



Standard Test Method for Inspection and Verification of Thermometers¹

This standard is issued under the fixed designation E 77; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers visual and dimensional inspection, test for permanency of pigment, test for bulb stability, and test for scale accuracy to be used in the verification of liquid-in-glass thermometers as specified in Specification E 1. However, these procedures may be applied to other liquid-in-glass thermometers.²

NOTE 1—The use of NIST SP250-23² is recommended.

1.2 *This standard does not purport to address all of the safety problems, 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

E 1 Specification for ASTM Thermometers

E 344 Terminology Relating to Thermometry and Hydrometry

3. Terminology

3.1 Definitions:

3.1.1 The definitions given in Terminology E 344 apply. Some that are considered essential to this standard are given below.

3.1.2 *complete-immersion thermometer, n*—a liquid-in-glass thermometer, not specified in ASTM documents, designed to indicate temperature correctly when the entire thermometer is exposed to the temperature being measured.

3.1.3 *partial-immersion thermometer, n*—a liquid-in-glass thermometer designed to indicate temperature correctly when the bulb and a specified part of the stem are exposed to the temperature being measured.

3.1.4 *total-immersion thermometer, n*—a liquid-in-glass thermometer designed to indicate temperature correctly when just that portion of the thermometer containing the liquid is exposed to the temperature being measured.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *calibration, n*—the determination of the indications of a thermometer with respect to temperatures established by a standard resulting in scale corrections to be applied when maximum accuracy is required.

3.2.2 *reference point, n*—a temperature at which a thermometer is checked for changes in the bulb volume.

3.2.3 *verification, n*—the process of testing a thermometer for compliance with specifications.

3.2.4 *verification temperatures, n*—the specified temperatures at which thermometers are tested for compliance with scale error limits.

3.2.5 Other descriptions of terms relating to thermometers are included in Sections 3 and 17 of Specification E 1.

4. Significance and Use

4.1 The test method described in this standard will ensure that the thermometers listed in Specification E 1 will indicate temperatures within the maximum scale errors listed, be compatible with the apparatus, and serve the purpose for which they were designed. Fig. 1

4.2 Thermometers that do not pass the visual and dimensional inspection tests may give erroneously high or low temperature readings, or may not fit into existing equipment used in ASTM methods. If the pigment in the scale etchings washes out or fades, the thermometer will be difficult to read. Improper annealing of the bulb, as determined by the bulb stability test, will result in thermometer readings rapidly changing with time and use. For accurate temperature measurements the scale readings of the thermometer should be verified as described in this test method.

¹ This test method is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.05 on Liquid-in-Glass Thermometers and Hydrometers.

Current edition approved Nov. 1, 2003. Published November 2003. Originally approved in 1949. Last previous edition approved in 1998 as E 77 – 98.

² “Liquid-in-Glass Thermometer Calibration Service,” NIST Special Publication 250-23, 1988, Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325.

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.