Designation: D3306 – 21

Standard Specification for Glycol Base Engine Coolant for Automobile and Light-Duty Service[1]

This standard is issued under the fixed designation D3306; 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 specification covers the requirements for ethylene glycol or propylene glycol or ethylene glycol containing glycerin base engine coolants used in automobiles or other light-duty service cooling systems. When concentrates are used at 40 % to 60 % concentration (allowance to 70 % concentration agreement between manufacturer and user) by volume in water, or when prediluted glycol base engine coolants 50 volume % or higher engine coolant concentrate are used without further dilution, they will function effectively to provide protection against freezing, boiling, and corrosion.

1.2 The coolants governed by this specification are categorized as follows:

Coolant Type	Description
I	Ethylene glycol base concentrate
II	Propylene glycol base concentrate
V	Ethylene glycol base concentrate containing glycerin
III	Ethylene glycol predilute 50 volume % or higher engine coolant concentrate
IV	Propylene glycol predilute 50 volume % or higher engine coolant concentrate
VI	Ethylene glycol base predilute containing glycerin 50 volume % or higher engine coolant concentrate

NOTE 1—This specification is based on the knowledge of the performance of engine coolants prepared from new or virgin ingredients. This specification shall also apply to engine coolants prepared using glycol generated from recycled or reprocessed used coolant or reprocessed industrial-source glycol, provided that said glycol meets the requirements of Specification E1177. Separate specifications (D6471 and D6472) exist for engine coolants prepared from recycled or reprocessed used coolant or reprocessed industrial-source glycol that does not meet the requirements established in Specification E1177. This specification shall also apply to glycol based engine coolants prepared using fully refined glycerin provided that said glycerin meets the requirements for Specification D7640.

1.3 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.

1.4 *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.*

NOTE 2—This specification applies to glycol base engine coolant for automobiles and light-duty service. Specifications D4985 and D6210 exist for heavy duty engine service.

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:*[2]

D512 Test Methods for Chloride Ion In Water (Withdrawn 2021)[3]

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 Density or 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

[1] 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.

Current edition approved Nov. 1, 2021. Published November 2021. Originally approved in 1974. Last previous edition approved in 2020 as D3306–20. DOI: 10.1520/D3306-21.

[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] The last approved version of this historical standard is referenced on www.astm.org.

***A Summary of Changes section appears at the end of this standard**

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
D3321 Test Method for Use of the Refractometer for Field Test Determination of the Freezing Point of Aqueous Engine Coolants
D3634 Test Method for Trace Chloride Ion in Engine Coolants
D4327 Test Method for Anions in Water by Suppressed Ion Chromatography
D4340 Test Method for Corrosion of Cast Aluminum Alloys in Engine Coolants Under Heat-Rejecting Conditions
D4725 Terminology for Engine Coolants and Related Fluids
D4985 Specification for Low Silicate Ethylene Glycol Base Engine Coolant for Heavy Duty Engines Requiring a Pre-Charge of Supplemental Coolant Additive (SCA)
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
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
D6471 Specification for Recycled Prediluted Aqueous Glycol Base Engine Coolant (50 Volume % Minimum) for Automobile and Light-Duty Service (Withdrawn 2019)[3]
D6472 Specification for Recycled Glycol Base Engine Coolant Concentrate for Automobile and Light-Duty Service (Withdrawn 2019)[3]
D6660 Test Method for Freezing Point of Aqueous Ethylene Glycol Base Engine Coolants by Automatic Phase Transition Method
D7640 Specification for Engine Coolant Grade Glycerin
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:*[4]
Federal Method 2540B Total Dissolved Solids Dried at 103–105°C

[4] *Standard Methods for the Examination of Water and Wastewater*. American Public Health Association, et al, 800 I Street, NW, Washington, DC 20001, http://www.apha.org.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *glycerin, n*—Specification D7640 grade glycerin for engine coolant.

3.1.2 *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.

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

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

4. General Requirements

4.1 Engine coolant concentrates or prediluted glycol base engine coolants shall be formulated with either ethylene glycol or propylene glycol meeting Specification E1177, water, and shall contain suitable corrosion inhibitors, dye, and a foam suppressor.

4.2 Ethylene glycol base engine coolant concentrates (Type I) may contain a maximum of 15 % other glycols, as long as the physical, chemical, and performance requirements of this specification can be met. Similarly, prediluted ethylene glycol base coolants (Type III) may contain a maximum of 7.5 % other glycols as long as all of the requirements of this specification can be met.

4.3 Propylene glycol base engine coolant concentrates (Type II) may contain a combined maximum of 1 % other glycols (less than 0.5 % for prediluted propylene glycol base coolants, Type IV) and all of the physical, chemical, and performance requirements of this specification must be met.

4.4 Ethylene glycol base coolant concentrates (Type V) may contain glycerin as long as the physical, chemical and performance requirements of this specification can be met. Glycerin blended into Type V coolant concentrates shall be in accordance with Specification D7640.

4.5 All engine coolant concentrates or prediluted glycol base engine coolants shall conform to the general requirements given in Table 1.

4.6 Prediluted glycol base engine coolants shall be formulated using water that meets the following requirements:

Property	Specific Values	ASTM Test Method
Chlorides, µg/g (ppm)	25 max	D5827, D512, D4327
Sulfate, µg/g (ppm)	50 max	D5827, D516, D4327
Hardness, as $CaCO_3$, µg/g (ppm)	20 max	D6130, D1126
pH	5.5 to 8.5	D1287, D1293
Iron, µg/g (ppm)	1.0 max	D6130, E394

TABLE 1 General Requirements

Property	Specified Values	ASTM Test Method
Color	Distinctive	. . .
Effect on nonmetals	No adverse effect	Under consideration