



Standard Test Method for Thermal EMF Test of Single Thermoelement Materials by Comparison with a Reference Thermoelement of Similar EMF-Temperature Properties¹

This standard is issued under the fixed designation E207; 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.

^{ε1} NOTE—Editorial changes were made throughout in June 2015.

1. Scope

1.1 This test method covers a test for determining the thermoelectric emf of a thermoelement versus NIST platinum 67 (Pt-67) by means of measuring the difference between the emf of the test thermoelement and the emf of a reference thermoelement (previously referred to as a secondary standard), which has a known relationship to NIST Pt-67.

1.2 This test is applicable to new thermocouple materials over the temperature ranges normally associated with thermocouples and their extension wires. The table on Suggested Upper Temperature Limits for Protected Thermocouples in Specification E230 lists the ranges associated with the letter-designated types of thermocouples. *ASTM MNL-12*² lists the temperature range of extension circuit materials.

1.3 This test is not applicable to stability testing or inhomogeneity testing.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *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:³

¹ This test method is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.04 on Thermocouples.

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² *Manual on the Use of Thermocouples in Temperature Measurement*, ASTM MNL-12, Fourth Edition, ASTM, April 1993. (Revision of STP 407B).

³ 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.

E77 Test Method for Inspection and Verification of Thermometers

E220 Test Method for Calibration of Thermocouples By Comparison Techniques

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

3. Terminology

3.1 *Definitions*—The terms used in this test method are defined in Terminology E344.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *reference facility, n*—NIST, or a testing laboratory whose physical standards are traceable to NIST or another national standards laboratory.

3.2.2 *test temperature, n*—the temperature of the measuring junction.

3.2.2.1 *Discussion*—In reporting the results, the value of the test temperature may be rounded off, provided the stated test temperature is within the bounds indicated in 10.10.

4. Summary of Test Method

4.1 The emf of a thermoelement sample is determined by comparison to a reference thermoelement that has similar Seebeck coefficients.

4.2 This test is conducted on one or more lengths of specimens connected to a single length of the reference thermoelement at a single point. The joined ends are held at the test temperature, and their opposite ends are held at a constant reference temperature.

4.3 The emf of the reference thermoelement relative to Pt-67 at several test temperatures are provided by a reference facility.