

SELF-VALIDATING TEMPERATURE SENSORS (SVS™)

How do they work?

Thermocouple and RTD technology has been around for many years. It has been refined and extended to cover a broad range of temperature measurement needs. It is well documented that these contact temperature measurement devices experience “drift” or de-calibration while in service. For various reasons the sensor output can “drift” away from representing the true temperature. The magnitude of the drift depends on sensor construction, installation and the conditions to which it is subjected, but it is well established, though not widely advertised, that all sensors are subject to drift. The real problem is that there has been no way to tell when drift begins to occur or to determine its magnitude or direction. This costs industry millions of dollars each year in off-quality product, less than optimum yields, underutilized capacity, unnecessary emergency shutdowns, reduced equipment life and safety and emissions problems. Now, Dynamically Self-Validating Sensors have been invented that eliminate unreliable readings and warn in advance of the onset of drift.

Self-Validating Sensor technology is based on the ability to measure multiple, mutually exclusive thermoelectric properties of thermally sensitive materials contained in the tip of the sensor probe. Construction of the sensor probe is similar to that of a thermocouple or RTD but is specially designed so that the thermal response of each element of the sensor can be monitored using independent combinations with multiple other elements. The signal conditioner/transmitter multiplexes these measurements and determines the health of each individual thermo-element using multiple signals and at least two of its electrical properties. This concept makes it possible to continuously “validate” each of the measuring elements inside the sensor while it is in service so that no element can drift without detection. If an individual element begins to drift or de-calibrate for any reason, the system disregards the data for that element while still providing an accurate NIST Traceable temperature with the remaining “healthy” elements. Using information about the number of “healthy” elements in the sensor, the transmitter provides sensor health status to the operator or control system and notifies of impending loss of sensor validation before it occurs. Therefore an accurate and reliable temperature is reported for the life of the sensor.

Summarizing the features of this technology:

- 1) It uses a new concept of combining multiple independent measurements of the system temperature and monitoring individual element health.
- 2) It continuously validates and reports the system temperature.
- 3) It continuously reports the health of the sensor.
- 4) It warns in advance of the onset of de-calibration.
- 5) It reports a temperature traceable to a NIST standard for the life of the sensor.

This gives the process operator ultimate confidence in the temperature reading and provides reliable data for improving process control and optimization. It also makes possible predictive maintenance for replacement of sensors before they fail.

Daniel A. Barberree, PhD
Director of Technology
AccuTru International Corporation
817 Russell Palmer Road

Kingwood, Texas 77339
Phone: 281-358-5600 x516
Fax: 281-358-5605
Email: dbarberree@accutru.com