



Designation: D 1177 – 05

Standard Test Method for Freezing Point of Aqueous Engine Coolants¹

This standard is issued under the fixed designation D 1177; 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 Department of Defense.

1. Scope

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

NOTE 1—Where solutions of specific concentrations are to be tested, they shall be prepared from representative samples as directed in Test Methods D 1176. Secondary phases separating on dilution need not be separated.

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

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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

2. Referenced Documents

2.1 *ASTM Standards:*²

D 1176 Test Method for Sampling and Preparing Aqueous Solutions of Engine Coolants or Antirusts for Testing Purposes

E 1 Specification for ASTM Thermometers

3. Terminology

3.1 *Definitions:*

3.1.1 *freezing point*—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.

4. Summary of Test Method

4.1 This test method involves the determination of the time-temperature curve prior to freezing and the determination of the horizontal or flattened portion of the freezing curve. The freezing point is taken as the intersection of projections of the cooling curve and the freezing curve. If the solution supercools, the freezing point is the maximum temperature reached after supercooling.

5. Significance and Use

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

5.2 The freezing point of an engine coolant may be used to determine the approximate glycol content, provided the glycol type is known.

6. Apparatus

6.1 *Freezing Point Apparatus*, shown assembled in Fig. 1, consisting of the following:

6.1.1 *Cooling Bath*, in which the refrigerant is contained, consisting of a standard 1.9-L (2-qt) Dewar flask. The flask may be silvered or unsilvered, and is supported in a close-fitting container. A pad of glass wool is placed in the bottom of the flask to protect it from damage by tip of freezing tube.

6.1.2 *Freezing Tube*³ consisting of a 200-mL (6.8-oz.) unevacuated, unsilvered Dewar flask. The tube is closed by a cork having a central hole for the thermocouple or thermometer, a second hole placed to one side for passage of the stirring rod, and a third hole for introducing wire for seeding at appropriate time.

6.1.3 *Stirring Mechanism*, consisting of a five-coil stirrer formed of stainless steel wire 1.6 mm ($1/16$ in.) in diameter. The coils are so spaced that, in the extreme upward position during operation, no coils are exposed above the surface of the sample. The stirrer is agitated by means of an ordinary windshield wiper motor or other motor devices, operating

¹ 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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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.

³ For routine work, a tube with a seeding tip as described in the paper by R. E. Mallonee and F. L. Howard, "The Determination of Freezing Point of Engine Antifreeze," in the February 1951 issue of the *ASTM Bulletin* may be used. (See Fig. 2.)