

Proficiency Testing for Achieving Accreditation in Thermometry

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The establishment of traceability is a critical component of accreditation. Traceability requires that an unbroken chain of comparisons to national standards with stated and documented uncertainties be established. The use of proficiency testing for validating uncertainty claims contained within a Scope of Accreditation is an International Laboratory Accreditation Cooperation (ILAC) requirement. In order to support the ILAC requirement, the National Institute of Standards and Technology (NIST) Thermometry Group offers proficiency testing for contact thermometry including: thermometric fixed points, standard platinum resistance thermometers, industrial platinum resistance thermometers, thermistors, thermocouples, and liquid-in-glass thermometers. The NIST Thermometry Group proficiency tests scale inversely in difficulty as a function of the uncertainties contained within a facility's Scope of Accreditation. The offered proficiency tests are designed to establish confidence in the participant's calibration capabilities and uncertainty claims without being an undue burden to the calibration facility.

The NIST Thermometry Group proficiency tests involve measurements of NIST-owned artifact(s) at NIST, measurements of the artifact(s) at the participant's calibration facility, and then a second set of measurements at NIST. There are two approaches that a participant chooses when participating in a proficiency test, either "best effort" or "routine". The "routine" approach is considered the most beneficial for assessing the measurement capabilities and uncertainty claims provided to the participant's customers. On completion of the measurement phase of a proficiency test, a detailed report is generated to give the difference in temperature realization between that of the participant and NIST and the degree of equivalence. For each test point, an E_n value (degree of equivalence) is calculated by $E_n = \Delta T_{90} (\text{Participant} - \text{NIST}) / U_C (k = 2)$, where

U_C is the combined expanded uncertainty of the participant and NIST. An $|E_n|$ value of less than one signifies compliance for the participant. As part of the goal to improve the participant's measurement capabilities, the report also gives suggested solutions to any identified measurement issues that need attention.

The role of proficiency testing as part of the process in achieving NIST National Voluntary Laboratory Accreditation Program (NVLAP) accreditation in thermometry is discussed in the paper. Additionally, the descriptions of the NIST Thermometry Group unbiased third-party proficiency tests and some unidentified participant results are given.