



Designation: D7467 – 23

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

This standard is issued under the fixed designation D7467; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers fuel blend grades of 6 % to 20 % by volume 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](#). For grade B6-B20 S15 the biodiesel component shall be grade [D6751](#) S15 LM, except as allowed under [6.1.1.1](#) for S15 fuels used in diesel engines without Selective Catalytic Reduction (SCR) or Diesel Particulate Filter (DPF) aftertreatment technology. 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 meet 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 informa-

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 and Non-Aviation Gas Turbine Fuels.

Current edition approved Oct. 1, 2023. Published October 2023. Originally approved in 2008. Last previous edition approved in 2020 as D7467 – 20a. DOI: 10.1520/D7467-23.

tion on this subject, see Guide [D4865](#).

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

[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

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

- D1552** Test Method for Sulfur in Petroleum Products by 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
- 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 Blendstock (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
- 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)
- 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
- D7945** Test Method for Determination of Dynamic Viscosity and Derived Kinematic Viscosity of Liquids by Constant Pressure Viscometer
- D8183** Test Method for Determination of Indicated Cetane Number (ICN) of Diesel Fuel Oils using a Constant Volume Combustion Chamber—Reference Fuels Calibration Method
- 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 Taxes³
- 40 CFR Part 80** Regulation of Fuels and Fuel Additives³
- EN 14078** Liquid Petroleum Products—Determination of Fatty Acid Methyl Ester (FAME) Content in Middle Distillates—Infrared Spectrometry Method⁴
- EN 14112** Fat and Oil Derivatives—Fatty Acid Methyl Esters (FAME)—Determination of Oxidation Stability (Accelerated Oxidation Test)⁴
- EN 15751** Automotive Fuels—Fatty Acid Methyl Ester (FAME) Fuel and Blends with Diesel Fuel—Determination of Oxidation Stability by Accelerated Oxidation Method⁴

³ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

⁴ Available from the National CEN members listed on the CEN website (www.cenorm.be) or from the CEN/TC 19 Secretariat (astm@nen.nl).

ISO 4406 Hydraulic Fluid Power—Fluids—Method for Coding the Level of Contamination by Solid Particles⁵

ISO 16889 Hydraulic Fluid Power—Filters—Multi-pass Method for Evaluating Filtration Performance of a Filter Element⁵

3. Terminology

3.1 Definitions:

3.1.1 *B6 to B20, n*—fuel blend consisting of 6 % to 20 % by volume 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.

3.1.1.1 *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.

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

3.1.3 *S(numerical specification maximum), n*—a part of the grade name that states the maximum sulfur content, in ppm by mass (mg/kg), allowed by this specification.

3.1.3.1 *Discussion*—mg/kg is equivalent to $\mu\text{g/g}$, 1×10^{-4} % by mass, and mass fraction 0.000001.

3.1.3.2 *Discussion*—Most, but not all, test methods to determine sulfur content mentioned in this specification produce results in units of mg/kg. Consult the test method in use to determine units for a particular result.

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. 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 Methods **D445**, **D7042**, or **D7945** may be used with the same limits. Bias-corrected results from Test Method **D7042** shall be reported as “Predicted **D445**.” Use bias correction for Biodiesel fuel according the Precision and Bias section of **D7042**. In case of dispute, Test Method **D445** shall be used as the referee test method.

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. The supplier of the fluorescent indicator dyed gel used in Test Method **D1319** (and IP 156) is no longer able to supply the dye needed for the method to work with diesel fuel. Lot numbers 3000000975 and above will not provide correct aromatics values.

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**, **D7668** (see **Note 2**), or **D8183** (see **Note 3**) 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.

NOTE 3—Precision from Test Method **D8183** were obtained from results produced by laboratories using pre-blended calibration reference materials from a single source.

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