

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 2409E
Superseding AMS 2409D

Issued 5-1-48
Revised 10-1-82

TIN PLATING, IMMERSION

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:** Primarily to prevent scuffing and galling of aluminum alloy parts.

2. **APPLICABLE DOCUMENTS:** The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 **SAE Publications:** Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 **Aerospace Material Specifications:**

AMS 2350 - Standards and Test Methods

2.2 **ASTM Publications:** Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

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

2.3 **U.S. Government Publications:** Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 **Military Standards:**

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade or their use by governmental agencies is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

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 time shall be controlled to provide a satisfactory deposit meeting the requirements of 3.5.
- 3.3 Preparation: Parts shall have chemically clean surfaces prior to immersion in the plating solution. Parts need not be dry when immersed in the plating solution.
- 3.4 Procedure:
- 3.4.1 Parts shall be immersed in the plating bath until reaction is essentially complete, as indicated by virtual cessation of evolution of hydrogen.
- 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 Parts shall be thoroughly rinsed and dried.
- 3.5 Properties: Plated tin shall conform to the following requirements:
- 3.5.1 Thickness: Unless otherwise specified, the plate thickness shall be
Ø approximately 0.0001 in. (2.5 μ m), determined in accordance with ASTM B487.
- 3.5.2 Adhesion: Plated tin shall show no evidence of flaking when scratched with a sharp needle point and examined at up to 6X magnification.
- 3.5.2.1 Unscratched plated parts shall show no blisters after being heated in a
Ø circulating-air oven to 375°F $\pm$ 15 (190°C $\pm$ 8) and held at heat for not less than 3 hours.
- 3.5.3 Quality: Plated tin shall be smooth, continuous, adherent to basis metal, uniform bright gray in appearance, and free from blisters, nodules, and other imperfections detrimental to usage of the plated parts.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The plating vendor shall supply all samples for vendor's tests and shall be responsible for performing all required
Ø tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser 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: Tests to determine conformance to requirements for quality (3.5.3) are classified as acceptance tests and shall be performed on each lot.
- 4.2.2 Periodic Tests: Tests to determine conformance to requirements for thickness (3.5.1) and adhesion (3.5.2 and 3.5.2.1) and tests of cleaning and plating solutions to ensure that the plated deposit will conform to the requirements of this specification are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.
- 4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of plated parts to a purchaser, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.
- 4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.
- 4.3 Sampling: Shall be not less than the following; a lot shall be all plated parts of the same part number plated in one continuous operation and presented for vendor's inspection at one time:
- 4.3.1 For Acceptance Tests: Shall be in accordance with MIL-STD-105, Normal Inspection Level II, with an acceptance quality level (AQL) of 2.5 on plated parts.
- 4.3.2 For Periodic Tests and Preproduction Tests: As agreed upon by purchaser and vendor.
- 4.4 Approval:
- 4.4.1 Sample plated parts shall be approved by purchaser before parts for production use are supplied, unless such approval be waived by purchaser. Results of tests on production parts shall be essentially equivalent to those on the approved sample parts.
- 4.4.2 Vendor shall use manufacturing procedures, processes, and methods of inspection on production parts which are essentially the same as those used on the approved sample parts. If necessary to make any change in type of equipment or in established composition limits and operating conditions of process solutions, vendor shall submit for reapproval of the process a statement of the proposed changes in processing and, when requested, sample plated parts. Production parts plated by the revised procedure shall not be shipped prior to receipt of reapproval.

AMS 2409E

- 4.5 Reports: The vendor of plated parts shall furnish with each shipment three copies of a report stating that the parts have been processed and tested in accordance with the requirements of this specification and that they conform to the acceptance test requirements. This report shall include the purchase order number, lot number, AMS 2409E, part number, and quantity.
- 4.6 Resampling and Retesting: If any part or specimen used in the above tests fails to meet the specified requirements, disposition of the parts may be based on the results of testing three additional parts or specimens for each original nonconforming part or specimen. Except as specified in 4.6.1, failure of any retest part or specimen to meet the specified requirements shall be cause for rejection of the parts represented and no additional testing shall be permitted. Results of all tests shall be reported.
- 4.6.1 If any part or specimen fails to meet the specified requirements, either on the original sampling as in 4.3 or upon resampling as in 4.6, the parts in that lot may be stripped by a method approved by purchaser which does not roughen, pit, or embrittle the basis metal, recoated, and retested.
5. PREPARATION FOR DELIVERY:
- 5.1 Packaging and Identification:
- 5.1.1 Plated parts of each different part number shall be packed in separate suitable containers, each marked with the purchase order number, AMS 2409E, lot number, vendor's identification, and quantity.
- 5.1.2 Plated parts shall be handled and packaged in such a manner as will ensure that the required physical characteristics and properties of the plating are preserved.
- 5.1.3 Packages of plated parts shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the parts to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.1.4 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1, 5.1.2, and 5.1.3 will be acceptable if it meets the requirements of Level C.
6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
7. REJECTIONS: Parts on which the plating does not conform to this specification or to modifications authorized by purchaser will be subject to rejection.