



Designation: D3699 – 18a

## Standard Specification for Kerosine<sup>1</sup>

This standard is issued under the fixed designation D3699; 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 specification covers two grades of kerosine suitable for use in critical kerosine burner applications:

1.1.1 *No. 1-K*—A special low-sulfur grade kerosine suitable for use in nonflue-connected kerosine burner appliances and for use in wick-fed illuminating lamps.

1.1.2 *No. 2-K*—A regular grade kerosine suitable for use in flue-connected burner appliances and for use in wick-fed illuminating lamps.

1.2 This specification is intended for use in purchasing, as a reference for industry and governmental standardization, and as a source of technical information.

1.3 This specification, unless otherwise provided by agreement between the purchaser and the supplier, prescribes the required properties of kerosine at the time and place of custody transfer.

NOTE 1—The generation and dissipation of static electricity can create problems in the handling of kerosines. For more information on the subject, see Guide D4865.

1.4 Nothing in this specification shall preclude observance of federal, state, or local regulations which can be more restrictive.

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

1.6 *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.*

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.E0 on Burner, Diesel, Non-Aviation Gas Turbine, and Marine Fuels.

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### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

- D56 Test Method for Flash Point by Tag Closed Cup Tester
- D86 Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure
- D130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
- D156 Test Method for Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
- D187 Test Method for Burning Quality of Kerosene
- D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
- D1266 Test Method for Sulfur in Petroleum Products (Lamp Method)
- D2386 Test Method for Freezing Point of Aviation Fuels
- D2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry
- D2887 Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
- D3227 Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)
- D3828 Test Methods for Flash Point by Small Scale Closed Cup Tester
- D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
- D4294 Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry
- D4865 Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems
- D4952 Test Method for Qualitative Analysis for Active Sulfur Species in Fuels and Solvents (Doctor Test)
- D5453 Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence

<sup>2</sup> 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

**TABLE 1 Detailed Requirements for Kerosine**

| Property  | ASTM Test Method | Limit <sup>A</sup>  |
|---|------------------|---|
| Flash Point °C, min   | D56              | 38  |
| Distillation temperature, °C  | D86              |   |
| 10 % volume recovered, max  |                  | 205   |
| Final boiling point, max  |                  | 300   |
| Kinematic viscosity at 40 °C, mm <sup>2</sup> /s                                | D445             |   |
| min   |                  | 1.0   |
| max   |                  | 1.9   |
| Sulfur, % mass  | D2622            |   |
| No. 1-K, max  |                  | 0.04  |
| No. 2-K, max  |                  | 0.30  |
| Mercaptan sulfur, % mass, max <sup>B</sup>                                      | D3227            | 0.003   |
| Copper strip corrosion rating max, 3 h at 100 °C                                | D130             | No. 3   |
| Freezing point, °C, max   | D2386            | -30   |
| Burn Quality  |                  |   |
| Time of Burning   | D187             | Minimum 16 h continuous after first weighing  |
| Rate of Burning   | IP 10            | 18 g/h to 26 g/h after first weighing   |
| Chimney Appearance  | D187             | Maximum light white deposit (at end of test)  |
| Flame Characteristics (comparison of properties from beginning and end of test) | D187             | Maximum variance of flame width – 6 mm<br>Maximum variance of flame height lowered – 5 mm |
| Saybolt color, min  | D156             | +16 <sup>C</sup>  |

<sup>A</sup> To meet special operating conditions, modifications of individual limiting requirements, except sulfur, can be agreed upon among purchaser, seller and manufacturer.

<sup>B</sup> The Mercaptan sulfur determination can be waived if the fuel is considered sweet by Test Method D4952.

<sup>C</sup> Appendixes X1.1 and X1.12 contain additional information on color, red dye, and potential application problems.

[D5901 Test Method for Freezing Point of Aviation Fuels \(Automated Optical Method\) \(Withdrawn 2010\)](#)<sup>3</sup>

[D5972 Test Method for Freezing Point of Aviation Fuels \(Automatic Phase Transition Method\)](#)

[D6469 Guide for Microbial Contamination in Fuels and Fuel Systems](#)

[D7042 Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer \(and the Calculation of Kinematic Viscosity\)](#)

[D7094 Test Method for Flash Point by Modified Continuously Closed Cup \(MCCCFP\) Tester](#)

[D7220 Test Method for Sulfur in Automotive, Heating, and Jet Fuels by Monochromatic Energy Dispersive X-ray Fluorescence Spectrometry](#)

[D7344 Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure \(Mini Method\)](#)

[D7345 Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure \(Micro Distillation Method\)](#)

2.2 *Energy Institute Standard*:<sup>4</sup>

[IP 10 Burning Test—24 Hour, Standard Methods for Analysis and Testing of Petroleum and Related Products, Vol 1](#)

2.3 *Other Documents*:<sup>5</sup>

[26 CFR Part 48 Diesel Fuel Excise Tax; Dye, Color, and Concentration](#)

### 3. Terminology

3.1 See Terminology [D4175](#) for terms used in this standard.

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

<sup>4</sup> Available from Energy Institute, 61 New Cavendish St., London, W1G 7AR, U.K., <http://www.energyinst.org>.

<sup>5</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

### 4. General Requirements

4.1 Kerosine shall be a refined petroleum distillate consisting of a homogeneous mixture of hydrocarbons essentially free of water, inorganic acidic or basic compounds, and excessive amounts of particulate contaminants. Additive usage can be established by mutual agreement of the supplier and the purchaser.

### 5. Detailed Requirements

5.1 The kerosine shall conform to the detailed requirements prescribed in [Table 1](#).

5.2 The kerosine shall conform to the following requirements when tested for burning quality as specified:

5.2.1 *Time of Burning*—A minimum of 16 h continuous burning after the first weighing shall be required.

5.2.2 *Rate of Burning*—After the first weighing, the rate of burning shall be 18 g/h to 26 g/h with Test Method IP 10.

5.2.3 *Appearance of Chimney at End of Tests*—The chimney shall have no more than a light, white deposit.

5.2.4 *Flame Characteristics at End of Test*—At the end of test, the width of the flame shall not vary by more than 6 mm, and the height of the flame shall not have lowered by more than 5 mm from the respective measurements recorded at the start of the test.

NOTE 2—The significance of ASTM specifications for kerosine is discussed in [Appendix X1](#).

### 6. Test Methods

6.1 The requirements enumerated in this specification shall be determined in accordance with the following ASTM methods except as noted.

6.1.1 *Flash Point*—Test Method [D56](#), except where other methods are prescribed by law. Test Method [D3828](#) and [D7094](#)