



AEROSPACE MATERIAL SPECIFICATION

AMS3144™**REV. B**Issued 2012-11
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Superseding AMS3144A

Primer, Anodic Electrodeposition for Aircraft Applications

RATIONALE

Five-Year Review to update pretreatment statements for chrome free. Technical changes include:

- 2.1 - removal of AMS1640 due to revision of footnote in Table 5
- 3.5.10 - addition of film thickness check following solvent rub test
- 4.7.3.1, Table 5, and Table 5 footnote - clarification on pretreatments for panels A and D
- 4.7.3.2 - update wording on Cleaning of Test Panels

1. SCOPE

1.1 Form

This specification establishes the requirements for a waterborne, corrosion-inhibiting, chemical- and solvent-resistant, anodic electrodeposition epoxy primer capable of curing at 200 to 210 °F (93 to 99 °C).

1.2 Application

The primers covered by this specification are typically applied as base primers on military, general aviation, and commercial aircraft aluminum surfaces to protect against corrosion. They are suitable for use in a service temperature range from -65 to 250 °F (-54 to 121 °C).

1.3 Classification

The primers covered by this specification shall be classified as follows:

Type 1 - Standard pigments

Type 2 - Low IR (infrared) pigments

Class C - Chromated - contains chromium-based corrosion inhibitors

Class N - Chrome Free - contains no chromium-based corrosion inhibitors

Grade 1 - For use with hexavalent chrome conversion coating

Grade 2 - For use with non-hexavalent chromate conversion coating

Grade 3 - For use with cleaned and deoxidized only

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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 that 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 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.

AMS2629	Fluid, Jet Reference
AMS3277	Sealing Compound, Polythioether Rubber, Fast Curing for Integral Fuel Tanks and General Purpose, Intermittent Use to 360 °F (182 °C)
AMS3721	Tape for Organic Coatings Adhesion Testing
AMS-QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
AMS-QQ-A-250/5	Aluminum Alloy Alclad 2024, Plate and Sheet
AMS-S-8802	Sealing Compound, Fuel-Resistant, Integral Fuel Tanks and Fuel Cell Cavities
AS1241	Fire Resistant Phosphate Ester Hydraulic Fluid for Aircraft
AS5127/1	Aerospace Standard Test Methods for Aerospace Sealants, Two-Component Synthetic Rubber Compounds
AS9100	Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

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 B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D329	Standard Specification for Acetone ^{1, 2}
ASTM D522	Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
ASTM D740	Standard Specification for Methyl Ethyl Ketone ^{1, 2}
ASTM D1974	Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes
ASTM D2247	Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D2794	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

ASTM D3335	Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy
ASTM D3359	Standard Test Methods for Rating Adhesion by Tape Test
ASTM D3363	Standard Test Method for Film Hardness by Pencil Test
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D5402	Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
ASTM D7091	Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
ASTM E1613	Standard Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques
ASTM F22-13	Standard Test Method for Hydrophobic Surface Films by the Water-Break Test
ASTM G85	Standard Practice for Modified Salt Spray (Fog) Testing

2.3 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-PRF-5606	Hydraulic Fluid, Petroleum Base; Aircraft, Missile, and Ordnance
MIL-PRF-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base
MIL-PRF-23377	Primer Coatings: Epoxy, High Solids
MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-152, O-154, O-156 and O-167
MIL-PRF-81733	Sealing and Coating Compound, Corrosion Inhibitive
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft, Metric, NATO Code Number H-537
MIL-PRF-85285	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-85582	Primer Coatings, Epoxy, Waterborne
TT-R-2918	Remover, Paint, No Hazardous Air Pollutants (HAPS)

2.4 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.p-r-i.org.

PD2000	Governance and Administration of an Industry Managed Product Qualification Program
PRI-QPL-AMS3144	Products Qualified Under AMS3144

2.5 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI Z400.1/Z129.1	Hazardous Workplace Chemicals - Hazard Evaluation and Safety Data Sheet and Precautionary Labeling Preparation
ISO/IEC 17025	General Requirements for the Competence of Testing and Calibration Laboratories
ISO 9001	Quality Management Systems - Requirements
ISO 11890-1	Paints and Varnishes - Determination of Volatile Organic Compound (VOC) Content - Part 1: Difference Method

3. TECHNICAL REQUIREMENTS

3.1 Materials

The primer shall be formulated in accordance with the manufacturer's material specification for anodic electrodeposition primer such that it meets the performance requirements set forth in this specification.

3.1.1 Composition

3.1.1.1 Resin Feed Component

The resin feed component shall consist of epoxy or epoxy-urethane resin combined with flow control agents and volatile solvents.

3.1.1.2 Pigment Paste Component

The pigment paste component shall consist of a resin combined with pigments, extenders, and volatile solvents.

3.1.1.3 Characteristics

The following characteristics (expressed as tolerance ranges) of the resin feed and pigment paste components shall be established and reported by the manufacturer at the time of initial process approval:

- a. Total solids, percent by weight
- b. Weight per gallon
- c. pH range (resin feed only)
- d. Viscosity, centipoise
- e. Condition in container

3.1.1.4 Mixed Primer

The following characteristics (expressed as tolerance ranges) of the mixed primer shall be established and reported by the manufacturer at the time of initial process approval:

- a. Total solids, percent by weight
- b. Pigment/binder content
- c. pH range
- d. Conductivity, micromho
- e. Volatile organic compounds (VOC), pounds/gallon (grams/liter)
- f. Cure time and temperature
- g. Dry film thickness

3.1.2 Prohibited Materials

The primer shall contain no more than 10 ppm lead or cadmium when tested per ASTM D3335 or equipment referenced in ASTM E1613. Class N primer shall additionally contain no intentionally added chromium compounds.

3.1.3 Toxicity

The primer shall have no adverse effect on the health of personnel when used for its intended purpose in accordance with the manufacturer's instructions and with appropriate handling procedures and precautions per the material safety data sheet (see 4.8.2).

3.2 Odor

The odor of the primer components and the mixed primer shall not be obnoxious nor cause discomfort to personnel during mixing or application.

3.3 VOC Content

The volatile organic compound (VOC) content of the mixed primer shall be reported in pounds/gallon and grams/liter on the qualification test report when tested in accordance with ASTM D3960 (calculate using Paragraph 10.2 and Appendices X2 and X3) and ISO 11890-1 (calculate using Method 3). Both values shall be included in the report.

3.4 Shelf Life and Storage

3.4.1 Shelf Life

The primer components (resin feed and pigment paste), in their original packaged and unopened condition, shall meet all the requirements in this specification for a period of 12 months from date of manufacture when stored in a temperature range of 60 to 90 °F (15 to 32 °C). For shelf-life extension requirements, see 4.4.3.

3.4.2 Storage Stability

The primer components, after storage in the original, unopened containers for the required shelf life, shall conform to all requirements of this specification.

3.5 Properties

The primer, when prepared in accordance with the manufacturer's instructions, shall conform to the requirements shown in Table 1, determined in accordance with the specified test methods.

Table 1 - Properties

Paragraph	Property	Test Requirement
3.5.1	Quality	Visual
3.5.2	Color	Visual
3.5.3	Thickness	4.7.5.1
3.5.4	Hardness	4.7.5.2
3.5.5.1	Flexibility - Impact Resistance	4.7.5.3.1
3.5.5.2	Flexibility - Low Temperature	4.7.5.3.2
3.5.5.3	Flexibility - Elongation	4.7.5.3.3
3.5.6.1	Adhesion - Wet Tape Test	4.7.5.4.1
3.5.6.2	Adhesion - Dry Tape Test	4.7.5.4.2
3.5.7.1	Compatibility - Topcoats	4.7.5.5.1
3.5.7.2	Compatibility - Repair Primer	4.7.5.5.2
3.5.7.3	Compatibility - Sealant Adhesion	4.7.5.5.3
3.5.8	Fluid Resistance	4.7.5.6
3.5.9	Humidity Resistance	4.7.5.7
3.5.10	Solvent Resistance	4.7.5.8
3.5.11.1	Corrosion Resistance - Neutral Salt Spray	4.7.5.9.1
3.5.11.2	Corrosion Resistance - Filiform	4.7.5.9.2
3.5.11.3	Corrosion Resistance - Sulfur Dioxide Salt Spray	4.7.5.9.3
3.5.12	Infrared Reflectance (Type 2 only)	4.7.5.10
3.5.13	Rain Erosion Resistance	4.7.5.11
3.5.14	Strippability	4.7.5.12

3.5.1 Quality

The primer components (resin feed and pigment paste) shall be uniform in quality and condition and free of grit, seeds, lumps, abnormal thickening, or livering. The components shall not show pigment flotation nor excessive settling and shall mix to a smooth, homogeneous, and pourable condition.

3.5.2 Color

The mixed primer shall exhibit the colors per Type as follows:

3.5.2.1 Type 1 shall be the natural color of the final mixed material.

3.5.2.2 Type 2 shall be dark green, dark gray, or black in color determined by the low infrared pigments used.

3.5.3 Thickness

The dry film thickness of the thermally cured primer (as defined in 4.7.5.1) shall be in the range of 0.6 to 1.2 mils when tested in accordance with 4.7.5.1.

3.5.4 Hardness

The scratch hardness shall be a minimum pencil hardness of F when tested in accordance with 4.7.5.2.

3.5.5 Flexibility

3.5.5.1 Impact Resistance

The primer shall exhibit no cracking or loss of adhesion at 50 in-lb forward and 40 in-lb reverse when tested in accordance with 4.7.5.3.1.