SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS3058

Issued 2008-08
Reaffirmed 2013-03

Grease: Wide Temperature Range
Lithium or Lithium Complex Thickened for Aircraft Wheel Bearings

RATIONALE

AMS3058 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Form

This specification covers grease for use on aircraft wheel bearings.

1.2 Application

This product is used typically for lubrication of anti-friction tapered roller wheel bearings, but usage is not limited to such applications. Each application should be considered separately.

This material has a service temperature range of -65 to +347 °F (-54 to +175 °C) where good performance in the presence of water is also required.

1.3 Precautions

1.3.1 Safety - Hazardous Materials

The materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials. This specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS3058

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS4640	Aluminum Bronze, Bars, Rods, Shapes, Tubes, and Forgings 81.5Cu - 10.0Al - 4.8Ni - 3.0Fe, Drawn and Stress Relieved (HR50) or Temper Annealed (TQ50)
AMS3217/2	Test Slabs, Acrylonitrile Butadiene (NBR-L), Low Acrylonitrile, 65 - 75

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 130	Copper Strip Corrosion Test.
ASTM D 217	Cone Penetration of Lubricating Grease
ASTM D 445	Kinematic Viscosity of Transparent and Opaque Liquids
ASTM D 566	Dropping Point of Lubricating Grease
ASTM D 942	Oxidation Stability of Lubricating Greases by the Oxygen Pressure Vessel Test Method
ASTM D 1264	Determining the Water Washout Characteristics of Lubricating Greases
ASTM D 1403	Cone Penetration of Lubricating Grease Using One Quarter and One Half Scale Cone Equipment
ASTM D 1478	Low-Temperature Torque of Ball Bearing Grease
ASTM D 1831	Roll Stability of Lubricating Grease
ASTM D 2265	Dropping Point of Lubricating Grease Over Wide Temperature Range
ASTM D 2266	Wear Preventative Characteristics of Lubricating Grease (Four-Ball Method)
ASTM D 2595	Evaporation Loss of Lubricating Greases Over Wide-Temperature Range
ASTM D 2596	Measurement of Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method)
ASTM D 3527	Life Performance of Wheel Bearing Grease
ASTM D 4048	Detection of Copper Corrosion from Lubricating Grease
ASTM D 4170	Fretting Wear Protection by Lubricating Greases
ASTM D 4289	Elastomer Compatibility of Lubricating Greases and Fluids
ASTM D 5706	Extreme Pressure Properties of Lubricating Greases Using a High Frequency, Linear Oscillation (SRV) Test Machine
ASTM D 5707	Friction and Wear Properties of Lubricating Grease Using a High Frequency, Linear Oscillation (SRV) Test Machine
ASTM D 6138	Determination of Corrosion-Preventive Properties of Lubricating Greases Under Dynamic Wet Conditions (Emcor Test)
ASTM D 6184	Oil Separation from Lubricating Grease (Conical Sieve Method)

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

FED-STD-791	Lubricants, Liquid Fuels, and Related Products: Methods of Testing Method 3467.1 Storage Stability of Lubricating Grease Method 3005.4 Dirt Content of Grease

2.4 ISO Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org and International Organization for Standardization, 1, rue de Varembé, Case postale 56, CH-1211 Geneva 20, Switzerland, Tel: +41-22-749-01-11, www.iso.org.

ISO 2176	Petroleum Products - Lubricating grease - Determination of dropping point
ISO 2160	Petroleum products - Corrosiveness to copper - Copper strip test

2.5 EI Publications

Available from Energy Institute, 61 New Cavendish Street, London, W1M 8AR, UK or www.energyinstpubs.org.uk.

IP 50	Full Scale Cone Penetration of Lubricating Grease
IP 71	Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity
IP 112	Corrosion Substances in Grease Copper Strip Test
IP 132	Petroleum Products - Lubricating grease - Determination of dropping point
IP 142	Determination of oxidation stability of lubricating grease - Oxygen bomb method
IP 154	Petroleum products - Corrosiveness to copper - Copper strip test
IP 215	Determination of water washout characteristics of lubricating grease
IP 220	Petroleum products and lubricants - Determination of rust-prevention characteristics of lubricating greases
IP 239	Determination of Extreme Pressure and Anti-wear Properties of Lubricants - Four Ball Machine Method
IP 396	Determination of Dropping Point of Lubricating Grease - Automatic Apparatus Method

2.6 MOD UK Ministry of Defense Publications

Available from Directorate of Standardisation, Kentigern House, 65 Brown Street, Glasgow, G2 8EX, UK or www.dstan.mod.uk.

DEF STAN 05-50	Methods for Testing Fuels, Lubricants and Assorted Products.
Part 9:	Separation of Oil from Grease.
Part 62:	Low Temperature Torque of Greases Contaminated with Water.

3. TECHNICAL REQUIREMENTS

3.1 Material

The grease shall be prepared from Synthetic Hydrocarbons or synthetic hydrocarbon/ester blend, lithium or lithium complex thickener(s) and additive(s) as shall be necessary to achieve the requirements detailed in this standard. The composition is not specified, see 9.2 for guidance. The use of chlorinated compounds or nitrites is not permitted.

3.2 Properties

The lubricating grease shall conform to Table 1. Test temperatures in all tests shall have a variance of ±4 °F (±2 °C), unless otherwise specified in the test method. Data required by Appendix A shall additionally be submitted for qualification of the product.

TABLE 1 - PROPERTIES

	Property	Requirement	Test Method
3.2.1	Appearance	Smooth, Homogenous, uniform appearance free from air, lumps, abrasive materials and undesirable fillers and impurities Color: Light tan to Amber	Visual examination
3.2.2	Penetration, Worked 1/10 mm	 265 to 305	ASTM D 217 or IP 50 77 °F/25 °C, 60 double strokes
3.2.3	Dropping Point °F/°C, min	 482 °F/250 °C	ASTM D 566, ASTM D 2265, ISO 2176, IP 132 or IP 396
3.2.4	Oil Separation % m/m, max	 8	ASTM D 6184 or DEF STAN 05-50 (Part 09) 347°F/175°C, 30 hours
3.2.5	Evaporation Loss % m/m, max	 10	ASTM D 2595, 347 °F/175 °C, 22 hours
3.2.6	Oxidation Stability Pressure Drop from 110 psi/758 kPa, max after 100 hours after 500 hours	 5 psi/35 kPa 15 psi/105 kPa	ASTM D 942 or IP 142 210 °F/99 °C
3.2.7.a	Corrosiveness Copper Strip	Shall not tarnish more than a classification 1b when compared with ASTM D 130, ISO 2160 or IP 154 corrosion standard	ASTM D 4048 or IP112 212 °F/100 °C, 24 hours
3.2.7.b	Corrosiveness Al/Ni Bronze AMS4640 (UNS #C63000)	No change in appearance, i.e. no evidence of pitting or corrosion at 2x	ASTM D 4048 212 °F/100 °C, 24 hours
3.2.8	Elastomer Compatibility Nitrile Rubber (NBR-L) AMS3217/2 Volume Change, %	-5 to +25	ASTM D 4289, 158 °F ± 2/70 °C ± 1, 168 hours
3.2.9	Roll Stability Without Water 1/10 mm	-15 to + 45	ASTM D 1831 *See Note 2 Table 1
3.2.10	Roll Stability With 10% Water 1/10 mm Difference between worked penetration of dry grease before Roll Stability test and after Roll Stability test with 10% water.	-20 to +50	ASTM D 1831, *See Notes 1 & 2, Table 1
3.2.11	Worked Stability (100 000 double strokes) 1/10 mm Penetration change, difference with D217 60X worked	-15 to +45	ASTM D 217 or IP 50

TABLE 1 - PROPERTIES (CONTINUED)

	Property	Requirement	Test Method
3.2.12a	Low Temperature Torque Without added water: Starting Torque, Nm, max Running Torque, Nm, max	 2.0 0.5	 ASTM D 1478 -65 °F/-54 °C
3.2.12b	Low Temperature Torque With 10% m/m added water: Starting Torque, Nm, max Running Torque, Nm, max Water addition to be conducted in accordance with DEF STAN 05-50 Part 62	 2.0 0.6	 ASTM D 1478 -65 °F/-54 °C
3.2.13	Extreme Pressure Load Wear Index, kg, min Weld Load, kg, min	 50 315	ASTM D 2596 or IP 239 Running time 10 seconds
3.2.14	Anti-Wear Mean Wear Scar Diameter mm, max	 0.7	ASTM D 2266 or IP 239 Test temp. 167 °F ± 4 (75 °C ± 2), 1 hour @ 40 kg
3.2.15	Water Washout % m/m, max	 15	ASTM D 1264 or IP 215 175 °F /79 °C
3.2.16	Dynamic Rust Prevention Rating Max	 1/1	ASTM D 6138 or IP 220, SKF Emcor Dynamic Anti-Rust Test, 3.0% NaCl solution
3.2.17	Elevated Temperature Performance Running Time, hours min	 100 hours	ASTM D 3527
3.2.18	Storage Stability Change in Worked Penetration (60 double strokes) from original. (change of +/- permitted) max	 30	FED-STD-791, Method 3467.1, Storage 100 °F/ 38 °C, 6 months
3.2.19	Odor	No odor of rancidity, perfume or free alcohol	
3.2.20	Dirt (particles/ml of grease, max) 25-74 microns dia. >74 microns dia.	 1000 None	FED-STD-791 Method 3005.4
3.2.21	Base Fluid Viscosity in cSt @ 212 °F/100 °C @ 104 °F/40 °C	 Report 165 maximum	ASTM D 445 or IP 71
3.2.22	Compatibility		See Note 3

NOTE 1: To allow Requirement 3.2.10 to be completed with water, ASTM D 1831 shall be modified as follows:

In place of a 50 g sample of the grease, a 45 g sample shall be spread around the inside of the cylinder. 5 ml of deionised water shall then be placed in the cylinder using a pipette.

NOTE 2: All worked penetrations for the purposes of Roll Stability testing shall be conducted using a 1/2 scale apparatus with conversion to full-scale penetration units as detailed in method ASTM D 1403.

NOTE 3: Compatibility of greases that meet this specification has not been determined. The user is cautioned that mixing or substitution of greases may cause unpredictable results. When considering interchange of greases, if intermixing is expected in the end-use, compatibility should be determined prior to application.

4. QUALIFICATION

4.1 Material furnished under this specification may require qualification approval by OEMs before being authorized for use in their equipment.

If a QPG for AMS-M is formed and empowered this AMS will be updated with an associated QPL.

4.2 For qualification, the tests described in Table 1 shall be performed by an ISO 9002 accredited laboratory.

4.3 In addition, equipment builders may require mechanical rig testing or controlled service introduction prior to granting approval for use in their equipment.

5. QUALITY ASSURANCE PROVISIONS

5.1 Responsibility for Inspection

The manufacturer of the product shall be responsible for performance of all required tests. Purchaser reserves the right to sample and perform any testing deemed necessary to ensure that the product conforms to specified requirements.

5.2 Acceptance Tests

The tests listed in Table 2 shall be performed on each batch prior to delivery.

TABLE 2 - ACCEPTANCE TESTS

Test	Requirement
Appearance	3.2.1
Penetration, Worked	3.2.2
Dropping Point	3.2.3
Oil Separation	3.2.4
Oxidation Stability (100 hours only)	3.2.6
Corrosiveness (Copper Strip)	3.2.7.a
Roll Stability (with water)	3.2.10 *See Notes 1 & 2, Table 1
Low Temperature Torque (Dry)	3.2.12.a
Extreme Pressure, (weld load only)	3.2.13

5.2.1 Batch

Product formulated and processed as one production entity.

5.2.2 Random Sampling

Sufficient product shall be taken at random from each batch to perform all the required acceptance tests. The number of determinations for each requirement shall be as specified in the applicable test procedure.

5.2.3 Report

The supplier of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance requirements, and certifying that the product conforms to all of the technical requirements of the AMS.

5.2.4 Report Contents

AMS3058, manufacturer's identification and product designation, batch number and date of manufacture.