



AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 2468C

Superseding AMS 2468B

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HARD COATING TREATMENT OF ALUMINUM ALLOYS

1. SCOPE:

1.1 Purpose: This specification establishes the engineering requirements for producing a hard coating on aluminum alloys and the properties of the coating.

1.2 Application: Primarily to increase, by the formation of a dense aluminum oxide, surface hardness and resistance to abrasion and corrosion of aluminum and aluminum-alloy parts containing, in general, less than 5% copper or 8% silicon or a total of 8% of both. Alloys with higher silicon content alone can be coated satisfactorily with proper precautions in processing. Careful consideration should be given to the use of this process on highly-stressed parts because of the resultant marked lowering of fatigue performance and on parts with sharp corners and edges where chipping may result.

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 Society of Automotive Engineers, Inc., 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 B137 - Measurement of Weight of Coating on Anodically Coated Aluminum

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

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Preparation:

3.1.1 All heat treatment, machining, forming, brazing, welding, and perforating operations shall, insofar as practicable, be completed before parts are hard coated.

3.1.2 Parts, prior to being coated, shall have clean surfaces, free from water-breaks, prepared with minimum abrasion, erosion, or pitting.

3.2 Procedure: Consists of the formation of aluminum oxide on surfaces of parts made the anode in a suitable electrolyte. After coating, parts shall be thoroughly rinsed in cold, clean water and dried.

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- 3.2.1 Coated surfaces shall be honed or lapped as necessary to meet specified surface finish requirements.
- 3.2.2 Sealing of parts for improved corrosion resistance may be accomplished at the sacrifice of wear resistance when permitted by purchaser.
- 3.3 Properties: Coating on parts shall conform to the following requirements:
- 3.3.1 Thickness: AMS 2468 designates finished coating thickness of 0.002 in. \pm 0.0005 (0.05 mm \pm 0.013). Other coating thicknesses may be specified by this specification number and a suffix number designating the nominal thickness in thousandths of an inch. A tolerance of \pm 0.0005 in. (\pm 0.013 mm) in thickness of coating will be allowed, unless otherwise specified. Thus, AMS 2468-3 designates a finished coating thickness of 0.003 in. \pm 0.0005 (0.08 mm \pm 0.013).
- 3.3.1.1 Thickness of coating shall be determined on representative parts or specimens by microscopic method, micrometer measurement, or as agreed upon by purchaser and vendor. When micrometer measurement is used, specimens for thickness determination shall be of the same alloy as the parts they represent and shall be processed with the parts. Micrometer measurements shall be calibrated against microscopic measurements on specimens of the same alloy processed to the same nominal coating thickness. Coating thickness requirements shall not apply to blind holes or recesses with depth greater than twice the diameter or in open holes with depth greater than seven times the diameter unless a specific coating thickness is specified in those areas.
- 3.3.2 Coating Weight: Shall be not less than 0.030 g per sq in. per 0.001 in. (0.18 (g/cm²)/mm) of ϕ coating thickness, determined in accordance with ASTM B137 on unsealed coatings.
- 3.3.3 Color: Shall be substantially uniform on pieces of the same alloy processed to the same nominal coating thickness. Coated surfaces shall not have a sooty appearance or the presence of a moire pattern.
- 3.3.4 Abrasion Resistance: Shall be acceptable to the purchaser, determined by a procedure agreed upon by purchaser and vendor.
- 3.3.5 Corrosion Resistance: Shall be acceptable to the purchaser, determined by a procedure agreed upon by purchaser and vendor.
- 3.4 Quality: Coating shall be substantially uniform in thickness except in small holes unless a specific coating thickness is specified, and in fillets, radii, and deep recesses, and shall be free from scratches, chips, and burned areas. Small irregularities at points of electrical contact will be permitted.
- 3.5 Tolerances: When a limited area to be hard coated is specified, a tolerance of -0, +1/16 in. (+1.6 mm), unless otherwise specified, will be permitted on the extent of the hard coated area except when such area ends at a corner; in such cases, the area shall not extend beyond the corner by more than the projected thickness of the coating.
4. QUALITY ASSURANCE PROVISIONS:
- 4.1 Responsibility for Inspection: The coating vendor shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems 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 thickness (3.3.1) or coating weight (3.3.2) and for color (3.3.3) and quality (3.4) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for coating weight (3.3.2) unless determined in lieu of thickness for acceptance and for abrasion resistance (3.3.4) and corrosion resistance (3.3.5) 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 on the initial shipment of coated parts to a purchaser, when a change in material 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 as follows; a lot shall be all coated parts made from the same alloy, processed to the same coating thickness, and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests:

Ø 4.3.1.1 Thickness: Three parts from each lot.

Ø 4.3.1.2 Color and Quality: All parts.

4.3.2 For Periodic Tests and Preproduction Tests: As agreed upon by purchaser and vendor.

4.3.2.1 Samples for determination of coating weight shall be actual coated parts when size and shape permit accurate determination of surface area. If parts are of such size and shape that surface area cannot be determined readily, coating weight determinations shall be made on test panels 0.025 - 0.063 in. (0.64 - 1.60 mm) in nominal thickness and not less than 3 in. (75 mm) square and, except as specified in 4.3.2.1.1, made of the same alloy as the parts and processed with the parts they represent.

4.3.2.1.1 If test panels of an alloy different from that of the parts they represent are used, panels shall be processed under conditions, previously established, which will produce the same coating thickness as that on the parts they represent.

4.4 Approval:

4.4.1 Sample coated parts shall be approved by purchaser before parts for production use are supplied, unless such approval be waived. Results of tests on production parts shall be essentially equivalent to those on the approved samples.

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 any change is necessary 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 coated parts, test panels, or both. Production parts coated by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports: The vendor of coated 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 the parts conform to the technical requirements. This report shall include the purchase order number, AMS 2468C, part number, lot number, and quantity.

- 4.6 Resampling and Retesting: If any 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 specimens for each original nonconforming specimen. Except as specified in 4.6.1, failure of any retest 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 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 Coated parts shall be handled and packaged in such a manner as will ensure that the required physical characteristics and properties of the coating are preserved.
- 5.2 Packages of 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 coated parts to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.3 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 and 5.2 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 coating does not conform to this specification or to authorized modifications will be subject to rejection.
8. NOTES:
- 8.1 Marginal Indicia: The phi (ϕ) symbol is used to indicate technical changes from the previous issue of this specification.
- 8.2 Precautions:
- 8.2.1 Wire, hooks, racks, and clamps used to suspend parts in the electrolyte, if they also are in contact with the electrolyte, should be made of aluminum, aluminum alloys, titanium, or titanium alloys.
- 8.2.2 When parts are to be selectively coated, electrical contact should be made on a surface not required to be coated. When parts are not to be masked, the areas in which electrical contact is permissible will be indicated on the drawing.
- 8.2.3 Aluminum parts containing inserts of other metal should have the inserts masked off before the parts are coated.
- 8.2.4 In general, growth of parts will be approximately half the coating thickness, but this relationship will vary with basis material and coating thickness.
- 8.2.5 Difficulty may be encountered when treating some alclad materials when the cladding thickness is 50% or less of the final coating thickness.
- 8.2.6 Only parts made of the same alloy and, in the case of heat-treatable alloys, the same temper, should be processed in a single batch.