



AEROSPACE MATERIAL SPECIFICATION

AMS2530™**REV. A**

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Superseding AMS2530

Tungsten Disulfide Coating, Thin Lubricating Film, Binder-Less Impingement Applied

RATIONALE

AMS2530A revision includes revised adhesion testing frequency, revises dimensions for thickness and adhesion test specimens, and gives cognizant engineering organization the option to waive surface finishing by honing prior to coating.

1. SCOPE

1.1 Form

This specification covers a coating consisting of tungsten disulfide without binders and not requiring a curing process.

1.2 Application

This product has been used typically on metal parts and selected nonmetallic materials (e.g., thermoplastic and thermosetting polymers) where a friction-reducing coating under 0.00002 inch (0.5 μm) thick is required and where wear, galling, seizure, and fretting need to be minimized, but usage is not limited to such applications.

This lubricating film has been shown to be compatible with such fluids as reagent grade water, petroleum-based hydraulic fluid, petroleum-based oils and greases, SAE phosphate ester test fluid #1, silicone fluid, unsym-dimethylhydrazine (UDMH)-compatible grease, inhibited fuming red nitric acid (IFRNA)-compatible grease, solid rocket propellants, nitrogen tetroxide, liquid oxygen and hard radiation environments.

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 that 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.

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Documents
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2.1 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 B 567 Measurement of Coating Thickness by the Beta Backscatter Method

ASTM D 7091 Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals

ASTM D 2510 Adhesion of Solid Film Lubricants

ASTM D 2511 Thermal Shock Sensitivity of Solid Film Lubricants

ASTM D 2649 Corrosion Characteristics of Solid Film Lubricants

ASTM E 595 Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment

2.2 American Society for Quality Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI, 53203, Tel: 800-248-1946 (United States or Canada) or +1-414-272-8575, www.asq.org.

ANSI / ASQC Z1.4-2003 Sampling Procedures and Tables for Inspection by Attributes

3. TECHNICAL REQUIREMENTS

3.1 Coating Material

The material used for the coating shall consist tungsten disulfide in a finely powdered, lamellar form. The material shall contain no graphite, molybdenum disulfide, binders or organic constituents so as to be compatible in liquid oxygen systems and hard radiation environments. The coating material, properly applied, shall, without a curing process, form a lubricating film conforming to the requirements of 3.4

3.2 Preparation

3.2.1 Cleaning

The surfaces of the basis material shall be thoroughly cleaned with a procedure capable of removing all polar and non-polar substances including oils and greases as well as any corrosion products and scale/oxide deposits. The cleaning procedure shall not produce pitting or intergranular attack of the basis metal and shall preserve dimensional requirements. The cleaned surfaces shall be free from oils (including skin oils), greases, dirt, particulate matter or other surface contamination. All parts shall be handled in such a manner as to prevent re-contamination of any surfaces to be coated during the application process.

3.2.2 Surface Finishing

Unless otherwise approved by the cognizant engineering organization, surfaces of parts to be coated shall be honed with 5 micron aluminum oxide powder to prepare the basis material for coating. See 8.2.1. Following honing, surfaces shall be cleaned to remove all residual particles.

3.3 Procedure

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

3.4 Properties

The coating shall conform to the following requirements:

3.4.1 Adhesion

A pressure-sensitive-film-backed tape with an adhesion of not less than 45 ounces per inch (0.49 N/mm), shall be applied to a flat surface of a coated specimen, rolled in place, and rapidly removed in accordance with ASTM D 2510, Procedure B. The lifting of flakes or particles of the coating from the specimen, exposing the basis metal, is not acceptable. A uniform deposit of powdery material clinging to the tape is acceptable.

3.4.2 Thickness

Thickness shall be not greater than 0.00002 inch (0.5 μm), determined in accordance with ASTM D 7091 or ASTM B 567 or by a method acceptable to the cognizant engineering organization.

3.4.3 Thermal Stability

The coating shall be tested for thermal stability in accordance with ASTM D 2511, except that (a) the extremes of temperature exposure shall range from -188 °C or colder to 482 °C or hotter and (b) the samples shall be allowed to return to room temperature for a minimum of 5 minutes between the hot and cold exposures. After exposure, the film shall not crack, flake, blister or soften and shall then meet the adhesion requirements of 3.4.1.

3.4.4 Appearance

The film appearance shall be uniform silver gray in color and when examined under a 12X to 15X microscope shall show no evidence of cracks, scratches, pinholes, blisters, or surface imperfections, other than those reflected through from the underlying basis material.

3.4.5 Corrosion Resistance

The coating shall be tested for corrosion resistance in accordance with ASTM D 2649. The anodized aluminum panels shall show no signs of discoloration, pitting or formation of white deposits after not less than 500 hours of exposure.

3.4.6 Vacuum Stability

When specified by the cognizant engineering organization, the coating material shall be tested for vacuum stability in accordance with ASTM E 595. The coating material shall show a total mass loss of less than or equal to 1.0% and collected volatile condensable material measurement of less than or equal to 0.1% when tested in accordance with ASTM E 595.

3.4.7 Coefficient of Friction

Coefficient of friction tests shall be as agreed upon between purchaser and supplier. See 8.4.

3.4.8 Wear Testing

Wear performance tests shall be as agreed upon between purchaser and supplier. See 8.4.

3.5 Quality

The coating on parts, as received by purchaser, shall be uniform in color, smooth, adherent to basis material and free from surface imperfections detrimental to performance of the coating. Evidence of porosity or other conditions detrimental to performance of the coating is not acceptable.