



AEROSPACE MATERIAL SPECIFICATION

AMS2525™

REV. E

Issued	1972-05
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Superseding AMS2525D

Graphite Coating, Thin Lubricating Film
Impingement Applied

RATIONALE

AMS2525E results from a Five-Year Review and update of this specification with changes to Application (1.2.2), Cleaning (3.2.1), Thickness (3.3.2), Wear Life (3.3.3), Quality (3.4), Responsibility for Inspection (4.1), For Periodic Tests (4.3.2), and Rejections (Section 7).

1. SCOPE

1.1 Form

This specification covers a coating consisting of finely-powdered graphite in a heat-resistant inorganic binder.

1.2 Application

This coating has been used typically on metal parts and selected nonmetallic materials requiring a coating under 0.0001 inch (2.5 µm) thick (see 8.4) for reducing friction or wear or for minimizing galling, but usage is not limited to such applications.

1.2.1 Aluminum, magnesium, and ferrous alloys, other than corrosion-resistant types, either coated or in contact with other parts having this coating, may be susceptible to corrosion.

1.2.2 This coating may not be suitable for use in vacuum or low humidity due to loss of lubricity under these conditions.

1.3 Safety-Hazardous Materials

While 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 processor 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.

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2.1 SAE Publications

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.

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

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 D2510 Adhesion of Solid Film Lubricants

ASTM D2714 Calibration and Operation of the Falex Block-on-Ring Fixture Friction and Wear Testing Machine

ASTM D7091 Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals

3. TECHNICAL REQUIREMENTS

3.1 Coating Material

Shall consist of finely-powdered graphite in a heat-resistant inorganic binder. The coating, properly applied, shall form a lubricating film conforming to the requirements of 3.3.

3.2 Procedure

3.2.1 Cleaning

Before applying the coating, surfaces of the base material shall be thoroughly cleaned. The cleaned surfaces shall be visually free from oxides and from foreign materials detrimental to coating adhesion.

3.2.2 Masking

For parts with surfaces on which coating is not permitted, masking shall be applied and removed after coating by a method that will not change the properties of the base material or the applied coating. External shielding between the impingement nozzle and the part may be used instead of masking the part if its effectiveness can be demonstrated by inspection.

3.2.3 Surface Finishing

Surfaces of parts to be coated shall be honed with 120 to 400 mesh aluminum oxide powder to prepare the base material for coating.

3.2.3.1 To provide the proper surface for bearing applications, all residual metallic particles, whether mechanically or electrostatically held, shall be removed. The cleaning method may be the same or different from the one used in 3.2.1, depending on suitability.

3.2.4 Coating

The coating material shall be applied to all specified surfaces by spraying at high velocity (impinging) under controlled conditions.

3.2.5 Curing

Curing shall be performed at a temperature not exceeding 310 °F (154 °C).

3.2.6 Preservation

Unless otherwise specified by purchaser, after curing, a supplementary preservative treatment shall be applied to metallic parts subject to corrosion. The preservative treatment shall be removable by a suitable degreasing method.

3.3 Properties

The coating shall conform to the following requirements:

3.3.1 Adhesion

A pressure-sensitive film-backed tape, with an adhesion of not less than 45 oz/in (12.5 N/25.4 mm), shall be applied to a flat surface of a coated specimen, rolled in place, and then rapidly removed in accordance with ASTM D2510, Procedure B. The lifting of flakes or particles of the coating from the specimen exposing the base material is not acceptable. A uniform deposit of powdery material clinging to the tape is acceptable.

3.3.2 Thickness

Shall be not greater than 0.0001 inch (2.5 μ m), determined in accordance with ASTM D7091 or by a method acceptable to cognizant engineering organization when ASTM D7091 is not practical.

3.3.3 Wear Life

Average specimen time to failure shall be not less than 5 minutes, determined in accordance with ASTM D2714 and the following:

- 3.3.3.1 Coat the ring and block specimens in accordance with 3.2 excluding the application of the preservative coating (3.2.6).
- 3.3.3.2 Prepare the wear tester in accordance with ASTM D2714 excluding test fluid.
- 3.3.3.3 Testing is to be conducted in air at ambient temperature, typically 75 °F (24 °C).
- 3.3.3.4 Assemble coated ring and block specimens onto the wear tester, adjust counters to zero and run the tester for 5 seconds \pm 3 seconds to ensure alignment of the ring and block.
- 3.3.3.5 Apply 30.0 lbf \pm 0.5 lbf (133 N \pm 2 N) normal force at the frictional contact point and run the tester for 60 seconds \pm 5 seconds.
- 3.3.3.6 Increase the total applied normal force to 60.0 lbf \pm 0.5 lbf (267 N \pm 2 N) and run to failure, where failure is defined to occur when the coefficient of friction exceeds 0.20. Total test time shall include the time accumulated in 3.3.3.5 and 3.3.3.6.

3.3.4 Thermal Stability

Heat specimen to 2000 °F \pm 25 °F (1093 °C \pm 14 °C) and hold at temperature for 5 minutes \pm 0.5 minutes, air cool to room temperature and hold for 60 minutes \pm 5 minutes, followed by immersion in liquid nitrogen for 60 minutes \pm 5 minutes. Remove the specimens from the liquid nitrogen and permit the specimen to return to room temperature. Visual examination shall show no evidence of damage to the coating.

3.4 Quality

Coating on parts, as received by purchaser, shall be uniform in color, smooth, adherent to base material, and free from surface imperfections detrimental to performance of the coating. The coating shall be charcoal gray to black in color with blue or green tint permissible. Evidence of porosity, voids, blistering, or other conditions detrimental to performance of the coating is not acceptable.