



AEROSPACE MATERIAL SPECIFICATION

AMS2514™**REV. B**

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Superseding AMS2514A

Anodic Coating on Aluminum Alloys
Sulfuric Acid Process, Resin-Sealed

RATIONALE

AMS2514B results from a Five-Year Review and update of this specification with changes to ordering information, definitions (2.3), solutions (3.1.1), neutralizing rinse (3.1.2), cleaning (3.2.2), electrical contact points (3.2.3), anodizing (3.2.4), rinsing (3.2.5.1 and 3.2.5.3), coating thickness (3.3.1), corrosion resistance (3.3.2), responsibility for inspection (4.1), periodic tests (4.2.2), sampling and testing (4.3 and 4.3.1.1), for periodic tests (4.3.2), specimen configuration (4.3.3), resampling and retesting (4.6.1), rejections (Section 7), and notes (8.3 and 8.4). These changes were made to bring this specification in line with the requirements of AMS2471.

NOTICE

ORDERING INFORMATION: The following information shall be provided to the plating processor by the purchaser.

1. Purchase order shall specify not less than the following:

- AMS2415B
- Part number of parts to be anodized
- Quantity of pieces to be anodized
- Basis metal to be anodized
- Optional: Electrical contact locations, when not specified (see 3.2.3)
- Special features, geometry, or processing present on parts that require special attention by the anodizing processor
- Periodic testing frequency and sample quantity, if different from 4.2.2 and 4.3.2
- Whether approval is based on approval of process/control factors or sample part or both (see 4.4.1)

2. Parts manufacturing operations such as heat treating, forming, joining, and media finishing can affect the condition of the substrate for anodizing, or, if performed after anodizing, could adversely affect the anodized part. The sequencing of these types of operations should be specified by the cognizant engineering organization or purchaser and is not controlled by this specification.

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<https://www.sae.org/standards/content/AMS2514B>

1. SCOPE

1.1 Purpose

This specification covers the engineering requirements for producing an anodic coating on aluminum and aluminum alloys which are subsequently sealed with an organic resin.

1.2 Application

This coating has been used typically to increase corrosion resistance and provide surfaces which will ensure adhesion of subsequent organic finishes, but usage is not limited to such applications. This process is applicable to all forms and alloys of aluminum. Coatings produced through resin-seal anodizing cannot be subsequently dyed.

This process is not suitable for parts which contain joints or recesses in which the solutions utilized in the anodizing process may be retained.

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 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 +1 724-776-4970 (outside USA), www.sae.org.

AMS4037 Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

ARP4992 Periodic Test for Processign Solutions

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 B117 Operating Salt Spray (Fog) Testing Apparatus

ASTM B244 Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments

ASTM B487 Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section

ASTM B567 Measurement of Coating Thickness by the Beta Backscatter Method

2.3 Definitions

Terms used in AMS are clarified in ARP1917 and as follows.

2.3.1 CORROSION PIT

A corrosion pit is defined as an area of localized corrosion having a depth greater than its width. Pit size may be determined by either direct dimensional measurement or by comparison to known references. A superficial pit or discontinuity in the anodize surface itself, not penetrating through to the base metal and not showing the presence of white corrosion products is not rejectable. As a general rule, a corrosion pit usually displays a characteristic tail or line of white aluminum corrosion products.

3. TECHNICAL REQUIREMENTS

3.1 Solutions

3.1.1 Electrolyte shall be an aqueous solution of sulfuric acid of suitable concentration maintained within ± 2 °F (± 1 °C) of the temperature approved in 4.4 (see 8.4).

3.1.2 Neutralizing Rinse

Shall be an aqueous solution of 4 to 6% by weight commercial grade sodium bicarbonate maintained at a temperature below 80 °F (27 °C) or other suitable neutralizing solution. Water used for solution preparation shall be demineralized water not exceeding a conductivity of 50 μ S/cm or a chloride content of 25 ppm, when water with a conductivity of 100 μ S/cm or 50 ppm or less total solids content is not available.

3.1.3 Sealer

Shall be a colloidal suspension in water of a suitable resin concentrate. The resin concentrate shall be diluted with water and maintained in accordance with manufacturer's instruction.

3.2 Procedure

3.2.1 Preparation

All fabrication-type operations, such as heat treatment, machining, forming, brazing, welding, and perforating, shall be completed before parts are anodized.

3.2.2 Cleaning

Parts shall be cleaned to a water-break-free surface and deoxidized prior to anodizing. Acid or alkaline etching may be used to enhance surface preparation or coating adhesion. Cleaning and etching methods shall not cause pitting or intergranular attack of the base alloy.

3.2.3 Electrical Contact Points

Tight electrical contact shall be maintained during the anodic treatment process in order to prevent damage or contact arcing (burning) of parts, but small irregularities of coating at points of electrical contact are acceptable.

3.2.3.1 For parts that are to be anodized all over, and contact locations are not specified, contact locations shall be at the discretion of the processor.

3.2.3.2 For parts that are not to be anodized all over, and contact locations are not specified, locations shall be in areas on which coating is not required.

3.2.4 Anodizing

- 3.2.4.1 The cleaned parts shall be made the anode(s) in the electrolyte contained in a chemical-resistant tank which may also serve as the cathode. The processing shall be adjusted to obtain the required weight and quality of the coating. The anodizing current shall be maintained within ± 2 amperes per square foot ($\pm 21.5 \text{ A/m}^2$) of the nominal value.
- 3.2.4.2 Alternatively, the anodizing current shall be ramped up over a 5 minute or other pre-selected period to the desired final voltage and maintained until the anodic coating reaches the desired coating weight.

3.2.5 Rinsing

- 3.2.5.1 After anodizing, parts shall be rinsed in cold, running water for not less than 5 minutes. Water supplied for rinsing shall be demineralized water not exceeding a conductivity of $50 \mu\text{S/cm}$ or a chloride content of 25 ppm, when water with a conductivity of $100 \mu\text{S/cm}$ or 50 ppm or less total solids content is not available.
- 3.2.5.2 After water rinsing, parts other than castings shall be immersed for not less than 10 minutes in the neutralizing rinse of 3.1.2. Casting alloys shall be held in the neutralizing rinse for not less than 30 minutes.
- 3.2.5.3 After rinsing in the neutralizing rinse, parts shall be rinsed in water for an additional 5 minutes or longer. Water supplied for rinsing shall be demineralized water not exceeding a conductivity of $50 \mu\text{S/cm}$ or a chloride content of 25 ppm, when water with a conductivity of $100 \mu\text{S/cm}$ or 50 ppm or less total solids content is not available.

3.2.6 Resin Sealing

Following water rinsing, parts, while still wet, shall be totally immersed in the resin sealer for the time recommended by the sealer manufacturer. The resin seal tank shall remain covered for the time the parts are immersed. On completion of sealing, parts shall be removed from the resin seal tank and left untouched on the processing racks for not less than 2 hours. Teardropping of resin is permissible but teardrop areas shall not be used in determining coating thickness. Resin sealed parts shall not be handled or top coated until sealer has been cured in accordance with manufacturer's instructions.

3.3 Properties

Resin sealed anodic coated parts shall conform to the following properties.

3.3.1 Coating Thickness

Parts shall be processed to obtain a final coating thickness of 0.0003 to 0.0005 inch (7.6 to 12.7 microns). Other coating thicknesses may be specified by cognizant engineering organization.

- 3.3.1.1 Thickness of coating shall be determined on representative parts or specimens (4.3.3) in accordance with ASTM B244, ASTM B487, ASTM B567, or other method acceptable to cognizant engineering organization. Coating thickness shall not apply to blind holes, recesses with depth greater than twice the diameter, or in open holes with depth greater than seven times the diameter unless a specific thickness is specified in those areas.

3.3.2 Corrosion Resistance

Coated and sealed panels of AMS4037 aluminum alloy sheet shall withstand exposure for not less than 500 hours to salt spray corrosion testing in accordance with ASTM B117, except that the significant surface shall be inclined approximately 6 degrees from vertical. The exposed panels shall show no more than a total of 15 scattered spots or pits, none larger than 1/32 inch (0.8 mm) in diameter, in a total of 150 square inches (968 cm^2) of test area grouped from five or more test pieces, or more than five scattered spots or pits, none larger than 1/32 inch (0.8 mm) in diameter, in a total of 30 square inches (194 cm^2) from one or more test pieces. Areas within 1/16 inch (1.6 mm) from identification markings, and at electrode contact marks remaining after processing, need not be included. See 2.3.1 for definition of corrosion pit morphology.

3.4 Quality

The coating, as received by purchaser, shall be continuous, uniform in color, shall not exhibit evidence of arcing or burning, and shall be free from powdery areas and other imperfections detrimental to usage of the coating.

4. QUALITY ASSURANCE PROVISION

4.1 Responsibility for Inspection

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

4.2 Classification of Tests

4.2.1 Acceptance Tests

Thickness (3.3.1) and quality (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests

Corrosion resistance (3.3.2) is a periodic test and shall be performed at least monthly in any month that parts are processed unless frequency of testing is specified by the cognizant engineering organization. Tests of cleaning and processing 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.

4.2.2.1 Periodic testing may be suspended in any test period when parts are not processed but shall be performed before or at the time such processing is resumed. Preproduction testing may be required by the cognizant engineering organization, upon resumption of processing.

4.2.3 Preproduction Tests

All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of processed parts to a purchaser, when a change in material and/or processing requires reapproval by the cognizant engineering organization (see 4.4.2), and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

Shall not be less than the following: A lot is a group of parts, all of the same part number, processed through the same chemical solutions in the same tanks under the same conditions, which have completed the chemical processing within a period of 24 hours of each other and are presented to inspection at the same time.

4.3.1 For Acceptance Tests

As shown in Table 1.

Table 1 - Sampling for acceptance testing

Number of Parts in Lot			Quality	Thickness
Up	to	7	All	1
8	to	15	7	1
16	to	40	10	1
41	to	110	15	2
111	to	300	25	3
301	to	500	35	6
Over		500	50	8