

NOT MEASUREMENT SENSITIVE

MIL-PRF-32033A
W/Amendment 1
07 July 2016
MIL-PRF-32033A
16 February 2016

PERFORMANCE SPECIFICATION

LUBRICATING OIL, GENERAL PURPOSE, PRESERVATIVE (WATER-DISPLACING, LOW TEMPERATURE)

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 types of water-displacing, preservative lubricating oil, hereafter known as “oil(s)” or “Type I” and “Type II”, for general purpose applications at low temperatures. Type II is intended for use as a lubricant and preservative oil for corrosion-prone metallic surfaces. The oils can be applied by dipping, brushing, or by spraying from gas-pressurized cans. Type I is identified by Military Symbol PL-S and NATO Code Number O-190. Type II is identified by Military Symbol PL-SE. No NATO code is assigned for Type II.

1.2 Classification. The oils are of the following types and classes, as specified (see 6.2).

1.2.1 Types. The oils are of the following types, as specified (see 6.2).

Type I - General preservative lubricating oil.
Type II - Corrosion preventive preservative lubricating oil.

1.2.2 Classes. The oils are of the following classes, as specified (see 6.2)

Class 1 - Bulk container (brush, dip or spray application).
Class 2 - Self-pressurized container (for spray application).

Comments, suggestions, or questions on this document should be addressed to U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-SIE-ES-PLE-SI MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000 or emailed to usarmy.detroit.rdecom.mbx.tardec-standardization@mail.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 .
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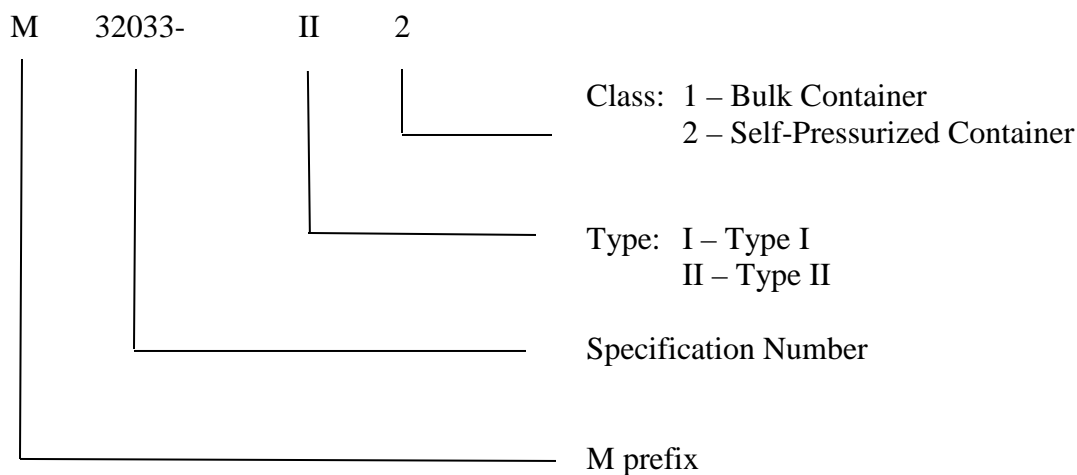
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1.3 Part or Identifying Number (PIN). PINs to be used for preservative oils acquired to this specification are created as follows:



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 in 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 issue of these documents are those cited in the solicitation or contract (See 6.2).

FEDERAL STANDARDS

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-680 - Degreasing Solvent

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

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

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AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS
(ACGIH)

Documentation of Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs).

(Electronic copies can be obtain from the website: <http://www.acgih.org>).

DEPARTMENT OF LABOR (DOL)

29 CFR 1910.1200 - Hazard Communication

(Electronic copies of the Code of Federal Regulations (CFR) Guideline may be obtained from the US Government Publishing Office website <http://www.ecfr.gov>).

NATIONAL TOXICOLOGY PROGRAM - Annual Report on Carcinogens.

(Electronic copies can be obtained from the website <http://ntp.niehs.nih.gov>)

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.

ASTM INTERNATIONAL

ASTM B117	-Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D91	- Standard Test Method for Precipitation Number of Lubricating Oils
ASTM D92	- Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D97	- Standard Test Method for Pour Point of Petroleum Products
ASTM D130	- Standard Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
ASTM D445	- Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D972	- Standard Test Method for Evaporation Loss of Lubricating Greases and Oils
ASTM D974	- Standard Test Method for Acid and Base Number by Color-Indicator Titration
ASTM D1152	- Standard Specification for Methanol (Methyl Alcohol).
ASTM D1500	-Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)
ASTM D1748	- Standard Test Method for Rust Protection by Metal Preservatives in the Humidity Cabinet
ASTM D4172	- Standard Test Method for Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method)
ASTM D4636	- Standard Test Method for Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants,

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	and Other Highly Refined Oils
ASTM D5949	- Standard Test Method for Pour Point of Petroleum Products (Automatic Pressure Pulsing Method)
ASTM D6547	- Standard Test Method for Corrosiveness of Lubricating Fluid to Bimetallic Couple

(Electronic copies can be found on the ASTM International website <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 the 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 lubricants furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list (QPL) before contract award (see 4.1.1 and 6.3). After the oil qualifies, there shall be no change in formulation or manufacturing procedure. Any change in the formulation of a qualified product will necessitate its requalification (see 6.3).

3.2 Materials. Unless otherwise specified herein, the chemical formula of the oil is the prerogative of the contractor as long as all articles submitted to the Government fully meet the operating, interface, support and ownership, and environmental requirements specified.

3.2.1 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3 Chemical and Physical Properties.

3.3.1 The chemical and physical properties of both types of preservative oil shall be as specified in Table I. See 3.3.2 for additional requirements for Type II.

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Property	Requirement	Test Method
Kinematic Viscosity		ASTM D445
at 40 ⁰ C, mm ² /s, min	11	
at -40 ⁰ C, mm ² /s, max	7,000	
at -54 ⁰ C, mm ² /s, max	60,000	
Corrosion Protection (humidity cabinet), 192 hrs	Pass	ASTM D1748 See Section 6.8
Removability	No evidence of oil residue, stain or discoloration	4.2.2.2.1
Water displacement and water stability	No evidence or rust, mottling, or surface stains	FED-STD-791, Method 3007
Corrosiveness (bimetallic couple)	No evidence of rust, mottling, or surface stains	ASTM D6547
Wear (Four ball wear scar), mm, max	1	ASTM D4172 Test Condition B
Copper Strip Corrosion, 3 hours at 100 ⁰ C, max	2a	ASTM D130
Corrosiveness and Oxidation Stability (metal protection), 168 hours at 121 ⁰ C		ASTM D4636 Alt Procedure 2
Weight change, mg/cm ²	±0.2	
Metal pitting/etching	None	
Oil insolubles /gums	None	
Viscosity change of oil at 40 ⁰ C, %	-5 to 20	ASTM D445
Neutralization Number change, mg KOH/g, max	0.20	ASTM D974
ASTM Color, max	7.0	ASTM D1500
Solid Sediment/Precipitation Number, mL mean total volume of sediment, max	0.05	ASTM D91
Flash Point, ⁰ C, min	135	ASTM D92
Pour Point, ⁰ C, max	-57	ASTM D97 (referee) or D5949
Evaporation loss at 100 ⁰ C, mass %, max	25	ASTM D972

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Low temperature stability at -45 ⁰ C for 72 hours	No gelling, crystallization, solidification or separation of insoluble materials	FED-STD-791, Method 3458
Film characterization/High temperature stability at 100 ⁰ C for 24 hours	No evidence of becoming gummy, tack, or hard	4.2.4.1

3.3.2 The chemical and physical properties of Type II preservative oil shall be as specified in Table I and Table II.

TABLE II. Additional requirements for Type II

Property	Requirement	Test Method
Salt Fog Corrosion Aluminum, 192 hrs Steel, 48 hours	Less than 3 corrosion dots per panel, all less than 1 mm diameter. Corrosion on the outer 6mm of the panel shall not be counted.	ASTM B117 See Sec. 4.2.2.2

3.4 Support and ownership requirements.

3.4.1 Toxicity. The oil shall have no adverse (injurious or damaging) effects on human health when it is used as intended (see 6.1). Blenders, formulators, and suppliers shall follow the guidelines of OSHA 29 CFR 1910.1200, the ACGIH Threshold Limit Values and Biological Exposure Indices and the most current National Toxicology Program's Annual Report on Carcinogens (see 4.2.3.1).

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 inspection. Qualification inspection shall consist of tests for all of the requirements specified in section 3 and may be conducted in any plant or laboratory approved by

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the qualifying activity (see 6.3).

4.1.2 Conformance inspection. Conformance inspection consists 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.

4.2 Verification methods. Acceptable verification methods included in this section are visual inspection, and measurement, sample tests, full-scale demonstration tests, simulation, modeling, engineering evaluation, component properties analysis, and similarity to previously approved or previously qualified designs.

4.2.1 Verification alternatives. The manufacturer may propose alternative test methods, techniques, or equipment, including the application of statistical process control, tool control, or cost effective sampling procedures to verify performance. See the contract for alternatives that replace verification methods required by this specification.

4.2.2 Operating requirements verifications.

4.2.2.1 Removability. To determine conformance to Table I, the oil shall be tested by completely immersing the three oil-coated test panels used for the humidity cabinet test in a breaker containing degreasing solvent in accordance with (IAW) MIL-PRF-680 at 25°C and agitating the solvent slightly for not more than one minute. Then, repeat this process with methanol IAW ASTM D1152. After removal from the solvent, the test panels shall not evidence any oil residue, stain, or discoloration.

4.2.2.2 Salt Fog Corrosion. To determine conformance to Table II, subject three steel and three aluminum panels treated with the preservative oil to salt spray corrosion testing IAW ASTM B117 for the duration specified in Table II. The panels shall be aluminum alloy panels, QQ-A-250/4 (2024 T-3 Bare), 2" x 4", 1/16 with hanging hole and Steel Panels, SAE 1020, cold rolled, 2" x 4" x 1/16 with hanging hole. Prepare the test panels by removing the preservative oil with toluene, hexane and acetone, then by sanding with 240-grit aluminum oxide paper as specified in ASTM D1748. Rinse the panels again in toluene, hexane and acetone and use a clean cloth to remove any residue until there is no dark stain present on the cloth. Immerse the panels in the sample oil for 10 s. Withdraw the panel with a continuous motion, drain for 10 s, then replace in the sample oil for 1 min with slight agitation. Remove from the sample oil in a continuous motion and place in salt spray apparatus immediately. (A procedure to test Type II Class 2 products is being developed and will be added at a future date.) Expose the panels for the duration specified in Table II to a spray of 5±1% salt (NaCl) solution as specified in ASTM B117. The panels shall be supported 10-20° angle from vertical with the 4 inch edge lying horizontal. At the completion of the exposure period, rinse the panels first in water, then in methanol as specified in ASTM D1152, and clean them by immersion in hexanes. Finally, rinse the panels in methanol and examine them.

4.2.3 Support and ownership requirements verifications.

4.2.3.1 Toxicity. To determine conformance to 3.4.1, components of the oil's formulation shall be compared with the toxic limits established by the guidelines of OSHA 29 CFR 1910.1200, the ACGIH Threshold Limit Values and Biological Exposure Indices, and the most current National Toxicology Program's Annual Report on Carcinogens. Oils with components

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exceeding the toxic limits shall be disqualified. Methods of quantitative determination shall be selected at the discretion of both the qualifying activity and the manufacture/blender.

4.2.4 Environmental requirements verifications.

4.2.4.1 Film characteristics/high temperature stability. To determine conformance to Table I, coat a glass panel or a microscope slide with a sample of the oil. Next, drain the panel for 24 hours at an angle of 45° with the horizontal and at a temperature of 25° C ± 3°C. Then store the panel in an oven at 100°C for 24 hours. The oil shall not exhibit any gumminess, tackiness or hardness.

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 requisite 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 which may be helpful, but is not mandatory.)

6.1 Intended use. The lubricating oil, general purpose, preservative, is intended for lubrication and protecting against corrosion of certain small arms and automatic weapons and whenever a general purpose, water-displacing, low-temperature lubricating oil is required. This oil becomes very viscous at low temperatures so that its use at temperatures below -40°C is limited by a number of machine design factors and should be proved for any specific item application by test before adoption. The availability of this material in gas-pressurized containers will prove to be beneficial for use in areas difficult to preserve by existing procedures. This preservative oil should not be used to protect the fuel system and combustion chamber of engines which are preserved in accordance with standard procedures. This material contains a carboxylic acid which could react with certain metals present in the fuel system, forming soaps which could contribute to fuel filter plugging.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification and type and class of lubricating oil required.
- b. If required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- c. Location of verification testing (see 4.1).

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d. Packaging requirements.

6.3 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. 32033, 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. Information pertaining to qualification of products may be obtained from: Department of the Army, U.S. RDECOM, F & L Technology Team, ATTN: RDTA-SIE-ES-FPT-FLT, MS110, Warren, Michigan 48397-5000 or email usarmy.detroit.rdecom.mbx.tardec-pol-help@mail.mil. An online listing of products qualified to this specification may be found in the Qualified Product Database (QPD) at <https://assist.dla.mil>.

6.4 Definitions.

6.4.1 Film characteristics. A drying process progresses through three stages identified as gummy, tacky, and hard. These are defined as follows:

Gummy - First evidence of becoming viscous.

Tacky - Advanced stage of drying, becoming sticky.

Hard - A completely dry-to-touch film.

6.5 Waste disposal instructions.

6.5.1 Recovery (RC). Coordinate with your local Defense Logistics Agency Disposition Services for the turn-in and disposal of any excess items of supply. You can locate the nearest Disposition Services by viewing their website <http://www.dispositionservices.dla.mil> and clicking on "Find a Disposition Services Site". The Disposition Services will identify whether they can accept physical custody of the property or provide further instructions. The potential for Disposition Services acceptance and disposal processing is enhanced by comprehensive identification. If the Disposition Services cannot accept the item for disposal (accountability), the manufacturer/supplier should be contacted for chemical recovery before proceeding with ultimate disposal management procedures.

DISCLAIMER

THE RECOMMENDED DISPOSAL INSTRUCTION IS FORMULATED FOR USE BY ELEMENTS OF THE DEPARTMENT OF DEFENSE. THE UNITED STATES OF AMERICA IN NO MANNER WHATSOEVER EXPRESSLY OR IMPLIEDLY WARRANTS, STATES, OR INTENDS SAID INSTRUCTION TO HAVE ANY APPLICATION, USE, OR VIABILITY BY OR TO ANY PERSON OR PERSONS OUTSIDE THE DEPARTMENT OF DEFENSE NOR ANY PERSON OR PERSONS CONTRACTING WITH ANY INSTRUMENT OF THE UNITED STATES OF AMERICA AND DISCLAIMS ALL LIABILITY FOR SUCH USE. ANY PERSON UTILIZING THIS INSTRUCTION WHO IS NOT A MILITARY OR CIVILIAN EMPLOYEE OF THE UNITED STATES OF

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AMERICA SHOULD SEEK COMPETENT PROFESSIONAL ADVICE TO VERIFY AND ASSUME RESPONSIBILITY FOR THE SUITABILITY OF THIS INSTRUCTION TO THEIR PARTICULAR SITUATION REGARDLESS OF SIMILARITY TO A CORRESPONDING DEPARTMENT OF DEFENSE OR OTHER GOVERNMENT SITUATION.

6.6 Safety Data Sheets (SDS). Contracting officers will identify those activities requiring copies of SDS's prepared in accordance with 29CFR1910.120029 CFR 1910.1200 requires that the SDS for each hazardous chemical used in an operation must be readily available to personnel using the material. Contracting officers will identify the activities requiring copies of the SDS.

6.7 Panel preparation for oil in gas-pressurized cans. Historically, the following procedure has been found to provide the best results for humidity cabinet testing of oil supplied in gas-pressurized cans (Class 2): Shake a gas-pressurized can of oil vigorously for 30 seconds. Set the cleaned panels at an angle of 15° from vertical. Hold the pressurized can vertically at a distance of 25 to 30 centimeters from the panel. With the valve open, move the can to direct the spray from one edge of the panel to the other. Make sufficient passes to assure a continuous coating. After five minutes examine the coating to determine if it is smooth and unbroken. If the coating shows evidence of gas entrapment, prepare another panel. Drain the panels for 2 hours and submit them to the test specified in ASTM D1748.

6.8 QPL tolerances. The oils supplied under contract should have the same formulation as when qualified. The finished oil properties should fall within permissible tolerances as listed in Table III. However, after the application of tolerances, the values of the properties of the oil should not exceed the maximum nor fall below the minimum requirements specified herein (See 3.3.1).

TABLE III. QPL tolerances.

Property	Tolerance
Kinematic viscosity @ 40°C	± 1.1 mm ² /s
Kinematic viscosity @ -40°C	± 700 mm ² /s
Kinematic viscosity @ -54°C	± 600 mm ² /s
Pour point	± 6°C
Flash point	± 10°C
Wear (scar diameter)	± 0.30 mm
Evaporation loss	± 5.0%

6.9 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, at 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 the 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

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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/>.

6.10 Subject term (key word) listing.

Corrosion
Gas-pressurized
Metallic

6.11 International standardization agreement implementation. This specification implements NATO STANAG 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>.

6.12 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.

Custodians:

Army - AT

Navy - AS

Air Force - 20

Preparing Activity:

Army - AT

(Project 9150-2016-004)

Review Activities:

Army – AR, MI, MD, SM

Navy – MC, SA

Air Force – 03, 50, 68

DLA – GS, PS

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 the information above using the ASSIST Online database at <https://assist.dla.mil>