AEROSPACE MATERIAL SPECIFICATION

AMS3050™

Issued 2017-12

Performance Specification
Anti-Seize Thread Compound, High Temperature

RATIONALE

This document has been revised to distinguish this foundation specification (AMS3050) and the associated category specifications (AMS3050/1 through AMS3050/9) and to classify different anti-seize greases conforming to this specification by the type of anti-seize additive. The category specifications have been added to the Applicable Documents section.

The specification is a direct copy from MIL-PRF-907F 17 November 2004, except that it is intended to be used (by slash sheet designation) to exclude anti-seize materials not required on commercial aircraft, aircraft engines, engine pylons and aircraft components.

All material referring to Mil Supply and usage; Contacts and addresses have been removed as not required for SAE purposes. **No importance should be given to this type of material for future balloting of this specification.**

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1. SCOPE

1.1 Form

This foundation specification (AMS3050) and its associated category specifications (AMS3050/1 through AMS3050/9) cover anti-seize compounds for use on threads of nuts, studs, bolts, and other mating surfaces, including those of superheated steam installations, at temperatures up to 1050 °F (566 °C). Compounds containing PTFE are limited to 600 °F/315 °C maximum. Materials for nuts, studs, bolts and other mating surfaces include, but are not limited to Steel, Nickel alloys, Stainless Steel, Silver coated materials.

1.1.1 Foundation and Category Specifications

This foundation specification establishes the requirements for all anti-seize compounds conforming to this specification.

The individual Category specifications establish the requirements by separate anti-seize additives. Synthetic fluids and lithium complex soap thickeners are typically part of greases of this type, but other base fluids and thickeners may be acceptable.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 General

The documents listed in this section are specified in Sections 3, 4, or 5 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, 4, or 5 of this specification, whether or not they are listed.

2.2 Government Publications

2.2.1 Specifications, Standards and Handbooks

The following specifications, standards, and handbooks 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.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-907

MIL-PRF-680 Degreasing Solvent

MIL-DTL-1222 Studs, Bolts, Hex Cap Screws and Nuts

(Copies of these documents are available at http://quicksearch.dla.mil.)

FEDERAL STANDARDS

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

(Copies of these documents are available at http://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 A109 Standard Specification for Steel, Strip, Carbon (0.25 Maximum Percent), Cold-Rolled. (DOD adopted)

ASTM A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service. (DOD adopted)

ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both. (DoD adopted)

ASTM A515 Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher-Temperature Service. (DOD adopted)

(Copies of these documents are available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.)

SAE

AMS3050 Performance Specification Anti-Seize Thread Compound, High Temperature

AMS3050/1 Performance Specification Anti-Seize Thread Compound, High Temperature - Copper Only

AMS3050/2 Performance Specification Anti-Seize Thread Compound, High Temperature - Aluminum Only

AMS3050/3 Performance Specification Anti-Seize Thread Compound, High Temperature - Nickel Only

AMS3050/4 Performance Specification Anti-Seize Thread Compound, High Temperature - Molybdenum Disulphide; Graphite Only

AMS3050/5 Performance Specification Anti-Seize Thread Compound, High Temperature - PTFE Only

AMS3050/6 Performance Specification Anti-Seize Thread Compound, High Temperature - 'Nickel+Graphite' Only

AMS3050/7 Performance Specification Anti-Seize Thread Compound, High Temperature - 'Copper+Graphite+Aluminum' Only

AMS3050/8 Performance Specification Anti-Seize Thread Compound, High Temperature - 'Graphite+Aluminum' Only

AMS3050/9 Performance Specification Anti-Seize Thread Compound, High Temperature - 'Graphite+Calcium Fluoride' Only

(Copies of these documents are available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.)

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

For this specification as per OEM requirements.

3.2 Material

The compound supplied under this specification shall be a smooth homogeneous mixture, uniform in appearance, free from lumps, abrasive materials, or other undesirable fillers or impurities. There shall be no odor of rancidity or perfume.

3.3 Corrosion on Copper

After 24-hour exposure, the compound shall show no green color, no pitting or etching on the copper, nor shall a dark brown or black stain remain on the copper strip after washing with N-hexane.

A slight brown stain shall not be cause for failure.

3.4 Toxicity

The compound shall comply with REACH and/or TCSA regulations. It shall have no adverse effect on the health of personnel when used for its intended purpose and shall not cause any environmental problems during waste disposal.

3.5 Homogeneity

The compound shall be completely homogeneous at the time of inspection or during storage awaiting completion of the qualification tests. It shall possess a smooth greasy consistency without lumps, crusts or granular particles when examined.

3.6 Oil Separation

The vehicle of the compound shall separate not more than 10% of the compound's weight in 30 hours when tested at 150 °F ± 5 °F (66 °C ± 3 °C).

3.7 Storage Stability

After the compound has been stored for 6 months at a temperature of 150 °F ± 5 °F (66 °C ± 3 °C), it shall be examined. The compound shall be a smooth homogeneous mixture free from lumps and granular materials.

3.8 Performance

There shall be no galling of the stud threads, the nut threads, the nut contacting surface and the corresponding plate contacting surface when the test apparatus is disassembled following the performance test. The average breakaway torque for loosening of the nuts from the studs shall be as specified in 4.4.2.1.4.

3.9 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

4. VERIFICATION

4.1 Classification of Inspections

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

Qualification inspection shall be conducted at a laboratory acceptable to the command or agency concerned. Qualification inspection shall consist of examination and tests specified in 4.3 and 4.4.

4.3 Conformance Inspection

4.3.1 Lot

For the purposes of sampling, a lot shall consist of all compound manufactured as one batch. Any container in the sample having one or more defects, or under required fill shall cause rejection of the container and if the number of defective containers in any sample exceeds the acceptable number for the appropriate sampling plan as specified in the contract or order, this shall cause rejection of the lot represented by the sample.

4.3.2 Examination of Filled Containers

A sample of filled containers selected from each lot in accordance with MIL-STD-1916 as specified in the contract or order shall be examined to verify compliance with all stipulations of this specification regarding fill, closure, marking and other requirements not involving tests. Containers shall be examined for defects of the container and the closure, for evidence of leakage, and for unacceptable markings; each sample filled container shall also be weighed to determine the amount of the contents. Any container in the sample having one or more defects, or under required fill shall cause rejection of the container and if the number of defective containers in any sample exceeds the acceptable number for the appropriate sampling plan as specified in the contract or order, this shall cause rejection of the lot represented by the sample.

4.3.2.1 Examination of Compound Material

Portions of the compound material shall be taken from top, bottom and intermediate parts of the sample of containers and examined visually to determine that there is no apparent difference in appearance or consistency. The material shall be homogeneous and show a smooth greasy consistency without lumps, crusts or granular particles. It shall not have an odor of rancidity or perfume.

4.3.3 Sample Material for Testing

From each lot, a 5-pound container shall be selected, sealed and marked. The 5-pound sample specimen shall be retained by the manufacturer or contractor for verification testing, if required, at a later date.

4.3.4 Sampling for Production Check Tests

Unless otherwise specified, (see 5.2), from the first lot produced on a contract or order and thereafter at such intervals as may be considered necessary by the command or agency concerned to verify the consistency of production quality, one 2-pound sample and two 1-pound samples of compound shall be forwarded to a laboratory acceptable to the command or agency concerned. These samples shall meet the requirements of 3.6 and any other tests deemed necessary by the command or agency concerned to determine conformance of the product.

4.4 Tests

4.4.1 Test Procedures

The following tests shall be performed in accordance with Table 1.

Table 1 - Test methods

Test	Applicable FED-STD-791 Test Method	Test Paragraph	Acceptance Criteria	Required for Qualification
Corrosion on copper	5309	-----	3.3	X
Oil separation (150 °F/66 °C)	ASTM D6184	-----	3.6	X
Storage stability	3467	4.4.3	3.7	X
Performance		4.4.2	3.8	X

4.4.2 Performance Tests

4.4.2.1 Torque, Galling and Seizing Test

4.4.2.1.1 Apparatus

The test apparatus shall consist of the following:

A fixture made of carbon steel, using material in accordance with ASTM A515, Grade 70, 13 by 3 inches by approximately 1-1/2 inches thick for the end blocks which have five equally spaced holes, 13/16 inch in diameter, with surface finish of 250 roughness height rating (RHR), to allow for insertion of 3/4 inch ten UNC studs (see Figure 1).

The top and bottom faces of the steel end blocks shall have a surface finish of 250 RHR and be parallel within ±0.002.

Five unused coarse thread studs, in accordance with grade B16 of MIL-DTL-1222, ASTM A193 or equal, cut from the same length of a continuously threaded stud stock and ten unused nuts, in accordance with Grade 4 of MIL-DTL-1222, ASTM A194 or equal, shall be used for this test.

Each stud shall be 12.000 inches ± 0.125 inch long and shall have end surfaces which are perpendicular to the axis of the stud to a degree which shall allow stud length measurements of the required accuracy.

Two carbon steel face places in accordance with ASTM A109, 13 by 3 inches and 0.125-inch-thick with a surface finish of 62 RHR or smoother and five equally spaced holes to match those of the above described end blocks, shall be furnished for this test.

Components for this test shall be as shown on Figure 1. A torque wrench shall be used which is easily readable, graduated in foot-pounds (ft-lb) and has a degree of accuracy of ±5%.

The overall length of each stud shall be measured with a dial indicator type device or equal, graduated in 0.0001-inch divisions, having an overall accuracy of ±0.0001 inch.

4.4.2.1.2 Preparation

Dry-cleaning solvent shall be in accordance with Type I of MIL-PRF-680. Each component shall be cleaned in the dry-cleaning solvent and dried just prior to lubrication. The test equipment shall be assembled using the two plates as specified in 4.4.2.1.1. The threads of the studs and nuts shall be evenly coated with the antiseize compound as follows:

a. A liberal quantity of compound shall be applied to the studs and nuts.

b. The nuts shall then be run to the ends of the studs (prior to assembly with the block).

c. The excess compound shall be removed from the ends of nut travel on the studs and from the edges of the nuts after removal from the studs.

The block and plate shall be assembled with a stud in each of the five holes. The surface of the plates and the mating surfaces of the nuts shall be coated with a light coating of the antiseize compound. The nuts shall be run on to the studs, hand tight, against the plates. The overall length of each stud shall be measured to ±0.0001 inch and recorded.

4.4.2.1.3 Procedure

The nuts shall be tightened until an elongation of 0.0162 inch ± 0.0001 inch is obtained, which corresponds to a stress of approximately 50000 pounds per square inch (PSI) at the root area of the stud thread. The torque required for each nut and stud tightening shall be recorded.

The test block assembly shall be placed in an electronically heated oven and subjected to 1050 °F +10, -0 °F for 6 hours. Then the assembly shall be removed from the oven and allowed to cool to room temperature. For compounds using PTFE, the temperature should be limited to 300 °F/150 °C.

The breakaway torque to loosen the nuts shall be measured and recorded. The length of the studs shall be measured. The nuts shall be tightened to re-establish the elongation of the stud length (that is, 0.0162 inch ± 0.0001 inch) and the torque required recorded.

The heating, cooling, torque measurements, and stud length measurements shall be repeated. Then for the third time the assembly shall be heated, cooled and subjected to a spray of 20% aqueous solution of sodium chloride for 7 days.

At the end of this period, the assembly shall be removed and allowed to dry at room temperature for 24 hours.

The torque required to loosen the nuts shall be determined and recorded. The condition of the threads and other contact surfaces, seizing of the nuts and shearing of the studs shall be noted and properly recorded.

A five -point check of the torque wrench calibration against another calibrated wrench at 150 ft-lb shall be made prior to torquing and untorquing each assembly. If the torque wrench is dropped or otherwise damaged during its use, its calibration shall be completely rechecked (five points) before further usage. The torque wrench calibration shall be considered acceptable if the torque reading is within 5% of the actual torque.

4.4.2.1.4 Acceptance Criteria

a. No nuts shall seize during this test.

b. There shall be no galling evident on the threads of the nuts or studs, the nut surfaces and the plate surfaces (under the nut faces). Only one nut per stud need be removed to inspect for galling on threads. Mating surfaces of each nut and plate shall be inspected after disassembly. No galling is defined as no raised metal on any contacting surfaces as can be observed with 20-20 vision at 1X magnification within the distance range of 1/2 to 2 feet.

c. The average breakaway torque for the loosening of the nuts from the five studs shall not exceed 250 ft-lb.