AEROSPACE MATERIAL SPECIFICATION

AMS2414™	REV. G

Issued 1948-05
Revised 2005-09
Reaffirmed 2021-08

Superseding AMS2414F

Plating, Lead

RATIONALE

AMS2414G has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Purpose:

This specification covers the requirements for electrodeposed lead on metal parts.

1.2 Application:

This process has been used typically to prevent galling of metal parts and to improve the performance of bearings, 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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 253	Preparation of Aluminum Alloys for Electroplating
ASTM B 487	Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS2414G/

2.1 (Continued):

ASTM B 499	Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals
ASTM B 504	Measurement of Thickness of Metallic Coatings by the Coulometric Method
ASTM B 567	Measurement of Coating Thickness by the Beta Backscatter Method
ASTM B 568	Measurement of Coating Thickness by X-Ray Spectrometry
ASTM B 571	Adhesion of Metallic Coating
ASTM B 748	Measurement of Thickness of Metallic Coatings by Measurement of Cross Section with a Scanning Electron Microscope

3. TECHNICAL REQUIREMENTS:

3.1 Preparation:

3.1.1 Steel parts having hardness of 40 HRC or higher and which have been ground after heat treatment shall be cleaned to remove surface contamination and stress relieved before preparation for plating. Temperatures to which parts are heated shall be such that maximum stress relief is obtained without reducing hardness of parts below drawing limits, but, unless otherwise specified, parts with a hardness of 55 HRC or higher shall be stress relieved at not less than 275 °F (135 °C) for not less than five hours and other parts shall be stress relieved at not less than 375 °F (191 °C) for not less than four hours.

3.1.2 The plating shall be applied over a surface free from water breaks. The cleaning procedure shall not produce pitting, embrittlement, or intergranular attack of the basis metal and shall preserve dimensional requirements.

3.1.2.1 For parts 40 HRC and over, contact time with surface activation acids such as hydrochloric, hydrofluoric, and sulfuric acids shall be minimized so as not to produce hydrogen embrittlement.

3.1.3 Except for barrel plating, electrical contact points shall be as follows. For parts which are to be plated all over, locations shall be acceptable to purchaser. For parts which are not to be plated all over, locations shall be in areas on which plating is not required.

3.1.4 Aluminum or aluminum alloys shall be zincate treated in accordance with ASTM B 253 or other method acceptable to purchaser, prior to plating.

3.2 Procedure:

3.2.1 Parts shall be plated by electrodeposition of lead from a suitable lead plating solution onto a properly prepared surface. The plate shall be applied directly on the basis metal except that, in the case of parts made of corrosion-resistant steels and high speed steels, a suitable strike plate may be used for bonding purposes.

3.3 Properties:

The deposited lead shall conform to the following requirements:

3.3.1 Thickness of lead plating shall be 0.0005 to 0.0007 inch (13 to 18 µm), determined on representative parts or test panels in accordance with ASTM B 487, ASTM B 499, ASTM B 504, ASTM B 567, ASTM B 568, ASTM B 748, or by other method acceptable to purchaser.

3.3.1.1 Plate thickness may be specified by AMS 2414 and a suffix number normally designating the minimum thickness in ten-thousandths of an inch (µm); the maximum plate thickness shall be 0.0002 inch (5 µm) greater than the minimum. Thus, AMS 2414-2 designates a thickness of 0.0002 to 0.0004 inch (5 to 10 µm) and AMS 2414-6 designates a thickness of 0.0006 to 0.0008 inch (15 to 20 µm).

3.3.1.2 Where “lead flash” is specified, the thickness of lead deposit shall be approximately 0.0001 inch (2.5 µm).

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

3.3.1.4 All surfaces of the part, except those which cannot be touched by a sphere 0.75 inch (19.0 mm) in diameter, shall be plated to the specified thickness. Unless otherwise specified, surfaces such as holes, recesses, threads and other areas where a controlled deposit cannot be obtained under normal plating conditions, may have thickness less than specified limits, provided they show visual coverage. Coverage cannot be expected, however, below one diameter depth in holes unless auxiliary anodes are used.

3.3.2 Adhesion shall meet the requirements of ASTM B 571 or a method acceptable to purchaser.

3.4 Quality:

Plating, as received by purchaser, shall be continuous, adherent to basis metal, uniform in appearance, and essentially free from pin holes, porosity, blisters, nodules, pits, and other imperfections detrimental to usage of the plating. Slight staining or discoloration is permissible. There shall be no evidence of double plating or spotting in.

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 to be tested, the parts shall be supplied by purchaser. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Thickness (3.3.1), adhesion (3.3.2), and quality (3.4) are acceptance tests and shall be performed on parts, or samples representing parts when permitted, from each lot.

4.2.2 Periodic Tests: Cleaning and plating solutions are periodic tests and shall be performed at a frequency selected by the processor unless frequency of testing is specified by purchaser (See 8.4).

4.2.3 Preproduction Tests: All property verification tests (section 3.3) are preproduction tests and shall be performed prior to or on the initial shipment of plated parts to a purchaser and when purchaser deems confirmatory testing to be required.

4.3 Sampling for Tests:

4.3.1 Sample Configuration:

4.3.1.1 Nondestructive testing shall be performed wherever practical. Except as noted, actual parts shall be selected as specimens for tests.

4.3.1.2 Thickness and Adhesion Tests: When used, separate test panels are made of the same generic class of alloy as the parts, cleaned, plated, and post-treated with the parts represented. Separate test panels may be used when plated parts are of a configuration or size not readily adaptable to specified tests, when nondestructive testing is not practical on actual parts, or it is not economically acceptable to perform destructive tests on actual parts.

4.3.2 Sampling for testing shall be not less than the following; a lot shall be all parts of the same part number coated in the same set of solutions in each consecutive 24 hours of operation, and presented for processor's inspection at one time.

4.3.2.1 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	Thickness and Adhesion
1 to 7	All	All or 3*
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
501 to 700	50	8
701 to 1200	75	10
Over 1200	125	15

*Whichever is less

4.3.2.2 Periodic Tests: Sample quantity shall be selected at the discretion of the processor unless otherwise specified by purchaser.

4.4 Approval:

4.4.1 The process and control factors, a preproduction sample, or both, whichever is specified, shall be approved by the cognizant engineering organization before production coated parts are supplied.

4.4.2 If the processor makes a significant change to any material, process, or control factor from that which was used for process approval, all preproduction tests shall be performed and the results submitted to the purchaser for process reapproval 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 plated parts.

4.4.2.1 Control factors include, but are not limited to, the following:

Surface preparation and cleaning methods
Bath type and composition limits
Temperature limits and control of processing solutions
Method of thickness determination
Stripping procedure, when applicable
Rack locations
Current density (amps per total surface area of the parts plated at one time in each tank) or amps per part
Periodic test plan (See 8.4)

4.5 Reports:

The processor of plated parts shall furnish with each shipment a report stating that the parts have been processed and tested in accordance with specified requirements and that they conform to the the procedures herein and acceptance test requirements of this specification. This report shall include the purchase order number, lot number, AMS 2414G, part number, and quantity.

4.6 Resampling and Retesting:

4.6.1 If results of any acceptance test fails to meet specified requirements, the parts in that lot may be stripped and retested. Alternatively, all parts in the lot may be inspected for the nonconforming attribute, and the nonconforming parts may be stripped and retested.

4.6.1.1 When stripping is performed, the method shall be acceptable to the purchaser and shall not roughen, pit, or embrittle the basis metal or adversely affect part dimensions, pretreated, coated, and post-treated as defined herein.