

SSI Technologies, Inc

Pressure Sensors Basics

Our P51 Media Sensor series pressure transducers use a piezo-resistive sensing element; a semiconductor element inside the pressure sensor that changes its resistance in proportion to pressure.

The P51 series has excellent linearity and repeatability. Linearity is defined as the maximum deviation from a perfect line, depicting output signal changes as pressure changes all the way from the minimum pressure to full scale pressure. The full range from the minimum calibrated pressure; usually zero, to the full scale pressure is known as pressure “span”. The ability to be within specification cycle after cycle is known as repeatability.

One interesting discussion regarding any sensor, not just pressure sensors is the difference between Accuracy and Repeatability. Figure 1, illustrates the difference. It is possible to have repeatable sensor, but not an accurate one.

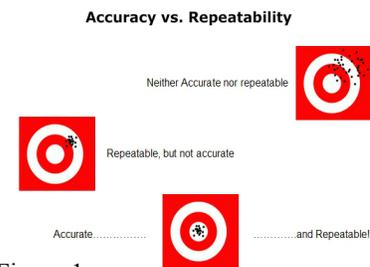


Figure 1

Hysteresis; as shown in figure 2, is another measure of accuracy which defines the ability, in a percentage of full scale, to provide the same output signal at any given pressure independent of whether the pressure is increasing or decreasing.

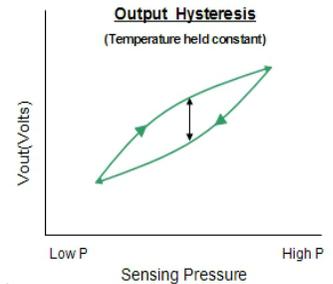


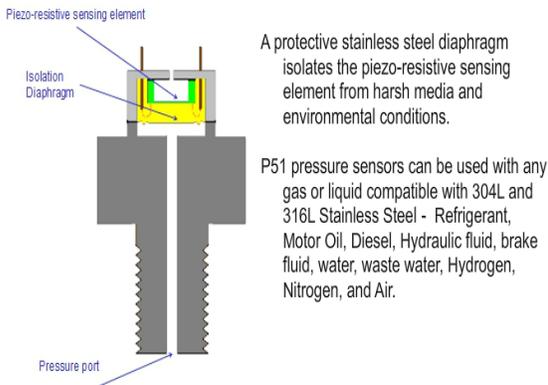
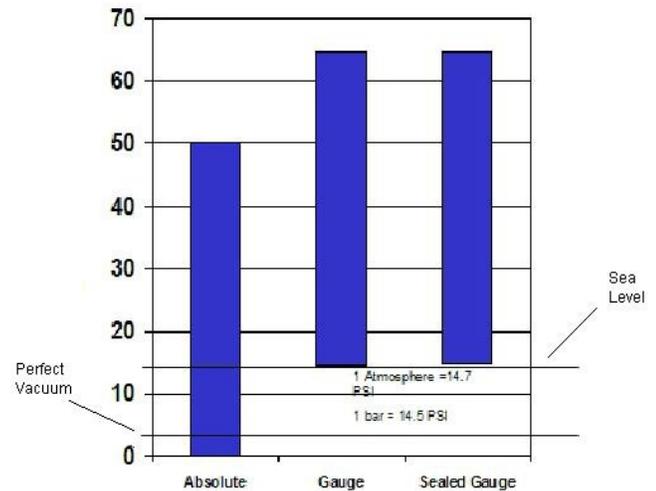
Figure 2

The P51 series offers three different pressure measurement types: Absolute, Gauge and Sealed Gauge.

Absolute Pressure - Absolute sensors (PSIA) measure pressure relative to a sealed chamber at a perfect vacuum, which remains unchanged regardless of ambient pressure conditions. PSIA sensors are used where vacuum, or both vacuum and positive pressure measurements are needed in an application.

Gauge Pressure - Gauge sensors (PSIG) measure pressure relative to ambient pressure rather than a chamber sealed at a perfect vacuum. PSIG sensors are used for lower pressure applications where measurement in a vacuum is not required or provided.

Sealed Gauge Pressure - Sealed gauge sensors (PSIS) measure pressure relative to a sealed chamber a 0 psig. PSIS sensors are used for higher pressure applications where measurement in a vacuum is not required or provided.



The process media or wetted material is important in the selection of a pressure sensor. Many transducers are made of brass and have internal o-rings for sealing the process media from the pressure sensor’s internal electronics. The P51 sensor is a good choice for harsh media as it is made of stainless steel and is laser welded for optimum design integrity. Some piezo-resistive pressure transducers use only an unprotected silicon sensing element. Silicon is a brittle crystalline material, which can sometimes crack under severe cold transient environments. The P51 pressure sensors use an additional 316L stainless steel convoluted diaphragm with a protective non-silicone oil to protect the sensitive silicon sensing element from the harsh media and environmental conditions. The P51 pressure sensor can handle cold temperature transients without sustaining damage. When exposed to extreme temperature transient conditions, and within normal operating temperature ranges, the oil acts as a buffer for the silicon sensing elements against signal bounce resulting from the thermal shock characteristic of certain application such as refrigeration.