

## **Making Low-Uncertainty Measurements with Thermistor Thermometers**

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### **Abstract**

Thermistor thermometers capable of achieving long-term measurement uncertainty performance similar to the best Platinum Resistance Thermometers (PRTs) are readily available and simple to use. If a limited temperature range is appropriate for the application, thermistors can not only provide low- uncertainty measurements, but they can also have the additional benefit of a sensor that is less sensitive to physical shock and vibration and that can also measure effectively in a smaller space than that required for a typical PRT. However, due to the International Temperature Scale of 1990 (ITS-90) requiring the use of Platinum Resistance Thermometers as interpolation devices, most reference thermometers are of the PRT type so most technical publications focus on PRTs for use at the highest levels of temperature metrology. Therefore, there aren't many clear and concise guidelines or standards to refer to when using thermistors at this level of performance. The purpose of this paper is to present the guidelines and best practice needed to achieve these low-uncertainty measurements. The paper describes how to achieve long-term total measurement uncertainty as low as 3 mK. The sources of uncertainty will be clearly explained, examples provided for calculation purposes, including the method of combining the uncertainties, and guidelines recommended for ensuring thermistors measure within the expected uncertainty.