SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS2466B

Issued 1997-07
Revised 2009-03

Superseding AMS2466A

Hard Anodic Coating of Magnesium Alloys Alkaline Type, High Voltage

RATIONALE

AMS2466B results from a Five Year Review and update of this specification.

NOTICE

ORDERING INFORMATION: The following information shall be provided to the processor by the purchaser.

1) Purchase order shall specify not less than the following:

- AMS 2466B
- Basis metal to be anodized
- Class (1.3)
- Special instructions, such as post-treatment (3.3.4).
- Quantity of pieces to be anodized

2) Parts manufacturing operations such as heat treating, forming, joining and media finishing can affect the condition of the substrate and adversely affect the finished part. The sequencing of these types of operations should be specified by the cognizant engineering organization or purchaser and is not controlled by this specification.

1. SCOPE

1.1 Purpose

This specification covers the requirements for a hard anodic coating on magnesium alloys.

1.2 Application

This coating has been used typically to provide corrosion resistance and abrasion resistance to cast magnesium alloys, but usage is not limited to such applications.

1.3 Classification

Anodic finishes are classified by coating thickness as follows:

Class 1	Thin Coating:	Coating thickness in the range of 0.0002 to 0.0004 inch (5 to 10 µm).
Class 1H	Heavy Coating:	Coating thickness in the range of 0.0005 to 0.0007 inch (13 to 18 µm).
Class 2	Thick Coating:	Coating thickness in the range of 0.0008 to 0.0010 inch (20 to 25 µm).

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

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http://www.sae.org/technical/standards/AMS2466B

1.3.1 If a class is not specified, Class 1 shall be supplied.

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 supplied 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 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS4418	Magnesium Alloy Castings, Sand Castings, 2.5Ag-2.1Di-0.70Zr (QE22A-T6), Solution and Precipitation Heat Treated
AMS4429	Magnesium Alloy Castings, Sand Castings, 2.8Nd-1.4Gd-0.4Zn-0.6Zr (EV31A-T6), Solution and Precipitation Heat Treated
AMS4439	Magnesium Alloy Castings, 4.2Zn - 1.2Rare Earths - 0.70Zr, (ZE41A-T5), Precipitation Heat Treated
AMS4446	Magnesium Alloy Castings, Sand Castings, 8.7Al - 0.70Zn - 0.26Mn, (AZ91E - T6), Solution and Precipitation Heat Treated
AS2390	Chemical Process Test Specimen Material

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 B 117	Operating Salt Spray (Fog) Apparatus
ASTM B 244	Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals With Eddy-Current Instruments
ASTM B 487	Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section
ASTM D 1193	Reagent Water
ASTM D 1654	Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 4060	Abrasion Resistance of Organic Coatings by the Taber Abraser

3. TECHNICAL REQUIREMENTS

3.1 Equipment

3.1.1 Tanks shall be fabricated from, or lined with, a material that is compatible with the baths used for cleaning, pretreatment, anodizing, or post-treatment solutions and shall be equipped with temperature controls capable of controlling the bath temperatures within specified limits.

3.1.2 Fixtures

Hooks, clamps, and racks used to suspend parts in the electrolyte, and which are in contact with the electrolyte, shall be fabricated from magnesium or magnesium alloys, or from aluminum alloys containing magnesium (5000 or 6000 series). Such fixtures shall be protected with suitable maskant at the electrolyte-air interface.

3.2 Preparation

3.2.1 Tight electrical contact shall be maintained during the anodic treatment to prevent contact arcing (burning) of parts, but small irregularities of coating at points of electrical contact are acceptable. For parts which are to be anodized all over, locations shall be acceptable to purchaser. For parts which are not to be anodized all over, locations shall be in areas on which anodize is not required.

3.2.2 Parts shall have clean surfaces, free from water break, prior to immersion in the anodizing solution. See 8.3.

3.3 Procedure

3.3.1 Pretreatment

The cleaned parts shall be immersed for 30 to 90 minutes in an aqueous solution of 83 to 102 grams per liter ammonium fluoride solution, with a pH of 6.0 to 6.8, and operated at 160 to 180 °F (71 to 82 °C) followed by a water rinse.

3.3.2 Anodizing shall be accomplished in an aqueous, chromate-free, alkaline electrolyte with the parts made the anode using voltage and current densities that produce an anodize coating conforming to specified properties. During anodizing, parts shall be oriented so as to prevent gas entrapment.

3.3.3 After coating, part shall be thoroughly rinsed in cold running water and dried.

3.3.4 Post-Treatment

When post-treatment is specified, parts shall be immersed in a bath containing 108 to 132 grams per liter sodium dihydrogen phosphate (NaH_2PO_4) in water meeting ASTM D 1193, Type IV, maintained at a pH of 4.3 to 4.5 and a temperature of 115 to 125 °F (46 to 52 °C). Immersion time shall be 30 to 60 seconds for Class 1 or 1H and 1 to 2 minutes for Class 2. Post treatment shall be followed by rinsing in cold water, hot reagent water, and drying.

3.4 Properties

Coated parts shall conform to the following requirements:

3.4.1 Coating thickness shall be 0.0002 to 0.0004 inch (5 to 10 µm) for Class 1 coatings, 0.0005 to 0.0007 inch (13 to 18 µm) for Class 1H, and 0.0008 to 0.0010 inch (20 to 25 µm) for Class 2 coatings, determined in accordance with any of the following methods as applicable: ASTM B 244, ASTM B 487, or other method acceptable to the cognizant engineering organization.

3.4.2 Corrosion Resistance

For each Class anodized during the month, coated samples shall be subjected for not less than the applicable time shown in Table 1 to salt spray corrosion test in accordance with ASTM B 117. The exposed surfaces of the panels shall show a rating of nine or greater after exposure, determined in accordance with ASTM D 1654, procedure B. Corrosion resistance of coatings applied to other alloys may be specified by the cognizant engineering organization.

TABLE 1 - Corrosion Resistance Requirements

Panel Material	Coating Class	Salt Spray Resistance Hours
AMS4439	1	24
AMS4439	2	72
AMS4446	1	168
AMS4446	2	336
AMS4429	1	168
AMS4429	2	336
AMS4418	1	24
AMS4418	2	72

3.4.3 Wear Resistance

Coated panels of AMS4439, AMS4418 and AMS4446 shall exhibit a wear index value less than 30 and a wear cycle rating greater than 5000 cycles for each 0.001 inch (25 μm) coating thickness when tested in accordance with ASTM D 4060 except that the CS-17 wheel shall be resurfaced after every 1000 cycles by running it for 25 cycles against the resurfacing medium, S-11 abrasive disk. Wear resistance test is applicable to all coating classes. Wear resistance requirements for coatings on other alloys may be specified by the cognizant engineering organization.

Coated panels of AMS4429 shall exhibit a wear index value less than 35 and a wear cycle rating greater than 5000 cycles for each 0.001 inch (25 μm) coating thickness when tested in accordance with ASTM D 4060 except that the CS-17 wheel shall be resurfaced after every 1000 cycles by running it for 25 cycles against the resurfacing medium, S-11 abrasive disk. Wear resistance test is applicable to all coating classes. Wear resistance requirements for coatings on other alloys may be specified by the cognizant engineering organization

3.4.4 Electrical Continuity

Coatings shall not conduct electricity when tested with a properly functioning, conventional, low-voltage continuity or resistance tester or the specific instrument specified by the cognizant engineering organization. Contact the surface of the anodic-coated part with the leads. Monitor the instrument for conduction of electricity.

3.5 Quality

Surfaces of coated parts, as received by purchaser, shall be uniform in texture and appearance except at the points of electrical contact and in pockets where gas was unavoidably trapped during processing. Powdery areas, laminations, pits, and other evidence of burning are not acceptable. Darkened corners or edges and excessive buildup are not acceptable.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The processor shall supply all test panels when required 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. The cognizant engineering organization 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

Coating thickness (3.4.1) and quality (3.5) are acceptance tests and shall be performed on parts, or specimens representing parts when permitted herein, from each lot. See 4.3.3.1.

4.2.2 Periodic Tests

Corrosion resistance (3.4.2) wear resistance (3.4.3)and electrical continuity (3.4.4) are periodic tests and shall be performed at least monthly unless frequency of testing is specified by the cognizant engineering organization. Tests of the cleaning and processing solutions 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. See 8.5 and 4.4.3.

4.2.3 Preproduction Tests

All property verification tests (section 3.4) are preproduction tests and shall be performed prior to production and when the cognizant engineering organization requires confirmatory testing.

4.3 Sampling for Testing

4.3.1 Acceptance Tests

Acceptance test samples shall be randomly selected from all parts in the lot. A lot shall be all parts of the same part number, coated in the same baths in not longer than 8 consecutive hours, and presented for processor's inspection at one time. Unless the cognizant engineering organization provides a sampling plan, the minimum number of samples shall be in accordance with Table 2.

TABLE 2 - Sampling For Acceptance Tests

Number of Parts in Lot	Quality (Visual)	Thickness
1 to 6	All	All or 3*
7 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 Periodic and Preproduction Tests

Sample quantities shall be not less than three for corrosion, one for electrical continuity, and one for wear resistance unless otherwise specified by the cognizant engineering organization.

4.3.3 Sample Configuration

4.3.3.1 Separate test specimens may be used under any one of the following circumstances: The parts are of such configuration or size as to be not readily adaptable to specified tests, nondestructive testing is not practical on actual parts, or it is not economically acceptable to perform destructive tests on actual parts. Except as specified below, acceptance test specimens shall be made of the same generic class of alloy as the parts, established in accordance with AS2390, distributed within the lot, cleaned, anodized, and post treated with the parts.

4.3.3.2 Corrosion resistance test panels shall be a minimum of 4 x 5 inches (102 x 127 mm).

4.4 Approval

4.4.1 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 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 cognizant engineering organization 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 coating.