Designation: D5752 – 10

Standard Specification for Supplemental Coolant Additives (SCAs) for Use in Precharging Coolants for Heavy-Duty Engines[1,2]

This standard is issued under the fixed designation D5752; 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 general, physical, chemical, and performance requirements for Supplemental Coolant Additives (SCAs) at a precharged level in the cooling systems of heavy-duty engines.

NOTE 1—After precharging, SCAs are customarily used periodically to service cooling systems at ¼ to ⅓ the precharged dosage to compensate for additives lost through dilution and depletion.

1.2 The SCA products meeting this specification are intended for use with water, with recommended dilutions of coolant concentrates, with prediluted engine coolants, or to upgrade the performance of light-duty engine coolants to meet the heav-duty requirements of Specification D6210. Engine coolant products shall be of the low-silicate type and, if ethylene glycol based, shall meet Specification D4985. Propylene glycol base low-silicate type coolant products may also be used, if these materials meet the chemical and performance requirements of Specification D4985.

1.3 The SCA concentrate, before dissolution, may be in either liquid, solid, or slurry form. The form is as agreed upon between the manufacturer and the user.

1.4 The values stated in SI units are to be regarded as standard. The inch-pound units in parentheses are approximate equivalents provided for information only.

1.5 *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:*[3]

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
D1121 Test Method for Reserve Alkalinity of Engine Coolants and Antirusts
D1126 Test Method for Hardness in Water
D1193 Specification for Reagent Water
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
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
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

[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.

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[2] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report: RR:D15-1024.

[3] 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.

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

D5828 Test Method for Compatibility of Supplemental Coolant Additives (SCAs) and Engine Coolant Concentrates
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
D6471 Specification for Recycled Prediluted Aqueous Glycol Base Engine Coolant (50 Volume % Minimum) for Automobile and Light-Duty Service
D6472 Specification for Recycled Glycol Base Engine Coolant Concentrate for Automobile and Light-Duty Service
E1177 Specification for Engine Coolant Grade Glycol
G32 Test Method for Cavitation Erosion Using Vibratory Apparatus

2.2 *Other Documents:*
Federal Method 2540B Total Dissolved Solids Dried at 103–105°C[4]

3. General Requirements

3.1 The SCA concentrate upon addition to water or water/glycol mixtures at the SCA manufacturer's recommended addition level shall provide the same performance as coolants meeting Specification D6210, except for freeze and boil protection..

3.2 Liquid SCA concentrates shall be storable in the manufacturer's original container at temperatures from −7 to + 55°C (20 to 130°F) without chemical change. Any precipitation of ingredients evidenced by the dropout of solid material or liquid turbidity shall disappear upon agitation and warming of the solution to a temperature exceeding 2°C (35°F).

3.3 Solid, slurry, and paste forms of SCA concentrate shall be so formulated and packaged as to prevent chemical or physical change during storage before use. This requirement applies to storage temperatures of −7 to + 55°C (20 to 130°F), regardless of humidity.

3.4 The SCA concentrates, when used according to the manufacturer's recommendations, shall dissolve totally in the test solutions required in this specification. A light haze is permitted.

3.5 If an engine, vehicle, or servicing organization recommends adding a precharge dosage of an SCA product to a fully formulated coolant governed by Specification D6210, that organization assumes responsibility for determining the compatibility and conducting suitable tests. ASTM has developed a compatibility test (Test Method D5828), which may be used. At the present time, it is recommended that precharge doses of SCAs be used only in conjunction with coolant products meeting Specification D4985.

4. Preparation of Test Solutions

4.1 The preparation of test solutions for this specification is listed in Table 1. The glycol used, either ethylene glycol or propylene glycol, shall meet Specification E1177. Where distilled water is required, it shall conform to Type IV of Specification D1193.

4.2 The quantity of any freshly prepared test solution required in this specification shall be sufficient to perform the specific tests. However, no test solution shall be stored longer than 96 h before initiation of a specific procedure.

5. Detailed Requirements

5.1 Test solutions prepared according to Table 1 shall meet the performance requirements in Table 2, the general requirements in Table 3, and the physical and chemical requirements in Table 4.

5.2 The SCAs shall additionally provide added protection in operating engines against cavitation corrosion (also termed liner pitting) and against scaling of internal engine hot surfaces. Hot surfaces are typically within the engine head, head spacer, or liquid-cooled exhaust manifold, oil coolers, after coolers, and exhaust gas recirculation (EGR) coolers. The American Society for Testing and Materials has test methods under development for both cavitation corrosion and hot surfaces scaling. Until these procedures are adopted as ASTM standards, the mandatory requirements of Annex A1 shall apply.

6. Keywords

6.1 heavy-duty engine coolants; precharging heavy-duty engines; SCA; supplemental coolant additives

TABLE 1 Composition of Test Solutions for Table 2 Performance Requirements[A]

Test Method	SCA Concentrate	Solvent Mixture
D1384	one-half manufacturer's recommended precharged level	standard corrosive water[B]
D1384	three times manufacturer's recommended precharged level	33 vol % glycol in standard corrosive water[B,C]
D1881	manufacturer's recommended precharge level	33 vol % glycol in standard corrosive water[B,C]
D2570	manufacturer's recommended precharge level	44 vol % glycol in standard corrosive water[B,C]
D2809	manufacturer's recommended precharge level	16.7 vol % glycol in standard corrosive water[B,C]
D4340	manufacturer's recommended precharge level	165-mg/L NaCl dissolved in a 1-L solution of 25 vol % glycol in deionized water[C,D]

[A] Test solution to be prepared according to Section 4.
[B] See Section 7 of Test Method D2570 for composition and method of preparation of standard corrosive water.
[C] The glycol used shall be ethylene glycol or propylene glycol and each shall meet Specification E1177.
[D] Water conforming to Type IV of Specification D1193 is acceptable.

[4] Standard Method for the Examinaiton of Water and Wastewater. American Public Health Association, et al, 1015 15th Street, N.W. Washington, DC 20005.

TABLE 2 Performance Requirements[A]

Property	Specific Values	Test Method
Corrosion in glassware mass loss, mg/specimen		D1384
Copper	10 max	
Solder	30 max	
Brass	10 max	
Steel	10 max	
Cast iron	10 max	
Aluminum	30 max	
Simulated service test mass loss, mg/specimen		D2570
Copper	20 max	
Solder	60 max	
Brass	20 max	
Steel	20 max	
Cast iron	20 max	
Aluminum	60 max	
Foaming		D1881
Volume, mL	150 max	
Break time, s	5 max	
Water pump cavitation erosion-corrosion rating	8 min	D2809
Corrosion of cast aluminum alloys at heat-rejecting surfaces, mg/cm^2/week	1.0 max	D4340
Ultrasonic cavitation resistance	see Annex A1	under development
SCA-glycol base coolant compatibility	[B]	D5828
Hot surface scaling and deposits resistance[C]	...	under development

[A]Test solutions for use in meeting Table 2 performance requirements are to be prepared according to Table 1.
[B]SCA products may be required to meet a compatibility requirement. Although Test Method D5828 has been developed, ASTM has not established allowable limits. Until allowable limits have been approved, an agreement must be established between the SCA manufacturer and engine or vehicle user. This agreement shall include a definition of the test procedure, acceptable equipment, and the performance rating criteria.
[C]See Appendix X2 for additional information.

TABLE 3 General Requirements

Property	Specific Value	Test Method
Effect on nonmetals[A]	no adverse effect	under consideration
Storage stability	see 3.2 and 3.3	...

[A]Evaluate using the SCA concentrate at the manufacturer's recommended precharge level in a 50:50 volume mixture of distilled water and ethylene glycol or distilled water and propylene glycol, each glycol conforming to Specification E1177.

TABLE 4 Physical and Chemical Properties

Property[A]	Specific Values	Test Method
Ash content, dissolved in distilled water, mass, %	5 max	D1119
pH, in distilled water	7.5 to 11.0	D1287
Reserve alkalinity, in distilled water	report[B]	D1121
Chloride ion, in distilled water, ppm	25 max	D3634, D5827[C]
Silicon, in distilled water, ppm	250 max	D6129, D6130
Effect on vehicle finish	no effect[D]	D1882

[A]Property must be met with the specified solution, at an SCA precharge addition level recommended by the SCA manufacturer. (This is usually 3 % by volume.)
[B]Value agreed upon between the supplier and the customer.
[C]In case of dispute, D3634 shall be the preferred test method.
[D]Currently, many heavy-duty engine manufacturers and vehicle manufacturers that use these engines prepare test panels using the specific paint finishes used on their actual products. Coolant product manufacturers and equipment builders should agree on the exact test procedures and acceptance criteria on an individual case basis.