



AEROSPACE MATERIAL SPECIFICATION	AMS2420™	REV. F
	Issued 1957-07 Reaffirmed 2012-08 Revised 2022-07	
Superseding AMS2420E		
Plating of Aluminum for Solderability Zinc Immersion Pre-Treatment Process		

RATIONALE

AMS2420F results from a Five-Year Review and update of this specification with additions to ordering information regarding thickness of plate, and test specimens for solderability test, clarified that under plate per AMS2418 be Type 1 (3.2.2), added that multiple layers of plating shall be a continuous process so that drying does not occur between layers (3.2.2.1), added that AMS's for sub layers of plating shall have their test requirements be fulfilled by AMS2420 testing (3.2.2.2), updated fixture contact locations (OI, 3.2.3, 4.4.3), added allowance for direct dimensional inspection (3.3.1), added that solderability test is destructive (3.3.4), added requirement for composition testing of Class 2 plating (3.3.5, 4.2.2), clarified thickness testing (4.2.1, 4.2.2), added standard wording for suspension of periodic testing (4.2.2.1), updated lot definition (4.3), added that test samples shall be randomly selected from the lot (4.3.1), changed Table 1 sampling for up to seven parts in lot, added thickness to periodic sampling and testing (4.3.2), added test specimen requirements for composition and solderability (4.3.3.2, 4.3.3.3), added method for reflowing plating to control factors (4.4.3), and clarified resampling and retesting (4.6).

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:
 - AMS2420F
 - Quantity of pieces to be plated
 - Permissible electrical contact locations, if not specified (see 3.2.2.1)
 - Class of plating desired (see 1.3)
 - Plating thickness desired if other than that specified in 3.3.1, copper underplate and tin or tin-zinc alloy plate
 - Basis metal aluminum alloy type to be plated
 - Optional: Fixture/electrical contact locations, when not specified (see 3.2.3)
 - Optional: If specimens are to be tested instead of parts for solderability test (see 3.3.4)
 - Reflow, when necessary (see 3.2.5)

SAE Executive Standards Committee Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2022 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

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
http://www.sae.org

SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS2420F/>

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 and is not controlled by this specification.

1. SCOPE

1.1 Purpose

This specification covers the requirements for preparation of aluminum and aluminum alloys for soldering by zinc immersion pre-treatment followed by copper plating and tin or tin-zinc alloy plating.

1.2 Application

This process has been used typically to facilitate soldering of aluminum and aluminum alloy mechanical and electronic instrument enclosures, but usage is not limited to such applications.

1.3 Classification

The final plating shall be one of the following.

Class 1 - Tin plating

Class 2 - Tin-zinc plating

1.3.1 When a class is not specified, Class 1 shall apply.

1.4 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.

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.

AMS2408	Plating, Tin
AMS2418	Plating, Copper
AMS2434	Plating, Tin-Zinc Alloy
AMS4751	Tin - Lead Eutectic, 63Sn - 37Pb
ARP4992	Periodic Test for Processing Solutions
AS2390	Chemical Process Test Specimen Material
AS7766	Terms Used in Aerospace Metals Specifications

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 B253 Preparation of Aluminum Alloys for Electroplating
- ASTM B487 Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
- 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 Preparation

3.1.1 Cleaning and Deoxidizing

Parts shall have clean, water break-free surfaces and shall be deoxidized to prepare for zinc immersion coating as a pretreatment for plating.

3.2 Procedure

3.2.1 Zinc Immersion Coating

Parts shall be processed in accordance with ASTM B253 or other method acceptable to the cognizant engineering organization.

3.2.2 Plating

Parts shall be preplated with a brass or copper strike from an alkaline solution, followed by electrodeposition of copper under plate in accordance with AMS2418, Type 1. When Class 1 is specified, parts shall receive a final deposit of tin in accordance with AMS2408. When Class 2 is specified, parts shall receive a final deposit of a tin-zinc alloy in accordance with AMS2434, Type 1 with a maximum of 25% by weight zinc.

3.2.2.1 Plating of multiple layers shall be continuous such that no drying of the plate occurs between plating solutions so as to achieve sufficient adhesion between the base metal and the subsequent layers.

3.2.2.2 Unless otherwise specified by the cognizant engineering organization, testing requirements of AMS2408, AMS2418, and AMS2434 are fulfilled by the tests specified herein.

3.2.3 Fixture/Electrical Contact Locations

3.2.3.1 Except for barrel plating, for parts that are to be electroplated/coated 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 electroplated/coated all over, and contact locations are not specified, contact locations shall be in areas on which plate/coating is not required.

3.2.4 Spotting-in is not permitted.

3.2.5 When reflow is specified for tin plate the deposit shall be reflowed to a bright, shiny appearance by immersion in hot oil at 490 to 525 °F (254 to 274 °C).

3.3 Properties

The deposit shall conform to the following requirements:

3.3.1 Thickness

Shall be as follows, determined in accordance with ASTM B487, ASTM B567, ASTM B568, direct dimensional inspection provided the resolution of the measuring instrument is ten times more precise than the attribute being measured, or other method acceptable to the cognizant engineering organization.

3.3.1.1 Copper Under Plate

Shall be 0.0003 to 0.0007 inch (8 to 18 μm).

3.3.1.2 Tin or Tin-Zinc Alloy Plate

Shall be 0.0003 to 0.0005 inch (8 to 13 μm).

3.3.1.3 The plate shall be substantially uniform in thickness on significant surfaces, except that build-up at exterior corners or edges will be permitted provided finished drawing dimensions are met.

3.3.1.4 No requirements are established for minimum plate thickness on surfaces of holes, recesses, internal threads, contact areas of parts plated all over, and other areas where a controlled deposit cannot be obtained under normal plating conditions, but such surfaces shall not be masked to prevent plating. The resultant thickness shall be considered only when such surfaces can be touched by a sphere 0.75 inch (19.0 mm) in diameter.

3.3.2 Heat Resistance

Parts shall show no visual evidence of blistering after reflow or after being held at 350 °F \pm 10 °F (177 °C \pm 6 °C) for 30 minutes \pm 3 minutes.

3.3.3 Adhesion

Plate shall be firmly and continuously bonded to the underlying metal, determined on representative parts or a test specimen as in 4.3.3, in accordance with a method described in ASTM B571. There shall be no indication of separation from the base metal or internal delamination. In case of dispute, either of the ASTM B571 bend tests shall apply.

3.3.4 Solderability

The plating shall demonstrate good solderability using AMS4751 tin/lead solder and a mildly activated rosin (RMA) flux. The solder shall flow uniformly and show no evidence of dewetting except for surfaces exempt from coating thickness requirements as in 3.3.1.4. Note: The solderability test is destructive in nature. If parts are not to be tested, the cognizant engineering organization shall specify that specimens shall be tested.

3.3.5 Composition

When AMS2420 Class 2 plating is specified, the composition of the final plating (AMS2434 Type 1) shall contain a maximum of 25% by weight zinc, the balance essentially tin, determined by a method approved by the cognizant engineering organization (see 4.4).

3.4 Quality

Plating shall be smooth, continuous, free from delamination within the plating, uniform in appearance and free from imperfections detrimental to usage of the plating. Plating shall be visually free from frosty areas, pin holes, porosity, blisters, nodules, and pits. Slight staining or discoloration is permissible.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

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

4.2 Classification of Tests

4.2.1 Acceptance Tests

Thickness of tin or tin-zinc (3.3.1.2), heat resistance (3.3.2), solderability (3.3.4), and quality (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests

Thickness of copper plate (3.3.1.1) is a periodic test and shall be performed at least monthly unless a frequency of testing is specified by the cognizant engineering organization. Adhesion (3.3.3) is a periodic test that shall be performed no less than daily for each generic class of alloy as defined by AS2390 processed during that day. Composition (3.5) is a periodic test and shall be performed at least quarterly unless a frequency of testing is specified by the cognizant engineering organization. Tests of preparatory and plating solutions (see 8.3) to ensure that the deposited metal will conform to specified requirements 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; however, preproduction testing may be required by the cognizant quality organization upon resumption of processing.

4.2.3 Preproduction Tests

All property verification tests (see 3.3) are preproduction tests and shall be performed prior to or on the initial shipment of processed parts to a purchaser, when a change in materials and/or processing requires approval by the cognizant engineering organization (see 4.4), and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

Shall be not 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 Acceptance Tests

Test samples shall be randomly selected from all parts in the lot. Unless the cognizant engineering organization provides a sampling plan, the minimum number of parts sampled shall be as shown in Table 1.

4.3.1.1 Quality, Heat Resistance, Solderability, and Thickness

As shown in Table 1.

Table 1 - Minimum sampling for acceptance testing

Number of Parts in Lots	Quality	Thickness, Heat Resistance, and Solderability
Up to 7	All	3 or all ⁽¹⁾
8 to 15	7	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

NOTE:

⁽¹⁾ Whichever is less.

4.3.2 Periodic Tests

For adhesion and thickness of copper plating tests, four test specimens of each generic class of alloy, as defined by AS2390, that have been 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 production lot of parts or with the first production lot of parts.

4.3.3 Test Specimens

Where practical, tests shall be performed on actual parts. Nondestructive testing shall be performed wherever practical and where authorized herein. When destructive tests are required and plated parts are of such configuration or size as to be not readily adaptable to the specified tests, separate test specimens may be used provided they are made of the same generic class of alloy, cleaned, plated, and post-treated with the parts represented. Specimens shall be either panels approximately 0.032 x 1 x 4 inches (0.81 x 25 x 102 mm) or bars approximately 0.5 inch (13 mm) in diameter and 4 inches (102 mm) long.

4.3.3.1 Test specimens for adhesion testing shall be made of the same generic class of alloy processed as defined by AS2390. The test specimens shall be 0.025 inch (0.6 mm) minimum thickness and not less than 1 x 4 inches (25 x 102 mm).

4.3.3.2 Test specimens for zinc-tin alloy composition testing may be made from any generic type of alloy that is conducive for testing. The test specimens shall be of any size that is practicable for testing.

4.3.3.3 If specified, test specimens for solderability shall be the same requirements as that used for adhesion testing.

4.4 Approval

4.4.1 The process and control procedure, a preproduction sample, or both, whichever is specified, 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 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 procedures

Surface activation procedures

Plating bath compositions and control limits

Plating bath temperature limits and controls

Fixture/electrical contact locations when approval is required by the cognizant engineering organization

Current/voltage/time limits and controls

Method for reflowing plating, when specified (3.2.5)

Method for testing plating system thickness

Method of checking composition when AMS2434 Type 1 plating applies, 25% by weight maximum zinc

Method for checking adhesion