

METRIC

MIL-PRF-2105E

22 August 1995

SUPERSEDING

MIL-L-2105D

7 August 1987

PERFORMANCE SPECIFICATION

LUBRICATING OIL, GEAR, MULTIPURPOSE (METRIC)

This specification is approved for use within the U S Army Tank-automotive and Armaments Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense

1. SCOPE

1.1 Scope. This performance 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).

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

Beneficial comments, recommendations, additions, deletions, clarifications, etc and any other data which may improve this document should be sent by a letter to U S Tank-Automotive and Armaments Command, ATTN AMSTA-TR-E, Warren, MI 48397-5000

AMSC N/A

FSC 9150

DISTRIBUTION STATEMENT A Approved for public release, distribution is unlimited

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2 APPLICABLE DOCUMENTS

2.1 General The documents listed in this section are needed to meet the requirements specified in sections 3, 4, and 5 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 insure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4, and 5 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 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 (see 6.2).

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 |

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robins Avenue, BLDG 4D, Philadelphia, PA 19111-5094.)

2.2.2 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.

DEPARTMENT OF LABOR (DOL)

- | | |
|-----------------------|--|
| OSHA 29 CFR 1910.1200 | Hazard Communication Interpretation Regarding Lubricating Oils |
|-----------------------|--|

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

2.3 Non-Government publications The following document(s) form a part of this document to the extent specified herein Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation Unless otherwise specified, the issues of documents not listed in the DODISS are the issue of the documents cited in the solicitation (see 6.2)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z1.4 - Sampling Procedures and Tables for Inspections by Attributes

(Copies of the ANSI Standards may be obtained from The American National Standards Institute, 11 West 42nd Street, New York, NY 10036)

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC Z1.4 - Sampling Procedures and Tables for Inspections by Attributes

(Application for Copies should be addressed to the American Society for Quality Control (ASQC), 641 East Wisconsin Ave., Milwaukee, WI 53202-4606)

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 (Kinematic and 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 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)

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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
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 4177	- Automatic 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
D 4629	- Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection
D 4927	- Elemental Analysis of Lubricants and Additive Components - Barium, Calcium, Phosphorus, Sulfur, and Zinc by Wavelength-Dispersive X-Ray Fluorescence Spectroscopy
D 4951	- Determination of Additive Elements in Lubricating Oils by Inductively-Coupled Plasma Atomic Emission Spectrometry
D 5185	- Determination of Additive Elements, Wear Metals and Contaminants in Used Lubricating Oils by Inductively-Coupled Plasma Emission 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-60-1 Test	- Test Method for Evaluating the Thermal and Oxidative Stability of Lubricants used for Manual Transmissions and Final Drive Axles

- Cyclic Durability - Test Method for Evaluating the Thermal Stability of Manual Transmission Lubricants in a Cyclic Durability Test
- Elastomer Compatibility - Test Method for Determining Automotive Gear Oil Compatibility with Typical Oil Seal Elastomers

(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)

2.4 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 performance specification shall be products which are qualified for listing on the applicable qualified products list at the time of contract award (see 4.1.1 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.

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 retested 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 are proposed changes in the base stock, refining treatment, or additives used in the formulation, retesting 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 retesting or may require only partial retesting in order to determine the significance and acceptability of the proposed changes.

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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 I and 3.4.1 through 3.4.10).

TABLE I Finished oil requirements

Property ^{1/}	Grade 75W	Grade 80W- 90	Grade 85W- 140
Viscosity Kinematic, cSt, @ 100°C Min	4.1	13.5	24.0
Max	-	<24.0	<41.0
@ 40°C	Report	Report	Report
Apparent Viscosity cP, 150,000 max @ °C temp	-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, °C	X	X	X
Pentane Insolubles, % wt	X	X	X
Sulfur, %wt	X	X	X
Phosphorus, %wt	X	X	X
Nitrogen, %wt	X	X	X
Boron, %wt	X	X	X
Zinc, %wt	X	X	X
Potassium, %wt	X	X	X
Chlorine, %wt	X	X	X
Organo-metallic components, %wt	X	X	X

1/ Values shall be reported for all requirements (X indicates report)

3.1.5 Material safety data sheets (MSDS) When applying for qualification, the manufacturer shall submit to the qualifying activity (see 6.4) MSDS, with the sample required for qualification (see 3.4.4), 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 I and 3.4.1 through 3.4.10.

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

3.4 Performance requirements. The oils shall conform to the requirements specified in 3.4.1 through 3.4.10.

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

3.4.2 Foaming All grades of oil shall demonstrate the following foaming characteristics when tested in accordance with 4.1.1, table II (ASTM D 892)

- a Initial test at $24 \pm 0.5^\circ\text{C}$ Not more than 20 mL of foam shall remain immediately following the 5-minute blowing period

TABLE II Test method

Test	ASTM Test Method	FED-STD-791 Method No
Viscosity, kinematic	D 445	3456
Viscosity apparent	D 2983	
Viscosity index	D 2270	
Channel point		
Flash point	D 92	
Gravity, API	D 287	
Pour point	D 97	
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	
Sulfur ^{1/}	D 1552, D 2622, D 129, D 4294, D 4927, D 4951, D 5185	
Phosphorus ^{2/}	D 1091, D 4047, D 4927, D 4951, D 5185	3440
Chlorine ^{3/}	D 808, D 1317	
Nitrogen	D 3228, D 4629	
Metallic Components	D 4628, D 4927, D 4951, D 5185	
Foaming	D 892	
Storage Stability		3430
Compatibility ^{4/}		
Copper Corrosion	D 130	
Moisture Corrosion ^{5/}	L-33	

TABLE II Test method - Continued

Test	ASTM Test Method	FED-STD-791 Method No
^{5/} Thermal and Oxidative Stability Load-carrying, extreme-pressure and deposition characteristics Gear Scoring ^{5/} , ^{6/} Gear Distress and deposits ^{5/} Cyclic Durability ^{5/} Elastomer Compatibility ^{5/}	L-60-1 L-42 L-37 Mack Cyclic Durability Elastomer Compatibility	

1/ D 1552 is the preferred method D 4294 is only for use with base stocks

2/ D 1091 is the preferred method

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

4/ See 4.1.1.1

5/ In accordance with ASTM STP 512A

6/ See 4.1.1.2

- b Intermediate test at $93.5 \pm 0.5^\circ\text{C}$ Not more than 50 mL of foam shall remain immediately following the 5-minute blowing period
- c Final test at $24 \pm 0.5^\circ\text{C}$ 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 4.1.1, table II (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

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

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 4.1.1, table II (method 3430, FED-STD-791), and 4.1.1.1 A one liter sample of the tested product shall be submitted to the qualifying activity (see 6.4) before product can be qualified

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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 1 1, table II (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 and oxidative stability The oil shall resist thermal and chemical oxidation. Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4 1 1, table II (ASTM STP 512A, L-60-1 Test) for 50 hours and meets the following criteria

Parameters	Limits
Kin Viscosity Increase %, @100° C, cSt	100 max
N-Pentane Insolubles, wt%	3 0 max
Toluene Insolubles, wt%	2 0 max
Carbon/Varnish Rating	7 5 min
Sludge Rating	9 4 min

If more than one test is conducted, then the average of two test results must meet the above limits. No more than three tests are allowed. When three tests are conducted, one of the three can be discarded and the average of the remaining two tests must meet the above limits.

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 1 1, table II (ASTM STP 512A, L-42 Test), 4 1 1 2, and exhibits scoring less than or equal to Reference Oil RGO 114, or most recent approved blend, 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 1 1, table II (ASTM STP 512A, L-37 Test) using untreated and phosphate-treated gear assemblies and prevents gear-tooth ridging, rippling, pitting, welding, spalling, and excessive wear or other surface distress and objectionable deposits and does not produce excessive wear, pitting or corrosion of bearing rollers, or races 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 1 1, table II (ASTM D 130) for 3-hours at 121 +1 °C and exhibits copper strip discoloration not exceeding ASTM No 2a when compared to ASTM Copper Strip Corrosion Standard

3 4.9 Cyclic durability Satisfactory performance shall be demonstrated when the oil is tested in accordance with 4 1 1, table II (ASTM STP 512A, Cyclic Durability) The test evaluates the thermal stability of gear lubricants when subjected to cyclic operating conditions of high-low range and high temperature The oil shall avoid deteriorating the synchronizer performance by preventing two unsynchronized shifts from occurring at cycles equal to or lower than the mean of the prior five passing reference oil results in the same test stand

3 4 10 Elastomer compatibility The gear lubricants shall minimize deterioration of elastomer materials Satisfactory performance shall be demonstrated when the oils are tested and rated in accordance with 4 1 1, table II (ASTM STP 512A, Elastomer Compatibility) and exhibits test results meeting the following nominal criteria as adjusted to accommodate slight changes in individual elastomer batches

Parameters	Minimum	Maximum
Polyacrylate @150°C, 240 hrs		
Elongation Change, %	---	-60
Hardness Change, points	-25	+5 0
Volume Change, %	-5	+30
Fluoroelastomer @ 150 °C, 240 hrs		
Elongation Change, %	---	-75
Hardness Change, points	-5	+10
Volume Change, %	-5	+15

3 5 Other requirements and tolerances for conformance inspections The following physical and chemical properties shall be tested in accordance with the appropriate methods listed in 4 1 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 I and 3 4 1 through 3 4 10, but test results shall be reported for all properties listed The qualifying activity (see 6 4) shall establish specific values and tolerances for subsequent conformance inspections of the finished lubricant for these properties (see 6 3 and 6 4)

Viscosity	Sulfur
Viscosity index	Phosphorus
Pour point	Nitrogen
Flash point	Chlorine
Gravity, API	Boron
Channel point	Potassium
Copper corrosion	Zinc
Pentane insolubles	Metallic components

4 VERIFICATION

4.1 Classification of inspections The inspection requirements specified herein are classified as follows

- a Qualification inspection (see 4.1.1)
- b Conformance inspection (see 4.1.2)

4.1.1 Qualification inspections Qualification inspections 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). These tests have been correlated with field performance. New lubricant technology must have demonstrated correlation with field performance for these tests to apply as required by the qualifying activity. Once correlation has been demonstrated, only the tests specified herein will be required for further qualification. 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. Perform tests in accordance with table II, 4.1.1.1, and 4.1.1.2.

4.1.1.1 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.

4.1.1.2 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.

4.1.2 Conformance inspections Perform tests in accordance with table II, 4.1.1.1, and 4.1.1.2. Inspection for conformance of individual lots shall consist of tests for all of the requirements in section 3, except for the following (see table II).

Requirements for base stocks
Storage stability
Compatibility
Moisture corrosion
Thermal and oxidative stability
Load-carrying, extreme-pressure and deposition characteristics
Cyclic Durability
Elastomer Compatibility

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 ANSI/ASQC Z1 4

4.3.2 Sampling for tests Take samples from bulk or packaged lots for tests in accordance with ASTM D 4057 or D 4177

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 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 ANSI/ASQC Z1 4, reject the lot represented by the sample

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5 PACKAGING

5.1 **Packing** For acquisition purposes, the packing requirement shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's Packaging Command. Packaging data retrieved is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contracting the responsible packaging activity. Packing requirement shall be as specified in the contract or order (see 6.2).

5.2 **Marking** Unless otherwise specified (see 6.2), marking shall be in accordance with MIL-STD-129.

6 NOTES

6.1 **Intended use** The gear lubricants covered by this specification meet American Petroleum Institute (API) Service Classifications GL-5 and MT-1 and are intended for automotive gear units, heavy-duty industrial type enclosed gear units, steering gear units, heavy-duty non-synchronized type 7 & 8 manual transmission, 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.

E X P E C T E D T E M P E R A T U R E S																		
°F	<-50	-40	-30	-20	-10	0	10	20	30	40	50	60	70	80	90	100	110	120
°C	<-46	-40	-34	-29	-23	-18	-12	-7	-1	4	10	16	21	27	32	38	44	49
	GO-85/140 (O-228)																	
	GO-80/90 (O-226)																	
	GO-75 (O-186)																	

FIGURE 1 Recommended ambient temperature ranges for usage of gear lubricants

6 2 Acquisition requirement Acquisition documents should specify the following

- 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 and 2 3)
- c. Grade of oil required (see 1 2)
- d. Quantity of oil required
- e. Type and size of containers required (see 5 1)
- f. Marking requirements (see 5 2)

6 3 Other requirements and tolerances for conformance inspections 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 identities 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 inspection, the qualifying activity (see 6 4) can set values, including permissible tolerances, for future conformance inspection.

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 of contract award, qualified for inclusion in 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 Tank-Automotive and Armaments Command Mobility Technology Center - Belvoir, ATTN: AMSTA-RBF, 10115 Gridley Road, STF 128 Ft. Belvoir, VA 22060-5843, and information pertaining to qualification of products may be obtained from this activity.

6 5 Military part number Gear lubricants furnished under this performance 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 III which indicates the container size, and the viscosity grade of the lubricant.

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EXAMPLE

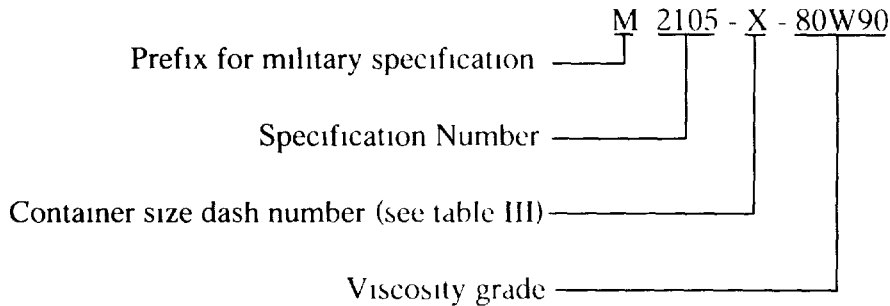


TABLE III Dash number designations for use in military part numbers

Dash Number	Container size
1	946 mL (1-quart)
2	3 785 L (1-gallon)
3	18 925 L (5-gallon)
4	208 175 L (55-gallon drum)
5	bulk

6.6 Subject Term (key word) listing.

Axles
 Gear
 Heavy-Duty
 Enclosed Gears
 Steering Units
 Non-Synchronized
 Manual Transmissions

6 7 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

6.8 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 - AT
Navy - SH
Air Force - 68

Preparing activity

Army - AT

(Project 9150-1131)

Review activities:

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

Industry Associations:

ASTM