



Standard Test Method for Freezing Point of Aqueous Ethylene Glycol Base Engine Coolants by Automatic Phase Transition Method¹

This standard is issued under the fixed designation D6660; 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.

^{ε1} NOTE—Units information was corrected and Note 4 was changed to a warning statement and included in Section 7.3 editorially in July 2014.

1. Scope

1.1 This test method covers the determination of the freezing point of an aqueous engine coolant solution.

1.2 This test method is designed to cover ethylene glycol base coolants up to a maximum concentration of 60 % (v/v) in water; however, the ASTM interlaboratory study mentioned in 12.2 has only demonstrated the test method with samples having a concentration range of 40 to 60 % (v/v) water.

NOTE 1—Where solutions of specific concentrations are to be tested, they shall be prepared from representative samples as directed in Test Method D1176. Secondary phases separating on dilution need not be separated.

NOTE 2—The products may also be marketed in a ready-to-use form (prediluted).

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.* Some specific hazards statements are given in 7.3.

2. Referenced Documents

2.1 ASTM Standards:²

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

D1177 Test Method for Freezing Point of Aqueous Engine Coolants

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 July 1, 2014. Published July 2014. Originally approved in 2001. Last previous edition approved in 2007 as D6660 – 01(2007). DOI: 10.1520/D6660-01R14E01.

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.

D3306 Specification for Glycol Base Engine Coolant for Automobile and Light-Duty Service

D6210 Specification for Fully-Formulated Glycol Base Engine Coolant for Heavy-Duty Engines

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *automatic phase transition method, n*—in this standard, the procedures of automatically cooling an engine coolant sample until solid crystals appear, followed by controlled warming and recording the temperature at which the crystals redissolve into the liquid phase.

3.1.2 *freezing point, n*—the temperature at which crystallization begins in the absence of supercooling, or the maximum temperature reached immediately after initial crystal formation in the case of supercooling, or the temperature at which solid crystals, formed on cooling, disappear when the temperature of the specimen is allowed to rise.

3.1.3 *peltier device, n*—a solid state thermoelectric device constructed with dissimilar semiconductor materials, configured in such a way that it will transfer heat to and away from a test specimen dependent on the direction of electric current applied to the device.

4. Summary of Test Method

4.1 A specimen is cooled by a Peltier device while continuously being illuminated by a light source. The specimen is continuously monitored by an array of optical detectors for the first formation of crystals. Once the crystals are formed, the specimen is then warmed at controlled rates until all the crystals return to the liquid phase. The detectors are sufficient in number to ensure that any crystals are detected. The specimen temperature at which the crystals return to the liquid phase is recorded by the temperature sensor as the freezing point.

5. Significance and Use

5.1 The freezing point of an engine coolant indicates the coolant freeze protection.