



Designation: D 2699 – 03

An American National Standard



Designation: 237/87

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

This standard is issued under the fixed designation D 2699; 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 Department of Defense.

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 Research O.N., except that this test method may not be applicable to fuel and fuel components that are primarily oxygenates.² The sample fuel is tested using a standardized single cylinder, four-stroke cycle, variable compression ratio, carbureted, CFR engine run in accordance with a defined set of operating conditions. The O.N. scale is defined by the volumetric composition of PRF blends. The sample fuel knock intensity is compared to that of one or more PRF blends. The O.N. of the PRF blend that matches the K.I. of the sample fuel establishes the Research O.N.

1.2 The O.N. scale covers the range from 0 to 120 octane number but this test method has a working range from 40 to 120 Research O.N. Typical commercial fuels produced for spark-ignition engines rate in the 88 to 101 Research O.N. range. Testing of gasoline blend stocks or other process stream materials can produce ratings at various levels throughout the Research O.N. 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-pound 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 applicability of regulatory limitations prior to use.* For specific hazard statements, see Section 8, 13.4.1, 14.5.1, 15.6.1, Annex A1,

A2.3.9, A2.4.8, A3.2.7.2(7), A4.2.3.1, A4.2.3.3(6) and (9), A4.3.5, X2.3.7, X3.2.3.1, X3.3.4.1, X3.3.9.3, X3.3.11.4, and X3.5.1.8.

2. Referenced Documents

2.1 ASTM Standards:

- D 1193 Specification for Reagent Water³
- D 1744 Test Method for Determination of 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 Chromatography⁵
- D 2360 Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by Gas Chromatography⁶
- D 2700 Test Method for Motor Octane Number of Spark-Ignition Engine Fuel⁷
- D 2885 Test Method for Determination of Octane Number of Spark-Ignition Engine Fuels by On-Line Direct Comparison Technique⁷
- 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 Fuel⁸
- D 5842 Practice for Sampling and Handling of Fuels for Volatility Measurements⁹
- E 1 Specification for ASTM Thermometers¹⁰
- E 456 Terminology Relating to Quality and Statistics¹¹

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

Current edition approved June 10, 2003. Published August 2003. Originally approved in 1968. Last previous edition approved in 2002 as D 2699 – 02.

² Motor O.N., determined using Test Method D 2700, is a companion method to provide a similar but typically lower octane rating under more severe operating conditions.

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

⁴ Discontinued. See 1999 *Annual Book of ASTM Standards*, Vol 05.01.

⁵ *Annual Book of ASTM Standards*, Vol 05.01.

⁶ *Annual Book of ASTM Standards*, Vol 06.04.

⁷ *Annual Book of ASTM Standards*, Vol 05.05.

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.

¹¹ *Annual Book of ASTM Standards*, Vol 14.02.

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