



Standard Test Method for Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer¹

This standard is issued under the fixed designation D3948; 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* Scope*

1.1 This test method covers a rapid portable means for field and laboratory use to rate the ability of aviation turbine fuels to release entrained or emulsified water when passed through fiberglass coalescing material.

1.2 The procedure section of this test method contains two different modes of test equipment operation. The primary difference between the modes of operation is the rate of fuel flow through the fiberglass coalescing material. Test method selection is dependent on the particular fuel to be tested.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

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:²

[D1655 Specification for Aviation Turbine Fuels](#)

[D2550 Method of Test for Water Separation Characteristics of Aviation Turbine Fuels](#) (Withdrawn 1989)³

[D3602 Test Method for Water Separation Characteristics of Aviation Turbine Fuels](#) (Withdrawn 1994)³

[D4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination](#) [D3948-20](#)

[D6615 Specification for Jet B Wide-Cut Aviation Turbine Fuel](#)

[D7224 Test Method for Determining Water Separation Characteristics of Kerosine-Type Aviation Turbine Fuels Containing Additives by Portable Separometer](#)

[D7261 Test Method for Determining Water Separation Characteristics of Diesel Fuels by Portable Separometer](#)

2.2 Military Standards:⁴

[MIL-T-5624/MIL-DTL-5624 Turbine Fuel, Aviation Grades JP-4, JP-5, and JP-5/JP-8](#) [STJP-4 and JP-5](#)

[MIL-T-38219/MIL-DTL-38219 Turbine Fuel, Low Volatility, JP-7](#)

[MIL-T-83133/MIL-DTL-83133 Turbine Fuel, Aviation, Kerosene Types, JP-8 NATO F34 \(JP-8\), F-34, NATO F-35, and JP-8+100 NATO F-37](#)

3. Terminology

3.1 For definitions of terms used in this test method that are not shown below, refer to Test Methods [D7224](#) and [D7261](#).

3.2 Definitions:

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.J0.05](#) on Fuel Cleanliness.

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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 Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

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

3.2.1 *Micro-Separometer*⁵ rating (MSEP⁵ rating), *n—in the aviation fuel industry*, a numerical value indicating the ease of separating emulsified water from aviation (jet) fuel by coalescence as affected by the presence of surface active materials (also known as surface active agents or surfactants).

⁵ 'MSEP', 'DSEP', and 'Micro-Separometer' are trademarks of EMCEE Electronics, Inc., 520 Cypress Ave., Venice, FL 34285.

3.2.1.1 Discussion—

MSEP ratings obtained using Test A and Test B are termed MSEP-A and MSEP-B, respectively.

3.2.1.2 Discussion—

MSEP ratings are only valid within the range of 50 to 100, with ratings at the upper end of the range indicating a clean fuel with little or no contamination by surfactants, which is expected to show good water-separating properties when passed through a filter-separator (coalescing-type filter) in actual service.

3.2.2 *reference fluid, n—in MSEP and DSEP⁵ [diesel separability] water separability tests*, a reference fluid base to which a prescribed quantity of a known surface active agent has been added.

3.2.2.1 Discussion—

The known surface active agent is typically bis-2-ethylhexyl sodium sulfosuccinate, commonly referred to as AOT, dissolved in toluene.

3.2.3 *surfactant, n—in petroleum fuels*, surface active material (or surface active agent) that could disarm (deactivate) filter separator (coalescing) elements so that free water is not removed from the fuel in actual service.

3.2.3.1 Discussion—

Technically, surfactants affect the interfacial tension between water and fuel which affects the tendency of water to coalesce into droplets.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *reference fluid base, n—in aviation MSEP water separability tests*, jet fuel that has been cleaned in a prescribed manner to remove all surface-active contaminants (agents), and having a minimum MSEP rating of 97.

4. Summary of Test Method

4.1 A water/fuel sample emulsion is created in a syringe using a high-speed mixer. The emulsion is then expelled from the syringe at a programmed rate through a standard fiberglass coalescer and the effluent is analyzed for uncoalesced water by a light transmission measurement. The results are reported on a 0-to-100 scale to the nearest whole number. High ratings indicate the water is easily coalesced, implying that the fuel is relatively free of surfactant materials. A test can be performed in 5 min to 10 min.

5. Significance and Use

5.1 This test method provides a measure of the presence of surfactants in aviation turbine fuels. Like Test Methods **D2550** and **D3602**, this test method can detect carryover traces of refinery treating residues in fuel as produced. They can also detect surface active substances added to or picked up by the fuel during handling from point of production to point of use. Certain additives can also have an adverse effect on the rating. Some of these substances affect the ability of filter separators to separate free water from the fuel.

5.2 The Micro-Separometer has a measurement range from 50 to 100. Values obtained outside of those limits are undefined and invalid. In the event a value greater than 100 is obtained, there is a good probability that light transmittance was reduced by material contained in the fuel used to set the 100 reference level. The material was subsequently removed during the coalescing portion of the test, thus, the processed fuel had a higher light transmittance than the fuel sample used to obtain the 100 reference level resulting in the final rating measuring in excess of 100.

5.3 Test Mode A function of the separometer will give approximately the same rating for Jet A, Jet A-1, MIL JP-5, MIL JP-7, and MIL JP-8 fuels as Test Methods **D2550** and **D3602**. Using Mode A water separation characteristic ratings of Jet B and MIL JP-4 fuels will not necessarily be equivalent to Test Method **D2550** but will give approximately the same rating as Test Method **D3602**. All Micro-Separometers have Test Mode A capability.