



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

This standard is issued under the fixed designation D 3338; 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 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.

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 D 3338 correlation was devised was obtained by a precision method similar to Test Method D 4809.

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

Kerosines, 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**).

1.3 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.

1.4 The net heat of combustion can also be estimated in inch-pound units by Test Method D 1405 or in SI units by Test Method D 4529. Test Method D 1405 requires calculation of one of four equations dependent on the fuel type with a precision equivalent to that of this test method. Test Method D 4529 requires calculation of a single equation for all aviation fuels with a precision equivalent to that of this test method. Unlike D 1405 and D 4529, D 3338 does not require the use of aniline point.

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.*

2. Referenced Documents

2.1 ASTM Standards:

D 86 Test Method for Distillation of Petroleum Products at Atmospheric Pressure³

D 240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter³

D 1266 Test Method for Sulfur in Petroleum Products (Lamp Method)³

D 1298 Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method³

D 1319 Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption³

D 1405 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels³

D 1552 Test Method for Sulfur in Petroleum Products (High-Temperature Method)³

D 2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-Ray Fluorescence Spectrometry³

D 3120 Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry³

D 4052 Test Method for Density and Relative Density of Liquids by Digital Density Meter⁴

D 4294 Test Method for Sulfur in Petroleum Products by Energy Dispersive X-Ray Fluorescence Spectrometry⁵

D 4529 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels⁴

D 4809 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter (Intermediate Precision Method)⁴

D 5453 Test Method for Determination of Total Sulfur in

¹ This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.05.B on Calorimetry of Liquid Hydrocarbon Fuels.

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² The boldface number in parentheses refers to the list of references at the end of this method.

³ *Annual Book of ASTM Standards*, Vol 05.01.

⁴ *Annual Book of ASTM Standards*, Vol 05.02.

⁵ *Annual Book of ASTM Standards*, Vol 05.03.