

Using BetaGauge PI-PRO for Absolute Pressure Measurement

The BetaGauge PI-PRO is a versatile high performance digital test gauge. One of the features of the PI-PRO is the fact that it can be obtained with one of four possible absolute pressure measurement ranges, 15 psi, 30 psi, 100 psi and 300 psi. It's important to note that these are gauges with the ability to make true barometric measurements. Read on to learn more about absolute pressure measurement, how to do it and tips and tricks...

What is absolute pressure measurement?

By far the most common absolute pressure measurement is used in weather forecasting. It's the barometric pressure. Barometric pressure is measured in inches of Mercury column or millimeters of Mercury column. These are abbreviated "Hg or mmHg respectively.

It's important to recognize that absolute pressure measurement is not the same as vacuum measurement although the measurements may frequently be less than atmospheric. This is a point that confuses many.

The reference for absolute pressure measurement is a "perfect" vacuum as opposed to the ambient atmospheric pressure used for most pressure measurements. Usually this takes the form of a sealed capsule within the pressure sensor. Absolute pressure measurements are valuable in processes where a reaction or state change needs to be closely controlled or monitored. Good examples are distillation columns and steam turbine condensers.

The sealed vacuum capsule in the BetaGauge PI-PRO sensor is important as that enables it to cancel out the effect of any variations in the ambient pressure. In fact, it can be used as a very accurate barometer.

How does it work in the BetaGauge PI-PRO?

The PI-PRO uses a silicon strain gauge sensor with a sealed vacuum capsule as described above. At the time of factory calibration, a barometric zero correction is established for each unit. This is a permanently stored offset that is applied each time the gauge is turned on.

This allows the gauge to accurately track changes in atmospheric pressure. When the sensor port is exposed to the open environment, the gauge will display the current barometric pressure.

Why do I have to "zero" the gauge using a standard?

Over time, long term drift in the silicon sensor will render the barometric zero correction offset invalid. So, the gauge includes a process to allow a user to reset or update the zero offset. The procedure is to press the zero button, then adjust the value displayed using the up and down arrows on the keypad. The gauge must be exposed to ambient atmospheric pressure while so doing.

Generally, the drift will be enough in 3-6 months to put the gauge out of spec. Best practice is to re-reference about every 6 weeks; the shorter the timeframe, the better, of course. As the user gains experience with the process, the period can be adjusted to be shorter or longer depending upon the actual performance of the sensor in the gauge.

By following the zero procedure, the user can store a new offset using data from a known good barometric reference. The factory offset is not overwritten and can be restored if needed.

Using the BetaGauge PI-PRO TARE Function for Absolute Pressure Measurement

The maximum available range for the true barometric style gauge is 300 psi. However, for applications requiring absolute pressure measurement at much higher ranges, the standard gauge as a feature that can be used to emulate the absolute measurement, the TARE function.

Essentially, using the TARE function, a user enters the current atmospheric pressure as an offset to the normal zero displayed by the gauge when vented. The zero will then be valid for a short period of time. It is important to recognize that fluctuations in barometric pressure will affect the performance.

However, since the variation in atmospheric pressure at a single location only varies slightly compared to the full range of the gauge measurement, it can be disregarded in some cases. In fact, the higher the full scale range of the gauge, the better this works.

Research indicates that the maximum variation in barometric pressure world-wide is 6.62" Hg from a low of 25.69" Hg to a high of 32.31" Hg. It is highly unlikely that any single location would experience that much variation.

So, to use this process, the user should obtain the current barometric pressure from a known good standard and set the TARE to the NEGATIVE of that value. The gauge can be returned to normal operation by resetting the TARE value to zero.

Since the value set with TARE will not track barometric changes, it should only be used for limited time periods and adjusted using a good reference as needed. At pressure ranges of 5,000 psi and above, normal variations in barometric pressure have a negligible effect so the need to periodically check the setting is unnecessary.

Summary

The BetaGauge PI-PRO is a good tool for measuring absolute pressure and can be used as a field calibration standard in many applications. It can also be used in high pressure absolute applications by applying a TARE zero offset.