



Designation: D6129 – 97 (Reapproved 2021)

Standard Test Method for Silicon in Engine Coolant Concentrates by Atomic Absorption Spectroscopy¹

This standard is issued under the fixed designation D6129; 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 test method covers the determination of silicon in the range from 200 ppm to 500 ppm in engine coolant concentrates by atomic absorption. This method is as accurate and precise as photometric methods, while requiring considerably less operator time and avoiding problems with reagent instability.

1.1.1 Coolants with silicon content outside of this range may be analyzed by this method by suitably adjusting the sample size. Care should be taken to ensure that the glycol content of the working standards corresponds to that of the sample solution being analyzed.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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

1.4 *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

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

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 D15.04 on Chemical 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. Summary of Test Method

3.1 The sample is dissolved in water and the silicon content is determined from a standard curve established at the time the sample is run. An atomic absorption spectrometer with a nitrous oxide-acetylene flame is used.

4. Apparatus

4.1 *Atomic Absorption Spectrometer*, with nitrous oxide-acetylene flame.

4.2 *Hollow-Cathode Lamp*, for silicon.

5. Reagents

5.1 Reagent grade chemicals shall be used in all tests.³

5.2 References to water shall be understood to mean distilled water or water of equal quality.

5.3 *Standard Silicon Solution*, 1000 mg/L (see **Note 1**).

5.4 *Ethylene Glycol* (propylene glycol should be used when analyzing PG-based coolants).

5.5 *Sodium Hydroxide*, 5 % in water (see **Note 1**). When preparing from solid sodium hydroxide avoid prolonged exposure to the atmosphere. **DO NOT STORE IN GLASS.**

5.6 Working standards: 0 mg/L, 20 mg/L, 40 mg/L, and 60 mg/L silicon.

5.6.1 Prepare these solutions by pipeting 2.0 mL, 4.0 mL, and 6.0 mL of the 1000 mg/L standard silicon solution into separate 100 mL volumetric flasks. Add 10.0 mL of ethylene glycol and 2.0 mL of 5 % sodium hydroxide solution to each flask and dilute to volume with water. Prepare the zero standard solution by adding 10.0 mL ethylene glycol and 2.0 mL 5 % sodium hydroxide solution to another 100 mL volumetric flask and diluting to volume with water.

NOTE 1—Standard silicon solutions and sodium hydroxide solutions are available from most laboratory supply companies.

³ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC) Rockville, MD.