

METRIC

MIL-DTL-23549D
10 May 2002
 SUPERSEDING
 MIL-G-23549C
 INTERIM AMENDMENT 1
 30 April 1997
 MIL-G-23549C
 31 MARCH 1981

DETAIL SPECIFICATION

GREASE, GENERAL PURPOSE

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

1. SCOPE

1.1 Scope. This specification covers the requirements for one type and grade of a general purpose molybdenum disulfide grease for extended use at temperatures up to 177 °C (350 °F) and for brief periods of use at temperatures up to 204 °C (400 °F) (see 6.1).

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 documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are 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).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
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AMSC N/A

FSC 9150

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STANDARDS

FEDERAL

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

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

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 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 issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

- ASQC-Z1.4 - Procedures, Sampling and Tables for Inspection by Attributes. (DoD adopted)

(Application for copies should be addressed to the American Society for Quality Control, P.O. Box 3005, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM-D97 - Petroleum Products, Pour Point of. (DoD adopted)
 ASTM-D130 - Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test, Detection of. (DoD adopted)
 ASTM-D217 - Cone Penetration of Lubricating Grease. (DoD adopted)
 ASTM-D2265 - Lubricating Grease, Over Wide Temperature Range, Dropping Point of. (DoD adopted)
 ASTM-D2595 - Greases, Lubricating, Over Wide Temperature Range, Evaporation Loss of. (DoD adopted)
 ASTM-D2596 - Grease, Lubricating, Measurement of Extreme-Pressure, Properties of (Four-Ball Method). (DoD adopted)

(Application for copies should be addressed to the American Society Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

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SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE-AMS-M-7866 - Molybdenum Disulfide, Technical, Lubrication
Grade. (DoD adopted)

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001).

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Qualification. The grease furnished under this specification shall be a product that is authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.2 and 6.3).

3.2 Material. The composition of the grease is not limited, except that it shall contain a high-viscosity mineral oil with a non-soap thickener, 5 percent molybdenum disulfide conforming to SAE-AMS-M-7866, and a corrosion inhibitor (see 6.5).

3.3 Physical properties. The finished grease shall meet the requirements specified in table I.

TABLE I. Physical properties.

Characteristics	Requirements	Test paragraph
Penetration, worked	270 – 315	4.5.2
Dropping point, °C (°F) minimum	232 (450)	4.5.2
Oil separation, percent weight loss, maximum <u>1/</u>	6	4.5.2
Copper corrosion, at 149 °C (300 °F), ASTM-D130 classification, maximum	<u>2/</u> 2a	4.5.2
Salt spray (galvanic corrosion)	Pass <u>3/</u>	4.5.2
Boiling water immersion, after 10 minutes	No disintegration <u>4/</u>	4.5.2
Evaporation, at 177 °C (350 °F), percent weight loss, maximum	7	4.5.2
Load wear index, minimum	50	4.5.2
Storage stability, after 6 months at 38 ± 3 °C (100 ± 5 °F), maximum <u>5/</u>	30 points	4.5.3

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- 1/ Thirty hours at 177 °C (350 °F).
- 2/ If a strip appears to have a darker orange color than ASTM-D130 standard strip 1b, consider the observed strip as still belonging in ASTM-D130 classification 1b. However, if any evidence of red color is noticed, the observed strip belongs in ASTM-D130 classification 2.
- 3/ After a test period of 48 hours, the steel disk shall show no corrosion in the area contacted by the brass clip. Slight corrosion in the area adjacent to the edge of the brass clip shall be acceptable.
- 4/ A thin film of oil or light scum shall not be cause for rejection.
- 5/ Change in test value from the original worked penetration.

3.4 Workmanship. The grease shall be a smooth, homogeneous, and uniform product that is not gritty.

4. VERIFICATION

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

- a. Qualification inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 Qualification inspection. The qualification inspection shall consist of all tests and examinations of this specification (see 6.3).

4.2.1 Retention of qualification. In order to retain qualification of a product approved for listing on the qualified Products List (QPL), the manufacturer will be required to verify by certification to the qualifying activity that the manufacturer's product complies with the requirements of this specification. The time of periodic verification by certification shall be in two 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.

4.3 Conformance inspection. Conformance inspection shall consist of the examinations and tests specified in table II.

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TABLE II. Conformance inspection tests and examinations.

Inspection	Paragraph	
	Requirement	Test method
Penetration, worked	3.3	4.5.2
Dropping point	3.3	4.5.2
Oil separation	3.3	4.5.2
Copper corrosion	3.3	4.5.2
Salt spray	3.3	4.5.2
Boiling water immersion	3.3	4.5.2
Evaporation	3.3	4.5.2
Load wear index	3.3	4.5.2
Workmanship	3.4	4.5.4

4.3.1 Sampling.

4.3.1.1 For examination of filled containers. A random sample of filled containers, fully prepared for delivery, shall be selected from each lot of grease (see 6.4.1) in accordance with ASQC-Z1.4, inspection level I.

4.3.1.2 For tests. The sample for the tests specified in 4.5.2 shall consist of two 2.27 kilograms (5-pound) samples of grease taken at random from filled containers from each lot of grease. Both samples shall meet the requirements and pass the tests specified in table II.

4.4 Test conditions. Unless otherwise specified, the tests contained in this specification shall be conducted in an atmosphere having a relative humidity (RH) of 50 ± 5 percent and a temperature ranging from 21 to 24.5 °C (70 to 76 °F). Material shall be considered in equilibrium after exposure to the above conditions for a minimum of 24 hours.

4.5 Methods of examinations and tests.

4.5.1 Examinations. Each of the filled containers, selected in accordance with 4.3.1.1, shall be weighed to determine the amount of contents, shall be examined for defects of the container and closure, and for evidence of leakage.

4.5.2 Tests. The samples, selected in accordance with 4.3.1.2, shall be tested in accordance with table III to determine conformance to the requirements specified in 3.3.

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TABLE III. Methods of tests.

Characteristics	FED-STD-791 Method	ASTM Method
Penetration, worked		D217
Dropping point		D2265
Oil separation	321	
Copper corrosion	<u>1/</u> 5309	
Salt spray	<u>2/</u> 5322	
Boiling water immersion	<u>3/</u> 3463	
Evaporation		D2595
Load wear index		D2596

- 1/ The test shall be conducted at 149 ± 2 °C (300 ± 4 °F) using cloud pour jars as specified in ASTM-D97, Method 2500. The jars shall be filled with enough test sample to cover the cleaned copper strip by at least 5 millimeters (mm). The strip shall be inserted to the bottom of the jar and the jar covered lightly with a crucible cover, watch glass, or vented cork. Interpret the corrosiveness of the sample according to how the appearance of the copper strip compares with one of the copper corrosion standard strips of ASTM-D130.
- 2/ Test cabinet and temperature shall be in accordance with FED-STD-791, Method 4001 using a 5 percent salt concentration.
- 3/ Duration of test shall be 10 minutes. Specimen size shall be 5 ± 0.1 grams and 500 milliliters shall be the volume of water.

4.5.3 Storage stability. The worked penetration after storage shall be determined on a sample of grease which has been stored in a one pound (453.6 grams) oil-tight container for 6 months at a temperature of 38 ± 3 °C (100 ± 5 °F) subsequent to the original determination of the penetration. The penetration after storage shall be determined in accordance with ASTM-D217.

4.5.4 Workmanship. The grease shall be examined to determine conformance to the requirements specified in 3.4.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel 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 activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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.

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6. NOTES

6.1 Intended use. The molybdenum disulfide grease exceeds commercially available greases in order to provide a general purpose grease used for lubrication of critical components of the shipboard aircraft catapult system, automotive, and ground support equipment. Specifically, the grease is intended for use in environments requiring normal high temperatures up to 177 °C (350 °F) or brief exposure to temperatures up to 204 °C (400 °F). It is also intended for use with systems requiring low speed, high load, salt water, and contact with high pressure steam.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2 and 2.3).
- c. Quantity desired.
- d. Size and type of container for grease.
- e. Packaging requirements (see 5.1).

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-23549), 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 the Commander, Naval Air Warfare Center Aircraft Division, Code 4.3.4.1, 48066 Shaw Road, Building 2188, Unit 5, Patuxent River, MD 20670-1908.

6.3.1 Qualification samples. Each laboratory qualification sample will consist of one 10-pound (4.5 kilograms) can of grease. The samples should be plainly identified by securely attached durable tags or labels marked with the following information:

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Sample for qualification inspection

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Name of manufacturer

Product code number

Batch or lot number

Date of manufacture

Submitted by (name) (date) for qualification inspection in accordance with the requirements of MIL-DTL-23549D under authorization of (reference authorizing letter).

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6.4 Batch. A batch consists of all the material which has been manufactured by some unit chemical process and subjected to some physical mixing operation intended to make the final product substantially uniform.

6.4.1 Lot. A lot consists of all the grease produced by one manufacturer, at one plant, from the same materials, and under the same conditions provided the operation is continuous and does not exceed a 24 hour period. In the event the process is a batch (see 6.4) operation, each batch constitutes a lot.

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

6.6 Subject term (key word) listing.

- Dropping point
- Lubrication
- Mineral oil
- Molybdenum disulfide
- Oil separation
- Penetration

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

- Navy - AS
- Air Force - 11
- DLA - GS3

Preparing activity:

- Navy - AS

(Project No. 9150-1265)

Review activity:

- Navy - OS, SH

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-23549D	2. DOCUMENT DATE (YYYYMMDD) 20020510
3. DOCUMENT TITLE GREASE, GENERAL PURPOSE		
4. NATURE OF CHANGE (<i>Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.</i>)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (<i>Last, First, Middle Initial</i>)	b. ORGANIZATION	
c. ADDRESS (<i>Include ZIP Code</i>)	d. TELEPHONE (<i>Include Area Code</i>) (1) Commercial (2) DSN (<i>If applicable</i>)	7. DATE SUBMITTED (YYYYMMDD)
8. PREPARING ACTIVITY		
a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION	b. TELEPHONE (<i>Include Area Code</i>) (1) Commercial (2) DSN (732) 323-2947 624-2947	
c. ADDRESS (<i>Include ZIP Code</i>) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533 Fort Belvoir, Virginia 22060-6221 Telephone (703) 767-6888 DSN 427-6888	