

METRIC

MIL-PRF-83261D

14 May 2020

SUPERSEDING

MIL-PRF-83261C

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PERFORMANCE SPECIFICATION

GREASE, AIRCRAFT, EXTREME PRESSURE, ANTI-WEAR

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

1. SCOPE

1.1 Scope. This specification covers grease intended to lubricate aircraft accessories which operate at high speeds and under heavy loads in a temperature range of -73°C to +232°C.

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 of documents cited in sections [3](#) and [4](#) of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to AFPET/PTPS, 2430 C Street, Building 70, Area B, Wright-Patterson AFB, OH 45433-7631 or e-mailed to afpet.ptps@us.af.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

AMSC N/A

FSC 9150

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2.2. Government documents.

2.2.1 Specification and standards. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

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

(Copies of this document are available online at <https://quicksearch.dla.mil/>.)

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 these documents are those cited in the solicitation or contract.

ASTM, INTERNATIONAL

- ASTM D217 - Standard Test Methods for Cone Penetration of Lubricating Grease
- ASTM D1264 - Standard Test Method for Determining the Water Washout Characteristics of Lubricating Greases
- ASTM D1478 - Standard Test Method for Low-Temperature Torque of Ball Bearing Grease
- ASTM D2266 - Standard Test Method for Wear Preventative Characteristics of Lubricating Grease (Four-Ball Method)
- ASTM D2595 - Standard Test Method for Evaporation Loss of Lubricating Greases Over Wide-Temperature Range
- ASTM D2596 - Standard Test Method for Measurement of Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method)
- ASTM D3336 - Standard Test Method for Life of Lubricating Greases in Ball Bearings at Elevated Temperatures
- ASTM D4057 - Standard Practice for Manual Sampling of Petroleum and Petroleum Products
- ASTM D6184 - Standard Test Method for Oil Separation from Lubricating Grease (Comical Sieve Method)

(Copies of these documents are available from <https://www.astm.org/>.)

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SAE INTERNATIONAL

- SAE AMS6447 - Steel, Bars, Forgings, and Tubing 1.4Cr (0.93-1.05C) (SAE 52100) Electroslag Remelted - UNS G52986
- SAE AMS6491 - Steel Bars, Forgings, and Tubing 4.1Cr - 4.2Mo - 1.0V (0.80 - 0.85C) (M-50) Premium Aircraft-Quality for Bearing Applications, Double Vacuum Melted - UNS T11350

(Copies of these documents are available from <https://www.sae.org>.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 Toxicity. The materials shall have no adverse effect on the health of personnel when used for their intended purpose.

3.2 First article. When specified (see [6.2](#)), a sample shall be subjected to first article inspection in accordance with [4.2](#).

3.3 Materials. The grease shall be a mixture consisting of a base fluid, a gelling agent, and the necessary additives. A formulation of a fluorinated polysiloxane fluid, a non-soap gelling agent, and the necessary additives is recommended but is not mandatory.

3.4 Properties of finished grease. The properties of the finished fluid shall be in accordance with those listed in [3.4](#) and [Table I](#).

3.4.1 Un-worked penetration. The un-worked penetration (as measured in units of 0.1 mm) of the grease shall be a minimum of 280 when tested as specified in [4.4.3](#).

3.4.2 Worked penetration. The worked penetration (as measured in units of 0.1 mm) of the grease shall be a minimum of 270 and a maximum of 350 when tested as specified in [4.4.3](#).

3.4.3 Workmanship. The grease shall be a high quality, smooth, homogenous product free from abrasives and impurities when examined as specified in [4.4.2](#).

4. VERIFICATION

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

- a. First article inspection (see [4.2](#)).
- b. Quality conformance inspection (see [4.3](#)).

4.2 First article inspection.

4.2.1 First article samples. When required, a first article inspection shall be performed on a 5 kg (12.5 pound) sample from a bulk lot (see [6.3](#)) to determine conformance with section [3](#).

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4.2.2 First article tests. First article sample(s) shall be subjected to all the tests specified in [4.4](#) and [Table II](#).

4.3 Quality conformance inspection. Quality conformance inspections shall consist of sampling plans [A](#) and [B](#). Samples shall be labeled completely with information which identifies the purpose of the sample, name of the product, specification number, lot/batch number (see [6.3](#)), date of sampling and contract number.

4.3.1 Sampling plan A. A 5 kg (12.5 pound) sample from a bulk lot (see [6.3](#)) shall be selected in accordance with ASTM D4057 and subjected to inspection and tests specified in [4.4.1](#) and [4.4.2](#), and shall be subjected to inspections for penetration, evaporation, and steel-on-steel wear as specified in [Table II](#). If the packaged sample size is less than 0.2 kg (0.5 pound), all tests in sampling plan [B](#) (see [4.3.2](#)) will also be run on the sample from the bulk lot. The inspection lot shall be rejected if the sample fails any of the tests.

4.3.2 Sampling plan B. A random sample of filled unit containers shall be selected from each packaged lot (see [6.3](#)) of fluid in accordance with [Table III](#). This sample(s) shall be subjected to inspections for worked stability, oil separation, load carrying capacity, water resistance, low temperature torque, and high temperature performance, as specified in [Table II](#). If any sample fails, the lot shall be rejected.

TABLE I. Physical properties of grease.

CHARACTERISTIC	PERFORMANCE	LIMITS	UNITS
Penetration, Unworked		280, minimum	0.1 mm
Penetration, Worked		270 – 350	0.1 mm
Worked Stability, 100,000 Strokes Penetration		375, maximum	0.1 mm
Evaporation		15.0, maximum	mass percent
Oil Separation		20.0, maximum	mass percent
Load Carrying Capacity		90, minimum	kgf
Water Resistance		20, maximum	mass percent
Steel-on-Steel Wear, 52100 Steel		1.30 maximum	mm
Steel-on Steel Wear, M-50 Steel		1.30 maximum	mm

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TABLE I. Physical properties of grease - Continued.

Storage Stability, Penetration Unworked		200, minimum	0.1 mm
Storage Stability, Penetration Worked (Change from Original)		30, maximum	0.1 mm
Low Temperature Torque	Starting	5000, maximum	g•cm
Low Temperature Torque	Running	1000, maximum	g•cm
High Temperature Performance	Average 4 Tests	500, minimum	hours

4.4 Method of inspection.

4.4.1 Inspection. Refer to the contract or purchase order for specific inspection requirements.

4.4.2 Examination of the product. Sample grease (see [3.3](#)) shall be inspected visually and a suitable portion shall be worked with a spatula on a glass surface. After working, the grease shall be spread with a straight edge and observed for uniformity as indicated by a smooth surface.

4.4.3 Storage stability. Penetration after the storage test shall be determined on a sample of grease (see [3.2](#)) which has been stored at a temperature of 38°C ± 3°C in a 0.5 kg (1 pound), oil-tight container for 6 months subsequent to the original determination of penetration. The unworked and worked penetration after storage shall be determined in accordance with ASTM D217.

TABLE II. Test methods for grease.

CHARACTERISTIC	TEST METHOD		TEST PARAGRAPH
	FED-STD-791	ASTM	
Penetration, Unworked		D217	
Penetration, Worked		D217	
Storage Stability			4.4.3
Worked Stability	313		

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TABLE II. Test methods for grease – Continued.

Evaporation ^{1/}		D2595	
Oil Separation ^{1/}		D6184	
Load Carrying Capacity		D2596	
Water Resistance ^{2/}		D1264	
Steel-on-Steel Wear, 52100 Steel ^{3/}		D2266	
Steel-on-Steel Wear, M-50 Steel ^{4/}		D2266	
Low Temperature Torque ^{5/}		D1478	
High Temperature Performance ^{1/}		D3336	
Notes			
^{1/} The test temperature shall be 232°C.			
^{2/} The test temperature shall be 38°C ± 3°C.			
^{3/} The test temperature for 52100 steel shall be 75°C, in accordance with AMS 6447.			
^{4/} The test temperature for M-50 steel shall be 232°C, in accordance with AMS 6491.			
^{5/} The test temperature shall be -73°C ± 3°C.			

TABLE III. Sample plan B.

LOT SIZE	SAMPLE SIZE
1-4	All
5-50	5
51-90	7
91-150	11
151-280	13
281-500	16
501-12,000	19
(acceptance number is zero, [c = 0])	

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5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see [6.2](#)). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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 that may be helpful, but is not mandatory.)

6.1 Intended use. The grease covered by the specification is intended for use in aircraft actuators, gears, gearboxes, anti-friction bearings, plain spherical bearings, miniature bearings, and other applications that involve heavy loads and sliding, rolling, or oscillatory motions. It is particularly suitable for use over the temperature range of -73°C to +232°C.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Quantity required.
- c. Packaging requirements (see [5.1](#)).

6.3 Definitions.

6.3.1 Bulk lot. A bulk lot (batch) is an indefinite quantity of a homogenous mixture of material ([3.2](#)) offered for acceptance in a single, isolated container; or manufactured in a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material.

6.3.2 Packaged lot. A packaged lot is an indefinite number of 55-gallon drums, or smaller unit containers (such as one-gallon cans) of identical size and type, offered for acceptance and filled with a homogenous mixture of material from one isolated container; or filled with a homogeneous mixture of material manufactured in a single plant run (not to exceed 24 hours), through the same processing equipment, with no change in ingredient material.

6.4 Shelf-life. This specification covers items where the assignment of a Federal shelf-life code is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order, and should include, as a minimum, shelf-life code, shelf-life package markings in accordance with MIL-STD-129 or FED-STD-123, preparation of a material quality storage standard for type II (extendible) shelf-life items, and a minimum of 85 percent shelf-life remaining at the time of receipt by the Government. These and other requirements, if necessary, are in DoDM 4140.27 Volume 1, DoD Shelf-Life Management Program: Program Administration, and DoDM 4140.27 Volume 2, DoD Shelf-Life Management Program: Materiel Quality Control Storage Standards. The shelf-life codes are the in Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoDM 4140.27 Volumes 1 and 2, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points that manage the item and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the DoD Shelf-Life Program can be contacted through the DoD

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Shelf-Life Management website: <https://www.shelflife.dla.mil/>.

6.5 Subject term (keyword) listing.

Evaporation
Fluorinated
Oil separation
Polysiloxane fluid
Worked stability

6.6 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the previous issue.

CONCLUDING SECTION

Custodians:

Air Force – 68
DLA – GS

Preparing activity:

Air Force – 68

(Project 9150-2020-007)

Review activities:

Air Force – 20

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information using the ASSIST Online database at <https://assist.dla.mil>.