PRODUCT INFORMATION

TEMPERATURE COMPENSATION

The problem of temperature effects upon metal elastic elements is not unique to dial gauges and plagues electronic instruments as well. Since electronic instruments operate on a vastly different principle than the dial gauge, the temperature compensation techniques are equally dissimilar. In fact, even among Heise® electronic instruments the methods of temperature compensation vary greatly, as can be evidenced by a closer look at the Series 9 indicator.

Older technology instruments employed the "analog approach" whereby compensation was achieved by conditioning the internal analog signal produced by the sensor. The analog signal was channeled through a series of resistors which vary resistance under different temperatures, thus offsetting the error caused by the effects of temperature upon the sensing element.

With the advent of the Series 9, a new method of temperature compensation was developed based on the "software approach." In this method, the need for thermistors and tempsistors has been eliminated. Instead, a temperature diode is attached to the sensor body. The diode produces an analog voltage signal which is multiplexed in conjunction with the analog (pressure) signal from the "duo-diode" inside the sensor. The signal is then converted from analog to digital (BCD) and directed to the microprocessor where it is corrected based on the second order polynomial curve fit information which is stored in the EE PROMS. These curves were established and programmed into the PROMS based on observations made during the initial temperature compensation and calibration cycle. Since the temperature profile is established and programmed while the unit is "on line" during the first temperature compensation cycle, a second cycle is usually not required.

The temperature error specification for Series 9 indicators is…"+0.004% of span per degree F from a reference temperature of 73 degrees, over the temperature compensated span." This means that for each degree that the temperature differs from 73, the user should add an additional 0.004% error to the advertised accuracy spec. For example, if a 901A is being operated in an 83 degree environment, the user should calculate the overall accuracy as follows:

0.004% x 10 (degrees difference from 73)	=	0.04%
Advertised Accuracy @ 73	=	+0.07%
Total Accuracy @ 83	=	0.11%

If a unit is being operated outside of the temperature compensation span envelope, then the 0.004%/degree F specification can no longer be applied as the unit has not been tested at these temperatures. The purpose of the extended temperature compensation option is to open up the temperature compensation span envelope from the standard 45/95 degrees to a span of 20/120 degrees F. Please note that the 0.004% specification is not changed as a result of selecting this option; it will only be applied over a wider range of temperature.

Like the dial gauge, the temperature compensation on electronic instruments is intended to compensate for the effects of ambient temperature only. However, by mounting the temperature diode onto the Series 9 sensor body, one of the inadvertent advantages has been the unit's ability to partially compensate for the process temperature as well. Due to the many variables involved in measuring the compensation affect, this benefit is difficult to quantify, and thus is not incorporated into the specifications