

MIL-G-25013E
20 June 1983
SUPERSEDING
MIL-G-25013D
19 January 1965

MILITARY SPECIFICATION

GREASE, AIRCRAFT, BALL AND ROLLER BEARING,
NATO CODE NUMBER G-372, 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 in anti-friction bearings where operation of low torque equipment will require lubrication for extended periods at temperatures as low as -73°C and as high as 232°C . This grease is identified by NATO symbol G-372 (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.
MIL-STD-1189	-	Standard Symbolology for Marking Unit Packs, Outer Containers, and Selected Documents.

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 270 - Petroleum and Petroleum Products, Sampling.
- 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 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.)

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

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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, 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 be a mixture consisting essentially of a suitable liquid lubricant, a gelling agent and any additives that may be needed to meet specification requirements.

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 be observed for uniformity and its 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).

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.

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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, BALL AND ROLLER BEARING,
NATO CODE NUMBER G-372
Name of manufacturer
Product code number
Batch number
Date of manufacture
Submitted by (name) (date) for qualification inspection in
accordance with MIL-G-25013E 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. Samples shall be labeled completely with the 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 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.

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.

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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. For users who obtain grease in large containers, two 2 kilogram samples shall be taken in accordance with ASTM D 270. 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. Unless otherwise specified, all tests shall be conducted on unworked grease.

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, MIL-STD-1189 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 covered by this specification is intended for use in ball and roller bearings over the temperature range of -73°C to 232°C . It is particularly designed for those ball and roller bearing applications in temperature ranges where soap-type petroleum oil or soap-type synthetic oil greases may not normally be applicable. It will permit operation of equipment at -73°C and will lubricate anti-friction bearings continuously at temperatures as high as 232°C when the DN value (product of bearing bore diameter in mm and speed in rpm) of the bearing does not exceed 200,000. It may be used for such applications as aircraft actuators, gear boxes, and similar equipment, and is recommended only after performance evaluation tests of the lubricant have proven satisfactory.

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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-25013) 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 9150-0606)

Review activities:

Army - ME

Navy - SH

Air Force - 68

DLA - PS

User activities:

Navy - OS

International Interests:

NATO (see 6.5)

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TABLE I. Physical properties.

Characteristics	Limits
Dropping point, °C, minimum	230
Penetration, worked	260 - 320
Corrosiveness (copper strip), maximum <u>1/</u>	1b
Low temperature torque: <u>2/</u>	
Starting, Nm, maximum	0.350
Running (after 60 minutes), at $-73^{\circ} \pm 1^{\circ}\text{C}$, Nm, maximum	0.050
Oxidation stability.	
Bomb oxidation, pressure drop in 100 hours, at $121 \pm 1^{\circ}\text{C}$, KPa, maximum	35.0
Water resistance, at $40^{\circ} \pm 3^{\circ}\text{C}$, percent, lubricant washed out, maximum <u>3/</u>	20
High temperature performance, after 500 hours, at $232^{\circ} \pm 3^{\circ}\text{C}$	Shall perform satisfactorily
Evaporation, percent, weight loss in 22 hours at $205^{\circ} \pm 2^{\circ}\text{C}$, maximum	4.0
Oil separation, percent, weight loss in 30 hours at $232^{\circ} \pm 3^{\circ}\text{C}$, maximum	7.5
Rust preventive properties <u>4/</u>	pass
Worked stability, after 100,000 double strokes, penetration	260 - 375
Storage stability, penetration:	
Unworked, minimum	200
Worked, (change in points from original), maximum	30
Dirt, particles per ml of grease, maximum:	
25 - 74 micrometres diameter	1,000
75 micrometres diameter or larger	none

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.

2/ There shall be no skidding or ball sliding during test.

3/ After the water washout drying period, the grease on the bearing shall remain homogeneous without evidence of excessive separation of oil constituent.

4/ Two of the three test bearings shall show no discoloration or corrosion in excess of three small spots per bearing or pitting, or etching.

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TABLE II. Inspection methods.

Tests	Method	
	FED-STD-791	ASTM
Dropping point	-	D 2265
Penetration	-	D 217
Corrosiveness (copper strip) <u>1/</u>	-	D 4048
Low temperature torque <u>2/</u>	-	D 1478
Oxidation stability	-	D 942
Dirt	3005	-
Water resistance	-	D 1264
High temperature performance	-	D 3336
Evaporation	-	D 2595
Oil separation	321	-
Rust preventive properties	-	D 1743
Worked stability	313	-
Storage stability <u>3/</u>	-	D 217

1/ The test shall be conducted at 100°C for 24 hours.

2/ Observations for skidding or ball sliding shall be made during test.

3/ Two standard grease worker cups (ASTM D 217) shall be filled with the grease sample; one flush with the top of the cup for unworked penetration and the second filled with an additional quantity of grease to insure sufficient sample to conduct the worked penetration. The cups shall be stored in an oven at a temperature of $40^{\circ} \pm 2^{\circ}\text{C}$ for six months subsequent to the original determination of the penetration. Upon termination of storage, the samples shall be allowed to cool to 25°C, prior to determining the unworked and worked penetration.

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TABLE III. Quality conformance tests.

Inspection	Paragraph	
	Requirement	Test method
Dropping point	3.3	4.6.2
Penetration	3.3	4.6.2
Dirt	3.3	4.6.2
Corrosive (copper strip)	3.3	4.6.2
Low temperature torque	3.3	4.6.2
Evaporation	3.3	4.6.2
Oil separation	3.3	4.6.2
Worked stability	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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Commanding Officer
Naval Air Engineering Center
Engineering Specifications and Standards Department
(ESSD), Code 93
Lakehurst, NJ 08733



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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1 DOCUMENT NUMBER MIL-G-25013E		2 DOCUMENT TITLE Grease, Aircraft, Ball and Roller Bearing	
3a. NAME OF SUBMITTING ORGANIZATION		4 TYPE OF ORGANIZATION (Mark one)	
b ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> 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	
c MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8 DATE OF SUBMISSION (YYMMDD)	