



Designation: D3338/D3338M – 20a

Standard Test Method for Estimation of Net Heat of Combustion of Aviation Fuels¹

This standard is issued under the fixed designation D3338/D3338M; 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 This test method covers the estimation of the net heat of combustion (megajoules per kilogram or [Btu per pound]) of aviation gasolines and aircraft turbine and jet engine fuels in the range from 40.19 MJ/kg to 44.73 MJ/kg or [17 280 Btu/lb to 19 230 Btu/lb]. The precision for estimation of the net heat of combustion outside this range has not been determined for this test method.

1.2 This test method is purely empirical and is applicable to liquid hydrocarbon fuels that conform to the specifications for aviation gasolines or aircraft turbine and jet engine fuels of grades Jet A, Jet A-1, Jet B, JP-4, JP-5, JP-7, and JP-8.

NOTE 1—The experimental data on heat of combustion from which the Test Method D3338 correlation was devised was obtained by a precision method similar to Test Method D4809.

NOTE 2—The estimation of the net heat of combustion of a hydrocarbon fuel is justifiable only when the fuel belongs to a well-defined class for which a relation between heat of combustion and aromatic and sulfur contents, density, and distillation range of the fuel has been derived from accurate experimental measurements on representative samples of that class. Even in this case, the possibility that the estimates may be in error by large amounts for individual fuels should be recognized. The fuels used to establish the correlation presented in this method are defined as follows:

Fuels:

Aviation gasoline—Grades 100/130 and 115/145 (1, 2)²

Kerosenes, alkylates, and special WADC fuels (3)

Pure hydrocarbons—paraffins, naphthenes, and aromatics (4)

Fuels for which data were reported by the Coordinating Research Council (5).

NOTE 3—The property ranges used in this correlation are as follows:

Aromatics—from 0 % by mass to 100 % by mass

API Gravity—from [25.7° to 81.2° API]

Volatility—from [160 °F to 540 °F], average boiling point

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each

system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3.1 Although the test method permits the calculation of net heat of combustion in either SI or inch-pound units, SI units are the preferred units.

1.3.2 The net heat of combustion can also be estimated in inch-pound units by Test Method D1405 or in SI units by Test Method D4529. Test Method D1405 requires calculation of one of four equations dependent on the fuel type with a precision equivalent to that of this test method. Test Method D4529 requires calculation of a single equation for all aviation fuels with a precision equivalent to that of this test method. Unlike Test Method D1405 and D4529, Test Method D3338/D3338M does not require the use of aniline point.

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.*

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:³

D86 Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure

D240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter

D1266 Test Method for Sulfur in Petroleum Products (Lamp Method)

D1298 Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.05 on Properties of Fuels, Petroleum Coke and Carbon Material.

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² The boldface numbers in parentheses refer to a list of references at the end of this standard.

³ 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.

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