Designation: D7962 – 16

Standard Practice for Determination of Minimum Immersion Depth and Assessment of Temperature Sensor Measurement Drift[1]

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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This practice describes a 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

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. These devices are sometimes referred to as a "digital thermometer".

3.1.1.2 *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 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.

4.1.1 Caution—when the ice bath is not made from distilled water, its temperature will differ from the natural fixed-point temperature by a consistent amount, typically less than 0.02 °C. If the user needs a more accurate ice point, then they should use Practice E563 to prepare the ice bath.

4.2 This practice includes a procedure for determining the minimum immersion depth of the temperature sensor using an ice bath.

4.2.1 This procedure determines minimum immersion depth with a 25 °C differential between sensed temperature and ambient temperature. If the probe is subjected to a greater differential temperature, a larger immersion depth may be required to correctly measure the temperature.

5. Significance and Use

5.1 This practice provides a means for the users of ASTM Committee D02 standards to monitor the drift in sensed

[1] 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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[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.

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