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MILITARY SPECIFICATION

LUBRICANT, SOLID FILM, HEAT CURED, CORROSION INHIBITING

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

1. SCOPE

1.1 Scope. This specification establishes the requirements for two types of heat cured solid film lubricants intended to reduce wear and prevent galling, corrosion and seizure of metals (see 6.1).

1.2 Classifications. This specification establishes the following types:

Type I - A cure temperature of 150 ±3 °C and a storage stability of one year (NATO Code No. S-1738, formerly MIL-L-8937).
Type II - A cure temperature of 204 ±3 °C with a storage stability of one years (formerly MIL-L-46010).

1.3 Military part numbers. Solid film, heat cured, corrosion inhibiting lubricant furnished under this specification shall be identified by a military part number consisting of the prefix "M" and basic specification number followed by a two-digit number taken from table I indicating the unit container and type I or II as shown in the following example:

M46010-02 000

"M" prefix and basic specification number

Dash number from table I indicating container size (see 6.6).

No military symbol has been assigned

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
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TABLE I. Container Size.

Dash number (see 1.3)	Container size
0.1	1 pint (type I)
0.2	1 gallon (type I)
0.3	1 quart (type II)
0.4	1 gallon (type II)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards 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.

SPECIFICATIONS

FEDERAL

QQ-A-250/5 - Aluminum Alloy, Alclad 2024, Plate and Sheet.
VV-D-1078 - Damping Fluid, Silicone Base (Dimethyl Polysiloxane).

MILITARY

MIL-C-372 - Cleaning Compound, Solvent, (For Bore of Small Weapons and Automatic Aircraft Weapons).
MIL-T-5624 - Turbine Fuel, Aviation, Grades JP-4 and JP-5.
MIL-A-8243 - Anti-icing and Deicing - Defrosting Fluid.
MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys.
MIL-L-14107 - Lubricating Oil, Weapons, Low Temperature.
DOD-P-16232 - Phosphate Coatings, Heavy, Manganese or Zinc Base (for Ferrous Metals).
MIL-L-23699 - Lubricating Oil, Aircraft Turbine Engines, Synthetic Base.
MIL-L-46000 - Lubricant, Semi-Fluid (Automatc Weapon).
MIL-L-63460 - Lubricant, Cleaner and Preservative for Weapons and Weapon Systems.
MIL-C-81302 - Cleaning Compound, Solvent, Trichlorotrifluoroethane.
MIL-T-81533 - 1,1,1 Trichloroethane (Methyl Chloroform) Inhibited, Vapor Degreasing.

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MIL-H-83282 - Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, Metric, NATO Code Numer H-537.

STANDARDS

FEDERAL

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

FED-STD-313 - Material Safety, Data Sheets, Preparation and Submission of.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-290 - Packaging of Petroleum and Related Products.

(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)

A 167 - Stainless and Heat-Resisting Chromiun-Nickel-Steel Plate, Sheet and Strip.
A 108 - Steel Bars, Carbon, Cold-Finish, Standard Quality.
D 1141 - Substitute Ocean Water.
D 1193 - Reagent Water.
D 1310 - Flashpoint of Liquids by Tag Open-Cup Apparatus.
D 2510 - Adhesion of Solid Film Lubricants.
D 2511 - Thermal Shock Sensitivity of Solid Film Lubricants.
D 2625 - Endurance (Wear) Life and Load-Carrying Capacity of Solid Film Lubricants (Falex Method).
D 2649 - Corrosion Characteristics of Solid Film Lubricants.

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

(Nongovenment 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.)

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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. The lubricant furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3). Any change in the formulation of a qualified product will necessitate its requalification.

3.2 Materials. Component materials used in the manufacture of both types of this lubricant shall consist essentially of finely powdered lubricating solids dispersed in a suitable binder. The lubricant shall be suitable for application by brushing, dipping or by spraying. The applied film shall be capable of being cured within 60 minutes at 150 ±3 °C (302 ±5 °F) for type I and at 204 ±3 °C (399 ±5 °F) for type II when applied as specified in 4.5.2 and be of such a nature that it shall conform to the requirements of this specification. The lubricant shall contain no graphite, powdered metal or non-EPA/OSHA approved flurocarbon solvents (see 4.6.1).

3.3 Film appearance and thickness. The bonded solid film lubricant, when examined in accordance with 4.6.2, shall appear uniform in color and shall be smooth, free from any cracks, scratches, pinholes, blisters, bubbles, runs, sags, foreign matter, grit, rough particles, separation of ingredients or other surface imperfections. The thickness of the cured film shall be between 0.005 and 0.013 mm (0.0002 and 0.0005 inch). Film thickness shall be determined in accordance with 4.6 (see table III).

3.4 Performance characteristics.

3.4.1 Film adhesion. The bonded solid film lubricant, when tested as specified in 4.6, shall not be lifted to expose any bare metal surface. A uniform deposit of powdery material clinging to the tape shall not be objectionable.

3.4.2 Resistance to fluids. The bonded solid film lubricant, after immersion in each of the fluids as specified in 4.6, shall not be lifted by the tape to expose any bare metal surface; nor shall the solid film lubricant soften, lift, blister, crack, or peel. A uniform deposit of powdery material clinging to the tape shall not be objectionable.

3.4.3 Thermal stability. The thermal stability of the bonded solid film lubricant, when tested as specified in 4.6, shall not flake, crack, nor soften and shall conform to the requirements for film adhesion, 3.4.1.

3.4.4 Endurance life. When tested in accordance with 4.6, the bonded solid film lubricant shall have an average endurance life at 1000 pounds load (lbf) [4450 Newtons (N)] [765 lbf (3400N) on the direct-reading gauge] as follows:

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Type I - 250 minutes with no single test less than 210 minutes.
Type II - 450 minutes with no single test less than 390 minutes.

3.4.5 Load carrying capacity. When tested in accordance with 4.6, the bonded solid film lubricant shall have the following capacities:

Type I - At least 2500 pounds (11,120N) gauge, with no single test less than 2250 pounds (10,000N).
Type II - At least 2000 pounds (8900N) load and no single test being less than 1750 pounds (7780N).

3.4.6 Aluminum corrosion resistance (type I only). When subjected to heat and high humidity conditions as specified in 4.6, the bonded solid film lubricant on anodized aluminum panels shall not show or cause discoloration, pitting, formation of white deposits, or other evidence of corrosion.

3.4.7 Sulfurous acid - salt spray (type I only). When dry steel specimens coated with solid film lubricant are exposed to sulfurous acid - salt spray in accordance with 4.6, there shall be no resultant pitting, visible corrosion, or staining.

3.4.8 Salt - spray (fog) test (type II only). The lubricant, after applying to steel panels and cured to a film thickness of 0.0002 to 0.0005 inches (0.005 to 0.013 mm) shall show no more than three rust spots per panel, none greater than one mm in diameter after 100 hours exposure to a 5 percent salt spray solution in a salt fog cabinet conforming to FED-STD-791, method 4001.2.

3.4.9 Solids content. The lubricant shall contain a minimum of 40 percent by weight of solid material. The test shall be performed in accordance with 4.6.3 for types I and II.

3.4.10 Storage stability. The fluid lubricant after a minimum storage period as specified in 4.6.4 shall conform to the requirements for endurance life, 3.4.4, (type I and type II), and the sulfurous acid - salt spray, 3.4.7 (type I only) and 3.4.8 (type II only) when tested in accordance with 4.6.

3.5 Toxicity. The lubricant shall have no adverse effects on human health when it is used as intended (see 6.1). Questions on toxicology shall be referred by the procuring activity to the appropriate departmental medical service after consulting the qualifying activity (see 6.3). A material safety data sheet will be submitted in accordance with 4.6.6.

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

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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 Classification of inspections. The inspections specified herein are classified as follows:

a. Qualification inspection (see 4.3).
b. Quality conformance inspection (see 4.4).

4.3 Qualification inspection. The qualification inspection performed by the qualification laboratory shall consist of approval of the manufacturer's submitted report, and subjecting the qualification sample, 4.3.1, to examination and testing for all the requirements of this specification (see table III).

4.3.1 Qualification samples. The qualification sample shall consist of 1 gallon of the lubricant dispersion from one batch provided in 1-gallon containers, and two copies of the supplier's report for the product for which qualification is desired. The report shall show the product inspection results for all the requirements of this specification and shall refer specifically to the applicable paragraphs in the specification. The samples, reports and Military Safety Data Sheets for each component and the confidential formula for th product shall be forwarded to the Commander, Belvoir Research, Development, and Engineering Center, STRBE-VF, Ft. Belvoir, VA 22060-5606. The samples shall be plainly identified by securely attached durable tags or labels marked with the following information:

Sample for qualification inspection.
LUBRICANT, SOLID FILM, HEAT CURED, CORROSION INHIBITING, type I (NATO Code Number S-1738) or type II.
Name of manufacturer.
Product code number.
Date of manufacture.
Submitted by (name) (date) for qualification inspection in accordance with MIL-L-46010 under authorization of (reference authorizing letter) (see 6.3).

4.3.2 Retention of qualification. In order to retain qualification of a product approved for listing on the qualified products list (QPL), the manufacturer shall verify by certification to the qualifying activity, that the manufacturer's product complies with the requirements of this specification. The time of

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periodic verification by certification shall be in five-year intervals from the date of original qualification. The Government reserves the right to re-examine the qualified product whenever deemed necessary to determine that the product continues to meet any or all of the specification requirements.

4.4 Quality conformance inspection. The quality conformance inspection shall consist of inspection of samples for tests (see 4.4.2) for all of the tests specified in table III, (except for thermal stability [3.4.3], aluminum corrosion resistance [3.4.6], and storage stability [3.4.9]), and inspection of samples of filled containers (see 4.4.3) for conformance to section 5 packaging. Samples shall be labeled completely with information identifying the purpose of the sample, name of product, specification number, lot and batch number, date of sampling, and contract number.

4.4.1 Lot and batch. All lubricant manufactured as one batch shall be considered a lot and shall be numbered as such for purposes of inspection. A batch is defined as the end product of all the raw materials mixed or blended in a single operation.

4.4.2 Sample for tests. The sample for test shall consist of 4 separate quarts of lubricant selected at random from each lot of lubricant. The lot shall be unacceptable if a sample fails to meet any of the test requirements specified.

4.4.3 Sample for examination of filled containers. When the lubricant 1 t is in solid film dispersion, a random sample of filled containers shall be selected from each lot of lubricant in accordance with MIL-STD-105 at inspection level II and acceptable quality level (AQL) of 1.0 percent defective.

4.5 Inspection conditions.

4.5.1 Atmospheric conditions. Unless otherwise specified, all examinations and tests shall be performed at a temperature of 25 ±3 °C (77 ±5 °F) and at a relative humidity between 45 and 55 percent. Physical values specified in 3.4.4 and 3.4.5 apply to the average of the determinations made on the samples.

4.5.2 Preparation of test panels.

4.5.2.1 Preparation of and application to test panels for solid film lubricant, type I. The panels shall be made from: aluminum alloy conforming to QQ-A-250/5, anodized to conform to MIL-A-8625, type 1, and measuring approximately 0.020 by 3 by 6 inches; and corrosion resistant steel conforming to ASTM A 167, and measuring approximately 0.036 by 6 inches. The panels shall be precleaned with 1,1,1-trichloroethane conforming to MIL-T-81533. Applcation of the lubricant shall be performed in a well-ventilated area or hood where no flames or ignition sources are present. Only one side of each panel shall be fully coated, except for two of the annodized aluminum panels which shall have the lubricant applied to a 1-inch wide strip to enable measurement of the film thickness. A spray application technique shall be used to coat the panels for the tests specified herein. The solid film lubricant thickness, after cure,

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shall be 0.005 to 0.013 mm (0.0002 to 0.0005 inches). Three coats shall be the maximum number required to obtain the desired film thickness. An air dry temperature of 25 ±3 °C (77 ±5 °F) for ten minutes between coats is allowed. After the final coat has been applied, the coated specimens shall be allowed to air dry for 30 minutes. The coated specimens shall then be placed in an air circulating oven at 150 ±3 °C (302 ±5 °F) for one hour. The coated specimens shall be removed from the oven and allowed to cool to room temperature. At least two test panel specimens shall be used in each test method.

4.5.2.2 Preparation of and application to test panels for solid film lubricant, type II. The panels shall be steel panels approximately 0.125 by 3 by 6 inches conforming to ASTM A 108. The panels shall be precleaned with 1,1,1,1,-trichloroethane conforming to MIL-T-81533. The panels shall have both faces and all edges grit or sand-blasted with 120 mesh, clean, dry sand or grit. Phosphate the panels in accordance with DOD-P-16232, using FED-STD-791, method 3816 to measure the thickness of the phosphated panels. The type II panels shall be dipped or sprayed to the same thickness as specified for the type I panels (see 4.5.2.1). After air drying 30 minutes, bake the panels in an air circulating oven at 204 ±3 °C (400 ±5 °F) for one hour. The coated specimens shall be removed from the oven and allowed to cool to room temperature. At least two test panel specimens shall be used in each test method.

4.6 Methods of inspection. Methods of inspection shall be in accordance with table III and 4.6.1 through 4.6.5.

4.6.1 Graphite and powdered metal. The contractor shall submit for the contracting officer's approval certification that no graphite or powdered metal are present in the product furnished under this specification.

4.6.2 Film appearance. The bonded solid film lubricant specimens shall be examined visually and microscopically at a magnification of 12X for uniformity in color, smoothness and evidence of cracks, scratches, pinholes, blisters, bubbles, runs, sags, foreign matter, grit, rough particles, separation of ingredients, and any other surface imperfections.

4.6.3 Solid content. Stir the lubricant thoroughly, weigh 5.0 ±0.5 grams into a disposable weighing dish (Fisher Scientific catalog number 08-732). Place the dish and contents into a forced draft oven maintained at a temperature of 120 ±5 °F (49 ±3 °C) for 18 ±1 hour. Remove from oven and place in desicator. Raise temperature of oven to 400 ±2 °F (204 ±1 °C) and replace dish with residue into 400 °F (204 °C) oven for 1 additional hour. Remove dish and contents and cool in a desicator. When cool, weigh dish and contents. Calculate percent by weight of solids in fluid lubricant as follows:

$$\text{Percent total solids} = \frac{\text{Weight of solid materials (grams)}}{\text{Weight of sample (grams)}} \times 100$$

4.6.4 Storage stability. Set aside a one-quart type I qualification sample in a storage of 25 ±3 °C (77 ±5 °F) for a period of 1 year ±7 days. At the end of the storage period, determine the endurance life (see 3.4.4), of the cured

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lubricant film and the sulfurous acid - salt spray (see 3.4.7). Set aside a one-quart type II qualification sample in storage of 25 ±3 °C (77 ±5 °F) for a period of 1 year ±7 days. After this period determine the endurance life of cured film (see 3.4.4), salt-spray (fog) test (see 3.4.8).

4.6.5 Examination of filled containers. Each filled container selected in accordance with 4.4.3 shall be examined for defects of the container and the closure, for evidence of leakage, and for unsatisfactory markings. Each sample container shall also be weighed to determine the amount of the contents. If the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, failure of the lot shall be indicated.

4.6.6 Toxicity. A material safety data sheet conforming to FED-STD-313 is required for each component of the product at the time of qualification.

5. PACKAGING

5.1 Packaging, packing, and marking. The lubricant shall be packaged, packed, and marked in accordance with MIL-STD-290. The type and size of containers and the level of packaging and packing shall be as specified by the acquiring activity (see 6.2).

5.2 Precautionary marking. In addition to the marking specified in 5.1, the individual containers and the shipping containers shall be marked to show the date of manufacture, recommended conditions for storage, and flash point by Tag open cup method, ASTM D 1310, and the marking shall include the following information:

a. WARNING! Do not use this lubricant in food processing or food handling equipment on surfaces that may contact foods.
b. CAUTION! Use only in a well ventilated area or in a hood where no flames or other ignition sources are present.
c. NOTE. Use this lubricant within 12 months from date of manufacture.

5.2.1 Additional marking. The individual containers shall be marked with the following application instruction:

a. Degrease and clean component part thoroughly.
b. Spray wet at 40 psi, 10 to 12 inches from part (shake mixture constantly), using a Binks No. 18 spray gun with No. 66DS nozzle or equivalent.
c. Allow 10 minutes air dry between coats (to dullness).
d. Do not exceed 0.0005 inches (0.013mm) total thickness.
e. For type I, after spraying, air dry for 1/2 hour and cure at 150 °C (302 °F) for 1 hour. For type II, after spraying, air dry 1/2 hour and cure at 204 °C (400 °F).

6. NOTES

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6.1 Intended use. The solid film lubricant covered by this specification is intended for use on aluminum, aluminum alloys, copper and copper alloys, steel and stainless steel, titanium, and chrominum and nickel bearing surfaces (see appendix for application instructions). It is useful under the following conditions:

a. To touch up worn surfaces originally coated with lubricant conforming to MIL-L-8937 or MIL-L-46010.
b. For sliding motion applications such as plain and spherical bearings, flap tracks, hinges, threads, and cam surfaces.
c. Where conventional lubricants are difficult to apply or retain, or where other lubricants may be easily contaminated with dirt and dust.
d. For use within 12 months of the date of manufacture.
e. Where temperatures may range from -90 to 400 °F (-68 to 204 °C).
f. If mechanisms are operated at infrequent intervals or are lubricated for life.
g. Where long-term corrosion protection is required.
h. Where a solvent-resistant coating is required.
i. Where a lubricant requires extremely heavy load ability in initial start-up of heavy loaded mechanism designed for fluid lubrication.

6.1.1 Use limitations. This lubricant should not be used under the following conditions:

a. On materials which will be adversely affected by the curing temperatures of 150 - 204 °C (302 - 400 °F) for 1 hour.
b. In operations consisting of rotary motion above 100 rpm under heavy loads where the possibility of conventional fluid lubricant contamination exists. The cured lubricant film is highly resistant to conventional fluid lubricants, but the high fluid pressures developed in heavily loaded sleeve type bearings drastically reduces the wear life provided by the solid lubricant film.
c. On bearings containing rolling elements.
d. Where there is potential contact with liquid oxygen.

6.1.2 Corrosion protection life. This lubricant can be expected to provide corrosion protection for five years in indoor storage and approximately two years protection in outdoor storage when lubricant is applied over phosphated steel to a thickness of 0.0005 inch (0.013 mm). Where maximum corrosion protection on steel is desired, the lubricant should be applied over phosphated steel to a thickness of 0.001 inch (0.025 mm). The heavier coating can be expected to provide outdoor corrosion protection for approximately four years.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type required (see 1.2).
c. Packaging, packing, and marking data with requirements in detail (see 5.1).
d. Quantity (see 6.2.1.1).

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6.2.1.1 Age limitation. The lubricant should not be ordered for use beyond 12 months from the date of manufacture.

6.2.1.2 Packaging options. In the preparation of contracts or orders, it must be noted that various options, choices and alternatives, as indicated in MIL-STD-290, may be exercised in the preparation of this lubricant for delivery.

6.3 Qualifications. 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 qualified products list (QPL-46010) 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 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 Commander, US Army Belvoir Research, Development, and Engineering Center, ATTN: STRBE-VF, Fort Belvoir, VA 22060-5606. Products shall not be considered for inclusion in QPL-46010B until such time as appropriate departmental medical activity has reviewed all pertinent material saftey data sheets (FED-STD-313).

6.4 Falex lubricant tester. Information pertaining to the Falex lubricant tester (see 3.4.4) can be obtained from the Faville-LeValley Corp., 2055 Comprehensive Dr., Aurora, IL 60505. The attention of the operator is called to the fact that repeatable and reproducible test results can only be obtained if the test instrument is in proper calibration.

6.5 International standardization agreements. Certain provisions of this specification (see 1.1) are the subject of international standardization agreement (ASCC Air Standard 15/1, NATO STANAG 1135, Annex C). When amendment, revision, or cancellation of this specification is proposed, which will effect or violate the international agreement concerned, the preparing activity should take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.6 Container size and stock number.

TABLE II. Container size and stock number.

National stock number	Container size
9150-00-834-5608	1 pint (type I)
9150-00-985-7255	1 gallon (type I)
9150-00-948-6912	1 quart (type II)
9150-00-948-7025	1 gallon (type II)

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6.7 Subject term (key word) listing.

Lubricant, bonded solid film.
Lubricant, corrosion inhibiting.
Lubricant, heat cured.
Lubricant, solid film.

6.8 Changes from previous issue. Asterisks 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 - AS
Air Force - 20

Review interest:
Army - AR, AV, MI, AL, SM, AT, MD
Navy - SH
Air Force - 68
DLA - GS

Preparing activity:
Army - ME

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TABLE III. Qualification inspection tests.

Characteristic	Test method		Requirement paragraph	
	FED-STD-791	ASTM	Type I	Type II
1	2	3	4	5
Film thickness 1/	3816		3.3	3.3
			0.0002 - 0.0005 in (0.005 - 0.013 mm)	
Film adhesion		D 2510 Procedure A	3.4.1	3.4.1
Resistance to fluids 2/		D 2510 Procedure C	3.4.2	3.4.2
Thermal stability 3/		D 2511	3.4.3	3.4.3
Endurance wear life 4/		D 2625 Procedure A	3.4.4	3.4.4
Load carrying capacity (Falex Pin and Vee-block method) 4/		D 2625 Procedure B	3.4.5 11,120 N (2500 lbf) average with no single test less than 10,000N (2250 lbf)	3.4.5 8900 N (2000 lbf) average with no single test less than 7780N (1750 lbf)
Aluminum corrosion resistance 5/		D 2649 (type I)	3.4.6	Not required
Corrosion protection	5331 (type I) 6/		3.4.7	Not required
	4001.2 (type II) 5/		Not required	3.4.8
Solids content (4.6.3)			3.4.9	3.4.9
Storage stability			3.4.10	3.4.10

1/ Film thickness is determined after panels are prepared in accordance with FED-STD-791, method 3816 and air dried and baked for 60 ±5 minutes at:

a. 150 ±3 °C (302 ±5 °F) for type I.
b. 204 ±3 °C (400 ±5 °F) for type II.

2/ Test fluids shall be in accordance with table IV.

3/ Any condensation shall be removed with clean, dry compressed air. The dried panel shall then be subjected to the film adhesion test.

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4/ The surface of test pins and Vee-block shall be pretreated with phosphate in accordance with DOD-P-16232 or grit blasted (120 steel grit, 50-60 RMS).

5/ All lubricants film thicknesses must fall within 0.002 - 0.005 inch when prepared in accordance with 4.5.2 (type II) before placing in salt fog cabinet in accordance with No. 4001.2.

6/ The panels shall be subjected to 4 cycles. Each cycle consisting of 2 hours spray time and 24 hours drying time before inspection.

TABLE IV. Test fluids.

Fluid	Specification
1,1,1-Trichloroethane, Inhibited, Vapor Degreasing..	MIL-T-81533
Anti-icing fluid.	MIL-A-8243
Cleaning compound, solvent for bore of small arms and automatic weapons.	MIL-C-372
Trichlorotrifluoroethane.	MIL-C-81302
Reagent water.	ASTM D 1193, type III
Substitute Ocean Water	ASTM D 1141, Vol. 31
Hydraulic fluid, Synthetic hydrcarbon base.	MIL-H-83282
Turbine fuel.	MIL-T-5624, Grade JP-4
Lubricating oil, aircraft turbine engine, synthetic base.	MIL-L-23699
Damping fluid, silicone base (dimethyl polysiloxane).	VV-D-1078
Lubricating oil, weapons, low temperature	MIL-L-14107
Lubricant, semi-fluid (automatic weapons)	MIL-L-46000
Lubricant, cleaner and preservative for weapons and weapons systems.	MIL-L-63460

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APPENDIX

INSTRUCTIONS FOR APPLYING LUBRICANT, SOLID-FILM, HEAT-CURED, CORROSION INHIBITING

10. SCOPE

10.1 Scope. This appendix is not a mandatory part of the specification. The information contained herein is intended for guidance for surface pretreatment, temperature, and baking time required to cure the solid film lubricant when it is applied over the bearing surfaces of various metals.

20. APPLICABLE DOCUMENTS

20.1 Government documents.

20.1.1 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.

SPECIFICATIONS

FEDERAL

QQ-P-35	- Passivation Treatments for Corrosion-Resisting Steel.
TT-N-95	- Naphtha, Aliphatic.

MILITARY

MIL-F-495	- Finish, Chemical, Black, for Copper Alloys.
MIL-M-45202	- Magnesium Alloy, Anodic Treatment of.

30. REQUIREMENTS

30.1 General application instructions for all metals. Do not touch the pretreated surfaces with the fingers. Apply the lubricant by brushing, dipping, or spraying to a film thickness of 0.005 to 0.013 mm (0.0002 to 0.0005 inch) and permit the coated parts to air dry for at least 30 minutes to assure complete removal of solvent. Bake at 150 °C (302 °F) for one hour or 204 °C (400 °F) for

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types I and II respectively. The coated surface of the piece must remain at the cure temperature for the specified time. This may require that the coated piece remain in the oven for a period longer than that specified to assure compliance with this requirement.

The use of a thermocouple attached to the coated surface to indicate the temperature of the coating has been found to be satisfactory for determining the beginning of the timed baking period.

30.2 Application on aluminum and aluminum alloys. Vapor degrease the surfaces to be coated with 1,1,1-trichloroethane meeting the requirements of MIL-T-81533. Anodize and seal the surface in accordance with MIL-A-8625, types I, II, or III, class 1.

30.3 Application on copper and copper alloys. Vapor degrease the surface with 1,1,1-trichloroethane meeting the requirements of MIL-T-81533. Sandblast the surfaces with 130 mesh clean, dry sand. Form a black oxide finish on the surfaces in accordance with MIL-F-495.

30.4 Application on magnesium and magnesium alloys. Vapor degrease the surfaces to be coated with 1,1,1,-trichloroethane meeting the requirements of MIL-T-81533. Anodize the surface in accordance with MIL-M-45202, type I, class A, B, or C.

30.5 Application on steel. Vapor degrease the surfaces to be coated with 1,1,1-trichloroethane meeting the requirements of MIL-T-81533. Sandblast the surfaces with 120 mesh clean, dry sand or steel grit. Phosphate in accordance with DOD-P-16232, type M, class 3 or type Z, class 3.

30.6 Application on stainless steels. Vapor degrease the surfaces to be coated with 1,1,1-trichloroethane meeting the requirements of MIL-T-81533. Sandblast the surfaces with 120 mesh clean, dry sand. Passivate the surfaces with QQ-P-35, types I, II, or III as applicable.

30.7 Application on titanium and titanium alloys. Degrease the surfaces to be coated with aliphatic naphtha meeting the requirements of TT-N-95. Sandblast the surface with 120 mesh clean, dry sand or steel grit and alkaline anodize.

30.8 Engineering tolerances. The operating thickness of this lubricant ranges for 0.005 to 0.013 mm (0.0002 to 0.0005 inch) per lubricated surface. This thickness seldom requires alteration of established clearances between moving parts. There is one exception. The lubricant coating thickness must be considered in the case of small parts which normally operate with very little clearance. The cured lubricant film is relatively soft and any interference produced by the thickness of the lubricant will cause rapid wear of the lubricant film to the point where interference is eliminated.

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1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-L-46010B	Lubricant, Solid Film, Heat Cure, Corrosion Inhibiting

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
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	☐ 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
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