

**Plating, Immersion Tin
For Aluminum Alloys**

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.

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 canceled and no superseding document has been specified, the last published issue of that document shall apply.

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SAE WEB ADDRESS:

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 487 Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section

ASTM B 567 Measurement of Coating Thickness by the Beta Backscatter Method

ASTM B 568 Measurement of Coating Thickness by X-Ray Spectrometry

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 water break 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.

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 B 487, ASTM B 567, ASTM B 568, or other method acceptable to purchaser.

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

3.5.2.1 When acceptable to purchaser, adhesion may be determined by scratching the plated surface with a sharp point. When examined at 4 to 6X magnification, there shall be no evidence of flaking of the plating (See 4.3.3).

3.6 Quality:

Plated tin, as received by purchaser, shall be smooth, continuous, adherent to basis metal, uniform bright 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. Purchaser 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: Adhesion (3.5.2 or 3.5.2.1, as applicable) and quality (3.6) are acceptance tests and shall be performed to represent each lot.

4.2.2 Periodic Tests: Thickness (3.5.1) and tests of cleaning and plating solutions (See 8.4) are 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: All technical requirements are 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 approval by the cognizant engineering organization (See 4.4.2), and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:

Shall be not less than the following; a lot shall be all plated parts made of the same aluminum alloy 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: As shown in Table 1.

TABLE 1 - Sampling for Acceptance Tests

Number of Parts in Lot	Quality	Adhesion
Up to 7	All	3
8 to 15	2	4
16 to 40	10	4
41 to 110	15	5
111 to 300	25	6
301 to 500	35	7
Over 500	50	8

- 4.3.2 For Periodic Tests and Preproduction Tests: Sample quantity shall be at the discretion of the processor unless otherwise specified by purchaser.
- 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, cleaned and plated with the parts represented may be used.
- 4.4 Approval:
- 4.4.1 The process and control factors, a preproduction sample, or both, whichever is specified by purchaser, shall be approved by the cognizant engineering organization before production parts are supplied.
- 4.4.2 The processor shall make no significant change to materials, processes, or control factors from those on which the approval was based, unless the change is approved by the cognizant engineering organization. A significant change is one which, in the judgement 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:
- Precleaning procedure
 - Bath composition limits
 - Bath temperature limits
 - Bath pH limits
 - Method used for adhesion tests
 - Periodic test plan.