



Designation: D5059 – 14 (Reapproved 2019)

Standard Test Methods for Lead in Gasoline by X-Ray Spectroscopy¹

This standard is issued under the fixed designation D5059; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These test methods cover the determination of the total lead content of a gasoline within the following concentration ranges:

0.010 g Pb/US gal to 5.0 g Pb/US gal
0.012 g Pb/UK gal to 6.0 g Pb/UK gal
0.0026 g Pb/L to 1.32 g Pb/L

1.1.1 Test Methods A and B cover the range of 0.10 g Pb/US gal to 5.0 g Pb/US gal. Test Method C covers the range of 0.010 g Pb/US gal to 0.50 g Pb/US gal.

1.1.2 These test methods compensate for normal variation in gasoline composition and are independent of lead alkyl type.

1.2 *Test Method A* (formerly in withdrawn Test Method D2599)—Sections 5 – 9.

Test Method B (formerly in withdrawn Test Method D2599)—Sections 10 – 14.

Test Method C (formerly in withdrawn Test Method D3229)—Sections 15 – 19.

1.3 The values stated in SI are to be regarded as the standard. For reporting purposes the values stated in grams per U.S. gallon are the preferred units in the United States. Note that in other countries, other units can be preferred.

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.* For specific hazard statements, see Sections 5, 6, 11, and 18.

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

D3341 Test Method for Lead in Gasoline—Iodine Monochloride Method

D4057 Practice for Manual 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 Management Systems in Petroleum Products, Liquid Fuels, and Lubricants Testing Laboratories

3. Summary of Test Method

3.1 There are three alternative test methods, as follows.

3.1.1 *Test Method A (Bismuth Internal Standard Method High Concentration)*—One volume of sample is mixed thoroughly with an equal volume of bismuth internal standard solution. The mixture is placed in the X-ray beam and the intensities of the lead $L\text{-}\alpha_1$ radiation at 1.175 Å and the bismuth $L\text{-}\alpha_1$ radiation at 1.144 Å are determined. The lead concentration of the sample is measured by comparing the ratio of gross counting rate at 1.175 Å with the gross counting rate at 1.144 Å to a previous prepared calibration curve of concentration versus the same ratios.

3.1.2 *Test Method B (Scattered Tungsten Radiation Method)*—The ratio of the net X-ray intensity of the lead $L\text{-}\alpha_1$ radiation to the net intensity of the incoherently scattered tungsten $L\text{-}\alpha_1$ radiation is obtained on a portion of the sample. The lead content is determined by multiplying this ratio by a calibration factor obtained with a standard lead solution of known concentration.

3.1.3 *Test Method C (Bismuth Internal Standard Method, Low Concentration)*—Twenty millilitres of sample is mixed thoroughly with two millilitres of bismuth internal standard solution. The mixture is placed in the X-ray beam of a spectrometer and the intensities of the lead $L\text{-}\alpha_1$ radiation at

¹ These test methods are under the jurisdiction of Committee D02 on Petroleum Products, Liquid Fuels, 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.