

MIL-G-23827B
 20 June 1983
 SUPERSEDING
 MIL-G-23827A
 1 August 1965

MILITARY SPECIFICATION

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

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. In addition, it will lubricate gears, actuator screws and other equipment requiring a lubricant with high load carrying capacity. This grease is effective in the temperature range from -73°C to $+121^{\circ}\text{C}$. This grease is identified by NATO symbol G-354 (see 6.5).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

STANDARDS

FEDERAL

FED-STD-313	-	Material Safety Data Sheets Preparation and Submission of.
FED-STD-791	-	Lubricants, Liquid Fuels and Related Products, Method of Testing.

MILITARY

MIL-STD-105	-	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-290	-	Packaging of Petroleum and Related Products.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

PUBLICATIONS

CODE OF FEDERAL REGULATIONS

49 CFR - Transportation - Hazardous Materials.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 217	-	Cone Penetration of Lubricating Grease.
ASTM D 942	-	Oxidation Stability of Lubricating Greases by the Oxygen Bomb Method.
ASTM D 1264	-	Water Washout Characteristics of Lubricating Greases.
ASTM D 1478	-	Low-Temperature Torque of Ball Bearing Greases.
ASTM D 1743	-	Corrosion Preventive Properties of Lubricating Greases.
ASTM D 2265	-	Dropping Point of Lubricating Grease Over Wide Temperature Range.
ASTM D 2595	-	Evaporation Loss of Lubricating Greases Over Wide Temperature Range.
ASTM D 2596	-	Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method), Measurement of.
ASTM D 3336	-	Performance Characteristics of Lubricating Greases in Ball Bearings at Elevated Temperatures.
ASTM D 4048	-	Detection of Copper Corrosion From Lubricating Grease by the Copper Strip Tarnish Test.

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z129.1 - American National Standard for the Precautionary Labeling of Hazardous Industrial Chemicals.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

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(Industry association specification and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification. The grease 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).

3.2 Material. The grease shall consist essentially of a gelling agent, a low temperature liquid lubricant, and an extreme-pressure additive and any other chemical addition agent required to meet the requirements of this specification. The composition of 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.

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

3.4 Material safety data sheets. Material safety data sheets shall be prepared and submitted in accordance with FED-STD-313. Material safety data sheets shall also be forwarded as specified in 4.3.2. The grease shall have no adverse effect on the health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the appropriate departmental medical service who will act as an advisor to the contracting agency (see 4.3.2 and 6.2.1e).

3.5 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 be spread with a straight edge to a smooth surface.

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 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.

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

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

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4.3 Qualification inspection. Qualification inspection shall consist of a review of the test report (see 4.3.2) for approval and by testing to determine that the qualification inspection sample (see 4.3.1) complies with all the requirements for the physical properties specified in Table I when tested in accordance with the inspection methods specified in Table II.

4.3.1 Qualification inspection sample. The qualification inspection sample shall consist of 5 kilograms of grease. The sample shall be forwarded to the Aircraft and Crew Systems Technology Directorate, Code 60612, Naval Air Development Center, Warminster, PA 18974. The sample shall be plainly identified by a securely attached durable tag or label 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-G-23827B under authorization of (reference
authorizing letter) (see 6.3).

4.3.2 Test reports. Two copies of the manufacturer's test report, containing complete test data showing that material submitted for qualification conforms to the requirements of this specification, shall be submitted with the qualification sample. Location and identity of the plant which produced the sample tested shall also be supplied. Material safety data sheets on toxicity, prepared as specified in 3.4, shall be submitted to the qualifying laboratory (see 4.3.1).

4.3.3 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 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.

4.4 Quality conformance inspection. The quality conformance inspection of the grease shall consist of tests of samples from 4.4.2.2 in accordance with Table III and an examination of samples from 4.4.2.1 for conformance with 4.6.1.

4.4.1 Lot formation. A lot shall consist of all 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 shall constitute a lot (see 6.4).

4.4.2 Sampling.

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4.4.2.1 For examination of filled containers. A random sample of filled containers, fully prepared for delivery, shall be selected from each lot of grease in accordance with MIL-STD-105, Inspection Level I with an Acceptable Quality Level (AQL) of 2.5 percent defective.

4.4.2.2 For tests. The sample for tests shall consist of two 2 kilogram samples of grease taken at random from filled containers from each lot of grease. The lot shall be unacceptable if either sample fails to comply with any of the requirements for the tests specified in 4.6.2.

4.5 Test conditions. Test conditions shall be in accordance with 4.6 and the physical values specified in Table I apply to the average of determinations made on the sample.

4.6 Methods of examinations and tests.

4.6.1 Examinations. Each of the filled containers, selected in accordance with 4.4.2.1, shall be examined for defects of the container and closure, for evidence of leakage and for unsatisfactory markings to determine conformance with 5.1. Each sample container shall also be weighed to determine the amount of contents. If the number of defective containers exceeds the acceptance number of the sampling plan specified in 4.4.2.1, the lot shall be rejected.

4.6.2 Tests. Tests shall be performed in accordance with Table II to determine conformance with the requirements specified in 3.3.

5. PACKAGING

5.1 Packaging and packing. The grease shall be packaged and packed in accordance with MIL-STD-290. The type and size of the containers and the level of packaging and packing shall be as specified by the acquiring activity (see 6.2.1).

5.1.1 Marking. All unit, intermediate and shipping containers shall be marked in accordance with MIL-STD-290 and Title 49 of the Code of Federal Regulations and any other additional special markings specified by the acquiring activity (see 6.2.1f). All unit and intermediate packs of toxic and hazardous chemicals and materials shall also be labeled in accordance with the applicable laws, statutes, regulations or ordinances, including Federal, State, and Municipal requirements. In addition unit and intermediate containers, including unit containers that serve as shipping containers, such as pails and drums, shall be marked with the applicable precautionary information detailed in ANSI Z129.1.

6. NOTES

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. It is suitable for rolling and sliding surfaces of equipment having low motivating power (low torque equipment). Its extremely low volatility is of advantage in preventing oil fogging in optical instruments. This grease is also intended for general use on aircraft gears, actuator screws and other equipment requiring a lubricant with high load carrying capacity over a temperature range of -73°C to $+121^{\circ}\text{C}$.

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6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. Quantity desired.
- c. Size and type of container for grease (see 5.1).
- d. Applicable levels of packaging and packing and other options (see 5.1).
- e. Specify DAR Clauses 7-104.98 and 1-323.2.
- f. Any special markings required (see 5.1.1).

6.3 Qualification. With respect to products requiring qualification, awards may be made only for products which are, at the time set for opening of bids, 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. The activity responsible for the Qualified Products List is Commander, Naval Air Systems Command, Attn: AIR-5304C, Washington, DC 20361; however, information pertaining to qualification of products and letter of authorization for submittal of sample may be obtained from the Aircraft and Crew Systems Technology Directorate, Code 60612, Naval Air Development Center, Warminster, PA 18974.

6.3.1 Qualification information. It is understood that the grease furnished under this specification subsequent to final approval should be of the same composition and shall be equal to products upon which approval was originally granted. In the event that the grease furnished under contract is found to deviate from the composition of the approved product, or that the product fails to perform satisfactorily, approval of such products will be subject to immediate withdrawal from the Qualified Products List.

6.4 Batch. A batch is defined as that quantity of 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.

6.5 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 NAT-STD-1135. When amendment, revision, or cancellation of this specification is proposed, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices, to change the agreement or make other appropriate accommodations.

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6.6 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 - AR
Navy - AS
Air Force - 20

Preparing activity:

Navy - AS
(Project 9150-0605)

Review activities:

Army - EA
Navy - SH

User activities:

Army - AV, ME
Navy - OS

International Interests:

NATO (see 6.5)

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TABLE I. Physical properties.

Characteristics	Limits
Dropping point, °C, minimum	165
Penetration.	
Unworked, minimum	200
Worked	270 - 310
Oxidation stability:	
Bomb oxidation, pressure drop, KPa, maximum:	
in 100 hours	70.00
in 500 hours	105.0
Corrosiveness (copper strip), maximum <u>1</u> /	1b
Water resistance, at $38^{\circ} + 3^{\circ}\text{C}$, percent lubricant washed out, maximum	20
Evaporation, percent, weight loss in 22 hrs at $100^{\circ} + 0.5^{\circ}\text{C}$, maximum	2
Oil separation, percent, weight loss in 30 hrs, maximum	5
Low temperature torque at $-73 + 1^{\circ}\text{C}$:	
Starting, Nm, maximum	1.00
Running (after 60 minutes), Nm, maximum	0.10
High temperature performance, hours, at 121°C , minimum	1,000
Load carrying capacity, mean Hertz load, minimum	30
Gear wear, mg/1,000 cycles, maximum:	
under a 2.3 kg load	2.5
under a 4.5 kg load	3.5
Worked stability, penetration	270 - 375
Rust preventative properties, maximum passing rate	2
Storage stability, penetration:	
Unworked, minimum	200
Worked (change from original), maximum	30
Odor <u>2</u> /	pass
Dirt, particles per ml of grease, maximum:	
25 - 74 micrometres diameter	1,000
75 micrometres diameter or larger	none

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TABLE I. Physical properties - Continued

- 1/ The grease shall show no green color in that portion contacting the copper strip. 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/ The grease shall not have an odor of rancidity, perfume or free alcohol.

TABLE II. Inspection methods.

Tests	Method	
	FED-STD-791	ASTM
Rust preventive properties	-	D 1743
Dropping point	-	D 2265
Penetration	-	D 217
Bomb oxidation	-	D 942
Dirt	3005	-
Corrosiveness (copper strip)	-	D 4048
Water resistance	-	D 1264
Evaporation	-	D 2595
Oil separation	321	-
High temperature performance	-	D 3336
Gear wear	335	-
Worked stability	313	-
Load carrying capacity	-	D 2596
Low temperature torque <u>1/</u>	-	D 1478
Storage stability <u>2/</u>	3467	-

1/ Test shall be conducted at $-73^{\circ} \pm 1^{\circ}\text{C}$. Observations for skidding or ball sliding shall be made during test run.

2/ Temperature of $40^{\circ} \pm 2^{\circ}\text{C}$ to be maintained for 6 months.

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TABLE III. Quality conformance tests.

Inspection	Paragraph	
	Requirement	Test method
Odor	3.3	4.6.2
Dropping point	3.3	4.6.2
Penetration	3.3	4.6.2
Dirt	3.3	4.6.2
Corrosiveness (copper strip)	3.3	4.6.2
Water resistance	3.3	4.6.2
Evaporation	3.3	4.6.2
Oil separation	3.3	4.6.2
Low temperature torque	3.3	4.6.2
Load carrying capacity	3.3	4.6.2
Worked stability	3.3	4.6.2
Rust preventive properties	3.3	4.6.2
Examination of filled containers	5.1	4.6.1

INSTRUCTIONS In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

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