AEROSPACE MATERIAL SPECIFICATION

AMS2409™	REV. H

Issued 1948-05
Revised 2016-05
Reaffirmed 2021-08

Superseding AMS2409G

Plating, Immersion Tin for Aluminum Alloys

RATIONALE

AMS2409H results from Five Year Review and update of this specification and includes testing frequency for thickness and adhesion.

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:

    - AMS2409H
    - Basis metal alloy and/or material specification to be plated
    - Special features, geometry or processing present on parts that requires special attention by the plating processor
    - Optional: alternative adhesion test (see 3.5.2.1)
    - Optional: periodic testing sample quantity (see 4.3.2)
    - Whether approval is based on approval of process/control factors or sample part or both (see 4.4.1)
    - Quantity of pieces to be plated

2. Parts manufacturing operations such as heat treating, forming, joining and media finishing can affect the condition of the substrate for plating, or, if performed after plating, could adversely affect the plated 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.

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS2409H/

1. SCOPE

1.1 Purpose

This specification covers the engineering requirements for producing a thin tin coating on aluminum alloys by an immersion process.

1.2 Application

This process has been used typically to prevent scuffing and galling of aluminum alloy parts, but usage is not limited to such applications (see 8.5).

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.

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

ARP4992 Periodic Test for Processing Solutions

AS2390 Chemical Process Test Specimen Material

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 B374 Standard Terminology Relating to Electroplating

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

ASTM B504 Measurement of Thickness of Metallic Coatings by the Couometric Method

ASTM B567 Measurement of Coating Thickness by the Beta Backscatter Method

ASTM B568 Measurement of Coating Thickness by X-Ray Spectrometry

ASTM B571 Qualitative Adhesion Testing of Metallic Coatings

3. TECHNICAL REQUIREMENTS

3.1 Plating Bath

Shall consist of an aqueous solution of stannate salts.

3.2 Operating Parameters

Temperature of bath, pH, solution concentration, and immersion time shall be controlled to provide a deposit meeting the requirements of 3.5.

3.3 Preparation

Parts shall have clean surfaces free of waterbreak prior to immersion in the plating solution. Parts shall be transferred to plating solution without drying after rinsing.

3.4 Procedure

3.4.1 Parts shall be immersed in the plating bath and shall remain in the bath until reaction is essentially complete, as indicated by virtual cessation of evolution of hydrogen from the surface of the parts.

3.4.1.1 Parts shall not be allowed to dry during the entire sequence of operations until completion of the final rinse.

3.4.1.2 After plating, parts shall be thoroughly rinsed and dried.

3.5 Properties

Plated tin shall conform to the following requirements:

3.5.1 Thickness

The plate thickness shall be approximately 0.0001 inch (2.5 µm), determined in accordance with ASTM B487, ASTM B504, ASTM B567, ASTM B568, or other method acceptable to the cognizant engineering organization.

3.5.2 Adhesion

Plated parts or representative specimens shall show no blisters after being heated in a circulating-air oven to 300 °F ± 15 °F (149 °C ± 8 °C) and held at heat for not less than three hours.

3.5.2.1 When acceptable to the cognizant engineering organization, adhesion may be determined by scratching the plated surface with a sharp point or other method specified in ASTM B571 for tin coatings. When examined at 4 to 6X magnification, there shall be no evidence of flaking or separation of the plating from the base metal.

3.6 Quality

Plated tin, as received by purchaser, shall be smooth, continuous, adherent to basis metal, uniform gray in appearance, and free from blisters and other imperfections detrimental to usage of the plating. Slight staining or discoloration is 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 the performance of all required tests. When parts are required to be tested, such parts shall be supplied by the purchaser. The cognizant engineering organization reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to the specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Quality (3.6) is an acceptance test and shall be performed on parts from each lot.

4.2.2 Periodic Tests

Thickness (3.5.1) is a periodic test and shall be performed at least once each month that parts are processed. Adhesion (3.5.2 or 3.5.2.1, as applicable) is a periodic test that shall be performed not less than daily for each generic class of alloy as defined by AS2390, processed during that day. Tests of cleaning and plating solutions (see 4.4.3 and 8.4) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by the cognizant engineering organization.

4.2.3 Preproduction Tests

All property verification tests (3.5) are preproduction tests and shall be performed prior to production and when the cognizant engineering organization deems confirmation testing necessary.

4.3 Sampling and Testing

Shall be not less than the following; a lot shall be all plated parts of the same part number plated in the same solution(s) in not longer than eight consecutive hours and presented for processor's inspection at one time:

4.3.1 For Acceptance Tests

Test samples shall be randomly selected from all parts in the lot. The minimum number of samples shall be as shown in Table 1.

Table 1 - Sampling for acceptance tests

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

4.3.2 For Periodic Tests and Preproduction Tests

Sample quantities shall be at the discretion of the processor for thickness tests unless otherwise specified by the cognizant engineering organization. For adhesion tests, four test specimens of each generic class of alloy, as defined by AS2390, shall be processed through the same cleaning and plating operations as the parts that they represent. These adhesion test specimens shall be processed prior to the first day's production lot of parts or with the first production lot of parts.

4.3.3 When plated parts are of such configuration or size as to be not readily adaptable to the specified tests or when nondestructive testing is not practical on actual parts, or it is not economically acceptable to perform destructive tests on actual parts, separate test specimens of the same generic class of alloy as the parts represented as defined by AS2390, cleaned and plated with the parts represented may be used.