



Standard Practice for Reporting Thermometer Calibrations¹

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1. Scope

1.1 This practice contains reporting requirements for thermometer calibrations included in ASTM Committee E20 Test Methods.

1.2 This practice covers reports of calibration for radiation thermometers, liquid-in-glass thermometers, resistance thermometers, digital thermometers, and new thermocouples.

NOTE 1—This practice does not apply to used thermocouples.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

E77 Test Method for Inspection and Verification of Thermometers

E344 Terminology Relating to Thermometry and Hydrometry

E1137 Specification for Industrial Platinum Resistance Thermometers

2.2 Other Standards or Guides:

ANSI/NCSL Z540.3-2006 American National Standard for Calibration—Calibration Laboratories and Measuring and Test Equipment—General Requirements³

ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories³

JCGM100:2008 Evaluation of Measurement Data—Guide to the Expression of Uncertainty in Measurement

ISO/IEC Guide 98-3 Uncertainty of Measurement—Part 3:

Guide to the Expression of Uncertainty in Measurement (GUM:1995)

NIST Technical Note 1297 Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results, 1994 Edition

UKAS M3003 The Expression of Uncertainty and Confidence in Measurement, Edition 2

ANSI/NCSL Z540.2-1997 (R2002) U.S. Guide to the Expression of Uncertainty in Measurement

3. Terminology

3.1 *Definitions*—Definitions given in Terminology E344, unless otherwise defined herein, apply to terms as used in this practice.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *correction, n*—numerical value added to the uncorrected result of a measurement to compensate for errors.

3.2.1.1 *Discussion*—The correction is equal to the negative of the estimated errors. Since the systematic error cannot be known perfectly, the compensation cannot be complete.

3.2.2 *error, n*—the indication of a thermometer or temperature measuring device minus the true value of the corresponding input quantity.

3.2.2.1 *Discussion*—Since the true value cannot be determined, in practice a conventional true value is used. This concept applies mainly when the instrument is compared to a reference standard.

3.2.3 *gradient zone, n*—the section of a thermocouple that is exposed during a measurement to temperatures in the range from $t_{amb} + 0.1(t_m - t_{amb})$ to $t_{amb} + 0.9(t_m - t_{amb})$, where t_{amb} is ambient temperature and t_m is the temperature of the measuring junction (all in °C).

3.2.3.1 *Discussion*—This term is used in thermocouple calibration reports as part of the description of the thermal profile along the length of the thermocouple. Although thermocouple emf is a function of the measuring and reference junction temperatures, the emf is actually generated along the length of the thermocouple, wherever the thermoelements pass through a temperature gradient. The gradient zone definition is intended to describe, in an approximate way, the section of thermocouple that created most of the emf during the calibration.

3.2.4 *half-maximum heated length, n*—the distance between the tip of the temperature sensor and the position along the

¹ This practice is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.07 on Fundamentals in Thermometry.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.