**Designation: ~~D1122 – 20~~ D1122 – 22**

# Standard Test Method for ~~Density or~~ Relative Density of Engine Coolant Concentrates and Engine Coolants By The Hydrometer[1]

This standard is issued under the fixed designation D1122; 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 U.S. Department of Defense.*

## 1. Scope*

1.1 This test method covers the determination of the relative density of glycols, glycerin, heat transfer fluids, engine coolant concentrates, and aqueous engine coolants.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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

1.4 *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:*[2]

D1176 Practice for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes

E100 Specification for ASTM Hydrometers

E230/E230M Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

## 3. Terminology

3.1 *Definitions:*

3.1.1 *relative density, n*—the ratio of the density of a material at a stated temperature to the density of water at the same stated temperature.

## 4. Significance and Use

4.1 The relative density of an engine coolant may be used to determine the approximate percent glycol, freezing point, and boiling point, provided the glycol type is known.

---

[1] This test method is under the jurisdiction of ASTM Committee D15 on Engine Coolants and Related Fluids and is the direct responsibility of Subcommittee D15.03 on Physical Properties.

Current edition approved ~~April 1, 2020~~Sept. 1, 2022. Published ~~May 2020~~September 2022. Originally approved in 1950. Last previous edition approved in ~~2017~~2020 as D1122-~~16 (2017)~~20. ~~ε1~~. DOI: ~~10.1520/D1122-20.~~10.1520/D1122-22.

[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**

4.2 The relative density of an engine coolant concentrate can be used as a production control test.

4.3 ASTM specifications normally state the temperatures for relative density of fluids; 25 °C, 20 °C, and 15.6 °C are commonly used temperatures.

## 5. Apparatus

5.1 *Hydrometers*—Hydrometers shall be of glass, graduated in specific gravity range as listed in Table 1, and shall conform to Specification E100.

5.2 *Hydrometer Cylinder*—The hydrometer cylinder in which the sample for the relative density test is confined shall be made of clear glass and shall be cylindrical in shape. For convenience in pouring, it may have a lip on the rim. The inside diameter of the cylinder shall be at least 25.4 mm (1.0 in.) greater than the outside diameter of the hydrometer. The height of the cylinder shall be such that the length of the column of sample it contains is greater by at least 25.4 mm (1.0 in.) than the portion of the hydrometer which is immersed beneath the surface of the sample after a state of equilibrium has been reached.

5.3 *Temperature Measuring Instrument* (environmentally safe thermometer or thermocouple) capable of monitoring the observed test temperature to within an accuracy of ±0.05 °C, Specification E230/E230M. If a liquid-in-glass thermometer is used, it shall be calibrated and graduated to 0.1 °C. The thermometer shall be calibrated at least annually against a certified and traceable standard. See Section 8, Precision and Bias. The data presented in this subsection are derived using mercury-in-glass thermometers only.

5.4 *Water Bath*—A water bath capable of maintaining a sample temperature to ±0.3 °C (±0.5 °F) during the test.

## 6. Sampling

6.1 Sample the coolant in accordance with Practice D1176, except as specified in this test method.

## 7. Procedure

7.1 If the coolant has a small amount of separated upper layer, remove it before determining the relative density of the lower layer. To separate, pour the sample into a 500 mL separatory funnel, allow to stand for 3 h at room temperature but not below 20 °C (68 °F), and then draw off the lower layer.

7.2 If the original coolant is homogeneous, no separation will be required.

7.3 Cool the homogeneous sample or the separated lower layer sample to about 2 °C below the test temperature. Pour the sample into the clean, dry hydrometer cylinder without splashing, so as to reduce to a minimum the formation of air bubbles (see Note 1). Place the cylinder vertically in the water bath and let the temperature of the sample reach 0.5 °C below the test temperature. Slowly and carefully lower the hydrometer into the sample to a level two smallest scale divisions below that at which it will float and then release the hydrometer. When the hydrometer has come to rest and floats freely away from the walls of the cylinder, and the temperature has reached ±0.3 °C (±0.5 °F) the test temperature, read the hydrometer.

NOTE 1—When handling the sample (that is, mixing, transferring, or stirring) be careful to avoid formation of air bubbles. Remove any air bubbles by touching them with a clean, dry glass rod.

7.4 The hydrometer is read in the following ways: If the sample is sufficiently transparent, place the eye slightly below the level of the liquid and slowly raise it until the surface of the sample changes from a distorted ellipse to a straight line cutting the hydrometer scale. If the sample is opaque, read the point on the hydrometer scale to which the sample rises above the main surface

**TABLE 1 Available Hydrometer Sets**

| ASTM Hydrometer No. | Type | Range | |
|---|---|---|---|
| | | Total | Each Hydrometer |
| 111H to 117H | for general use in heavy liquids | 1.000 to 1.350 | 0.050 |