



Standard Test Methods for Testing Industrial Resistance Thermometers¹

This standard is issued under the fixed designation E644; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods cover the principles, apparatus, and procedures for calibration and testing of industrial resistance thermometers.

1.2 These test methods cover the tests for insulation resistance, calibration, immersion error, pressure effects, thermal response time, vibration effect, mechanical shock, self-heating effect, stability, thermoelectric effect, humidity, thermal hysteresis, thermal shock, and end seal integrity.

1.3 These test methods are not necessarily intended for, recommended to be performed on, or appropriate for every type of thermometer. The expected repeatability and reproducibility of the results are tabulated in [Appendix X4](#).

1.4 These test methods, when specified in a procurement document, shall govern the method of testing the resistance thermometer.

1.5 Thermometer performance specifications, acceptance limits, and sampling methods are not covered in these test methods; they should be specified separately in the procurement document.

1.6 *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.* Specific precautionary statements are given in [5](#), [6](#), [8](#), [16](#), and [17](#).

2. Referenced Documents

2.1 *ASTM Standards:*²

[E1 Specification for ASTM Liquid-in-Glass Thermometers](#)
[E77 Test Method for Inspection and Verification of Thermometers](#)

¹ These test methods are under the jurisdiction of ASTM Committee [E20](#) on Temperature Measurement and are the direct responsibility of Subcommittee [E20.03](#) on Resistance Thermometers.

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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.

[E230 Specification and Temperature-Electromotive Force \(EMF\) Tables for Standardized Thermocouples](#)
[E344 Terminology Relating to Thermometry and Hydrometry](#)
[E563 Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature](#)
[E1137/E1137M Specification for Industrial Platinum Resistance Thermometers](#)
[E1502 Guide for Use of Fixed-Point Cells for Reference Temperatures](#)
[E1750 Guide for Use of Water Triple Point Cells](#)
[E1751 Guide for Temperature Electromotive Force \(EMF\) Tables for Non-Letter Designated Thermocouple Combinations \(Withdrawn 2009\)](#)³
[E2251 Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids](#)

2.2 *Military Standard:*⁴

[MIL-STD-202 Test Methods for Electronic and Electrical Component Parts](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 The definitions given in Terminology [E344](#) shall apply to these test methods.

3.1.2 *bath gradient error, n*—the error caused by temperature differences in the working space of the bath. (The bath or temperature equalizing blocks should be explored to determine the work areas in which the temperature gradients are insignificant.)

3.1.3 *connecting wire error, n*—the error caused by uncompensated connecting wire resistance. (Although the connecting wire is part of the measurement circuit, most of it is not at the temperature that is being determined. Thermometers are available in two-, three-, and four-wire configurations. There is no satisfactory way to compensate for the wire resistance in the measurement with a two-wire thermometer although the wire resistance can be compensated for in three and four-wire thermometers.)

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20234.