



## Oil Fill Offset

An oil-filled sensor has the advantages of being non-toxic and therefore compliant for many food, medical or other critical applications. A disadvantage of an oil-filled system is that the organic oil fill can degrade over time at high temperatures. Over a period of months and continuously operating at elevated temperatures greater than 275°C/525°F, some long chain molecules in the oil may degrade and generate gas molecules. While in continued operation, these gases remain in solution in the oil and have no effect on the performance of the sensor. However, if/when the sensor is returned to room temperature and zero pressure, the gas may come out of solution or "outgas" over a short period of time (minutes to hours), creating a bubble or bubbles in a closed filled system. At non-operating room temperature and zero pressure, the gas exerts a small additional pressure, on the order of 50-100psi, and results in an apparent increase in the zero output. The gas offset error represents a higher percentage effect in lower versus higher pressure range systems. The actual magnitude will depend on the percentage of oil that may have degraded over time at temperature.

When the sensor is returned to operation with increased pressure and temperature, the gas bubble(s) will go back into solution. Testing has shown that the gas is typically reabsorbed at temperatures exceeding 100°C/212°F. With the gas reabsorbed, the sensor is reading the true pressure at specified accuracies. When the sensor is installed and brought to operating temperature and before applying pressure, it can then be re-zeroed without any impact on the calibration accuracy.

### Recommended Zero Adjustment

Prior to performing a zero adjustment, it is recommended that the system be installed and the equipment brought to process temperature greater than 100°C, at or near zero pressure. This will allow any gas to be absorbed into the oil and will eliminate offset effects.

If a zero adjustment is conducted at less than 100°C (e.g., bench calibration test port), briefly pressurize to  $\geq 150$ psi/10bar, then depressurize the system prior to performing the zero adjustment. Pressurizing followed by depressurizing will temporarily allow any gas absorbed into the oil and eliminate offset effects. Verify that the zero output value will be repeated by reapplying pressure to  $\geq 150$ psi/10bar followed by depressurizing.