



Designation: D7962 – 21

# Standard Practice for Determination of Minimum Immersion Depth and Assessment of Temperature Sensor Measurement Drift<sup>1</sup>

This standard is issued under the fixed designation D7962; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

## 1. Scope\*

1.1 This practice describes two procedures for use with temperature measurement devices. Methodology is described for determining minimum immersion depth for thermal sensors, in particular RTDs or similar temperature sensors. Included is a procedure for consistently preparing a reference bath for the purpose of monitoring measurement drift of thermal sensors such as liquid-in-glass or digital contact thermometers.

1.2 This practice focuses on temperature measurement drift in a laboratory. If the user requires greater measurement accuracy, then they should follow the instructions in Practice E563.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

E563 Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.91 on Coordinating Subcommittee on Thermometry.

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<sup>2</sup> 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. Terminology

3.1 *Definitions:*

3.1.1 *digital contact thermometer (DCT), n*—an electronic device consisting of a digital display and associated temperature-sensing probe.

3.1.1.1 *Discussion*—This device consists of a temperature sensor connected to a measuring instrument; this instrument measures the temperature-dependent quantity of the sensor, computes the temperature from the measured quantity, and provides a digital output. This digital output goes to a digital display and/or recording device that may be internal or external to the device.

3.1.1.2 *Discussion*—The devices are often referred to as a “digital thermometers,” however the term includes devices that sense temperature by means other than being in physical contact with the media.

3.1.1.3 *Discussion*—Portable electronic thermometers (PET) is an acronym sometimes used to refer to a subset of the devices covered by this definition.

3.1.2 *ice-point bath, n*—physical system containing ice and water assembled to realize the ice point as a reference temperature, or to establish a constant temperature near 0 °C.

3.1.3 *minimum immersion depth, n*—depth that a thermometer should be immersed, in a uniform temperature environment, such that further immersion does not produce a change in indicated temperature greater than the specified tolerance.

## 4. Summary of Practice

4.1 This practice provides a procedure for determining measurement drift of a temperature sensor and a procedure for determining the minimum immersion depth of temperature sensor using an ice bath.

4.2 This practice describes a procedure for consistently preparing an ice bath that is an intimate mixture of crushed ice or ice particles and water in a thermally insulating vessel open to the atmosphere.

4.2.1 *Caution*—the ice and water used to prepare an ice bath should be made from distilled or deionized water. A bath so prepared can provide a temperature uncertainty of about

\*A Summary of Changes section appears at the end of this standard