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AEROSPACE STANDARD

Submitted for recognition as an American National Standard

SAE AS5127

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METHODS FOR TESTING AEROSPACE SEALANTS

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1. SCOPE:

1.1 Form:

This document describes the accepted methods used for testing aerospace sealants for qualification and for quality conformance or acceptance testing.

1.2 Application:

This document is intended to be used with AMS specifications or other materials specifications which govern the procurement of aerospace sealants.

NOTE: All test procedures and associated test materials designated in this standard were adopted from current military and consensus material specifications for sealing compounds. Cross-references for equivalent test materials may be obtained using documents such as the SAE AMS Index or the ASTM Metals & Alloys in the Unified Numbering System reference manuals.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this standard may involve the use of hazardous materials, this standard 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 following publications form a part of this standard to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and 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.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA, 15096-0001.

AMS 2471 Anodic Treatment of Aluminum Alloy, Sulfuric Acid Process, Undyed Coating
AMS 2629 Fluid, Jet Reference
AMS 3020 Oil, Reference, for “L” Stock Rubber Testing
AMS 3021 Fluid, Reference, for Testing Di-Ester (polyol) Resistant Material
AMS 3100 Adhesion Promoter for Polysulfide Sealing Compounds
AMS 3166 Solvents, Cleaning, Cleaning Prior to Application of Sealing Compounds
AMS 3803 Wipes, Cotton, Loosely Woven
AMS 3819 Cloths, Cleaning, for Aircraft Primary and Secondary Structural Surfaces

2.1 (Continued):

AMS 4037 Aluminum Alloy Sheet and Plate, 4.4Cu 1.5Mg 0.60Mn, (2024; -T3 Flat Sheet, -T351 Plate) Solution Heat Treated

AMS 4045 Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (7075; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated

AMS 4049 Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (Alclad 7075-T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated

AMS 4901 Titanium Sheet, Strip and Plate, Commercially Pure, Annealed, 70.0 ksi (485 MPa)

AMS 5516 Steel, Corrosion Resistant, Sheet, Strip, and Plate, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated

AS 4491 Plastic Disposable Cartridge, Plunger, Nozzles, and Cartridge Assembly

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 449 Chromates on Aluminum
ASTM D 412 Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1125 Tests for Electrical Conductivity and Resistivity of Water
ASTM D 2240 Rubber Property - Durometer Hardness

2.3 U.S. Government Publications:

Available from Standardization Document Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia PA 19111-5094.

CCC-C-419 Cloth, Duck, Cotton, Unbleached, Plied Yarns, Army and Numbered
PPP-C-96 Cans, Metal, 28 Gage and Lighter
L-P-390 Plastic Molding and Extrusion Material Polyethylene & Copolymers (Low, Medium & High Density)
O-O-670 Class 1 Orthophosphoric (Phosphoric) Acid, Technical
TT-B-848 Butyl Alcohol, Secondary (For use in organic compounds)
TT-I-735 Isopropyl Alcohol
TT-N-97 Naphtha, Aromatic
VV-B-231 Benzene
FED-STD-141 Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing
MIL-P-5425 Plastic Sheet, Acrylic, Heat Resistant
MIL-A-9962 Abrasive Mats, Non-woven, Non-metallic
MIL-G-25667 Glass, Monolithic, Aircraft Glazing
MIL-P-23377 Primer Coatings, High Solids, Chemical and Solvent Resistant

2.3 (Continued):

MIL-P-25690	Plastic, Sheets and Parts, Modified, Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-C-27725	Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks
MIL-C-38334	Corrosion Removing Compound, Prepaint, For Aircraft Aluminum Surfaces
MIL-S-38714	Sealant Cartridge for Two Component Materials
MIL-C-38736	Cleaning Compound, Solvent Mixtures
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-S-83310	Plastic Sheet, Polycarbonate, Transparent
MIL-C-85285	Coating, Polyurethane, High Solids
MIL-P-85582	Primer Coatings: Epoxy, VOC Compliant, Chemical and Solvent Resistant
MIL-C-87936	Cleaning Compounds, Aircraft Exterior Surfaces, Water Dilutable
MIL-STD-453	Inspection, Radiographic

2.4 AIA Publications:

Available from National Standard Association, Inc., 1321 14th. Street, N.W., Washington, DC 20005

NAS 679	Nut, Self-locking, Hexagon - Low Height
NAS 1154	Screw, Machine - Flat, 100 Degrees Head, Close Tolerance, Short Thread, Torque Set

3. STANDARD TOLERANCES:

3.1 Standard Tolerances:

Unless otherwise specified, standard tolerances shown in Table 1 shall apply.

TABLE 1 - Standard Tolerances

Measurement Units	Tolerance
Temperature	±2 °F (±1 °C)
Day	±2 hours
Hour	±5 minutes
Minute	±10 seconds
Inches (mm)	±0.010 inch (±0.20 mm)

4. STANDARD TEST CONDITIONS:

4.1 Test Conditions:

Standard laboratory conditions shall be 77 °F (25 °C) and 50% ± 5% relative humidity. Except as otherwise specified, all test specimens shall be cured under these conditions and all tests shall be performed at 77 °F (25 °C).

5. STANDARD HEAT CYCLES:

5.1 Standard Heat Cycle:

Heat cycles to which sealants shall be environmentally exposed prior to testing shall be identified in each material specification.

6. PREPARATION OF TEST SPECIMENS:

6.1 Chemical Conversion Coating Application:

6.1.1 Preparation of Aluminum Panel Test Surfaces: Aluminum panel test surfaces, both bare (AMS 4037 and AMS 4045) and Alclad (AMS 4049) shall be cleaned by flooding the surface with clean solvent conforming to AMS 3166 or MIL-C-38736 followed by scrubbing with clean AMS 3819 Grade A cloth wipes. After scrubbing, the panel surface shall again be flooded with solvent, then immediately wiped dry using clean, dry AMS 3819 Grade A wipe. DO NOT allow solvent to evaporate from surface.

NOTE: Panel cleaning shall be accomplished just prior to application of sealing compound.

6.1.2 Chemical Conversion Coating: When aluminum panel test surfaces require chemical conversion coating, MIL-C-81706, Class 1A, Form 11, Method C shall be followed. The chemical conversion coating shall be prepared according to the manufacturer's instructions.

6.1.2.1 Panel Preparation: Degrease aluminum test panels using a suitable organic solvent, followed by alkaline detergent cleaning using MIL-C-87936 Type I material or an equivalent commercially available alkaline cleaner. The cleaning may be accomplished by brushing, swabbing or soaking the panels in the detergent solution or by a combination of the above techniques. Rinse the cleaned panels in warm flowing tap water 60 to 100 °F (16 to 38 °C), and check for cleanliness by observing for a waterbreak free surface. If a waterbreak occurs on the panel surfaces, return them to the detergent solution and repeat the cleaning procedure until a waterbreak free surface is obtained. Immediately transfer the cleaned panels to a deoxidizing solution consisting of the following:

a. Butyl alcohol - 35% by weight (TT-B-848)
b. Distilled or deionized water - 22% by weight (ASTM D 1125)
c. Isopropyl alcohol - 25% by weight (TT-I-735)
d. H_3PO_4 (85% by weight) - 18% by weight (O-O-670, Class 1)

Acid deoxidizer conforming to MIL-C-38334 may also be used. Allow the panels to remain in the above solution for 3 to 5 min. Rinse the panels thoroughly under flowing tap water.

6.1.2.2 Coating Application (Immersion): Transfer the deoxidized panels immediately to the chemical conversion coating solution conforming to MIL-C-81706. Immerse the panels in the solution at standard temperature for 3 to 5 min or until a light straw color develops. (Color development time will vary with the aluminum alloy being conversion coated). After removal from the conversion coating solution, immediately rinse thoroughly in flowing distilled or deionized water. Arrange the panels in an upright position to permit them to drain dry. Apply the test materials to the conversion coated surfaces within 48 h.

NOTE: Mix the conversion coating solution in either 18-8 stainless steel, polyethylene or other compatible plastic containers. DO NOT MIX IN GLASS CONTAINERS.

6.2 Organic Coatings:

When organic coatings are specified for panel test surfaces, the coatings shall be fully cured as defined by the applicable coating specification. The applied coatings shall be at least 14 days old and not more than 6 months old when stored at ambient indoor temperatures.

6.2.1 Polyurethane Fuel Tank Coating: Bare aluminum (AMS 4045) test panels shall be sulfuric acid anodized in accordance with AMS 2471. One surface of the anodized aluminum panels shall then be coated with polyurethane according to MIL-C-27725.

NOTE: When organic coatings are specified for the test panels, the coatings shall be fully cured as defined by the applicable coating specification before cleaning.

6.2.1.1 Cleaning of MIL-C-27725 Surface for Sealing: The MIL-C-27725 test surface shall be cleaned by flooding the surface with clean solvent conforming to AMS 3166 or MIL-C-38736 followed by scrubbing with clean AMS 3819 Grade A cloth wipes. After scrubbing, the surface shall be again flooded with solvent, then immediately wiped dry using clean, dry AMS 3819 wipes. DO NOT allow solvent to evaporate from the surface.

NOTE: Panel cleaning shall be accomplished just prior to application of sealing compound.

6.2.2 High Solids Fuel Tank Primer: Bare aluminum (AMS 4045) test panels shall be sulfuric acid anodized in accordance with AMS 2471. One surface of the anodized aluminum panels shall then be primed with epoxy primer according to MIL-P-23377.

NOTE: When organic coatings are specified for the test panels, the coatings shall be fully cured as defined by the applicable coating specification before cleaning.

6.2.2.1 Cleaning of MIL-P-23377 Surface for Sealing: The MIL-P-23377 test surface shall be cleaned by flooding the surface with clean solvent conforming to AMS 3166 or MIL-C-38736 followed by scrubbing with clean AMS 3819 Grade A cloth wipes. After scrubbing, the test surface shall again be flooded with solvent, then immediately wiped dry using clean, dry AMS 3819 Grade A wipes. DO NOT allow the solvent to evaporate from the surface.

NOTE: Panel cleaning shall be accomplished just prior to application of sealing compound.

6.2.3 Aliphatic Isocyanate Urethane Coating: The primed surfaces of aluminum test panels prepared in accordance with 6.2.2 shall be coated according to the requirements of MIL-C-85285.

NOTE: When organic coatings are specified for the test panels, the coatings shall be fully cured as defined by the applicable coating specification.

6.2.3.1 Cleaning of MIL-C-85285 Surface for Sealing: The MIL-C-85285 test surface shall be cleaned by flooding the surface with clean solvent conforming to AMS 3166 or MIL-C-38736 followed by scrubbing with clean AMS 3819 Grade A cloth wipes. After scrubbing, the test surface shall again be flooded with solvent, then immediately wiped dry using clean, dry AMS 3819 Grade A wipes. DO NOT allow the solvent to evaporate from the surface.

NOTE: Panel cleaning shall be accomplished just prior to application of sealing compound.