



Designation: ~~D6751—11b~~ **D6751 – 12**

Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels¹

This standard is issued under the fixed designation D6751; 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.

1. Scope*

1.1 This specification covers ~~biodiesel (B100) Grades S15 and S500~~ four grades of biodiesel (B100) for use as a blend component with middle distillate fuels. These grades are described as follows:

1.1.1 Grade No. 1-B S15—A special purpose biodiesel blendstock intended for use in middle distillate fuel applications which can be sensitive to the presence of partially reacted glycerides, including those applications requiring good low temperature operability, and also requiring a fuel blend component with 15 ppm sulfur (maximum).

1.1.2 Grade No. 1-B S500—A special purpose biodiesel blendstock intended for use in middle distillate fuel applications which can be sensitive to the presence of partially reacted glycerides, including those applications requiring good low temperature operability, and also requiring a fuel blend component with 500 ppm sulfur (maximum).

1.1.3 Grade No. 2-B S15—A general purpose biodiesel blendstock intended for use in middle distillate fuel applications that require a fuel blend component with 15 ppm sulfur (maximum).

1.1.4 Grade No. 2-B S500—A general purpose biodiesel blendstock intended for use in middle distillate fuel applications that require a fuel blend component with 500 ppm sulfur (maximum).

1.2 This specification prescribes the required properties of diesel fuels 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.

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

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

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

2. Referenced Documents

2.1 *ASTM Standards:*²

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

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

[D189 Test Method for Conradson Carbon Residue of Petroleum Products](#)

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

[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](#)

[D874 Test Method for Sulfated Ash from Lubricating Oils and Additives](#)

[D974 Test Method for Acid and Base Number by Color-Indicator Titration](#)

[D975 Specification for Diesel Fuel Oils](#)

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

[D1160 Test Method for Distillation of Petroleum Products at Reduced Pressure](#)

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

¹ This specification is under the jurisdiction of ASTM Committee [D02](#) on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee [D02.E0](#) on Burner, Diesel, Non-Aviation Gas Turbine, and Marine Fuels.

Current edition approved ~~July 15, 2011~~ [Aug. 1, 2012](#). Published ~~July 2011~~ [November 2012](#). Originally approved in 1999 as PS 121–99. Adopted as a standard in 2002 as D6751–02. Last previous edition approved in 2011 as D6751–~~11a~~–11b. DOI: ~~10.1520/D6751-11b~~ [10.1520/D6751-12](#).

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

D1796 Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure)

D2274 Test Method for Oxidation Stability of Distillate Fuel Oil (Accelerated Method)

D2500 Test Method for Cloud Point of Petroleum Products

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ASTM D6751-12](#)

<https://standards.iteh.ai/catalog/standards/sist/e9a6902a-b351-4dbd-b2c0-4073e9a5c820/astm-d6751-12>

- D2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry
- 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
- D3242 Test Method for Acidity in Aviation Turbine Fuel
- D3828 Test Methods for Flash Point by Small Scale Closed Cup Tester
- D4057 Practice for Manual Sampling of Petroleum and Petroleum Products
- D4177 Practice for Automatic Sampling of Petroleum and Petroleum Products
- D4294 Test Method for Sulfur in Petroleum and Petroleum Products by Energy Dispersive X-ray Fluorescence Spectrometry
- D4530 Test Method for Determination of Carbon Residue (Micro Method)
- D4737 Test Method for Calculated Cetane Index by Four Variable Equation
- D4865 Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems
- D4951 Test Method for Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
- 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 (Optical Detection Stepped Cooling Method)
- D5772 Test Method for Cloud Point of Petroleum Products (Linear Cooling Rate Method)
- D5773 Test Method for Cloud Point of Petroleum Products (Constant Cooling Rate Method)
- D6217 Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration
- D6450 Test Method for Flash Point by Continuously Closed Cup (CCCFP) Tester
- D6469 Guide for Microbial Contamination in Fuels and Fuel Systems
- D6584 Test Method for Determination of Total Monoglycerides, Total Diglycerides, Total Triglycerides, and Free and Total Glycerin in B-100 Biodiesel Methyl Esters by Gas Chromatography
- D6890 Test Method for Determination of Ignition Delay and Derived Cetane Number (DCN) of Diesel Fuel Oils by Combustion in a Constant Volume Chamber
- D7039 Test Method for Sulfur in Gasoline and Diesel Fuel by Monochromatic Wavelength Dispersive X-ray Fluorescence Spectrometry
- D7397 Test Method for Cloud Point of Petroleum Products (Miniaturized Optical Method)
- D7501 Test Method for Determination of Fuel Filter Blocking Potential of Biodiesel (B100) Blend Stock by Cold Soak Filtration Test (CSFT)

2.2 Government Standard:

40 CFR Part 79 Registration of Fuels and Fuel Additives Section 211(b) Clean Air Act⁴

2.3 Other Documents:

AOCS Standard Procedure Ck 2-09⁵ Determination of Various Properties of Biodiesel by the QTA System Method⁶

UOP 389 Trace Metals in Oils by Wet Ashing and ICP-OES⁷

UOP 391–91 Trace Metals in Petroleum Products or Organics by AAS⁷

EN 14105 Fat and oil derivatives – Fatty Acid Methyl Esters (FAME) – Determination of free and total glycerol and mono-, di-, triglyceride contents (Reference method)⁸

EN 14110 Fat and oil derivatives—Fatty acid methyl esters (FAME)—Determination of methanol content⁸

EN 14112 Fat and oil derivatives—Fatty acid methyl esters (FAME)—Determination of oxidation stability (Accelerated oxidation test)⁸

EN 14538 Fat and oil derivatives—Fatty acid methyl esters (FAME)—Determination of Ca, K, Mg and Na content by optical emission spectral analysis with inductively coupled plasma (ICP OES)⁸

EN 15751 Automotive fuels - Fatty acid methyl ester (FAME) fuel and blends with diesel fuel - Determination of oxidation stability by accelerated oxidation method⁸

3. Terminology

3.1 Definitions:

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 AOCS Headquarters, 2710 S. Boulder, Urbana, IL 61802–6996. Download Product Code: MC-CK209 from www.aocs.org.

⁶ QTA is a registered trademark of the Cognis Corporation, 5051 Estecreek Drive, Cincinnati, OH 45232-1446.

⁷ Available from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA. Visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org.

⁸ Available from the National CEN Members listed on the CEN website (www.cenorm.be) or from the CEN/TC19 secretariat (astm@nen.nl).

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.

3.1.1.1 *Discussion*—

biodiesel, as defined above, is registered with the U.S. EPA as a fuel and a fuel additive under Section 211(b) of the Clean Air Act (40 CFR Part 79). There is, however, other usage of the term *biodiesel* in the marketplace. Due to its EPA registration and the widespread commercial use of the term *biodiesel* in the U.S. marketplace, the term *biodiesel* will be maintained for this specification.

3.1.1.2 *Discussion*—

Biodiesel is typically produced by a reaction of a vegetable oil or animal fat with an alcohol such as methanol or ethanol in the presence of a catalyst to yield mono-alkyl esters and glycerin, which is removed. The finished biodiesel derives approximately 10 % of its mass from the reacted alcohol. The alcohol used in the reaction may or may not come from renewable resources.

3.1.2 *biodiesel blend (BXX), n*—blend of biodiesel fuel with diesel fuel oils.

3.1.2.1 *Discussion*—

In the abbreviation BXX, the XX represents the volume percentage of biodiesel fuel in the blend.

3.1.3 *biodiesel fuel, n*—synonym for *biodiesel*.

3.1.4 *diesel fuel, n*—middle petroleum distillate fuel.

3.1.5 *free glycerin, n*—a measure of the amount of glycerin remaining in the fuel.

3.1.6 *Grade S15 B100, n*—a grade of biodiesel meeting ASTM Specification D6751 and having a sulfur specification of 15 ppm maximum.

3.1.7 *Grade S500 B100, n*—a grade of biodiesel meeting ASTM Specification D6751 and having a sulfur specification of 500 ppm maximum.

3.1.8 *middle distillate fuel, n*—kerosines and gas oils boiling between approximately 150°C and 400°C at normal atmospheric pressure and having a closed-cup flash point above 38°C.

3.1.9 *monoglyceride, n*—a partially reacted fat or oil molecule with one long chain alkyl ester group on a glycerin backbone.

3.1.10 *total glycerin, n*—the sum of the free glycerin and the glycerin portion of any unreacted or partially reacted oil or fat.

4. Requirements

4.1 The biodiesel specified shall be mono-alkyl esters of long chain fatty acids derived from vegetable oils and animal fats.

4.2 Unless otherwise specified, samples for analysis shall be taken by the procedure described in Practices **D4057** or **D4177**.

4.3 The biodiesel specified shall conform to the detailed requirements shown in **Table 1**.

NOTE 2—A considerable amount of experience exists in the U.S. with a 20 % blend of biodiesel, primarily produced from soybean oil, with 80 % diesel fuel (B20). Experience with biodiesel produced from animal fat and other oils is similar. Experience with B20 and lower blends in other applications is not as prevalent. Although biodiesel (B100) can be used, blends of over 20 % biodiesel with diesel fuel (B20) should be evaluated on a case by case basis until further experience is available.

NOTE 3—The user should consult the equipment manufacturer or owner's manual regarding the suitability of using biodiesel or biodiesel blends in a particular engine or application.

5. Test Methods

5.1 The requirements enumerated in this specification shall be determined in accordance with the following methods.

5.1.1 *Flash Point*—Test Methods **D93**, except where other methods are prescribed by law. Test Methods **D3828** or **D6450** can also be used. The precision and bias of Test Methods **D3828** and **D6450** with biodiesel is not known and is currently under investigation. Test Methods **D93** shall be the referee method.

5.1.2 *Water and Sediment*—Test Method **D2709**. Test Method **D1796** may also be used. Test Method **D2709** shall be the referee method. The precision and bias of these test methods with biodiesel is not known and is currently under investigation.

5.1.3 *Viscosity*—Test Method **D445**.

5.1.4 *Monoglycerides*—Test Method **D6584**, Test Method EN 14105, and AOCS Standard Procedure Ck 2-09 may be used. Test Method **D6584** shall be the referee test method.

5.1.5 *Sulfated Ash*—Test Method **D874**.

5.1.6 *Oxidation Stability*—Test Method EN 15751. Test Method EN 14112 may also be used. See ~~X1.18.1~~**X1.19.1** for further information. Test Method EN 15751 shall be the referee test method.

TABLE 1 Detailed Requirements for Biodiesel (B100) (All Sulfur Levels) Blend Stocks

Property	Test Method ^A	Grade S45No.	Grade S500No.	Units	Grade No. 2-B	Grade No. 2-B
		Limits 1-B S15	Limits 1-B S500		S15	S500
Sulfur, ^B % mass (ppm), max	D5453	0.0015 (15)	0.05 (500)		0.0015 (15)	0.05 (500)
Cold soak filterability, seconds, max	D7501	200	200		360 ^C	360 ^C
Monoglyceride content, % mass, max	D6584	0.40	0.40	
Requirements for All Grades						
Calcium and Magnesium, combined	EN 14538	5-max	5-max		ppm (µg/g)	
Calcium and Magnesium, combined, ppm (µg/g), max	EN 14538	5	5		5	5
Flash point (closed cup)	D93	93-min	93-min		°C	
Flash point (closed cup), °C, min	D93	93	93		93	93
Alcohol control						
One of the following shall be met:						
— 1. Methanol content	EN 14110	0.2-max	0.2-max		mass-%	
1. Methanol content, mass %, max	EN 14110	0.2	0.2		0.2	0.2
— 2. Flash point	D93	130-min	130-min		°C	
2. Flash point, °C, min	D93	130	130		130	130
Water and sediment	D2709	0.050-max	0.050-max		% volume	
Water and sediment, % volume, max	D2709	0.050	0.050		0.050	0.050
Kinematic viscosity, 40°C	D445	1.9-6.0 ^B	1.9-6.0 ^B		mm ² /s	
Kinematic viscosity, ^D mm ² /s, 40°C	D445	1.9-6.0	1.9-6.0		1.9-6.0	1.9-6.0
Sulfated ash	D874	0.020-max	0.020-max		% mass	
Sulfated ash, % mass, max	D874	0.020	0.020		0.020	0.020
Sulfur ^C	D5453	0.0015-max (15)	0.05-max (500)		% mass (ppm)	
Copper strip corrosion	D130	No. 3-max	No. 3-max			
Copper strip corrosion, max	D130	No. 3	No. 3		No. 3	No. 3
Cetane number	D613	47-min	47-min			
Cetane number, min	D613	47	47		47	47
Cloud point	D2500	Report ^D	Report ^D		°C	
Cloud point, ^F °C	D2500	Report	Report		Report	Report
Carbon residue ^E	D4530	0.050-max	0.050-max		% mass	
Carbon residue, ^F % mass, max	D4530	0.050	0.050		0.050	0.050
Acid number	D664	0.50-max	0.50-max		mg-KOH/g	
Acid number, mg KOH/g, max	D664	0.50	0.50		0.50	0.50
Gold-soak filterability	D7501	360-max ^E	360-max ^E		seconds	
Free glycerin	D6584	0.020-max	0.020-max		% mass	
Free glycerin, % mass, max	D6584	0.020	0.020		0.020	0.020
Total glycerin	D6584	0.240-max	0.240-max		% mass	
Total glycerin, % mass, max	D6584	0.240	0.240		0.240	0.240
Phosphorus content	D4951	0.001-max	0.001-max		% mass	
Phosphorus content, % mass, max	D4951	0.001	0.001		0.001	0.001
Distillation temperature;	D4160	360-max	360-max		°C	
Atmospheric equivalent temperature;						
90% recovered						
Distillation temperature;	D1160	360	360		360	360
Atmospheric equivalent temperature;						
90% recovered, °C, max						
Sodium and Potassium, combined	EN 14538	5-max	5-max		ppm (µg/g)	
Sodium and Potassium, combined, ppm (µg/g), max	EN 14538	5	5		5	5
Oxidation stability	EN 15751	3-minimum	3-minimum		hours	
Oxidation stability, hours, min	EN 15751	3	3		3	3

^A The test methods indicated are the approved referee methods. Other acceptable methods are indicated in 5.1.

^B Other sulfur limits may apply in selected areas in the United States and in other countries.

^C B100 intended for blending into diesel fuel that is expected to give satisfactory vehicle performance at fuel temperatures at or below -12°C shall comply with a cold soak filterability limit of 200 s maximum.

^D See X1.3.1. The 6.0 mm²/s upper viscosity limit is higher than petroleum based diesel fuel and should be taken into consideration when blending.

^E Other sulfur limits may apply in selected areas in the United States and in other countries.

^F The cloud point of biodiesel is generally higher than petroleum based diesel fuel and should be taken into consideration when blending.

^G Carbon residue shall be run on the 100 % sample (see 5.4.14.5.1.12).

iTeh Standards
[tps://standards.iteh.](https://standards.iteh.org)
Document Preview



^EB100 intended for blending into diesel fuel that is expected to give satisfactory vehicle performance at fuel temperatures at or below -12°C shall comply with a cold soak filterability limit of 200 s maximum.

[ASTM D6751-12](#)

[/standards.iteh.org/catalog/standards/sist/e9a6f51-4dbd-b2c0-4073e9a5c820/astm-d6751-](https://standards.iteh.org/catalog/standards/sist/e9a6f51-4dbd-b2c0-4073e9a5c820/astm-d6751-12)