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METRIC

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SUPERSEDING
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# PERFORMANCE SPECIFICATION

# LUBRICATING OIL, GEAR, PETROLEUM BASE

# (NATO O-153, O-155)

Comments, suggestions, or questions on this document should be addressed to AFPA/PTPT, 2430 C Street, Building 70, Area B, Wright-Patterson AFB OH 45433-7632 or e-mailed to AFPA.PTPS@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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# MIL-PRF-6086F
# w/ AMENDMENT 1

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

## 1. SCOPE

1.1 Scope. This specification covers two grades of petroleum-based lubricating oils for gears (see 6.1). This oil is identified by NATO Code Numbers O-153 and O-155 (see 1.2).

1.2 Classification. Oil covered by this specification shall be classified as one of the following two grades:

a. Grade L – Light; identified by military symbol OGL and NATO Code O-153.

b. Grade M – Medium; identified by military symbol OGR and NATO Code O-155.

## 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 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.

ASTM International

| | |
|---|---|
| ASTM D91 | Standard Test Method for Precipitation Number of Lubricating Oils (DoD Adopted) |
| 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 D892 | Standard Test Method for Foaming Characteristics of Lubricating Oils (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 D2270 | Standard Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 and 100°C (DoD Adopted) |
| ASTM D2783 | Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Fluids (Four-Ball Method) |

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

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2.3 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 gear oil 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 6.4).

3.2 Materials. The oil shall consist of base stock oil mixed with a suitable load-carrying additive. The additive shall not be corrosive or cause excessive foaming, and shall be completely compatible with the base stock. The oil shall be clear and free of visible water, suspended matter, dirt, sediment or other impurities when observed at room temperature (25°C ±2°C). Recycled constituent materials shall not be used.

3.3 Chemical and physical and performance requirements. The finished gear oil shall conform to the requirements specified in table I.

***TABLE I. Physical, chemical, and performance requirements.***

| **Property** | **Requirements, grade L** | **Requirements, grade M** | **Units of measurement** | **Test method** |
|---|---|---|---|---|
| Viscosity | 23-34 | 60-82 | $mm^2/s$ at 37.8°C | ASTM D445 |
| Viscosity index | 80 | 80 | (minimum) | ASTM D2270 |
| Flash point | 137.8 | 154.5 | °C (minimum) | ASTM D92 |
| Pour point | - 40 | - 28.9 | °C (maximum) | ASTM D97 |
| Load wear index | 40 | 40 | kg (minimum) | ASTM D2783 |
| Precipitation number | 0.1 | 0.1 | mL (maximum) | ASTM D91 |
| Acid number | 1.0 | 1.0 | mg KOH/g (maximum) | ASTM D974 |
| ASTM color | 8 | 8 | (maximum) | ASTM D1500 |
| Foaming Characteristics (tendency, stability) | | | | ASTM D892 |
| Sequence I | 10, 0 | 10, 0 | mL (maximum) | |
| Sequence II | 20, 0 | 20, 0 | mL (maximum) | |
| Sequence III | 10, 0 | 10, 0 | mL (maximum) | |
| Copper corrosion (3 hours @ 100°C) | 2 | 2 | (maximum) | ASTM D130 |

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3.4 Toxicity. The gear oil shall have no adverse effect on the health of personnel when used for its intended purpose (see 6.3).

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.

4.2.1 Qualification sampling. The qualification sample shall consist of a 1-gallon aliquot of the finished gear oil. At the discretion of the qualifying activity, a separate 1-ounce aliquot of the load-carrying additive may also be required. Information as noted in 6.4.2 must accompany the submission of a qualification sample.

4.2.2 Qualification testing. The qualification sample(s) shall be tested as specified in 4.4, Methods of Inspection.

4.2.3 Retention of qualification. In order to retain a qualified status and listing on the Qualified Products List (QPL), the manufacturer shall verify by certification to the qualifying activity that the product complies with the requirements of this specification. Periodic verification by certification shall be performed in two-year intervals from the date of original qualification. The qualification activity reserves the right to re-examine the qualified product whenever deemed necessary to determine whether the product continues to meet any of the specification requirements.

4.2.4 Requalification. Requalification will be required if there is a change in the base stock source, refining treatment or additives. A minor change in the fluid formulation may be made without requalification, but only after notification to, and approval by, the qualifying activity. The qualifying activity may, at its discretion, waive complete requalification or may require only partial requalification testing to determine the significance and acceptability of the proposed formulation change.

4.3 Conformance inspection. The conformance inspection shall include the tests for viscosity, viscosity index, flash point, acid number, copper corrosion, pour point, precipitation number, foaming characteristics, and load wear index as described in table I. Samples shall be labeled completely with information identifying the purpose of the sample, name of the product, specification number, lot and batch number (see 6.7), date of sampling, and contract number.

4.4 Method of inspection.

4.4.1 Inspection. Unless otherwise specified, inspection testing shall be performed in accordance with 4.4.2 and the contractual requirements.

4.4.2 Chemical and physical and performance requirements. Testing shall be performed in accordance with the applicable methods specified in table I. Values for the physicochemical properties specified in section 3 apply to the arithmetic average of the determinations made on the samples for those values that fall within any stated repeatability or reproducibility limits of the applicable test methods.

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

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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 two grades of gear oil covered by this specification are intended for use in light-to-moderate-loaded gear trains or gear boxes that operate in low-to-medium-speed ranges down to -40°C.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Grade and quantity of oil required.

c. Packaging requirements (see 5.1) to include size and type of container, level of packaging and level of packing required.

6.3 Toxicity. Questions pertinent to this effect should be referred by the contracting activity to the appropriate departmental medical service who will act as its advisor.

6.3.1 Material Safety Data Sheets. Contracting officers will identify those activities that require copies of completed Material Safety Data Sheets (MSDS) prepared in accordance with FED-STD-313. The pertinent Government mailing addresses for submission of data are listed in FED-STD-313.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 6086 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 AFPA/PTPT, 2430 C Street, Building 70, Area B, Wright-Patterson AFB, OH 45433-7632. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4.1 Qualification information. It is understood that the material furnished under this specification subsequent to final approval will be of the same composition and will be equal to products upon which approval was originally granted. In the event that the oil under contract is found to deviate from the composition of the approval product, or that the product fails to perform satisfactorily, approval of such products will be subjected to immediate withdrawal from the QPL at the discretion of the qualifying activity.

6.4.2 Information to accompany qualification samples. Qualification samples must be submitted with an MSDS and the following information:

a. A certified test report containing complete information as to the source and type of base stock and additive materials used for the test.

b. The detailed formulation and composition of the finished product.

c. Laboratory data showing quantitative results of all tests required by this specification. The samples and reports will be forwarded to AFPA/PTPT, 2430 C Street, Building 70, Area B, Wright-Patterson AFB, OH 45433-7632.

d. The samples will be plainly identified by securely attached durable tags or labels marked with the following information:

1. Sample for qualification inspection with grade identity: LUBRICATING OIL, GEAR
2. Specification: MIL-PRF-6086
3. Grade, L or M

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4. Name of ingredient (for ingredient materials)
5. Name of manufacturer
6. Product code number
7. Date of manufacture

6.4.2.1 Formulation sheet example. An example of a satisfactory form for the formulation sheet, indicating the weight percentage and nature of each ingredient, is as follows:

a. Petroleum oil base stock (composition) percentage

b. Load carrying additive (manufacturer's name and number) percentage

6.5 International agreements. This specification implements NATO STANAG 1135. 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.

6.6 Shelf-life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order, and should include, as a minimum, shelf-life code, shelf-life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a materiel quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at time of receipt by the Government. These and other requirements, if necessary, are in DoD 4140.27-M, *Shelf-life Management Manual*. The shelf-life codes are in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: https://www.shelflife.hq.dla.mil.

6.7 Definitions.

6.7.1 Bulk lot. A bulk lot (batch) is an indefinite quantity of a homogeneous mixture of material offered for acceptance in a single, isolated container or manufactured in a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in the ingredient materials.

6.7.2 Packaged lot. A packaged lot is an indefinite number of one-quart cans, or other unit containers of identical size and type, offered for acceptance and filled with a homogeneous mixture of material from a single, isolated container; or filled with a homogeneous mixture manufactured in a single plant run (not exceeding 24 hours) through the same processing equipment, with no change in the ingredient materials.

6.8 Subject term (key word) listing.

Flash point
Foaming characteristics
Gear boxes
Gear trains
Viscosity

6.9 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. 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 and relationship to the previous issue.

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CONCLUDING MATERIAL

Custodians:
Army – MR
Navy – AS
Air Force – 68
DLA – GS

Review activities:
Army – AT, MI, MD1
Navy – SA, SH
Air Force – 11,
DLA – PS

Preparing activity:
Air Force – 68
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