SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS2477 REV. A

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Superseding AMS2477

Conversion Coating for Aluminum Alloys Low Electrical Resistance Coating

RATIONALE

AMS2477A results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Purpose

This specification covers the requirements for a low-electrical-resistance chemical conversion coating on aluminum and aluminum alloy parts.

1.2 Application

This process has been used typically to provide aluminum with a thin inorganic film that improves corrosion resistance and adhesion of organic coatings and possesses low electrical resistance, but usage Is not limited to such applications.

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 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.

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.

AMS4027 Aluminum Alloy, Sheet and Plate, 1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated

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/AMS2477A

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshocken, PA 15248-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 117	Operating Salt Spray (Fog) Apparatus
ASTM D 3359	Test Methods for Measuring Adhesion by Tape Test

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5044, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-PRF-23377	Primer Coatings: Epoxy High-Solids
MIL-P-53022	Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free
MIL-P-53030	Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free
MIL-PRF-85582	Primer Coatings: Epoxy, Waterborne

3. TECHNICAL REQUIREMENTS

3.1 Preparation

3.1.1 Location of racking points shall be on areas not to be coated or where acceptable to the cognizant engineering organization.

3.1.2 The coating shall be applied over a surface free from water breaks. The cleaning procedure shall not produce pitting or intergranular attack of the basis metal and shall preserve dimensional requirements. See 8.5.

3.2 Procedure

3.2.1 The application process shall consist of immersion, spray, pen, or brush (swab) application of a solution capable of generating a coating compliant with the requirements of this specification. See 8.6.

3.2.2 Touchup

Unless otherwise specified by the cognizant engineering organization, areas from which the coating has been removed may be touched up provided the area touched-up does not exceed 5 percent of the total surface area of the part.

3.3 Properties

Coated surfaces shall conform to the following requirements:

3.3.1 Electrical contact resistance of the coated product shall not exceed 0.005 ohm (5 milliohm) per square inch when tested in accordance with a procedure acceptable to the cognizant engineering organization See 8.11.

3.3.2 Corrosion Resistance

The basis metal shall not show evidence of corrosion beyond the limits specified below after exposure to 168 hours ± 1 to salt spray corrosion testing in accordance with ASTM B 117 with the exposed surface of test panels inclined back approximately 6 degrees from vertical.

3.3.2.1 No specimen shall show more than five isolated spots or pits, none larger than 1/32 inch (0.79 mm) in diameter. Areas within 0.25 inch (6.4 mm) from the edges, identification markings, and racking points shall be excluded. Loss of color shall not be cause for rejection. See 8.8.

3.3.2.2 No more than 15 isolated spots or pits, none larger than 1/32 inch (0.79 mm) in diameter, on the combined surface area of all five test panels. See 8.8.

3.3.2.3 Electrical contact resistance after salt fog exposure shall not exceed 0.010 ohm (10 milliohm) per square inch when tested in accordance with a procedure acceptable to the cognizant engineering organization. See 8.11.

3.3.3 Color

Coating shall be any distinctive color that distinguishes coated from the uncoated items. See 8.9.

3.3.4 Primer Adhesion

Primer in accordance with MIL-P-53022, MIL-P-53030, MIL-PRF-23377, or MIL-PRF-85582 applied over the conversion coating and cured in accordance with manufacturer's instructions shall show no separation between the primer and the conversion coating when tested in accordance with ASTM D 3359 dry tape method

3.4 Quality

3.4.1 The coating, as received by purchaser, shall be continuous, adherent to basis metal, and visually free from powdery residue, pin holes, pits, and other imperfections detrimental to usage of the parts. Appearance shall be uniform although slight variations in color are permissible.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The processor shall supply all samples for processor's tests and shall be responsible for performance of all required tests. When parts are to be tested, the parts shall be supplied by purchaser. The cognizant engineering organization reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Color (3.3.3) and quality (3.4) are acceptance tests and shall be performed on parts, or samples representing parts when permitted, from each lot. See 4.3.3.

4.2.2 Periodic Tests

Corrosion resistance (3.3.2) and primer adhesion (3.3.4) are periodic tests and shall be performed monthly unless frequency of testing is specified by the cognizant engineering organization. Tests of cleaning and coating solutions are periodic tests and shall be performed at a frequency established by the processor unless frequency of testing is specified by the cognizant engineering organization. See 8.4.

4.2.2.1 Periodic testing may be suspended in any month when parts are not processed, however, preproduction testing may be required by the cognizant quality organization upon resumption of processing.

4.2.3 Preproduction Tests

All property verification tests (section 3.3) are preproduction tests shall be performed prior to production and when the cognizant engineering organization deems confirmatory testing to be required.

4.3 Sampling for Testing

4.3.1 Acceptance Tests

Test samples shall be randomly selected from all parts in the lot. A lot shall be all parts of the same part number coated in the same set of solutions in each consecutive 24 hours of operation, and presented for processor's inspection at one time. Unless the cognizant engineering organization provides a sampling plan, the minimum number of samples shall be as shown in Table 1.

TABLE 1 - Sampling For Acceptance Tests

Number of Parts in Lot	Quality and Color
up to 6	All
7 to 15	7
16 to 40	10
41 to 110	15
111 to 300	25
301 to 500	35
501 to 700	50
701 to 1200	75
over 1200	125

4.3.2 Periodic Tests

Five test panels are required for corrosion resistance tests. Two test panels are required for primer adhesion tests.

4.3.3 Sample Configuration

4.3.3.1 AMS4027 (6061-T6) test panels for corrosion and electrical resistance testing shall be cleaned and processed with parts. Dimensions, number of test panels, and number and location of readings shall be in accordance with the test procedure. See 3.3.1.

4.4 Approval

4.4.1 The process and control factors or a preproduction part, or both, whichever is specified, shall be approved by the cognizant engineering organization before production parts are supplied.

4.4.2 If the processor makes a significant change to any material, process, or control factor from that which was used for process approval, all preproduction tests shall be performed and the results submitted to the cognizant engineering organization for process reapproval unless the change is approved by the cognizant engineering organization. A significant change is one which, in the judgment of the cognizant engineering organization, could affect the properties or performance of the parts.

4.4.3 Control factors shall include, but not be limited to the following:

Surface preparation and cleaning methods
Coating material trade name and manufacturer
Coating bath composition and composition control limits
Coating bath temperature limits and controls
Primer application and adhesion test procedure
Electrical contact resistance test procedure
Stripping procedure, when applicable
Periodic test plan for cleaning and processing solutions. See 8.4.