



Designation: D6823 – 08 (Reapproved 2021)

Standard Specification for Commercial Boiler Fuels With Used Lubricating Oils¹

This standard is issued under the fixed designation D6823; 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

1.1 This specification covers four grades of fuel oil made of at least 25 % used lubricating oils. The four grades of fuel are intended for use in various types of fuel-oil-burning industrial equipment and commercial boilers under various climatic and operating conditions. These fuels are not intended for use in residential heaters.

1.1.1 Grades RFC4, RFC5L, RFC5H and RFC6 are used lubricating oil blends of increasing viscosity, with or without middle distillate or residual fuel oil, or both, that are intended for use in industrial burners and commercial boilers equipped to handle these types of fuels. This specification is for applications where Specification D6448 would not meet the performance or other requirements of the burner or boiler in question.

NOTE 1—For information on the significance of the terminology and test methods used in this specification, see Appendix X1.

1.2 This specification is for use in contracts for the purchase of fuel oils derived from used lubricating oil and for the guidance of consumers of such fuels. This specification does not address the frequency with which any particular test must be run.

1.3 Nothing in this specification shall preclude observance of national or local regulations which can be more restrictive. In some jurisdictions, used oil is considered a hazardous waste and fuels derived from used oil are required to meet certain criteria before use as a fuel.

NOTE 2—For United States federal requirements imposed on used oil generators, transporters and transfer facilities, reproducers, marketers, and burners, see 40 CFR Part 279.

NOTE 3—The generation and dissipation of static electricity can create problems in the handling of distillate burner fuel oils. 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.

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.P0 on Recycled Products.

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1.4.1 *Exception*—Table 1 and Table X1.1 include inch-pound values in parentheses for information only.

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

- D56 Test Method for Flash Point by Tag Closed Cup Tester
- D93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester
- D95 Test Method for Water in Petroleum Products and Bituminous Materials by Distillation
- D97 Test Method for Pour Point of Petroleum Products
- D129 Test Method for Sulfur in Petroleum Products (General High Pressure Decomposition Device Method)
- D240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter
- D396 Specification for Fuel Oils
- D445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
- D473 Test Method for Sediment in Crude Oils and Fuel Oils by the Extraction Method
- D482 Test Method for Ash from Petroleum Products
- D664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration
- D974 Test Method for Acid and Base Number by Color-Indicator Titration
- D1266 Test Method for Sulfur in Petroleum Products (Lamp Method)
- D1298 Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method

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.

TABLE 1 Detailed Requirements for Non-Industrial Burner Fuels from Used Lubricating Oils

Properties	Test Method ^A	Limits ^B			
		RFC4	RFC5L	RFC5H	RFC6
Physical					
Viscosity at 100 °C mm ² /s ^C	D445				
min	...	...	5.0	9.0	15.0
max	...	<5.0	8.9	14.9	50.0
Flash point, °C (°F), min	D93 , Procedure B	38 (100)	55 (130)	55 (130)	60 (140)
Water and sediment, ^D % volume max	D1796	1.0	1.0	2.0	2.0
Pour point, °C (°F), max	D97	-6 (21)	^E	^E	^E
Density, kg/m ³ at 15 °C ^F	D1298	Report	Report	Report	Report
Chemical					
Acid no., mg KOH/g, max	D664	0.15	0.15	0.30	0.30
Ash, % mass, max ^G	D482	0.2	0.3	0.3	Report
Sulfur, % mass ^H	D129	Report	Report	Report	Report
Performance					
Gross heating value, MJ/kg (BTU/gal), ^I min	D240	40.0 (130 000)	41.5 (135 000)	41.5 (135 000)	43.0 (140 000)
Contaminants ^J					
Arsenic, ppm, max.	^K			5	
Cadmium, ppm, max	^K			2	
Chromium, ppm, max	D5185 ^K			10	
Lead, ppm, max	D5185 ^K			100	
Total halogens, ppm, max	D5384 ^K			1000	
PCBs, ppm, max	D6160			50 ^L	

^A See Section 8 for details and additional test methods.

^B Units given in parentheses are for informational purposes only.

^C 1 cSt = 1 mm²/s.

^D Solids content shall not exceed 0.5 %. Filtration may be required to obtain appropriate particle size for use. A deduction in quantity shall be made for all water and sediment in excess of 1.0 % by mass for Grades RFC5H and RFC6.

^E Buyer and seller to agree.

^F Density in kg/L at 15 °C multiplied by 1000 = kg/m³.

^G Buyer and seller may agree on a higher ash content.

^H Local jurisdictions may limit the sulfur content in burner fuels.

^I Assumes 7.5 lb/US gal.

^J These are US EPA current limits (40 CFR Part 279 and 40 CFR Part 761). If state or local requirements for used oil are more stringent, the burner fuel offered shall comply with the more stringent requirements.

^K US EPA SW-846 6010. Where Test Method **D5185** is listed, Test Method **D5185** will be the referee test method.

^L In the United States, current unrestricted use IAW 40 CFR Part 279 is <2 ppm. PCBs are permitted in qualified incinerators as defined in 40 CFR Part 761. US EPA prohibits blending down oils of >50 ppm to <50 ppm and oils <50 ppm to less than 2 ppm.

D1552 Test Method for Sulfur in Petroleum Products by High Temperature Combustion and Infrared (IR) Detection or Thermal Conductivity Detection (TCD)

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

D2622 Test Method for Sulfur in Petroleum Products by Wavelength Dispersive X-ray Fluorescence Spectrometry

D2983 Test Method for Low-Temperature Viscosity of Automatic Transmission Fluids, Hydraulic Fluids, and Lubricants using a Rotational Viscometer

D3228 Test Method for Total Nitrogen in Lubricating Oils and Fuel Oils by Modified Kjeldahl Method

D3245 Test Method for Pumpability of Industrial Fuel Oils (Withdrawn 2010)³

D3828 Test Methods for Flash Point by Small Scale Closed Cup Tester

D4052 Test Method for Density, Relative Density, and API Gravity of Liquids by Digital Density Meter

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

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

D4629 Test Method for Trace Nitrogen in Liquid Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection

D4865 Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems

D4868 Test Method for Estimation of Net and Gross Heat of Combustion of Hydrocarbon Burner and Diesel Fuels

D5185 Test Method for Multielement Determination of Used and Unused Lubricating Oils and Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)

D5291 Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants

D5384 Test Methods for Chlorine in Used Petroleum Products (Field Test Kit Method)

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