

AEROSPACE MATERIAL SPECIFICATION



AMS-A-8625A

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Superseding AMS-A-8625

Anodic Coatings for Aluminum and Aluminum Alloys

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This specification has been declared "CANCELLED" by the Aerospace Materials Division, SAE, as of July, 2003, and has been superseded by MIL-A-8625. The requirements of the latest issue of MIL-A-8625 shall be fulfilled whenever reference is made to the cancelled AMS-A-8625. By this action, this document will remain listed in the Numerical Section of the index of Aerospace Materials Specifications noting that it is superseded by MIL-A-8625. Cancelled specifications are available from SAE upon request.

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This document has been taken directly from U.S. Military Specification MIL-A-8625F and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-A-8625F. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

1. SCOPE:

1.1 Scope:

This specification covers the requirements for six types and two classes of electrolytically formed anodic coatings on aluminum and aluminum alloys for non-architectural applications (see 6.1).

1.2 Classification:

The anodic coating Types and Classes covered by this specification are as specified herein (see 6.2 and 6.21).

1.2.1 Types:

- Type I - Chromic acid anodizing, conventional coatings produced from chromic acid bath (see 3.4.1)
- Type IB - Chromic acid anodizing, low voltage process, $22 \pm 2V$, (see 3.4.1)
- Type IC - Non-chromic acid anodizing, for use as a non-chromate alternative for type I and IB coatings (see 3.4.1 and 6.1.2)
- Type II - Sulfuric acid anodizing, conventional coatings produced from sulfuric acid bath (see 3.4.2)
- Type IIB - Thin sulfuric acid anodizing, for use as a non-chromate alternative for Type I and IB coatings (see 3.4.2 and 6.1.2)
- Type III - Hard Anodic Coatings (see 3.4.3)

1.2.2 Classes:

- Class 1 - Non-dyed (see 3.5.)
- Class 2 - Dyed (see 3.6.)

2. APPLICABLE DOCUMENTS:

The following specifications and standards form a part of this document to the extent specified herein.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-P-23377	Primer Coating, Epoxy-Polyamide, Chemical and Solvent Resistant
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-P-85582	Primer Coatings: Epoxy, Waterborne
QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet

2.1 (Continued):

FED-STD-141	Paint, Varnish, Lacquer, and Related Materials: Methods for Sampling and Testing
FED-STD-151	Metals; Test Methods
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attribute

2.2 ASTM Publications:

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

ASTM B 117	Method of Salt Spray (Fog) Testing
ANSI/ASTM B 137	Weight of Coating on Anodically Coated Aluminum, Measurement of
ASTM B 244	Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy Current Instruments, Measurement of
ASTM D 822	Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer and Related Products, Standard Practice for Operating
ASTM D 2244	Color Differences of Opaque Materials, Instrumental Evaluation of
ASTM G 23	Standard Practice for Operating Light Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Non-metallic Materials
ASTM G 26	Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Non-metallic materials

3. REQUIREMENTS:

3.1 Materials:

The materials used shall be such as to produce coatings which meet the requirements of this specification.

- 3.1.1 Base metal: The base metal shall be free from surface defects, caused by machining, cutting, scratching, polishing, buffing, roughening, bending, stretching, deforming, rolling, sandblasting, vaporblasting, etching, heat treatment condition, alloy chemistry imbalance and inclusions, that will cause coated test panels or parts to fail any of the requirements of this specification. The base metal shall be subjected to cleaning, etching, anodizing and sealing procedures as necessary to yield coatings meeting all requirements of this specification.

3.2 Equipment and processes:

The equipment and processes employed shall be such as to produce coatings which meet the requirements of this specification. Unless otherwise specified in the contract, purchase order or applicable drawing (see 6.2), process operating conditions shall be at the option of the supplier.

3.3 General:

3.3.1 Anodizing of parts and assemblies:

3.3.1.1 Anodizing of parts: Unless otherwise specified in the contract, purchase order or applicable drawing (see 6.2), parts shall be anodized after all heat treatment, machining, welding, forming and perforating have been completed.

3.3.1.2 Anodizing of assemblies: Unless otherwise specified in the contract, purchase order or applicable drawing, anodic coatings shall not be applied to assemblies which will entrap the electrolyte in joints or recesses (components shall be anodized separately prior to assembly). When anodizing of assemblies is authorized by the contract, purchase order or applicable drawing, the processing method used shall not result in subsequent damage to the assembly from electrolyte entrapment (Type I or IA coatings shall be used unless another coating Type is specified). Assemblies which contain non-aluminum parts such as steel, brass or organic substances, which would be attacked by pretreatment or anodizing solutions or would prevent uniform formation of the anodic coating, shall not be anodized as assemblies, unless the non-aluminum surfaces are masked or electrically insulated in a manner which produces anodic coatings meeting the requirements of this specification.

3.3.1.2 Anodizing of complex shapes: When anodizing complex shapes which will entrap the electrolyte in recesses, the processing method used shall not result in subsequent damage to the part from electrolyte entrapment (Type I or IA coatings shall be used unless another coating Type is specified).

3.3.2 Handling and cleaning: Parts shall be so handled during all pretreatments, anodizing and post treatments that mechanical damage or contamination will be avoided. Parts shall be free of all foreign substances, oxides and soils, such as greases, oil, paint and welding flux. Parts shall have oxide and other interfering films removed by the use of proper cleaning procedures so as to be clean and have water break free surfaces. Abrasives containing iron, such as steel wool, iron oxide rouge and steel wire, which may become embedded in the metal and accelerate corrosion of aluminum and aluminum alloys, are prohibited as a means of mechanical cleaning, prior to anodizing. If special cleaning requirements are required they shall be specified in the contract or purchase order (see 6.2).

3.3.3 Reflective surfaces: When specified in the contract or purchase order (see 6.2), parts fabricated to produce a highly reflective surface shall be chemically or electrochemically brightened, prior to anodic coating (see 6.9).

3.3.4 Touch up (mechanical damage and contact marks): Unless otherwise specified (see 6.2), mechanically damaged areas from which the anodic coating has been removed without damage to the part may be touched up using chemical conversion materials approved on QPL-81706 for Class 1A coatings and the applicable method of application. Touch up shall apply only to inadvertent mechanical damage such as scratch marks. For Type III coatings, touch up shall only be allowed in areas which will not be subjected to abrasion (see 6.1.1). The mechanically damaged area(s) shall not exceed 5 percent of the total anodized area of the item or touch up shall not be permitted. When specified in the contract or purchase order (see 6.2), contact marks shall be touched up using the above method required for mechanical damage.

3.4 Coatings:

Conventional anodic coatings as specified in the contract, purchase order or applicable drawings (see 6.2), shall be prepared by any process or operation to produce the specified coating on aluminum and aluminum alloys.

3.4.1 Type I, IB, and IC coatings: Type I and IB coatings shall be the result of treating aluminum and aluminum alloys electrolytically in a bath containing chromic acid to produce a uniform anodic coating on the metal surface. Type IC coatings shall be the result of treating aluminum and aluminum alloys electrolytically in a bath containing mineral or mixed mineral/organic acids (non-chromic acid) to produce a uniform anodic coating on the metal surface. Unless otherwise specified in the contract, purchase order or applicable drawing, Type I coatings shall not be applied to aluminum alloys with a nominal copper content in excess of 5.0 percent; nominal silicon contents in excess of 7.0 percent; or when the total allowable contents of nominal alloying elements exceed 7.5 percent. Heat treatable alloys which are to receive a Type I, IB, or IC coating shall be in the required temper to receive a Type I, IB, or IC coating shall be in the required temper obtained by heat treatment, such as -T4, -T6, or T73, prior to anodizing.

3.4.1.1 Type IC coatings: Type IC coatings provide a non-chromate alternative to Type I and IB coatings. Unless approved by the procuring activity, substitution of a Type IC coating where Type I or IB is specified shall be prohibited.

3.4.2 Type II and IIB coatings: Type II and IIB coatings shall be the result of treating aluminum and aluminum alloys electrolytically in a bath containing sulfuric acid to produce a uniform anodic coating on the metal surface. Heat treatable alloys shall be in the required temper obtained by heat treatment, such as -T4, -T6, or T73, prior to anodizing.

3.4.2.1 Type IIB coatings: Type IIB coatings provide a non-chromate alternative to Type I and IB coatings. Unless approved by the procuring activity, substitution of a Type IIB coating where Type I or IB is specified shall be prohibited.

3.4.3 Type III coatings: Type III coatings shall be the result of treating aluminum and aluminum alloys electrolytically to produce a uniform anodic coating on the metal surface. Type III coatings shall be prepared by any process operation to produce a heavy dense coating of specified thickness on aluminum alloys (see 3.7.2.1). Unless otherwise specified in the contract, purchase order or applicable drawing, Type III coatings shall not be applied to aluminum alloys with a nominal copper content in excess of 5 percent or a nominal silicon content in excess of 8.0 percent. Alloys with a nominal silicon content higher than 8.0 percent may be anodized subject to approval of the procuring activity. Heat treatable alloys shall be in a temper obtained by heat treatment, such as -T4, -T6, or T73, prior to anodizing.

3.5 Class 1:

When class 1 is specified in the contract or purchase order, (see 6.2), the anodic coating shall not be dyed or pigmented. Any natural coloration resulting from anodic treatment with the various alloy compositions shall not be considered coloration. The characteristic color imparted by the sealing process shall also be considered as non-dyed.

3.6 Class 2:

When class 2 is specified in the contract or purchase order, (see 6.2), the anodic coating shall be uniformly dyed or pigmented by exposure to a solution of a suitable type dye or stain. The color on wrought alloys shall be uniform. Cast alloys may exhibit dye bleed-out or lack of color (or color uniformity) associated with the inherent porosity of the casting. The dyes and pigments used shall not be damaging to the anodic coatings.

3.6.1 Dye color: When dyed or pigmented coatings are required, the color and color uniformity requirements shall be as specified on the contract, purchase order or applicable drawing (see 6.2).

3.6.1.1 Casting alloys: Dyed casting alloys may show a slight lack of color uniformity. The degree of non-uniformity that is acceptable shall be established by the procuring activity (see 6.2).

3.7 Detail requirements:

3.7.1 Types I, IB, IC, II, and IIB coatings:

3.7.1.1 Weight of coating: Prior to dyeing or sealing, Type I, IB, IC, II, and IIB coatings shall meet the coating weight requirements of Table I when tested in accordance with 4.5.2 (see 6.10.6).