

INCH-POUND

MIL-PRF-6081E  
w/Amendment 1  
10 SEPTEMBER 2019SUPERSEDING  
MIL-PRF-6081E  
12 DECEMBER 2014**PERFORMANCE SPECIFICATION****LUBRICATING OIL, JET ENGINE**

This specification is approved for use by all Departments and Agencies of the Department of Defense.

**1. SCOPE****1.1 Scope.**

This specification covers the requirements for three grades of jet engine lubricating oil.

**1.2 Classification.**

The lubricating oil will be furnished in the following grades, as specified:

<b><u>GRADE</u></b>	<b><u>NATO Code Number</u></b>
1005	---
1010	O-133
1010N	---

Comments, suggestions, or questions on this document should be addressed to AFLCMC/EZSS, 2145 Monahan Way, Bldg. 28, Wright-Patterson AFB OH 45433-7017 or e-mailed to [ENGINEERING.STANDARDS@US.AF.MIL](mailto:ENGINEERING.STANDARDS@US.AF.MIL). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

AMSC N/A

FSC 9150

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w/Amendment 1**2. APPLICABLE DOCUMENTS****2.1 General.**

The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

**2.2 Government documents.****2.2.1 Specifications, standards, and handbooks.**

The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

**FEDERAL STANDARDS**

FED-STD-791                      Testing Method of Lubricants, Liquid Fuels, and Related Products

(Copies of these documents are available online at <https://quicksearch.dla.mil/>.)

**2.2.2 Other Government documents, drawings and publications.**

The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

**CODE OF FEDERAL REGULATIONS (CFR)**

29 CFR 1910.1200      Occupational Safety and Health Standards – Hazard Communication

(Copies of this document are available online at <http://www.ecfr.gov>.)

**DEFENSE STANDARDIZATION PROGRAM OFFICE**

SD-6                              Provisions Governing Qualification: Qualified Products Lists and Qualified Manufacturers Lists

(Copies of this document are available online at <https://quicksearch.dla.mil/>.)

**2.3 Non-Government publications.**

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

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## ASTM INTERNATIONAL

ASTM D92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester (DoD adopted)
ASTM D97	Standard Test Method for Pour Point of Petroleum Products (DoD adopted)
ASTM D130	Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test (DoD adopted)
ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity) (DoD adopted)
ASTM D664	Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration (DoD adopted)
ASTM D974	Standard Test Method for Acid and Base Number by Color-Indicator Titration (DoD adopted)
ASTM D1500	Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale) (DoD adopted)
ASTM D2273	Standard Test Method for Trace Sediment in Lubricating Oils (DoD adopted)
ASTM D2532	Standard Test Method for Viscosity and Viscosity Change After Standing at Low Temperature of Aircraft Turbine Lubricants (DoD adopted)
ASTM D4636	Standard Test Method for Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils (DoD adopted)

(Copies of these documents are available online at <http://www.astm.org/>.)

### 2.4 Order of precedence.

Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

### 3.1 Qualification.

The jet engine lubricating oils furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

### 3.2 Materials.

The composition of this lubricating oil is not limited; however, known or suspected human carcinogens (see 29 CFR 1910.1200) are prohibited. The lubricating oil may contain oxidation inhibitors and pour-point depressants. The engine lubricating oil shall have no adverse effect on the health of personnel when used for its intended purpose. Recycled base stocks are permitted; however, each batch must be fully tested in accordance with all qualification requirements of this

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specification. The manufacturer may be required to submit certification of conformance to this paragraph (see 6.2).

### 3.2.1 Ozone depleting chemicals.

The following test currently requires the use of toxic or ozone depleting chemicals (ODCs), but an acceptable substitute has been identified for the test.

<u>ASTM Test Method</u>	<u>Toxic Chemicals/ ODC Substance</u>	<u>Acceptable Substitute</u>
ASTM D2532	Toluene	n-Heptane

### 3.3 Chemical and physical requirements.

All classifications of the finished lubricating oil shall conform to the requirements listed in section 3 and Table I when tested in accordance with the applicable test methods.

**TABLE I. Chemical, physical, and performance requirements.**

Characteristics	Requirement		Test Method	
	Grade 1005	Grade 1010/1010N	ASTM	FED-STD-791
Total Acid Number (T.A.N.), mg KOH/g	0.10 max	0.10 max	D664 <sup>1/</sup> /D974	
Viscosity at: 37.8 °C (100 °F), mm <sup>2</sup> /s -40 °C (-40 °F), mm <sup>2</sup> /s -54 °C (-65 °F), mm <sup>2</sup> /s	5.0 min  2600 max	10.0 min 3000 max	D445 D2532 D2532	
Viscosity stability mm <sup>2</sup> /s, % change @ 3 hours -54 °C (-65 °F) -40 °C (-40 °F)	3 max <sup>2/</sup>	2 max <sup>2/</sup>	D2532 D2532 D2532	
Flash point	107 °C (225 °F) min	132 °C (270 °F) min	D92	
Pour point		-57 °C (-70 °F) max	D97	
ASTM Color	No. 5.5 max	No. 5.5 max	D1500	

MIL-PRF-6081E  
w/Amendment 1**TABLE I. Chemical, physical, and performance requirements - Continued.**

Characteristics	Requirement		Test Method	
	Grade 1005	Grades 1010 / 1010N	ASTM	FED-STD-791
Copper strip corrosion At 100 ±1 °C (212 ±2 °F)	1 max	1 max	D130	
Corrosion and oxidation stability at 121 °C (250 °F) <sup>3/</sup> Post Test Oil Properties Viscosity change, % <sup>4/</sup> Acid number change Sludge volume, mL <sup>5/</sup> Post Test Metal Specimen Weight change, mg/cm <sup>2</sup> <sup>6/</sup> Copper Steel Aluminum alloy Magnesium alloy Cadmium-plated steel	-5 to +20 max 0.2 max 0.05 mL max  ±0.2 max ±0.2 max ±0.2 max ±0.2 max ±0.2 max	-5 to +20 max 0.2 max 0.05 mL max  ±0.2 max ±0.2 max ±0.2 max ±0.2 max ±0.2 max	D4636	
Trace sediment, (mL/200 mL of oil) <sup>7/</sup> Grade 1010N sediment requirement, mg/L	0.005 mL max <sup>8/</sup>	0.005 mL max <sup>8/</sup>  2.0 max	D2273	3010.1

1/ ASTM D664 is designated the referee method.

2/ Viscosity stability calculation uses measurements taken after 35 minutes and three hours at the required test temperature.

3/ Measurements taken after metal has been subjected to the lubricating oil for 168 hours at 121 °C (250 °F) using Alternate Procedure 2.

4/ Compared with viscosity of new oil samples tested at 37.8 °C (100 °F).

5/ Sludge content is to be reported in mL to the nearest centrifuge tube subdivision level. If no sludge is visible, report "no visible sludge".

6/ There shall be no pitting, etching or visible corrosion on the surface of any of the metals when viewed under a magnification of 20 diameters. A slight brown stain on the surface of the copper shall be permitted, but dark brown, gray, or black stain shall be cause for rejection. A slight discoloration of the cadmium will be permitted.

7/ When using ASTM D2273 to determine presence of trace sediment in the lubricating oil, no diluents shall be used.

8/ Measurements taken after centrifuging.

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### 3.4 Workmanship.

The finished lubricating oil shall be transparent and uniform in appearance, and free from cloudiness, suspended matter, or other adulterations when examined visually by transmitted light.

## 4. VERIFICATION

### 4.1 Classification of inspections.

The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

### 4.2 Qualification inspection.

Qualification inspection shall consist of testing to all the requirements specified in section 3 and Table I. When required by the qualifying activity, additional evaluations may be required on candidate formulations.

#### 4.2.1 Qualification process.

The general outline of the qualification process (see 6.3) is described in the SD-6.

#### 4.2.2 Requalification.

Requalification shall be required when any change is made in source of manufacture, purity, or composition of the lubricating oil base stocks or additives. A minor change in the oil formulation may be made without requalification testing, but only after notification to, and approval by, the qualification activity. Two specific requalification categories of the lubricating oil are reblend and rebrand (see 6.5).

#### 4.2.3 Qualification inspection sample.

The qualification test sample shall consist of two gallons of finished lubricating oil, one gallon of the petroleum oil-base stock before the addition of ingredients, and one ounce of each of the additive ingredients used in the manufacture of the qualification sample; and shall be submitted prior to qualification. In the event that additives are supplied as concentrated solutions, an equivalent quantity of the solution shall be furnished. Each lubricant ingredient shall be from the same bulk lot (see 6.5) used in preparation of the qualification test sample.

### 4.3 Conformance inspection.

Conformance inspection of production lots shall consist of all the tests specified in Table II. Failure of production lots to pass any of the conformance tests shall be cause for rejection of the lot.

**TABLE II. Conformance tests.**

Characteristics	Test Method
Copper strip corrosion (see Table I)	ASTM D130
Viscosity stability at -54 °C (-65 °F) or -40 °C (-40 °F), % <sup>1/</sup> (see Table I)	ASTM D2532
Total acid number, mg KOH/g (see Table I)	ASTM D664 <sup>2/</sup> /D974
Viscosity (see Table I), mm <sup>2</sup> /s at 37.8 °C (100 °F) at -40 °C (-40 °F)	ASTM D445 ASTM D2532

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**TABLE II. Conformance tests - Continued.**

Characteristics	Test Method
at -54 °C (-65 °F)	ASTM D2532
Flash point °C (°F) (see Table I)	ASTM D92
Pour point °C (°F) (see Table I)	ASTM D97
ASTM color (see Table I)	ASTM D1500
Trace sediment in lubricating oils (see Table I)	ASTM D2273 FED-STD-791, 3010.1
<p>1/ Viscosity stability calculation uses measurements taken after 35 minutes and three hours at the required test temperature.</p> <p>2/ ASTM D664 is designated as the referee method.</p>	

#### 4.3.1 Examination of filled containers.

A random sample of filled containers from each packaged lot (see 6.6) shall be examined with regard to fill, closure, sealing and leakage.

## 5. PACKAGING

### 5.1 Packaging.

For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

### 6.1 Intended use.

The lubricating oils grades 1005 and 1010 (NATO Code Number O-133) are intended for the use in specific models of military aircraft jet engines. Lubricating oil grade 1010N is intended for use as a preservative fluid for aircraft fuel system components and equipment.

### 6.2 Acquisition requirements.

Acquisition documents should specify the following:

- Title, number, and date of this specification.
- Grade required (see 1.2).
- If certification of conformance to material prohibitions is required (see 3.2).
- Quantity desired.
- Submittal of conformance test results (see 4.3).

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- f. Packaging requirements (see 5.1).

### 6.3 Qualification.

With respect to products requiring qualification, awards will be made only for products which are, at the time of the award of contract, qualified for inclusion in Qualified Products List QPL No. 6081 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from AFRL/RQTM, Engine Mechanical Systems Branch, Bldg. 490, 1790 Loop Road North, Wright-Patterson AFB, OH 45433-7103. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil/>.

### 6.4 Subject term (key word) listing.

Flash point  
Heptane  
Preservative fluid  
Sediment  
Thermal stability  
Viscosity

### 6.5 Definition.

Bulk lot	A bulk lot is defined as an indefinite quantity of a homogeneous mixture of material offered for acceptance in a single, isolated container or manufactured by a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material.
Packaged lot	A packaged lot is defined as an indefinite number of 208-liter (55-gallon) drums, or smaller unit packages of identical size and type, offered for acceptance and filled with a homogeneous mixture of material from one isolated container; or, filled with a homogeneous mixture of material manufactured by a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material.
Reblend	A reblend lubricating oil is an original qualified lubricating oil as specified in 4.2, into which one or more ingredients have been blended by a manufacturer other than the manufacturer of the original formulation. A bulk lot of the reblended oil will be subjected to the qualification tests (see 4.2). Reblend approvals may be initiated by the process described in 6.3.
Rebrand	A rebrand lubricating oil is a qualified, fully-formulated oil which has successfully passed all qualification tests (see 4.2) and is manufactured by the original formulator at the original manufacturing site but which is packaged/distributed using a second party identifying trade name. Rebrand approvals may be initiated by the process described in 6.3.



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**6.6 International standardization agreement implementation.**

This specification implements AFIC Air Standard ACS (FG) 4024, Interchangeability Chart of Standardized Aviation Fuels, Lubricants and Associated Products, and NATO STANAG/AFLP-1135, Interchangeability of Fuels, Lubricants and Associated Products Used by the Armed Forces of the North Atlantic Treaty Nations. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at <https://assist.dla.mil>.

**6.7 Amendment notations.**

The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

**CONCLUDING MATERIAL**

Custodians:

Army - AV

Navy - AS

Air Force - 20

Preparing activity:

Air Force - 20

Agent:

Air Force - 11

Review activity:

Army - AT, TE

Navy - SA

Air Force - 06, 68

DLA - GS, PS

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of this information above using the ASSIST Online database at <https://assist.dla.mil>.