

Absolute reference & gauge reference defined

API TECH SUPPORT - TS1013

What is "Gauge Reference"?

One of the most common pressure references is "gauge reference," which is pressure measured relative to atmospheric pressure. This means that the gauge will read zero with no pressure applied and continue to read zero as atmospheric pressure changes. It is typically signified by a (g) after the pressure unit (e.g. 100 psi g). One common reason for using gauge reference when monitoring pressure is to ensure that, with any location throughout the world, the sensor will always reference zero with no pressure applied. A pressure measurement higher than ambient pressure is referred to as positive pressure. If the measured pressure is below atmospheric pressure, it is called vacuum gauge pressure (negative pressure). Gauges built to measure 1000 psi and above use sealed reference transducers which are referenced to a fixed value of 14.7 psi (normal atmospheric pressure). At these higher pressures, slight atmospheric changes cause no noticeable operational differences.

What is "Absolute Reference"?

Absolute reference gauges use absolute vacuum as a zero reference and thus will read zero at high vacuum and atmospheric pressure with the gauge port open to ambient pressure. It is signified by an (a) after the pressure unit (e.g. 100 psi a). The gauge's reading will vary with barometric pressure and altitude. As locations change, the reference point can change because of atmospheric pressure differences. (The most common reason for this effect is changing elevation.) As vacuum is applied, the readings will decrease, eventually reaching zero when full vacuum is applied. Absolute reference gauges are not available in ranges below 15 psi because the transducer would always be in an over-range condition at normal atmospheric pressures.

A note about atmospheric pressure:

Atmospheric pressure is affected by high and low pressure weather systems and how high the measuring station is located above sea level. For weather barometer readings to make sense, it is desirable to remove the effect of weather station altitude. A weather barometer reading is corrected to a hypothetical sea level reading by taking into account the altitude, pressure reading and temperature. An altimeter reading is corrected by taking into account the altitude and pressure reading.



- ◆ **Gauge pressure** is zero-referenced against ambient air pressure, so it subtracts atmospheric pressure from the pressure measurement equation.
- ◆ **Absolute pressure** is zero-referenced against a perfect vacuum, so it adds atmospheric pressure into the pressure measurement equation.