



Standard Practice for Calibration and Use of Thermocouple Reference Junction Probes in Evaluation of Electronic Reference Junction Compensation Circuits¹

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ε¹ NOTE—Note 12 was moved to a new location below Table 2 in November 2015.

1. Scope

1.1 This guide covers methods of calibration and use of thermocouple reference junction probes (cold junction compensation probes) in the evaluation of electronic reference junction compensation circuits. Their use with instruments that measure only voltage is also covered.

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

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

- 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
- E1129/E1129M Specification for Thermocouple Connectors
- E1684 Specification for Miniature Thermocouple Connectors
- E1750 Guide for Use of Water Triple Point Cells

¹ This practice 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 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.

E2623 Practice for Reporting Thermometer Calibrations

2.2 Other References:

- NIST Monograph 175 Temperature-Electromotive Force Reference Functions and Tables for the Letter-Designated Thermocouple Types Based on the ITS-90
- ASTM MNL12 Manual On The Use Of Thermocouples In Temperature Measurement
- BIPM JCGM 100:2008 Evaluation of Measurement Data—Guide to the Expression of Uncertainty in Measurement

3. Terminology

3.1 *Definitions*—The definitions given in Terminology E344 shall apply to this guide.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *correction, n*—an offset value added to the result of a measurement to obtain a correct result.

NOTE 1—This definition is from Test Method E220.

3.2.2 *reference junction compensation, n*—the electrical correction of the indication of a thermocouple such that the corrected indication is equivalent to the emf or temperature the instrument would indicate if the reference junctions were physically maintained at 0°C.

3.2.3 *reference junction probe, n*—a probe constructed from thermocouple materials and high purity copper wire for the purpose of serving as the reference junction for a thermocouple assembly. Reference junction probes may be constructed as part of the measuring probe or they can be manufactured separately and later attached to thermocouple sensors via plugs or other connection types.

3.2.4 *UUT, n*—Unit Under Test.

4. Summary of Guide

4.1 Calibration of a Reference Junction Probe (RJP) consists of establishing the emf error in the RJP relative to the applicable thermocouple reference function by placing the measuring junction and the reference junctions at known temperatures while measuring the voltage with a digital voltmeter (DVM) or potentiometer. Three methods are described