



**Designation: D4985 – 10 (Reapproved 2023)**

## **Standard Specification for Low Silicate Ethylene Glycol Base Engine Coolant for Heavy Duty Engines Requiring a Pre-Charge of Supplemental Coolant Additive (SCA)<sup>1</sup>**

This standard is issued under the fixed designation D4985; 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 ( $\epsilon$ ) 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 specification covers the requirements for low silicate ethylene glycol base engine coolants for cooling systems of heavy-duty engines. When concentrates are used at 40 % to 60 % concentration by volume in water, or when prediluted glycol base engine coolants (50 volume % minimum) are used without further dilution, they will function effectively to provide protection against corrosion, freezing to at least  $-36.4^{\circ}\text{C}$  ( $-33.5^{\circ}\text{F}$ ), and boiling to at least  $108^{\circ}\text{C}$  ( $226^{\circ}\text{F}$ ).

NOTE 1—This specification is based on the knowledge of the performance of engine coolants prepared from new or virgin ingredients. A separate specification exists (Specification **D6210**) for heavy-duty engine coolants which may be prepared from recycled or reprocessed used coolant or reprocessed industrial-source ethylene glycol.

1.2 Coolants meeting this specification require an initial charge of a supplemental coolant additive (SCA) and require regular maintenance doses of an SCA to continue the protection in certain operating heavy-duty engine cooling systems, particularly those of the wet cylinder liner-in-block design. The SCA additions are defined by and are the primary responsibility of the engine manufacturer or vehicle manufacturer. If they provide no instructions, follow the SCA supplier's recommended instructions.

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

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

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee **D15** on Engine Coolants and Related Fluids and is the direct responsibility of Subcommittee **D15.07** on Specifications.

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1.5 *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:<sup>2</sup>**

**D512 Test Methods for Chloride Ion In Water**

**D516 Test Method for Sulfate Ion in Water**

**D1119 Test Method for Percent Ash Content of Engine Coolants**

**D1120 Test Method for Boiling Point of Engine Coolants**

**D1121 Test Method for Reserve Alkalinity of Engine Coolants and Antirusts**

**D1122 Test Method for Relative Density of Engine Coolant Concentrates and Engine Coolants By The Hydrometer**

**D1123 Test Methods for Water in Engine Coolant Concentrate by the Karl Fischer Reagent Method**

**D1126 Test Method for Hardness in Water**

**D1177 Test Method for Freezing Point of Aqueous Engine Coolants**

**D1287 Test Method for pH of Engine Coolants and Antirusts**

**D1293 Test Methods for pH of Water**

**D1384 Test Method for Corrosion Test for Engine Coolants in Glassware**

**D1881 Test Method for Foaming Tendencies of Engine Coolants in Glassware**

**D1882 Test Method for Effect of Cooling System Chemical Solutions on Organic Finishes for Automotive Vehicles**

**D2570 Test Method for Simulated Service Corrosion Testing of Engine Coolants**

**D2809 Test Method for Cavitation Corrosion and Erosion-Corrosion Characteristics of Aluminum Pumps With Engine Coolants**

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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  
**D3634** Test Method for Trace Chloride Ion in Engine Coolants  
**D4327** Test Method for Anions in Water by Suppressed Ion Chromatography  
**D4725** Terminology for Engine Coolants and Related Fluids  
**D5827** Test Method for Analysis of Engine Coolant for Chloride and Other Anions by Ion Chromatography  
**D5931** Test Method for Density and Relative Density of Engine Coolant Concentrates and Aqueous Engine Coolants by Digital Density Meter  
**D6129** Test Method for Silicon in Engine Coolant Concentrates by Atomic Absorption Spectroscopy  
**D6130** Test Method for Determination of Silicon and Other Elements in Engine Coolant by Inductively Coupled Plasma-Atomic Emission Spectroscopy  
**D6210** Specification for Fully-Formulated Glycol Base Engine Coolant for Heavy-Duty Engines  
**D6660** Test Method for Freezing Point of Aqueous Ethylene Glycol Base Engine Coolants by Automatic Phase Transition Method  
**E29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications  
**E394** Test Method for Iron in Trace Quantities Using the 1,10-Phenanthroline Method  
**E1177** Specification for Engine Coolant Grade Glycol  
2.2 *Other Document*.<sup>3</sup>  
**Federal Method 2540B** Total Dissolved Solids Dried at 103–105°C

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *heavy duty engine*—a diesel, gasoline, or similarly fueled internal combustion engine, having operating characteristics of a long duty cycle at or near maximum rated conditions. Such engines are typically used in off-highway machinery for agriculture, mining, earth-moving, and construction; Class 5 to 8 over the road trucks and buses; high output stationary engine installations; and locomotive and marine installations. (See Specification **D3306** for coolant requirements for automobiles, vans, and pickup class trucks.)

3.1.2 *supplemental coolant additive (SCA)*—a material added to the cooling system of a heavy-duty engine to provide additional cavitation protection and corrosion inhibition and to minimize deposits on heat transfer surfaces.

#### 3.2 Definitions:

3.2.1 *other glycols, n*—in ethylene glycol base engine coolant, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, and 1,3-propanediol.

3.2.2 For definitions of other terms used in this specification, refer to Terminology **D4725**.

<sup>3</sup> Standard Methods for the Examination of Water and Wastewater. American Public Health Association, et al, 801 I Street, N.W. Washington, DC 20001, <http://www.apha.org>.

### 4. General Requirements

4.1 Ethylene glycol base engine coolant concentrates or prediluted ethylene glycol base engine coolants shall be formulated with ethylene glycol meeting Specification **E1177**, water, and shall contain suitable corrosion inhibitors, dye, and a foam suppressor. Other glycols, such as propylene and diethylene, may be included in concentrates up to a maximum of 15 % (7.5 % for prediluted coolants) if the physical and chemical properties in **Table 1** are met.

4.2 All ethylene glycol base engine coolants shall conform to the general requirements in **Table 2**.

4.3 Prediluted coolants shall be prepared using deionized water that meets the following requirements:

| Property                                                 | Specific Values | ASTM Test Method          |
|----------------------------------------------------------|-----------------|---------------------------|
| Chlorides, µg/g (ppm (grains/gal))                       | 25 (1.5) max    | <b>D5827, D512, D4327</b> |
| Sulfate, µg/g (ppm (grains/gal))                         | 50 (3.0) max    | <b>D5827, D516, D4327</b> |
| Hardness, as CaCO <sub>3</sub> , µg/g (ppm (grains/gal)) | 20 (1.2) max    | <b>D6130, D1126</b>       |
| pH                                                       | 5.5 to 8.5      | <b>D1287, D1293</b>       |
| Iron, µg/g (ppm (grains/gal))                            | 1.0 (0.06) max  | <b>D6130, E394</b>        |

**TABLE 1 Physical and Chemical Requirements**

| Property                                                                  | Specific Values                |                     | ASTM Test Method                |
|---------------------------------------------------------------------------|--------------------------------|---------------------|---------------------------------|
|                                                                           | Concentrate                    | Predilute           |                                 |
| Relative density, 15.5/15.5 °C (60/60 °F)                                 | 1.110 to 1.145                 | 1.065 min           | <b>D1122, D5931</b>             |
| Freezing point, <sup>A</sup> °C (°F):<br>50 vol % in DI water             | –36.4 (–33.5) max              |                     | <b>D1177, D6660</b>             |
| Undiluted                                                                 |                                | –36.4 (–33.5) max   |                                 |
| Boiling point, <sup>B</sup> °C (°F):<br>Undiluted<br>50 vol % in DI water | 163 (325) min<br>108 (226) min | 108 (226) min       | <b>D1120</b>                    |
| Ash content, mass %                                                       | 5 max                          | 2.5 max             | <b>D1119</b>                    |
| pH:<br>50 vol % in DI water<br>Undiluted                                  | 7.5 to 11                      | 7.5 to 11           | <b>D1287</b>                    |
| Reserve alkalinity, mL                                                    | report <sup>C</sup>            | report <sup>C</sup> | <b>D1121</b>                    |
| Water, mass %                                                             | 5 max                          | not applicable      | <b>D1123</b>                    |
| Chloride ion, µg/g                                                        | 25 max                         | 25 max              | <b>D3634, D5827<sup>D</sup></b> |
| Silicon, µg/g                                                             | 250 max                        | 125 max             | <b>D6129, D6130</b>             |
| Effect on engine or vehicle finish                                        | no effect                      | no effect           | <b>D1882<sup>E</sup></b>        |

<sup>A</sup> For purposes of determining conformance with this specification, an observed value shall be rounded “to the nearest unit” in the last right-hand digit used in expressing the specification limit, in accordance with the rounding method of Practice **E29**.

<sup>B</sup> Some precipitate may be observed at the end of the test method. This should not be cause for rejection.

<sup>C</sup> Value as agreed upon between the supplier and the customer.

<sup>D</sup> In case of dispute, Test Method **D3634** shall be the preferred test method.

<sup>E</sup> Currently, many heavy-duty engine manufacturers and vehicle manufacturers that use these engines prepare test panels using the specific paint finishes employed on their actual products. Coolant suppliers and equipment builders should agree on the exact test procedures and acceptance criteria on an individual case basis.