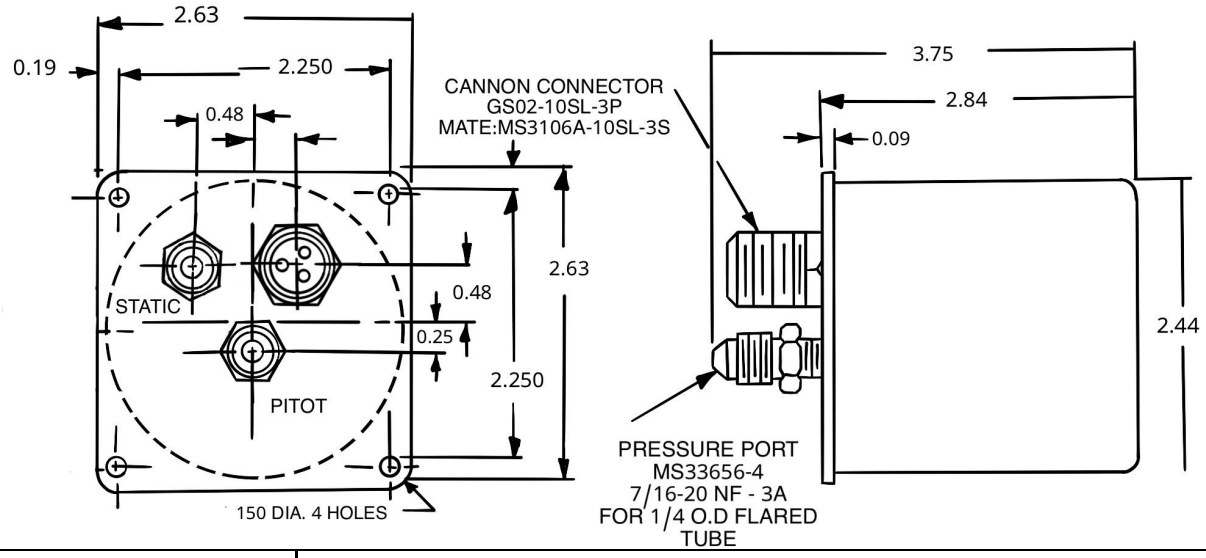
ACCELERATION ERROR - ±0.05%/G to 30G

***Altitude in accordance with U.S standard atmosphere (ICAO) 1962**

***Dual element units (altitude control potentiometer and or altitude limit switch) also available to suit.**

MODEL 7100

AIRSPEED TRANSDUCER



ELECTRICAL SPECIFICATIONS	TYPICAL AIRSPEED RANGES			
Altitude Ranges	0-150 knots	0-350 knots	0-600 knots	0-1000 knots
Terminal Resistance	50Ω to 10KΩ ±10%			
Conformity (Linear with Altitude)	±0.6 knots	±1 knot	±3 knots	±10 knots
Static Error Band (includes effects of friction and Hysteresis)	±1.5 knots	±3 knots	±5 knots	±12 knots
Dynamic Error Band (Friction eliminated by light vibration)	±0.8 knots	±1.4 knots	±3.6 knots	±11 knots
Threshold	30 knots	70 knots	100 knots	120 knots
Effective Resolution	0.03 knots	0.05 knots	0.1 knots	0.15 knots
Repeatability	±0.15 knots	±0.4 knots	±0.8 knots	±0.15 knots
Power Rating (max)	0.25 watts	0.25 watts	0.25 watts	0.2 watts
Temperature Sensitivity	±0,02%/°C			
Response Time	20 milliseconds to respond to 63% of step pressure input			
End Points	Theoretical curve is drawn through 0 knots, 0% input voltage. At maximum knots, 95% input voltage.			

ELECTRICAL SPECIFICATIONS:

OVER PRESSURE - 20% (higher available)

WEIGHT - 10 ounces

LIFE SPAN - Up to 10 million cycles, depending upon application.

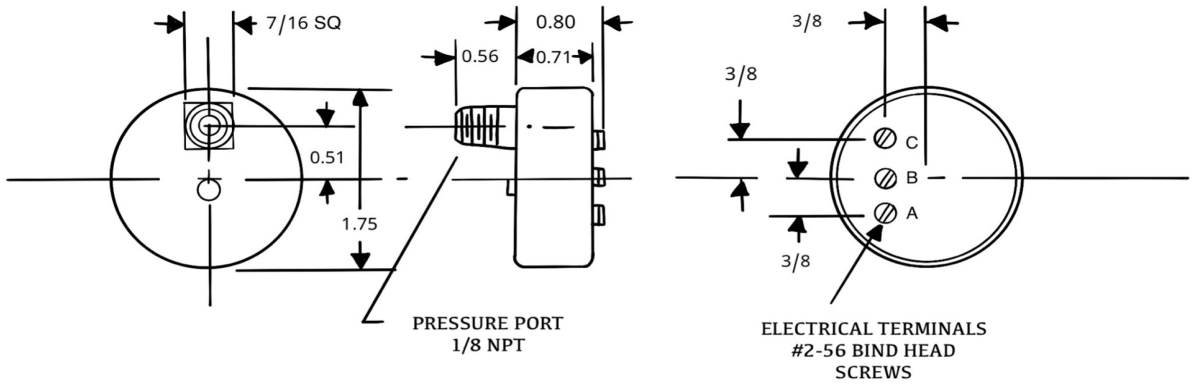
ENVIRONMENTAL

TEMPERATURE RANGE - -55°C to 85°C

ACCELERATION ERROR - ±0.05%/G to 20G

MODEL 9000

STANDARD TRANSDUCER



Model 9000 utilizes a NI-Span tube sensing element that can provide infinite resolution through the use of conductive film resistance elements. Typical applications include pressure monitoring in process control, agriculture, bench testing and oil refinery applications with a variety of resistance and linearity ranges.

ELECTRICAL SPECIFICATIONS:

PRESSURE RANGE - 100, 500, 1000, 5000 PSIG.

RESISTANCE - 1K, 2K, 5K, OHMS

INDEPENDENT LINEARITY - to $\pm$5% F.S.

REPEATABILITY - 0.25% F.S.

OUTPUT: 100% PSIG - 80% min / 0% PSIG - 20% max

POWER RATING - 1 Watts.

LIFE SPAN - 100 psig - $5x10^6$ FS Cycles / 500 psig - $5x10^6$ FS Cycles / 1000 psig - $5x10^6$ FS Cycles / 5000 psig - $5x10^6$ FS Cycles

OVER PRESSURE - 20% (higher available)

WEIGHT - 6 ounces

TEMPERATURE RANGE - -55°C to 85°C

PRESSURE MEDIA - Ni-Span C, Stainless Steel, Braze.

CONSTRUCTION

CASE - Aluminum Phenolic

PRESSURE FITTING - Stainless Steel

SENSING ELEMENT - Ni-Span-C

RESISTANCE ELEMENT - Conductive Film

SPECIAL FEATURES

High voltage output AC or DC

Require no auxiliary equipment for Signal conditioning, Amplifying, Converting electrical inputs or outputs.

SENSOR SYSTEMS LLC

Silicon Strain Gauge Type

NO MOVING PARTS

GENERAL DESCRIPTION

Sensor Systems LLC, recognizing the changing marketplace for Pressure Transducers, has developed the capability to manufacture Pressure Transducers based on bonded strain ga1,1ge technology. After lengthy evaluations of semiconductor IC type units, they were rejected in favor of bonded strain gauges - both silicon and foil types. The superior performance of the bonded units over the IC types, especially in terms of stability, both short and long term, enables Sensor Systems LLC to deliver a superior product, the cornerstone of our corporate commitment to our customers.

Our initial offerings in this field are mV output devices physically patterned after a pseudo industry-standard envelope: 1" diameter units with a body length of 1.5". The units are of all stainless steel construction and feature E-Beam welded seals. As shown on our first data sheet for the Model 10000 series, standard fittings are of the straight thread / O-Ring seal MS 33649-4 type. Due to our modular construction techniques, alternate fittings, such as male and female 1/4"-18 NPTF, male 1/8"-27 NPTF or male MS 33656-4 for 1/4" flare fittings are available. Also available, due to our modular construction, are alternate connection methods. In addition to our standard 36" cable, we can offer a glass-seal6pinMlL-C-26482 connector, welded at the back of the body, which will mate with a standard PT06-10-6 type connector.

Flexibility has been the hallmark of Sensor Systems LLC's success in the past and will continue into the future with our commitment to serve our customer's needs. The strain gauge Pressure Transducer product base will be expanding rapidly to include slightly larger units with internal signal conditioning for applications requiring 0-5VDC, 4-20mA and other higher level outputs. And because of our flexibility and commitment to the needs of the real world around us, we are eager to hear Your requirements, so that we may respond to your needs and mold our transducer line into one which will fill your requirements now and in the future.

SPECIFYING STRAIN GAUGE PRESSURE TRANSDUCERS

Even if our existing product offerings don't fit your needs, we are here for you and want to know what you need - we will be more than happy to quote you special. Here are the basics of what we need to know:

Pressure Range	Proof Pressure	Accuracy Required
Burst Pressure	Fitting Required	Excitation Available
Output Signal Required	Output Load	Media Temp Range
Operating Temp Range	Storage Temp Range	Size Constraints
Temp Range - Full Accuracy	Physical Environment	Application
Quantity Required	Delivery Required	
	Pressure Media	

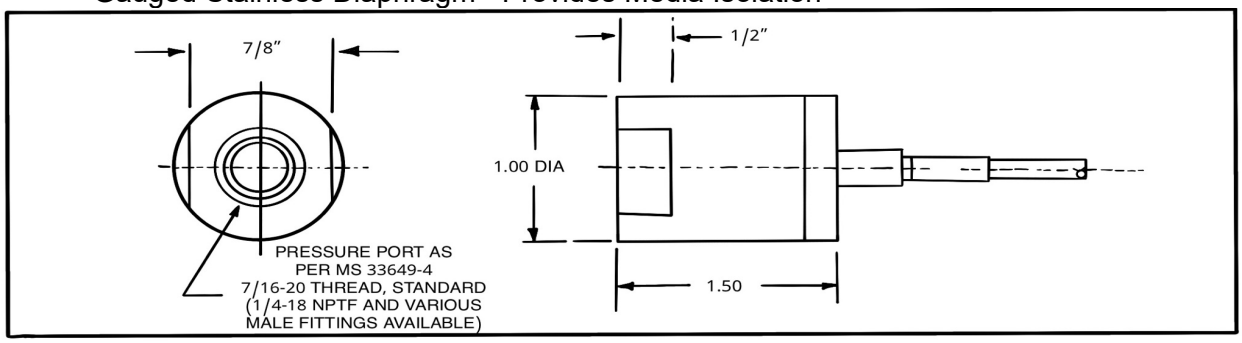
SENSOR SYSTEMS LLC

Silicon Strain Gauge Type

MODEL 10000

DIFFERENTIAL VOLTAGE OUTPUT PRESSURE TRANSDUCERS

- Designed to interface with Standard Strain Gauge Signal Conditioners.
- Utilizes proven High Accuracy Bonded Silicon Strain Gauge Technology
- Gauged Stainless Diaphragm - Provides Media Isolation



FUNCTIONAL SPECIFICATIONS:

SERVICE - Liquid, Gas or vapor compatible with 15-5 and 17-4 PH Stainless Steel.

RANGES - 15 and 30 PSI Gauge or Absolute; Overpressure 200% of Full Scale 50 to 10,000 PSI gauge or Absolute; Overpressure 150% of Full Scale

OUTPUT- True Ratiometric Differential Bridge Voltage Output

INSULATION - 500 Megohms min at 50 VDC

ENVIRONMENTAL

STORAGE TEMPERATURE RANGE - -40°C to 90°C

OPERATING TEMPERATURE RANGE - -40°C to 90°C

COMPENSATED TEMPERATURE RANGE - -17.8°C to 65.5°C

OPTIONAL SPECIFICATIONS

PRESSURE REFERENCES - PSIA, PSID, PSIS sealed at 15.0 PSIA. Other options available (contact Sensor Systems LLC for further assistance

PERFORMANCE SPECIFICATIONS (*PSIG)

PRESSURE RANGE	15 PSI	30 PSI*	50 -10K*
Ind. Linearity:	±0.25% FS	±0.25% FS	±0.25% FS
Repeatablity:	±0.25% FS	±0.25% FS	±0.25% FS
Excitation:	10.00 VDC	10.00 VDC	10.00 VDC
Common Mode Voltage	5.00 VDC	5.00 VDC	5.00 VDC
Nominal Input Resistance:	1500 Ohms	1500 Ohms	1500 Ohms
Nominal Output Resistance:	450 Ohms	450 Ohms	450 Ohms
Accuracy (Lin/Hys/Rep):	±0.25% FS	±0.25% FS	±0.25% FS
Sensitivity (mV/V):	6.0 ±5%	12.0 ±5%	20.0 ±5%
Zero Offset (% FS):	±3.3	±2.5	±2.0
Temp Sensitivity: Zero	±0.03%/°F	±0.02%/°F	±0.01%/°F
Span	±0.01%/°F	±0.01%/°F	±0.01%/°F
Overpressure (% FS):	200	200	150

Burst Pressure: 7 x F.S. @ 15-250 PSI, 5 x F.S. @ 300-3500 PSI, 3 x F.S. @ 4000-10K PSI
Standard Pressure Ranges: 50, 100, 500, 1000, 2000, 5000, and 10,000 PSI
Life: to 10,000,000 cycles (depending on application)