

METRIC

MIL-PRF-23827C

28 August 1998

SUPERSEDING

MIL-G-23827B

20 June 1983

PERFORMANCE SPECIFICATION

GREASE, AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW, NATO CODE NUMBER G-354

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 grade of grease for use at extremely low temperatures on aircraft and instruments. This grease is effective in the temperature range from -73° to 121°C . This grease is identified by NATO symbol G-354 (see 6.8).

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.

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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2.2 Government documents.

2.2.1 Standard. The following standard forms 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).

STANDARD

FEDERAL

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

(Unless otherwise indicated, copies of the above standard 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 TESTING AND MATERIALS (ASTM)

ASTM-D217 - Cone Penetration of Lubricating Grease, Standard Test Methods for (DoD adopted)

ASTM-D942 - Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method, Standard Test Method for (DoD adopted)

ASTM-D1264 - Determining the Water Washout Characteristics of Lubricating Greases, Standard Test Method for (DoD adopted)

ASTM-D1478 - Low-Temperature Torque of Ball Bearing Grease, Standard Test Method for (DoD adopted)

ASTM-D1743 - Determining Corrosion Preventative Properties of Lubricating Greases, Standard Test Method for (DoD adopted)

ASTM-D2265 - Dropping Point of Lubricating Grease Over Wide Temperature Range Standard Test Method for (DoD adopted)

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ASTM-D2595	-	Evaporation Loss of Lubricating Greases Over Wide Temperature Range, Standard Test Method for (DoD adopted)
ASTM-D2596	-	Measurement of Extreme Pressure Properties of Lubricating Grease (Four Ball Method), Standard Test Method for (DoD adopted)
ASTM-D3336	-	Life of Lubricating Greases in Ball Bearings at Elevated Temperatures, Standard Test Method for (DoD adopted)
ASTM-D4048	-	Detection of Copper Corrosion from Lubricating Grease, Standard Test Method for (DoD adopted)
ASTM-D4057	-	Manual Sampling of Petroleum and Petroleum Products, Standard Practice for (DoD adopted)
ASTM-D6184	-	Oil Separation from Lubricating Grease (Conical Sieve Method), Standard Test Method for (DoD Adopted)

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

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 4.3 and 6.3). Any change in the formulation of a qualified product shall require requalification of that product.

3.2 Material. The grease shall consist of a gelling agent, a diester base oil, and an extreme-pressure additive, and any other chemical addition agent required to meet the requirements of this specification (see 6.7).

3.2.1 Toxicity. The grease furnished under this specification shall have no adverse effect on the health of personnel when used for its intended purpose (see 6.2).

3.3 Physical properties. Physical properties of the grease shall be in accordance with table I.

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TABLE I. Physical properties.

Property	Requirements
Corrosiveness (copper strip), maximum <u>1</u> /	1b
Dirt, particles per ml of grease, maximum:	
25 – 74 micrometres diameter	1,000
75 micrometres diameter or larger	none
Dropping point, °C, minimum	165
Evaporation, percent, weight loss in 22 hours at 100° ±0.5°C, maximum	2
Gear wear, mg/1,000 cycles, maximum:	
under a 2.3 kg load	2.5
under a 4.5 kg load	3.5
High temperature performance, hours, at 121°C, minimum	<u>2</u> / 1,000
Load carrying capacity, mean Hertz load, minimum	30
Low temperature torque at -73° ±1°C:	
starting, Nm, maximum	1.00
running (after 60 minutes), Nm, maximum	0.10
Odor	No odor of rancidity, perfume, or free alcohol
Oil separation, percent, weight loss in 30 hours, maximum	5
Oxidation stability:	
Bomb oxidation, pressure drop, Kpa, maximum:	
in 100 hours	70.00
in 500 hours	105.0
Penetration, (0.1 mm):	
unworked, minimum	200
worked	270 – 310

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TABLE I. Physical properties – Continued.

Property	Requirement
Rust preventative properties, maximum passing rate	2
Storage stability at 40° ±2°C , penetration (0.1 mm) after:	
unworked, minimum	200
worked (change from original), maximum	30
Water resistance, at 38° ±3°C, percent lubricant washed out, maximum	20
Worked stability, penetration (0.1 mm)	270 – 375

1/ The grease shall show no green color in that portion contacting the copper strip.

2/ Average of four runs.

3.4 Workmanship. The grease, when examined visually, shall be a smooth homogenous mixture, free of lumps and abrasive material. When worked with a spatula on a glass surface, the grease shall exhibit uniformity and ability to spread with a straight edge to a smooth surface.

4. VERIFICATION

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

- a. Qualification inspection (see 4.3).
- b. Conformance inspection (see 4.4).

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the conditions specified in tables I and II on unworked grease. The physical requirements specified in table I apply to the average of determinations made on the sample.

4.3 Qualification inspection. Qualification inspection shall consist of all the requirements and tests in table II.

4.3.1 Sampling. Qualification test samples shall consist of a minimum of 5 kilograms (kg) of grease for which qualification is desired.

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TABLE II. Qualification inspection and methods.

Requirements	Test method or paragraph
Corrosiveness (copper strip)	<u>1</u> / ASTM-D4048
Dirt	FED-STD-791, Method 3005
Dropping point	ASTM-D2265
Evaporation	ASTM-D2595
Gear wear	FED-STD-791, Method335
High temperature performance	ASTM-D3336
Load carrying capacity	ASTM-D2596
Low temperature torque <u>2</u> /	ASTM-D1478
Odor	4.5.1
Oil separation	ASTM-D6184
Oxidation stability	ASTM-D942
Penetration	ASTM-D217
Rust preventative properties	ASTM-D1743
Storage stability <u>3</u> /	FED-STD-791, Method 3467
Water resistance	ASTM-D1264
Worked stability	FED-STD-791, Method 313
Workmanship	Visual

- 1/ The copper strip shall not tarnish more than a classification of 1b when compared with ASTM copper strip corrosion standards. Test shall be conducted at $100^{\circ} \pm 1^{\circ}\text{C}$ for 24-hours.
- 2/ Test shall be conducted at $-73^{\circ} \pm 1^{\circ}\text{C}$. Observation for skidding or ball sliding shall be made during test run.
- 3/ Temperature of $40^{\circ} \pm 2^{\circ}\text{C}$ to be maintained for 6 months.

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4.4 Conformance inspection.

4.4.1 Sampling. Conformance inspection sample shall consist of two, 2 kg samples of grease taken at random from filled containers from each lot of grease. For users who obtain grease in large containers, samples shall be selected in accordance with ASTM-D4057. The sample shall be tested as specified in 4.4.2.

4.4.2 Conformance testing. Conformance samples selected in accordance with 4.4.1 shall be subjected to the following tests performed in accordance with the applicable test methods in table II, and shall meet the applicable requirements of table I.

Corrosiveness (copper strip)	Odor
Dirt	Oil separation
Dropping point	Penetration
Evaporation	Rust preventative properties
Load carrying capacity	Water resistance
Low temperature torque	Worked stability

Failure of either conformance sample to comply with any of the tests listed above shall be cause to reject the lot represented by these samples.

4.5 Test methods. Test methods shall be as specified in table II.

4.5.1 Odor. The odor of the grease shall be observed for conformance to table I immediately upon opening the test containers.

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.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory).

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6.1 Intended use. The grease is intended for use in ball, roller and needle bearings, gears, and on sliding and rolling surfaces of such equipment as instruments, cameras, electronic gear and aircraft control systems that are subject to extreme marine and low temperature conditions not encountered in commercial aviation. It can be used for rolling and sliding surfaces of equipment having low motivating power (low torque equipment). Its extremely low volatility (see evaporation requirement in table I) is of advantage in preventing oil fogging in aircraft optical instruments. This grease is also intended for use on aircraft gears, actuator screws, and other equipment requiring a lubricant with high load carrying capacity over a temperature range of -73° to +121°C.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1).
- c. Quantity desired.
- d. Toxicity (see 6.5).
- e. Packaging requirements and marking (see 5.1 and 6.2.1).

6.2.1 Marking. Containers should be marked in accordance with MIL-STD-290, "Packaging of Petroleum and Related Products." All unit and intermediate packs of toxic and hazardous chemicals and materials should also be labeled in accordance with the applicable laws, statutes, regulations, and ordinances, including federal, state, and municipal requirements. Unit and intermediate containers should be marked in accordance with ANSI-Z129.1, "Precautionary Labeling of Hazardous Industrial Chemicals."

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-23827, 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, Attn: Code 4.3.4.1, Building 2188, Naval Air Warfare Center Aircraft Division, 22347 Cedar Point Road, Unit 6, Patuxent River, MD 20670-1161.

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6.3.1 Submission of samples. Prior to submitting samples for qualification testing, manufacturers will request authorization from the qualification activity. Upon receipt of authorization, the samples will be forwarded as directed. The qualifying activity will require the manufacturer to submit for review and approval, two copies of the manufacturer's test report, including the sample's Material Safety Data Sheet (MSDS) (see 6.5), the location and identity of the plant which produced the sample, and the item composition report. The samples should be plainly and durably marked with the following information:

Sample for qualification inspection.

GREASE, AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW,
NATO CODE NUMBER G-354, METRIC

Name of manufacturer.

Product code number.

Batch number.

Date of manufacture.

Submitted by (name) (date) for qualification inspection in accordance with
MIL-PRF-23827C under authorization of (reference authorizing letter) (see 6.3).

6.3.2 Retention of qualification. In order to retain qualification of a product approved for listing on the Qualified Products List (QPL), the Government will require the manufacturer 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 will be in two year intervals from the date of original qualification and will be initiated by the Government. The Government reserves the right to re-examine the qualified product whenever deemed necessary to ensure that the product continues to meet any or all of the specification requirements.

6.4 Lot and batch. A lot is the grease produced by one manufacturer at one plant from the same materials and under essentially the same conditions, provided the operation is continuous and does not exceed a 24-hour period. In the event the process is a batch operation, each batch constitutes a lot. A batch is that quantity of material which has been manufactured by the same unit chemical process and subjected to the same physical mixing operation intended to make the final product substantially uniform.

6.5 Material safety data sheets (MSDSs). 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 FED-STD-313; and 29 CFR 1910.1200 requires that the Material Safety Data Sheet for each hazardous chemical used in an operation must be readily available to personnel using the material.

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6.6 Subject term (key word) listing.

High load carrying
Low temperature
Lubricant

6.7 Composition for volatility and low temperature. The composition if the lubricant is not otherwise limited, but substantial proportions of non-petroleum materials will be required to meet the volatility and low temperature requirements of this specification (see 3.2).

6.8 International standardization agreements. Certain provisions of this specification (see 1.1) are the subject of international standardization agreements AIR-STD-15/1, "Interchangeability Chart of Standardized Aviation Fuels, Lubricants and Allied Products" and 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 which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement to make other appropriate accommodations.

6.9 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.

CONCLUDING MATERIAL

Custodians:

Army - CR4
Navy - AS
Air Force - 11

Preparing activity:

Navy - AS
(Project 9150-1225)

Review activities:

Army - AV, EA
Navy - OS
Air Force - 68
DLA - GS, PS

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.
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-PRF-23827C

2. DOCUMENT DATE (YYMMDD)
 980828

3. DOCUMENT TITLE

GREASE AIRCRAFT AND INSTRUMENT, GEAR AND ACTUATOR SCREW, NATO CODE
 NUMBER G-354

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

d. TELEPHONE
(Include Area Code)
 (1) Commercial:

 (2) DSN:
(If Applicable)

7. DATE SUBMITTED
 (YYMMDD)

8. PREPARING ACTIVITY

a. NAME
 COMMANDER
 NAVAL AIR WARFARE CENTER
 AIRCRAFT DIVISION

b. TELEPHONE NUMBER *(Include Area Code)*
 (1) Commercial (732) 323-2947 (2) DSN 624-2947

c. ADDRESS *(Include Zip Code)*
 CODE 414100B120-3
 HIGHWAY 547
 LAKEHURST, NJ 08733-5100

IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:
 Defense Logistics Agency (DLSC-LM),
 Attn: Carla Jenkins/John Tascher
 8725 John J. Kingman Road, Ste 2533
 Fort Belvoir, VA 22060-6221
 Telephone (703) 767-6874