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An American National Standard



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Standard Test Method for Motor Octane Number of Spark-Ignition Engine Fuel¹

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1. Scope

1.1 This laboratory test method covers the quantitative determination of the knock rating of liquid spark-ignition engine fuel in terms of Motor octane number except that this test method may not be applicable to fuel and fuel components that are primarily oxygenates.² The sample fuel is tested in a standardized single cylinder, four-stroke cycle, variable compression ratio, carbureted, CFR engine run in accordance with a defined set of operating conditions. The octane number scale is defined by the volumetric composition of primary reference fuel blends. The sample fuel knock intensity is compared to that of one or more primary reference fuel blends. The octane number of the primary reference fuel blend that matches the knock intensity of the sample fuel establishes the Motor octane number.

1.2 The octane number scale covers the range from 0 to 120 octane number, but this test method has a working range from 40 to 120 octane number. Typical commercial fuels produced for automotive spark-ignition engines rate in the 80 to 90 Motor octane number range. Typical commercial fuels produced for aviation spark-ignition engines rate in the 98 to 102 Motor octane number range. Testing of gasoline blend stocks or other process stream materials can produce ratings at various levels throughout the Motor octane number range.

1.3 The values of operating conditions are stated in SI units and are considered standard. The values in parentheses are the historical inch-pounds units. The standardized CFR engine measurements continue to be in inch-pound units only because of the extensive and expensive tooling that has been created for this equipment.

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 and health practices and determine the applica-*

bility of regulatory limitations prior to use. For more specific hazard statements, see 8.1.1, 8.2, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.4, 8.5, 8.6, 13.4.1, 14.5.1, 15.6.1, A2.3.9, A2.4.8, A3.2.7.2(g), A4.2.3.1, A4.2.3.3(f) and (i), A4.3.5, X2.3.7, X3.2.3.1, X3.3.4.1, X3.3.9.3, X3.3.12.4, and X3.5.1.8 and Annex A1.

2. Referenced Documents

2.1 ASTM Standards:

- D 1193 Specification for Reagent Water³
- D 1744 Test Method for Water in Liquid Petroleum Products by Karl Fischer Reagent⁴
- D 2268 Test Method for Analysis of High-Purity *n*-Heptane and Isooctane by Capillary Gas Chromatography⁴
- D 2360 Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by Gas Chromatography⁵
- D 2699 Test Method for Research Octane Number of Spark Ignition Engine Fuel⁶
- D 2885 Test Method for Research and Motor Method Octane Ratings Using On-Line Analyzers⁶
- D 3116 Test Method for Trace Amounts of Lead in Gasoline⁷
- D 3237 Test Method for Lead in Gasoline by Atomic Absorption Spectrometry⁸
- D 3703 Test Method for Peroxide Number of Aviation Turbine Fuels⁸
- D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products⁸
- D 4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants⁸
- D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products⁸
- D 4814 Specification for Automotive Spark-Ignition Engine Fuel⁹
- E 1 Specification for ASTM Thermometers¹⁰

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.01 on Combustion Characteristics.

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² Research octane number, determined using Test Method D 2699, is a companion method to provide a similar but typically higher octane rating under milder operating conditions.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 05.01.

⁵ *Annual Book of ASTM Standards*, Vol 06.04.

⁶ *Annual Book of ASTM Standards*, Vol 05.04.

⁷ Discontinued; see 1994 *Annual Book of ASTM Standards*, Vol 05.02.

⁸ *Annual Book of ASTM Standards*, Vol 05.02.

⁹ *Annual Book of ASTM Standards*, Vol 05.03.

¹⁰ *Annual Book of ASTM Standards*, Vol 14.03.