



Designation: D7467 – 18

Standard Specification for Diesel Fuel Oil, Biodiesel Blend (B6 to B20)¹

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1. Scope*

1.1 This specification covers fuel blend grades of 6 volume percent to 20 volume percent (%) biodiesel with the remainder being a light middle or middle distillate diesel fuel, collectively designated as B6 to B20. These grades are suitable for various types of diesel engines.

1.1.1 The biodiesel component of the blend shall conform to the requirements of Specification [D6751](#). The remainder of the fuel shall be a light middle or middle distillate grade diesel fuel conforming to Specification [D975](#) grades No. 1-D and No. 2-D of any sulfur level specified with the following exceptions. The light middle or middle distillate grade diesel fuel whose sulfur level, aromatic level, cetane, or lubricity falls outside of Specification [D975](#) may be blended with biodiesel meeting Specification [D6751](#), provided the finished mixtures meets this specification.

1.1.2 The fuel sulfur grades are described as follows:

1.1.2.1 *Grade B6 to B20 S15*—A fuel with a maximum of 15 ppm sulfur.

1.1.2.2 *Grade B6 to B20 S500*—A fuel with a maximum of 500 ppm sulfur.

1.1.2.3 *Grade B6 to B20 S5000*—A fuel with a maximum of 5000 ppm sulfur.

1.2 This specification prescribes the required properties of B6 to B20 biodiesel blends at the time and place of delivery. The specification requirements may be applied at other points in the production and distribution system when provided by agreement between the purchaser and the supplier.

1.2.1 Nothing in this specification shall preclude observance of federal, state, or local regulations that may be more restrictive.

NOTE 1—The generation and dissipation of static electricity can create problems in the handling of distillate diesel fuel oils. For more information on this subject, see Guide [D4865](#).

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

1.4 *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

[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

[D93](#) Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

[D129](#) Test Method for Sulfur in Petroleum Products (General High Pressure Decomposition Device Method)

[D130](#) Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

[D445](#) Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

[D482](#) Test Method for Ash from Petroleum Products

[D524](#) Test Method for Ramsbottom Carbon Residue of Petroleum Products

[D613](#) Test Method for Cetane Number of Diesel Fuel Oil

[D664](#) Test Method for Acid Number of Petroleum Products by Potentiometric Titration

[D975](#) Specification for Diesel Fuel Oils

[D976](#) Test Method for Calculated Cetane Index of Distillate Fuels

[D1266](#) Test Method for Sulfur in Petroleum Products (Lamp Method)

[D1319](#) Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption

[D1552](#) Test Method for Sulfur in Petroleum Products by

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.

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

- High Temperature Combustion and Infrared (IR) Detection or Thermal Conductivity Detection (TCD)
- D2500** Test Method for Cloud Point of Petroleum Products and Liquid Fuels
- D2622** Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry
- D2624** Test Methods for Electrical Conductivity of Aviation and Distillate Fuels
- D2709** Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge
- D2880** Specification for Gas Turbine Fuel Oils
- D3117** Test Method for Wax Appearance Point of Distillate Fuels (Withdrawn 2010)³
- D3120** Test Method for Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry
- D3828** Test Methods for Flash Point by Small Scale Closed Cup Tester
- D4057** Practice for Manual Sampling of Petroleum and Petroleum Products
- D4294** Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry
- D4308** Test Method for Electrical Conductivity of Liquid Hydrocarbons by Precision Meter
- D4539** Test Method for Filterability of Diesel Fuels by Low-Temperature Flow Test (LTFT)
- D4737** Test Method for Calculated Cetane Index by Four Variable Equation
- D4865** Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems
- D5453** Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence
- D5771** Test Method for Cloud Point of Petroleum Products and Liquid Fuels (Optical Detection Stepped Cooling Method)
- D5772** Test Method for Cloud Point of Petroleum Products and Liquid Fuels (Linear Cooling Rate Method)
- D5773** Test Method for Cloud Point of Petroleum Products and Liquid Fuels (Constant Cooling Rate Method)
- D6079** Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig (HFRR)
- D6217** Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration
- D6304** Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration
- D6371** Test Method for Cold Filter Plugging Point of Diesel and Heating Fuels
- D6468** Test Method for High Temperature Stability of Middle Distillate Fuels
- D6469** Guide for Microbial Contamination in Fuels and Fuel Systems
- D6751** Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels
- D6890** Test Method for Determination of Ignition Delay and Derived Cetane Number (DCN) of Diesel Fuel Oils by Combustion in a Constant Volume Chamber
- 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)
- D7371** Test Method for Determination of Biodiesel (Fatty Acid Methyl Esters) Content in Diesel Fuel Oil Using Mid Infrared Spectroscopy (FTIR-ATR-PLS Method)
- D7397** Test Method for Cloud Point of Petroleum Products and Liquid Fuels (Miniaturized Optical Method)
- D7619** Test Method for Sizing and Counting Particles in Light and Middle Distillate Fuels, by Automatic Particle Counter
- D7668** Test Method for Determination of Derived Cetane Number (DCN) of Diesel Fuel Oils—Ignition Delay and Combustion Delay Using a Constant Volume Combustion Chamber Method
- D7689** Test Method for Cloud Point of Petroleum Products and Liquid Fuels (Mini Method)
- D7861** Test Method for Determination of Fatty Acid Methyl Esters (FAME) in Diesel Fuel by Linear Variable Filter (LVF) Array Based Mid-Infrared Spectroscopy
- E29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E1064** Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration

2.2 Other Standards:

- 26 CFR Part 48** Manufacturers and Retailers Excise Taxes⁴
- 40 CFR Part 80** Regulation of Fuels and Fuel Additives⁴
- EN 14078** Liquid Petroleum Products—Determination of Fatty Acid Methyl Ester (FAME) Content in Middle Distillates—Infrared Spectrometry Method⁵
- EN 14112** Fat and Oil Derivatives—Fatty Acid Methyl Esters (FAME)—Determination of Oxidation Stability (Accelerated Oxidation Test)⁵
- EN 15751** Automotive Fuels—Fatty Acid Methyl Ester (FAME) Fuel and Blends with Diesel Fuel—Determination of Oxidation Stability by Accelerated Oxidation Method⁵
- ISO 4406** Hydraulic Fluid Power—Fluids—Method for Coding the Level of Contamination by Solid Particles⁶

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

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

⁵ Available from the National CEN members listed on the CEN website (www.cenorm.be) or from the CEN/TC 19 Secretariat (astm@nen.nl).

⁶ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

ISO 16889 Hydraulic Fluid Power—Filters—Multi-pass Method for Evaluating Filtration Performance of a Filter Element⁶

3. Terminology

3.1 Definitions:

3.1.1 *biodiesel*, *n*—fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100.

3.1.2 *B6 to B20*, *n*—fuel blend consisting of 6 volume percent to 20 volume percent biodiesel conforming to the requirements of Specification **D6751** with the remainder being a light middle or middle distillate grade diesel fuel and meeting the requirements of this specification.

3.1.2.1 *Discussion*—The abbreviation BXX represents a specific blend concentration in the range B6 to B20, where XX is the percent volume of biodiesel in the fuel blend.

3.1.3 *S(numerical specification maximum)*—indicates the maximum sulfur content, in weight ppm ($\mu\text{g/g}$), allowed by this specification.

4. Test Methods

4.1 The requirements enumerated in this specification shall be determined in accordance with the following methods:

4.1.1 *Acid Number*—Test Method **D664**.

4.1.2 *Flash Point*—Test Method **D93**, except where other methods are prescribed by law. For all grades, Test Method **D3828** and Test Method **D7094** may be used as an alternate with the same limits. Test Method **D56** may be used as an alternate with the same limits, provided the flash point is below 93 °C. This test method will give slightly lower values. In cases of dispute, Test Method **D93** shall be used as the referee method.

4.1.3 *Cloud Point*—Test Method **D2500**. For all B6 to B20 grades in **Table 1**, Test Method **D7397** and the automatic Test Methods **D5771**, **D5772**, **D5773**, or **D7689** may be used as alternates with the same limits. Test Method **D3117** may also be used since it is closely related to Test Method **D2500**. In case of dispute, Test Method **D2500** shall be the referee test method.

4.1.4 *Cold Filter Plugging Point (CFPP)*—Test Method **D6371**.

4.1.5 *Low Temperature Flow Test (LTFT)*—Test Method **D4539**.

4.1.6 *Water and Sediment*—Test Method **D2709**. See **Appendix X4** for additional guidance on water and sediment in biodiesel blends.

4.1.7 *Carbon Residue*—Test Method **D524**.

4.1.8 *Ash*—Test Method **D482**.

4.1.9 *Distillation*—Test Method **D86**, **D7344**, or **D7345**. For all grades, Test Method **D7344** can be used as an alternative. Results from Test Method **D7344** shall be reported as “Predicted D86” results by application of the corrections described in Test Method **D7344** to improve agreement with D86 values. Results from Test Method **D7345** shall be reported as “Predicted D86” results by application of the corrections described

in Test Method **D7345** to improve agreement with D86 values. In case of dispute, Test Method **D86** shall be used as the referee test method.

4.1.10 *Viscosity*—Test Method **D445**.

4.1.11 *Sulfur*—**Table 2** shows the referee test methods and alternate test methods for sulfur, the range over which each test method applies and the corresponding fuel grades.

4.1.12 *Aromaticity*—Test Method **D1319**. This test method provides an indication of the aromatic content of fuels. For fuels with a maximum final boiling point of 315 °C, this test method is a measurement of the aromatic content of the fuel. Grade S5000 does not have an aromatics content.

4.1.13 *Cetane Index*—Test Method **D976**.

4.1.14 *Lubricity*—Test Method **D6079**.

4.1.15 *Copper Corrosion*—Test Method **D130**, 3 h test at 50 °C minimum.

4.1.16 *Cetane Number*—Test Method **D613**. Test Method **D6890** or Test Method **D7668** (see **Note 2**) may also be used. In cases of dispute, Test Method **D613** shall be the referee test method.

NOTE 2—Precision from Test Method **D7668** were obtained from results produced by laboratories using externally obtained pre-blended calibration reference material.

4.1.17 *Oxidation Stability*—Test Method EN 15751. Test Method EN 14112 may also be used but has been shown to provide falsely low readings in some cases. See **X1.16.2** for further information. In case of dispute, Test Method EN 15751 shall be the referee test method.

4.1.18 *Biodiesel Content*—Test Method **D7371**. Test Method EN 14078 or Test Method **D7861** may also be used. In cases of dispute, Test Method **D7371** shall be the referee test method. See Practice **E29** for guidance on significant digits.

4.1.19 *Conductivity*—Both conductivity test methods, Test Methods **D2624** and **D4308**, are allowed for all B6 to B20 grades. For conductivities below 1 pS/m, Test Method **D4308** is preferred.

5. Workmanship

5.1 The biodiesel blend (B6 to B20) shall be visually free of undissolved water, sediment, and suspended matter.

5.2 The biodiesel blend (B6 to B20) shall also be free of any adulterant or contaminant that may render the fuel unacceptable for its commonly used applications.

6. Requirements

6.1 The biodiesel blend (B6 to B20) specified shall conform to the detailed requirements shown in **Table 1**.

7. Precautionary Notes on Conductivity

7.1 Accumulation of static charge occurs when a hydrocarbon liquid flows with respect to another surface. The electrical conductivity requirement of 25 pS/m minimum at temperature of delivery shall apply when the transfer conditions in **Table 3** exist for the delivery into a mobile transport container (for example, tanker trucks, railcars, and barges).