



AEROSPACE MATERIAL SPECIFICATION

AMS1640™**REV. D**

Issued 1979-01
Reaffirmed 2000-06
Revised 2024-02

Superseding AMS1640C

(R) Corrosion Removing Compound
for Aircraft Surfaces

RATIONALE

This revision will update specification verbiage/requirements and establish a qualified products list.

1. SCOPE

1.1 Form

This specification establishes requirements for a corrosion-removing compound in the form of a liquid concentrate.

1.2 Application

The compounds covered by this specification are typically applied to aircraft exterior aluminum surfaces to remove pitting corrosion and heavy surface oxidation, but usage is not limited to such applications.

1.3 Precautions

The compounds meeting the requirements of this specification may cause hydrogen embrittlement of high-strength steels and will remove cadmium plating.

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 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.

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SAE WEB ADDRESS:

For more information on this standard, visit
<https://www.sae.org/standards/content/AMS1640D>

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.

- | | |
|--------------|--|
| AMS4037 | Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated |
| AMS4049 | Aluminum Alloy, Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075; -T6 Sheet - T651 Plate), Solution and Precipitation Heat Treated |
| AMS-QQ-A-200 | Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube, and Wire, Extruded: General Specification for |

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.

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|------------|---|
| ASTM D93 | Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester |
| ASTM D329 | Standard Specification for Acetone |
| ASTM D740 | Standard Specification for Methyl Ethyl Ketone |
| ASTM D1193 | Standard Specification for Reagent Water |
| ASTM D1568 | Standard Test Methods for Sampling and Chemical Analysis of Alkylbenzene Sulfonates |
| ASTM D2196 | Standard Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational Viscometer |
| ASTM F483 | Standard Practice for Total Immersion Corrosion Test for Aircraft Maintenance Chemicals |
| ASTM F484 | Standard Test Method for Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds |
| ASTM F502 | Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces |
| ASTM F1104 | Standard Test Method for Preparing Aircraft Cleaning Compounds, Liquid Type, Water Base, for Storage Stability Testing |
| ASTM F2111 | Standard Practice for Measuring Intergranular Attack or End Grain Pitting on Metals Caused by Aircraft Chemical Processes |

2.3 U. S. Government Publications

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

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|----------------|---|
| MIL-PRF-25690 | Plastic, Sheet and Formed Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant |
| MIL-STD-2073-1 | Standard Practice for Military Packaging |

2.4 PRI Publications

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

PD2000 PRI-QPL Program Requirements

PRI-QPL-AMS1640 Products Qualified Under AMS1640

2.5 ISO Publications

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

ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories

2.6 ANSI Accredited 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

3. TECHNICAL REQUIREMENTS

3.1 Material

The compound shall be viscous, thixotropic, and concentrated. It will readily mix with water to form a homogeneous solution. The compound, diluted with ASTM D1193 Type IV water to use concentration in accordance with the manufacturer's recommendations, shall retain its thixotropic properties, shall be suitable for application by brushing or spraying, and shall be readily removable by wiping or rinsing procedures.

3.1.1 There shall be no violent or dangerous reactions when the concentrate is diluted for use in accordance with the manufacturer's recommendations.

3.1.2 The compound 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 safety data sheet (see 4.8.2).

3.2 Properties

The compound shall conform to the following requirements. Tests shall be performed in accordance with specified test methods on the product supplied in concentrated form and at use dilution recommended by the manufacturer as hereinafter specified.

3.2.1 Concentrated Compound

3.2.1.1 Quality

The compound shall be a homogeneous liquid free from sediment, abrasives, skins, lumps, and other impurities detrimental to usage of the compound.

3.2.1.2 Flash Point

The compound shall have a flash point not lower than 150 °F (65 °C) when tested per 4.7.3.1.

3.2.1.3 Solubility

The compound shall be completely soluble in water to make a uniform solution free from gelatinous lumps, layering of ingredients, and sediment.

3.2.1.4 Stability

The compound shall remain homogeneous and free from sedimentation and layering of ingredients when tested per 4.7.3.2. The compound, stored in an unopened shipping container or use package, shall meet all other technical requirements of this specification at any time up to 1 year from date of manufacture.

3.2.2 Concentrated Compound and at Use Dilution

3.2.2.1 Viscosity

The viscosity shall be no lower than the following when tested per 4.7.3.3:

Concentrated Compound 550 cP (mPa·s)

50% Solution of Concentrate in ASTM D1193 Type IV Water 55 cP (mPa·s)

3.2.2.2 Immersion Corrosion

The compound shall neither show evidence of pitting or corrosion, nor cause an average weight change on AMS4049 and AMS4037 aluminum alloys panels greater than 2.5 mg/in² per 30 minutes (0.4 mg/cm² per 30 minutes) when tested per 4.7.3.4. Staining is not acceptable for AMS4049 panels, but is allowable for AMS4037 panels.

3.2.2.3 Intergranular and Pitting Attack on Aluminum

The compound shall not cause end grain pitting in excess of 0.001 inch (25.4 microns) or intergranular attack in excess of 0.0002 inch (5.1 microns) depth of AMS-QQ-A-200 aluminum alloy 7075-T6511 or 7178-T6511 when tested per 4.7.3.5.

3.2.2.4 Effect on Transparent Plastics

The compound shall not craze, stain, or discolor MIL-PRF-25690 stretched acrylic plastic when tested per 4.7.3.6.

3.2.2.5 Effect on Painted Surfaces

The compound shall neither decrease the hardness of the paint film by more than one pencil hardness level nor shall it produce any streaking, discoloration, or blistering of the paint film when tested per 4.7.3.7.

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification of Compound

Qualification is the process by which material properties of the compound are verified through laboratory testing prior to inclusion on a qualified products list (QPL). All compounds sold to this specification shall be listed, or approved for listing, on an approved QPL in accordance with PD2000.

4.1.1 Qualified Products Lists

PRI-QPL-AMS1640 is the approved QPL administered by the Performance Review Institute (PRI), 161 Thorn Hill Road, Warrendale, PA 15086-7527, phone +1-724-772-1616. Information pertaining to qualification of the compounds may be obtained from PRI at www.eAuditnet.com.

4.1.2 Contract Awards

Awards will be made only for compounds which are, prior to the award of contract, QPL approved.

4.2 Quality System of Manufacturer

Before submitting a compound for qualification to this specification for the purpose of being listed on the QPL, the manufacturer shall have a quality system in place which holds a third party accreditation to ISO9001 or AS9100.

4.3 Responsibility for Testing

The manufacturer of the compound shall supply all samples needed and shall be responsible for the performance of all required tests of this specification.

4.4 Classification of Tests

4.4.1 Qualification Tests

All technical requirements of this specification (see Section 3) are qualification tests. Conformance to these requirements shall be established prior to QPL approval. All qualification testing shall be carried out by a laboratory which is independent of the manufacturer and is accredited per ISO/IEC 17025 with a Scope of Accreditation that is approved by the Committee J Qualified Products Group (QPG), or a laboratory otherwise approved by the Committee J QPG.

4.4.2 Acceptance Tests

Viscosity (see 3.2.2.1) and immersion corrosion (see 3.2.2.2) are classified as acceptance tests. Conformance to these requirements shall be established on each lot of compound. A lot shall be all compound produced in one continuous manufacturing operation from the same lots of raw materials and presented for inspection at one time. Unless otherwise specified herein, acceptance testing may be carried out by a laboratory of the manufacturer's choosing.

4.5 Sampling and Testing

Sampling shall be in accordance with all applicable requirements of ASTM D1658.

4.5.1 For Qualification Tests

Samples shall consist of approximately 2 gallons of compound from a single lot. The material shall be furnished in containers of the type to be used in filling contract orders. Samples shall be identified as follows and forwarded to the laboratory responsible for testing:

CORROSION REMOVING COMPOUND FOR AIRCRAFT SURFACES

AMS1640D

MANUFACTURER'S PRODUCT IDENTIFICATION

NAME OF MANUFACTURER

LOT NUMBER

DATE OF MANUFACTURE

DATE OF EXPIRATION

SUBMITTED BY (NAME) (DATE) FOR QUALIFICATION TESTS IN ACCORDANCE WITH AMS1640

4.5.2 For Acceptance Tests

Samples shall consist of sufficient compound taken at random from each lot to perform the required tests.

4.5.2.1 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by the purchaser and manufacturer, sampling shall be in accordance with such plan in lieu of sampling as in 4.5.2 and the report of 4.8.1 shall state that such plan was used.

4.6 Approval, Reapproval, and Recertification

Approval of qualification test results, reapproval, and recertification of qualification for QPL listing shall be in accordance with PD2000, unless otherwise specified herein. Data shall be reviewed by the Committee J QPG.

4.6.1 Approval

The manufacturer shall submit qualification test data to PRI for approval by the Committee J QPG. Qualification will be valid until such time that the conditions in 4.6.2 or 4.6.3 occur, or unless qualification is withdrawn per the conditions set forth in PD2000.

4.6.2 Reapproval

The manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production compound that are the same as those used on the qualification sample. If necessary to make any change in product formulation, raw materials, basic methods of processing, or plant site, the manufacturer shall submit for reapproval by the Committee J QPG a statement of the proposed changes in ingredients and/or processing and, when requested, sample compound. Production compound made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.6.2.1 A review of the submitted changes may result in reapproval without testing, reapproval after partial requalification testing, or reapproval after full requalification testing.

4.6.3 Recertification

Recertification of qualification is required every 5 years. Recertification consists of a letter certifying that there have been no changes in the material ingredients, manufacturing processes, or site of production since qualification, and that the compound meets all the requirements of this specification. In addition, a test report shall be provided by the manufacturer showing compliance with all qualification tests. The testing laboratory shall be as specified in 4.4.1.

4.7 Test Methods

Testing shall be as follows:

4.7.1 Standard Test Conditions

Standard test conditions shall be $77^{\circ}\text{F} \pm 2$ ($25^{\circ}\text{C} \pm 1$) and $50\% \pm 5\%$ relative humidity. Unless otherwise specified herein, all test specimens shall be cured and tested under these conditions.

4.7.2 Standard Tolerances

Unless otherwise specified herein, standard tolerances shown in Table 3 shall be applied throughout the test methods.

TABLE 3 – Standard tolerances

Measurement Units	Tolerance
Temperatures	$\pm 2^{\circ}\text{F}$ ($\pm 1^{\circ}\text{C}$)
Days	± 2 hours
Hours	± 5 minutes
Minutes	± 10 seconds
Distance	± 0.010 inch (0.25 mm)

4.7.3 Test Procedures

4.7.3.1 Flash Point

Flash point shall be determined in accordance with ASTM D93.

4.7.3.2 Stability

Stability shall be determined in accordance with ASTM F1104.

4.7.3.3 Viscosity

Viscosity shall be determined in accordance with ASTM D2196 at $68\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$ ($20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$) using a No. 1 spindle at 6 RPM.

4.7.3.4 Immersion Corrosion

Immersion corrosion shall be determined in accordance with ASTM F483 and 4.7.3.4.1.

4.7.3.4.1 The weighed panels shall be totally immersed in 100 mL of the compound, immediately removed, and suspended vertically for 30 minutes ± 1 minute at $77\text{ }^{\circ}\text{F} \pm 4\text{ }^{\circ}\text{F}$ ($25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$).

4.7.3.5 Intergranular and Pitting Attack on Aluminum

Intergranular and pitting attack on aluminum shall be determined in accordance with ASTM F2111 and 4.7.3.5.1.

4.7.3.5.1 Clean the ASTM F2111 aluminum alloy specimens by wiping with a clean cloth wet with ASTM D740 methyl ethyl ketone or ASTM D329 acetone. Allow specimens to air dry. Immerse specimens for 30 minutes in 500 mL of compound. Remove specimens, immediately flush residual compound from the specimen surfaces with flowing water, followed by rinsing with flowing ASTM D1193 Type IV water. Allow to air dry. Examine specimens for pitting and intergranular attack in accordance with ASTM F2111.

4.7.3.6 Effect on Transparent Plastics

The effect on transparent plastics shall be determined in accordance with ASTM F484.

4.7.3.7 Effect on Painted Surfaces

The effect on painted surfaces shall be determined in accordance with ASTM F502.

4.8 Reports

4.8.1 The manufacturer of the compound (or subsequent vendor) shall furnish a report with each shipment showing the acceptance test results (see 4.4.2) and stating that the compound conforms to all requirements of AMS1640D. This report shall include the applicable lot number and the manufacturer's identification.

4.8.2 A safety data sheet, conforming to an acceptable format for the purchaser, shall be supplied to the purchaser prior to, or concurrent with, the first shipment of the product. ANSI Z400.1/Z219.1 is one possible safety data sheet format.

4.8.3 A bulletin describing the compound and method of use shall be provided by the compound manufacturer. This bulletin shall provide the purchaser with detailed instructions for use of the compound. The bulletin shall also include mixing instructions, material compatibility, properties, control analysis procedures, and safety practices including precautions pertaining to hazardous ingredients, and recommended dilution for use.

4.9 Resampling and Retesting

If any sample used in the above tests fails to meet the specified requirements, disposition of the compound may be based on the results of testing three additional samples for each original nonconforming sample. Failure of any retest sample to meet the specified requirements shall be cause for rejection of the compound represented and no additional testing shall be permitted. Results of all tests shall be reported.