



Designation: D4529 – 01 (Reapproved 2011) D4529 – 17



Designation: 381/97

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

This standard is issued under the fixed designation D4529; 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.

1. Scope-~~Scope~~*

1.1 This test method covers the estimation of the net heat of combustion at constant pressure in metric (SI) units, megajoules per kilogram.

1.2 This test method is purely empirical, and it is applicable only to liquid hydrocarbon fuels derived by normal refining processes from conventional crude oil which conform to the requirements of specifications for aviation gasolines or aircraft turbine and jet engine fuels of limited boiling ranges and compositions as described in **Note 1**.

NOTE 1—The estimation of the net heat of combustion of a hydrocarbon fuel from its aniline point temperature and density is justifiable only when the fuel belongs to a well-defined class for which a relationship between these quantities has been derived from accurate experimental measurements on representative samples of that class. Even in this class, the possibility that the estimates can be in error by large amounts for individual fuels should be recognized. The JP-8 fuel, although not experimentally tested, has properties similar to JP-5 and Jet A fuels and can be considered in the same class. The classes of fuels used to establish the correlation presented in this test method are represented by the following applications:

Fuel	Specification
Aviation gasoline fuels: Grades 80, 82, 100/130, and 115/145	Specification D910 Specification D6227
<u>Grades 80, UL82, UL87, 90, 91, UL91, 94, UL94, 100/100LL/100VLL</u>	Specification D6227 Specification D7547 Specification D7592 DEF STAN 91-90 NATO Code F-18
Aviation turbine fuels: Aviation turbine fuels: Jet B, JP-4 JP 4, Avtag/FSH	MIL-DTL-5624 Specification D6615 MIL-DTL-5624
—	NATO Code F-40 MIL-DTL-5624
JP-5	MIL-DTL-5624
JP-5, Avcat/FSH	MIL-DTL-5624 DEF STAN 91-86 NATO Code F-44
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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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*A Summary of Changes section appears at the end of this standard

JP-8, Avtur/FSH
JP-8

MIL-DTL-83133
MIL-DTL-83133
DEF STAN 91-87

NATO Code F-34

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Jet A, Jet A-1, Avtur

Specification ~~D1655~~

Jet A, Jet A-1

Specification ~~D1655~~
Specification ~~D7223~~
Specification ~~D7566~~
DEF STAN 91-91
NATO Code F-35

1.3 The net heat of combustion can also be estimated by Test Method/Methods ~~D1405~~ or ~~D3338~~. Test Method ~~D1405~~ requires calculation of one of four equations dependent on the fuel type with the precision equivalent to that of this test method, whereas Test Method ~~D3338~~ requires calculation of a single equation for aviation fuel with a precision equivalent to that test method.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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:²

- [D129 Test Method for Sulfur in Petroleum Products \(General High Pressure Decomposition Device Method\)](#)
- [D240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter](#)
- [D611 Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents](#)
- [D910 Specification for Leaded Aviation Gasolines](#)
- [D941 Test Method for Density and Relative Density \(Specific Gravity\) of Liquids by Lipkin Bicapillary Pycnometer \(Withdrawn 1993\)³](#)
- [D1217 Test Method for Density and Relative Density \(Specific Gravity\) of Liquids by Bingham Pycnometer](#)
- [D1250 Guide for Use of the Petroleum Measurement Tables](#)
- [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](#)
- [D1405 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels](#)
- [D1655 Specification for Aviation Turbine Fuels](#)
- [D2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry](#)
- [D3120 Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry](#)
- [D3338 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels](#)
- [D4052 Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter](#)
- [D4294 Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry](#)
- [D4809 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter \(Precision Method\)](#)
- [D5453 Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence](#)
- [D6227 Specification for Unleaded Aviation Gasoline Containing a Non-hydrocarbon Component](#)
- [D6615 Specification for Jet B Wide-Cut Aviation Turbine Fuel](#)
- [D7039 Test Method for Sulfur in Gasoline, Diesel Fuel, Jet Fuel, Kerosine, Biodiesel, Biodiesel Blends, and Gasoline-Ethanol Blends by Monochromatic Wavelength Dispersive X-ray Fluorescence Spectrometry](#)
- [D7223 Specification for Aviation Certification Turbine Fuel](#)
- [D7547 Specification for Hydrocarbon Unleaded Aviation Gasoline](#)
- [D7566 Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons](#)
- [D7592 Specification for Specification for Grade 94 Unleaded Aviation Gasoline Certification and Test Fuel \(Withdrawn 2016\)³](#)

2.2 U.S. Military Standards:⁴

- [MIL-DTL-5624 Aviation Turbine Fuels, Grades JP-4, JP-5, and JP-5/JP-8 STFuel, Aviation, Grades JP-4 and JP-5](#)

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from for electronic download at ASSIST Quick Search (<http://quicksearch.dla.mil>). The ASSIST Quick Search website is the official US Department of Defense Single Stock Point, 700 Robbins Ave., Building 4D, Philadelphia, PA 19111-5098, depository for public releasable specifications, standards and handbooks.