



## Standard Test Method for Density and Relative Density of Engine Coolant Concentrates and Aqueous Engine Coolants by Digital Density Meter<sup>1</sup>

This standard is issued under the fixed designation D 5931; 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 test method covers the determination of the density or relative density of engine coolant concentrates and aqueous engine coolants.

1.2 This test method should not be applied to samples so dark in color that the absence of air bubbles in the sample cell cannot be established with certainty.

1.3 The accepted units of measure for density are grams per milliliter or kilograms per cubic meter.

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.* For specific hazard statements, see Note 1.

### 2. Referenced Documents

2.1 *ASTM Standards:*

D 1193 Specification for Reagent Water<sup>2</sup>

D 4052 Test Method for Density and Relative Density of Liquids by Digital Density Meter<sup>3</sup>

### 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. Summary of Test Method

4.1 A small volume of liquid sample is introduced into an oscillating sample tube, and the change in oscillating frequency

caused by the change in the mass of the tube is used in conjunction with calibration data to determine the density of the sample.

### 5. Significance and Use

5.1 Density is a fundamental physical property that can be used in conjunction with other properties to characterize engine coolant concentrates and aqueous engine coolants.

5.2 Determination of the density or relative density of these products is necessary for the conversion of measured volumes to volumes at the standard temperature of 20°C (68°F).

### 6. Apparatus

6.1 *Digital Density Analyzer*, consisting of a U-shaped, oscillating sample tube and a system for electronic excitation, frequency counting, and display. The analyzer must accommodate the accurate measurement of the sample temperature during measurement or must control the sample temperature as described in 6.2. The instrument must meet the precision requirements described in this test method.

6.2 *Circulating Constant—Temperature Bath*, (optional) capable of maintaining the temperature of the circulating liquid constant to  $\pm 0.05^\circ\text{C}$  in the desired range. Temperature control can be maintained as part of the density analyzer instrument package.

6.3 *Syringes*, at least 2 mL in volume with a tip or an adapter tip that will fit the opening of the oscillating tube.

6.4 *Flow-Through or Pressure Adapter*, for use as an alternative means of introducing the sample into the density analyzer either by a pump or by vacuum.

6.5 *Thermometer*, calibrated and graduated to  $0.1^\circ\text{C}$ , with a thermometer holder that can be attached to the instrument for setting and observing the test temperature. In calibrating the thermometer, the freeze point should be estimated to the nearest  $0.05^\circ\text{C}$ .

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D15 on Engine Coolants and is the direct responsibility of Subcommittee D15.03 on Physical Properties.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 11.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 05.02.