

METRIC  
MIL-L-2105D  
7 August 1987  
SUPERSEDING  
MIL-L-2105C  
12 October 1976

## MILITARY SPECIFICATION

## LUBRICATING OIL, GEAR, MULTIPURPOSE (METRIC)

## 1. SCOPE

1.1 Scope. This specification covers multipurpose gear-lubricating oils (see 6.1).

1.2 Classification. The gear lubricating oils shall be of the following grades, as specified (see 6.2).

<u>Grade</u>	<u>Military symbol</u>	<u>NATO code</u>
75W	GO-75	O-186
80W-90	GO-80/90	O-226
85W-140	GO-85/140	O-228

1.3 Military part number. Gear lubricants furnished under this specification shall be identified by a military part number consisting of; a "M" prefix and specification number, a single digit "Dash Number" taken from table I which indicates the container size, and the viscosity grade of the lubricant. The military part number from Grade 80W-90 lubricant to be furnished in 1-quart containers is shown in the following example:

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 9150

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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## EXAMPLE

M2105-1-80W90

"M" prefix and specification number \_\_\_\_\_

Dash number from table I indicating the container size. \_\_\_\_\_

Viscosity grade \_\_\_\_\_

TABLE I. Dash number designations for use in military part numbers.

Dash number	Container size
1	1-pint
2	1-quart
3	1-gallon
4	5-gallon pail
5	55-gallon drum
6	bulk

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

## STANDARDS

## FEDERAL

- |             |  |
|-------------|--|
| FED-STD-791 | - Lubricants, Liquid Fuels and Related Products; Methods of Testing. |
| FED-STD-313 | - Material Safety Data Sheets Preparation and the Submission of.     |

## MILITARY

- |             |   |
|-------------|---|
| MIL-STD-105 | - Sampling Procedures and Table for Inspection by Attributes. |
| MIL-STD-290 | - Packaging of Petroleum and Related Products.                |

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

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## DEPARTMENT OF LABOR (DOL)

## OSHA 29 CFR 1910.1200 Hazard Communication Interpretation Regarding Lubricating Oils.

(Guideline CPL 2-2.38 may be obtained from OSHA Publication Office, Room S-4203, 200 Constitution Avenue, NW, Washington, DC 20210.)

(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).

- D 92 - Flash and Fire Points by Cleveland Open Cup.
- D 94 - Saponification Number of Petroleum Products.
- D 97 - Pour Point.
- D 129 - Sulfur in Petroleum Products by the Bomb Method.
- D 130 - Detection of Copper Corrosion from Petroleum Products, by the Copper Strip Tarnish Test.
- D 287 - API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method).
- D 445 - Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity).
- D 524 - Ramsbottom Carbon Residue of Petroleum Products.
- D 664 - Test for Neutralization Number by Potentiometric Titration.
- D 808 - Chlorine in New and Used Petroleum Products (Bomb Method).
- D 811 - Chemical Analysis for Metals in New and Used Lubricating Oils.
- D 874 - Sulfated Ash from Lubricating Oils and Additives.
- D 892 - Foaming Characteristics of Lubricating Oils.
- D 893 - Insolubles in Used Lubricating Oils.
- D 1091 - Phosphorus in Lubricating Oils and Additives.
- D 1317 - Chlorine in New and Used Lubricants (Sodium Alcoholate Method).
- D 1500 - ASTM Color of Petroleum Products (ASTM Color Scale).
- D 1552 - Sulfur in Petroleum Products (High-Temperature Method).
- D 2270 - Calculating Viscosity Index from Kinematic Viscosity at 40 and 100 °C.
- D 2622 - Sulfur in Petroleum Products (X-Ray Spectrographic Method).
- D 2887 - Boiling Range Distribution of Petroleum Fractions by Gas Chromatography.
- D 2983 - Low-Temperature Viscosity of Automotive Fluid Lubricants Measured by Brookfield Viscometer.

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- D 3228 - Total Nitrogen in Lubricating Oils and Fuel Oils by Modified Kjeldahl Method.
- D 4047 - Phosphorus in Lubricating Oils and Additives by Quinoline Phosphomolybdate Method.
- D 4057 - Manual Sampling of Petroleum and Petroleum Products.
- D 4294 - Sulfur in Petroleum Products by Non-Dispersive X-Ray Fluorescence Spectrometry.
- D 4628 Analysis of Barium, Calcium, Magnesium and Zinc in Unused Lubricating Oils by Atomic Absorption Spectrometry.
- ASTM Special Technical Publication (STP) 512A.
- L-33 Test - Performance Test for Evaluating the Moisture Corrosion Tendencies of Automotive Gear Lubricants.
- L-37 Test - Performance Test for Evaluating the Load Carrying Capacity of Automotive Gear Lubricants Under Conditions of Low Speed and High Torque.
- L-42 Test - Performance Test for Evaluating the Load Carrying Capacity of Automotive Gear Lubricants Under Conditions of High Speed Shock Loading.
- L-60 Test - Performance Test for Evaluating the Thermal Oxidation Stability of Automotive Gear Lubricants.

(Application for copies of all ASTM test methods should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated detail specifications, specifications sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Qualification. Gear oils furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time for opening of bids (see 4.5.1 and 6.4).

3.1.1 Companion lubricants. When companion gear lubricants in grades 80W-90 and 85W-140 are submitted for qualification, testing prescribed in 3.4.7 is required only on the grade 80W-90 product, provided the additive type and concentration used, base stock source and refining treatment are identical for both products.

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3.1.2 Qualification period. Each grade of oil which satisfies all the requirements of this specification will be qualified for a period not to exceed five years from the date of its original qualification. The qualification period for each grade 85W-140 oil qualified in accordance with 3.1.1 shall not exceed that of the companion grade 80W-90 product used in the qualification procedure.

3.1.3 Requalification. When the qualification period has expired, each product must be requalified if the supplier wishes to maintain the formulation as a current product and be eligible to bid on prospective procurements. If a product is submitted for requalification and there has been no change in the specification requirements, the qualifying activity may, at its discretion, waive complete retesting or require only partial retesting of the product to determine its continued acceptability. Whenever there is a change in the base stock, refining treatment, or additives used in the formulation, requalification will be required. When the proposed changes are minor and may not be expected to significantly affect performance, the qualifying activity may, at its discretion, waive complete requalification or may require only partial requalification in order to determine the significance and acceptability of the proposed changes.

3.1.4 Tolerances. The gear oil supplied under contract shall be identical, within permissible tolerances assigned by the qualifying activity, to the product receiving qualification. The values resulting after application of tolerances shall fall within the maximum and minimum limits specified herein (see table II and 3.4.1 through 3.4.8).

3.1.5 Material safety data sheets. When applying for qualification, the manufacturer shall submit to the qualifying activity (see 6.4) material safety data sheets prepared in accordance with FED-STD-313 and 29 CFR 1910.1200. When FED-STD-313 is at variance with the CFR, 29 CFR 1910.1200 shall take precedence, modify and supplement FED-STD-313.

3.2 Materials. The gear lubricating oil shall be derived from petroleum fractions, synthetically prepared compounds or a combination of the two types of products. They may be virgin or rerefined stocks or combination thereof. The stocks shall be compounded with such functional additives (extreme pressure agents, corrosion inhibitors, friction modifiers, etc.) as are necessary to meet specified requirements. The contractor shall certify that no carcinogenic or potentially carcinogenic constituents are present as defined under the Hazard Communication Standard (HCS) 29 CFR 1910.1200. Certification to this effect shall be made available to the contracting officer or the contracting officer's representative.

3.3 Physical and chemical requirements.

3.3.1 Requirements for finished oil. The oils shall conform to the requirements specified in table II and 3.4.1 through 3.4.8.

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3.3.2 Requirements for base stock. A one liter sample of each base stock component used in formulating the finished oil, accompanied by the following property data, shall be submitted to the qualifying activity (see 6.4) at the time of qualification. Annually thereafter a one liter production sample of each base stock component used in formulating the finished oil, accompanied by the property data, shall be submitted to the qualifying activity.

Viscosity, Kinematic  
 at 100 °C, centistokes  
 at 40 °C, centistokes  
 Viscosity index  
 Gravity, °API  
 Flash point, °C  
 Pour point, °C  
 Carbon residue, mass %  
 Sulfated ash, mass %  
 Total acid number  
 Saponification number  
 Elemental content, mass %  
 Nitrogen  
 Chlorine  
 Sulfur  
 Color  
 Boiling point distribution, °C at 1%, 5%, 10%, 50% and 90% points

3.4 Performance requirements. The oils shall conform to the requirements specified in 3.4.1 through 3.4.8.

3.4.1 Channel point. The gear oil shall be non-channeling at the temperature indicated by table II when tested in accordance with table III (method 3456, FED-STD-791).

3.4.2 Foaming. All grades of oil shall demonstrate the following foaming characteristics when tested in accordance with 4.6, table III (ASTM D 892).

- a. Initial test at 24  $\pm 0.5$  °C. Not more than 20 mL of foam shall remain immediately following the 5-minute blowing period.
- b. Intermediate test at 93.5  $\pm 0.5$  °C. Not more than 50 mL of foam shall remain immediately following the 5-minute blowing period.
- c. Final test at 24  $\pm 0.5$  °C. Not more than 20 mL of foam shall remain immediately following the 5-minute blowing period.

3.4.3 Storage stability. The gear oil shall demonstrate the following characteristics for separated solid material, liquid material, or a combination of the two materials when tested in accordance with 4.6, table III (method 3440, FED-STD-791).

3.4.3.1 Solid material. When the separated material is solid, the average increase in the weight of each centrifuge tube and residue over the initial weight of the clean tube shall not exceed 0.25 mass percent of the additive material originally contained in the sample.

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3.4.3.2 Liquid material. When the separated material is liquid, it shall not exceed 0.50 volume percent of the additive material originally contained in the sample.

TABLE II. Finished oil requirements.

Property <sup>1/</sup>	Grade 75W	Grade 80W-90	Grade 85W-140
Viscosity at 100 °C Kinematic, cSt			
min.	4.1	13.5	24.0
max.	-	< 24.0	< 41.0
Temperature for apparent viscosity of 150,000 cP, °C, max.	-40	-26	-12
Channel point, °C, max.	-45	-35	-20
Flash point, °C, min.	150	165	180
Gravity, API	X	X	X
Viscosity index	X	X	X
Pour point	X	X	X
Pentane insolubles	X	X	X
Sulfated ash	X	X	X
Sulfur	X	X	X
Phosphorus	X	X	X
Nitrogen	X	X	X
Boron	X	X	X
Zinc	X	X	X
Potassium	X	X	X
Chlorine	X	X	X
Organo-metallic components	X	X	X

<sup>1/</sup> Values shall be reported for all requirements (x indicates report).

3.4.4 Compatibility. The gear oil shall be compatible with other gear lubricants previously qualified under this specification when tested against selected reference oils in accordance with 4.6, table III (method 3430, FED-STD-791) and 4.6.1.

3.4.5 Moisture corrosion. The oil shall prevent or minimize corrosion to gear unit components in the presence of moisture. Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4.6, table III (ASTM STP 512A, L-33 Test) and exhibits test results of one percent or less rust on the test cover plate and no rust on gear teeth, bearings and functional components.

3.4.6 Thermal oxidation stability. The oil shall resist thermal and chemical oxidation. Satisfactory performance shall be demonstrated when the oil is

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tested in accordance with 4.6, table III (ASTM STP 512A, L-60 Test) for 50 hours and exhibits test results of no more than 100 percent increase in lubricant viscosity, n-pentane insolubles no higher than three mass percent and toluene insolubles no higher than two mass percent.

3.4.7 Load-carrying, extreme-pressure and deposition characteristics. The oil shall prevent or minimize gear distress and lubricant deposits under conditions of high-speed and shock-loading and conditions of high-speed, low-torque and low-speed, high-torque operation.

3.4.7.1 Gear scoring. Satisfactory performance shall be demonstrated when the oil is tested in duplicate in accordance with 4.6, table III (ASTM STP 512A, L-42 Test) and exhibits scoring less than or equal to Reference Oil RGO 110-90 under conditions of high-speed and shock-loading.

3.4.7.2 Gear distress and deposits. Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4.6, table III (ASTM STP 512A, L-37 Test) using untreated and phosphate-treated gear assemblies and prevents gear-tooth ridging, rippling, pitting, welding and excessive wear or other surface distress and objectionable deposits and does not produce excessive wear, pitting or corrosion of bearing rollers, races or thrust washers under conditions of high-speed, low-torque and low-speed, high-torque.

3.4.8 Copper corrosion. The oil shall minimize copper corrosion. Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4.6, table III (ASTM D 130) for 3-hours at  $121 \pm 1$  °C and exhibits copper strip discoloration not exceeding ASTM No. 3 when compared to ASTM Copper Strip Corrosion Standard.

3.5 Other requirements and tolerances for quality conformance testing. The following physical and chemical properties shall be tested in accordance with the appropriate methods listed in 4.6 to ensure that purchase products are of the same compositions as the respective qualification samples and to identify the products. No specific values or limits are assigned in qualification testing, except as otherwise specified in table II and 3.4.1 through 3.4.8, but test results shall be reported for all properties listed. The qualifying activity (see 6.4) shall establish specific values and tolerances for subsequent quality conformance testing of the finished lubricant for these properties (see 6.3 and 6.4):

- Viscosity
- Viscosity index
- Pour point
- Flash point
- Gravity, API
- Channel point
- Copper corrosion
- Pentane insolubles
- Sulfated ash
- Sulfur



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Phosphorus  
Nitrogen  
Chlorine  
Boron  
Potassium  
Zinc  
Metallic components

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Lot.

4.2.1 Bulk lot. A bulk lot is an indefinite quantity of a homogeneous mixture of one grade of oil offered for acceptance in a single, isolated container; or manufactured in a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in the ingredient materials.

4.2.2 Packaged lot. A packaged lot is an indefinite number of 55-gallon drums or smaller unit containers of identical size and type, offered for acceptance, and filled with a homogeneous mixture of one grade of oil from a single, isolated container; or filled with a homogeneous mixture of one grade of oil, manufactured in a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in the ingredient materials.

4.3 Sampling.

4.3.1 Sampling for the examination of filled containers. Take a random sample of filled containers from each lot in accordance with MIL-STD-105, at inspection level II, and acceptable quality level (AQL) shall be 1.0 percent defective.

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4.3.2 Sampling for tests. Take samples from bulk or packaged lots for tests in accordance with ASTM D 4057.

4.4 Inspection. Perform inspection in accordance with method 9601 of FED-STD-791.

4.4.1 Examination of filled containers. Examine samples taken in accordance with 4.3.1 for compliance with MIL-STD-290 with regard to fill, closure, sealing and leakage. Reject any container having one or more defects or under the required fill. If the number of defective or underfilled containers exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, reject the lot represented by the sample.

4.5 Classification of tests.

- a. Qualification tests (see 4.5.1).
- b. Quality conformance tests (see 4.5.2).

4.5.1 Qualification tests. Qualification tests consist of tests for all of the requirements specified in section 3 and may be conducted in any plant or laboratory approved by the qualifying activity (see 6.4). In addition the manufacturer shall provide certification of noncarcinogenicity (i.e. materials are not considered carcinogenic or potentially carcinogenic) and shall provide material safety data sheets.

4.5.2 Quality conformance tests. Tests for quality conformance of individual lots shall consist of tests for all of the requirements in section 3, except for the following (see table III):

Requirements for base stocks.  
 Storage stability.  
 Compatibility.  
 Moisture corrosion.  
 Thermal oxidation stability.  
 Load-carrying, extreme-pressure and deposition characteristics.

4.6 Test methods. Perform tests in accordance with table II, 4.6.1, and 4.6.2.

TABLE III. Test method.

Test	Method No.	Method No.
	FED-STD-791	ASTM
Viscosity, kinematic		D 445
Viscosity apparent		D 2983
Viscosity index		D 2270
Channel point	3456	
Flash point		D 92
Gravity, API		D 287
Pour point		D 97

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TABLE III. Test method. (Cont'd)

Test	Method No. FED-STD-791	Method No. ASTM
Pentane insolubles		D 893
Carbon residue		D 524
Color		D 1500
Total acid number		D 664
Saponification number		D 94
Boiling range distribution		D 2887
Sulfated ash		D 874
Sulfur <sup>1/</sup>		D 1552, D 2622, D 129, D 4294
Phosphorus <sup>2/</sup>		D 1091, D 4047
Chlorine <sup>3/</sup>		D 808, D 1317
Nitrogen		D 3228
Metallic components <sup>4/</sup>		D 811, D 4628
Foaming		D 892
Storage stability	3440	
Compatibility <sup>5/</sup>	3430	
Copper corrosion		D 130
Moisture corrosion <sup>6/</sup>		L-33
Thermal oxidaton stability <sup>6/</sup>		L-60
Load-carrying, extreme-pressure and deposition characteristics		
Gear scoring <sup>6/</sup> , <sup>7/</sup>		L-42
Gear distress and deposits <sup>6/</sup>		L-37

<sup>1/</sup> D 1552 is the preferred method but D 129 or D 2622 may be used as alternates. D 4294 is only for use with base stocks.

<sup>2/</sup> D 1091 is the preferred method but D 4047 may be used as an alternate.

<sup>3/</sup> D 808 is the preferred method but D 1317 may be used as an alternate.

<sup>4/</sup> D 4628 or other spectrochemical analysis methods approved by the qualifying activity (see 6.4) may be used as alternates.

<sup>5/</sup> See 4.6.1.

<sup>6/</sup> In accordance with ASTM STP 512A.

<sup>7/</sup> See 4.6.2.

4.6.1 Compatibility. Determine compatibility by subjecting separate mixtures of the oil with six selected reference oils designated by the qualifying activity to the procedure specified by method 3430 of FED-STD-791.

4.6.2 Gear scoring. For grade 75W oil, the L-42 gear scoring test shall be modified such that the sequence II (high-speed) portion of the test shall be commenced at a temperature of 79 °C and sequence IV (shock-loading) run with water sprays on commencing at 93 °C with a maximum rise of 5.5 to 8.3 °C.

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4.7 Inspection of packaging.4.7.1 Quality conformance inspection of pack.

4.7.1.1 Unit of product. For the purpose of inspection, a complete pack prepared for shipment shall be considered a unit of product.

4.7.1.2 Inspection lot. The inspection lot shall be as defined in 4.2 packed for shipment.

4.7.1.3 Sampling. Samples for examination of packaging shall be selected at random from each inspection lot in accordance with procedures prescribed in MIL-STD-105.

4.7.1.4 Examination. Samples selected in accordance with 4.7.1.3 shall be examined for the defects listed below. AQL shall be 1.0 percent defective.

101. Unit container not as specified and not in accordance with the requirements of MIL-STD-290.
102. Intermediate container when required, not as specified in MIL-STD-290.
103. Quantity and arrangement of unit containers packed in intermediate containers not as specified in MIL-STD-290.
104. Exterior container not as specified in MIL-STD-290.
105. Quantity and arrangement of intermediate containers packed in exterior containers not as specified in MIL-STD-290.
106. Marking not as specified in MIL-STD-290.

## 5. PACKAGING

5.1 Unit, intermediate and exterior packing and marking. Unit, intermediate and exterior packing and marking of lubricating oil shall be in accordance with MIL-STD-290, level B, C, or commercial as specified (see 6.2). Type and size of unit container shall be as specified (see 6.2).

## 6. NOTES

6.1 Intended use. The gear lubricants covered by this specification meet American Petroleum Institute (API) Service Classification GL-5 and are intended for automotive gear units, heavy-duty industrial type inclosed gear units, steering gear units and fluid lubricated universal joints of automotive equipment. The lubricants covered by this specification are intended for use as defined by appropriate lubrication orders when ambient temperatures are above -54 °C. Recommended ambient temperature ranges for use of specific viscosity grade lubricants are shown by figure 1.

6.2 Ordering data. Acquisition documents should specify the following information:

- a. Title, number, and date of this specification.
- b. Date of issue of DoDISS applicable to this contract and exceptions thereto (see 2.1.1).

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- c. Grade of oil required (see 1.2).
- d. Quantity of oil required.
- e. Type and size of containers required (see 5.1).
- f. Level of packaging required (see 5.1).

### 6.3 Other requirements and tolerances for quality conformance testing.

Definite numerical values are not specified for certain of the physical and chemical properties listed in 3.5, and for which corresponding test methods are given in section 4. Values of some properties vary from one commercial brand of oil to another for the same grade. These values are influenced by the source of the base stock, the indentities and quantities of additives, etc. Definite numerical values are not always functionally important except, for some properties, within specified maximum and minimum limits. It is not possible (or necessary) to assign restrictive values in the specification before the testing of qualification samples. During qualification, test values will be determined which are characteristic of a particular product and which can serve thereafter to identify the product. Using the results of qualification testing, the qualifying activity (see 6.4) can set values, including permissible tolerances, for future quality conformance testing.

6.4 Qualification. Lubricating oils are submitted for qualification with the intent to manufacture and supply the products to the Federal Government. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable qualified products list (QPL No.) 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 purchase orders for the products covered by this specification. The activity responsible for the qualified products list is the US Army Belvoir Research, Development and Engineering Center, Materials, Fuels and Lubricants Laboratory, ATTN: STRBE-VF, Fort Belvoir, VA 22060-5606, and information pertaining to qualification of products may be obtained from this activity.

6.5 Material safety data sheets. Contracting officers will identify those activities requiring copies of completed Material Safety Data Sheets prepared in accordance with 3.1.5. The pertinent government mailing addresses for submission of data are listed in appendix B of FED-STD-313.

6.6 International standardization agreements. Certain provisions of this specification are the subject of international standardization agreements STANAGs 2845 and 1135. When amendment, revision, or cancellation of this specification is proposed which would affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international channels, including departmental standardization offices, if required.

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6.7 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - ME  
Navy - SH  
Air Force - 68

Preparing activity:

Army - ME

Project 9150-0744

Review activities:

Army - MI, AV, AR, MD, SM  
Navy - SA, YD  
DLA - GS

User activities:

Army - AT  
Navy - OS, MC

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		EXPECTED TEMPERATURE																		
		-70	-60	-50	-40	-30	-20	-10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+120
Lubricant	°F																			
	°C	-57	-51	-46	-40	-34	-29	-23	-18	-12	-7	-1	+4	+10	+16	+21	+27	+32	+38	+49
GO (MIL-L-2105)	Lubricating Oil, Gear, Multipurpose	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
GO-75 (0-186)		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
GO-80/90 (0-226)		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
GO-85/140 (0-228)		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

FIGURE 1. Recommended ambient temperature ranges for usage of gear lubricants.

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER		2. DOCUMENT TITLE	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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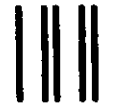
**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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