



Standard Test Methods for Determination of Aluminum and Silicon in Fuel Oils by Ashing, Fusion, Inductively Coupled Plasma Atomic Emission Spectrometry, and Atomic Absorption Spectrometry¹

This standard is issued under the fixed designation D5184; 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 These test methods cover the determination of aluminum and silicon in fuel oils at concentrations between 5 and 150 mg/kg for aluminum and 10 and 250 mg/kg for silicon.

1.2 *Test Method A*—Inductively coupled plasma atomic emission spectrometry is used in this test method to quantitatively determine aluminum and silicon.

1.3 *Test Method B*—Flame atomic absorption spectrometry is used in this test method to quantitatively determine aluminum and silicon.

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

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.* Specific warning statements are given in Sections 7.6, 10.1, and 11.5.

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance

D6792 Practice for Quality System in Petroleum Products and Lubricants Testing Laboratories

D7260 Practice for Optimization, Calibration, and Validation of Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) for Elemental Analysis of Petroleum Products and Lubricants

D7740 Practice for Optimization, Calibration, and Validation of Atomic Absorption Spectrometry for Metal Analysis of Petroleum Products and Lubricants

E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials

3. Terminology

3.1 Definitions:

3.1.1 *emission spectroscopy, n*—Refer to Terminology E135.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *calibration, n*—the process by which the relationship between signal intensity and elemental concentration is determined for a specific element analysis.

3.2.2 *check standard, n*—in calibration, an artifact measured periodically, the results of which typically are plotted on a control chart to evaluate the measurement process.

4. Summary of Test Methods

4.1 A weighed quantity of homogenized sample is heated in a clean platinum dish, the combustible material is removed by burning and the carbon finally removed by heating in a muffle furnace at a temperature of $550 \pm 25^\circ\text{C}$. The residue is fused with a lithium tetraborate/lithium fluoride flux. The fused mixture is digested in a solution of tartaric acid and hydrochloric acid and diluted to volume with water. The resulting solution is aspirated into an inductively-coupled plasma and the emission intensities of aluminum and silicon lines are measured. Standard calibration solutions are also aspirated and aluminum and silicon intensities are measured for comparison.

¹ These test methods are under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and are the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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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.