



Designation: D3701 – 23

# Standard Test Method for Hydrogen Content of Aviation Turbine Fuels by Low Resolution Nuclear Magnetic Resonance Spectrometry<sup>1</sup>

This standard is issued under the fixed designation D3701; 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 ( $\epsilon$ ) 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 determination of the hydrogen content of aviation turbine fuels.

1.2 Use Test Methods [D4808](#) or [D7171](#) for the determination of hydrogen in other petroleum liquids.

1.3 The values stated in SI units are to be regarded as standard. The preferred units are mass percent hydrogen.

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.* For a specific warning statement, see [7.1](#).

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:*<sup>2</sup>

[D1322](#) Test Method for Smoke Point of Kerosene and Aviation Turbine Fuel

[D1740](#) Test Method for Luminometer Numbers of Aviation Turbine Fuels (Withdrawn 2006)<sup>3</sup>

<sup>1</sup> 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 [D02.03](#) on Elemental Analysis.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

[D4057](#) Practice for Manual Sampling of Petroleum and Petroleum Products

[D4175](#) Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

[D4808](#) Test Methods for Hydrogen Content of Light Distillates, Middle Distillates, Gas Oils, and Residua by Low-Resolution Nuclear Magnetic Resonance Spectroscopy

[D7171](#) Test Method for Hydrogen Content of Middle Distillate Petroleum Products by Low-Resolution Pulsed Nuclear Magnetic Resonance Spectroscopy

## 3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology [D4175](#).

## 4. Summary of Test Method

4.1 A sample of the material is compared in a continuous wave, low-resolution, nuclear magnetic resonance spectrometer with a reference standard sample of a pure hydrocarbon. The results from the integrator on the instrument are used as a means of comparing the theoretical hydrogen content of the standard with that of the sample, the result being expressed as the hydrogen content (percent mass basis) in the sample.

## 5. Significance and Use

5.1 The combustion quality of aviation turbine fuel has traditionally been controlled in specifications by such tests as smoke point (see Test Method [D1322](#)), smoke volatility index, aromatic content of luminometer number (see Test Method [D1740](#)). Evidence is accumulating that a better control of the quality may be obtained by limiting the minimum hydrogen content of the fuel.

5.2 Existing methods allow the hydrogen content to be calculated from other parameters or determined by combustion techniques. The method specified provides a quick, simple, and more precise alternative to these methods.

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