

Decalibration and Drift – Part 1

All thermocouples are subject to calibration drift with use, it is just a matter of how much, and how fast this may happen. Thermocouple performance is critically dependent upon absolute uniformity of both physical and chemical properties along the entire length of the wires in the circuit. This is because the thermoelectric emf produced by the thermocouple is a combination of the emf produced at every point along its length.

Thermoelement materials are carefully produced to assure that uniformity (or homogeneity) is achieved. However, when placed in service, different parts of the thermoelements experience different conditions of heat, chemical exposure etc, and as a result those parts actually do become physically and chemically "different" over time.

Because the thermoelectric emf (and therefore the temperature reading) depends on the chemical and metallurgical properties of the wire along its entire length, the total emf produced by a used probe can be different from an otherwise identical new one under the same conditions. Fortunately in many applications the changes over time are small. But under adverse conditions, large drifts at rapid rates can and do occur and the temperature reading can be far from the true temperature in the process.

Some processes can tolerate small errors in the thermocouple measurements from the true temperature without being adversely affected. However in many processes the temperature measurements are critical to process safety, yield, energy consumption, equipment life and environmental compliance and even small deviations in the readings from true can have significant economic impact.

To achieve long and reliable thermocouple life, the usual strategy is to operate the device comfortably under its maximum temperature, and provide it with the cleanest possible environment in which to work. Protective sheaths, tubes, and thermowells are often employed to try to control the conditions that surround the thermoelements themselves.

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