

Cleaner for Exterior Aircraft Surfaces
Thickened or Gel-Type, Water-Base

RATIONALE

This specification was revised to meet current verbiage required by SAE standards with no technical changes.

1. SCOPE

1.1 Form

This specification covers a thickened, water-base, type cleaner in the form of a gel.

1.2 Application

This cleaner has been used typically for removing soils from exterior surfaces of aircraft, such as landing gears, wheel wells, and flap cavities, but usage is not limited to such applications.

1.3 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.

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.

AMS2470	Anodic Treatment of Aluminum Alloys, Chromic Acid Process
AMS2475	Protective Treatments, Magnesium Alloys
AMS4037	Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated

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AMS4041	Aluminum Alloy, Alclad Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn, Alclad 2024 and 1-1/2% Alclad 2024, -T3 Flat Sheet; 1-1/2% Alclad 2024-T351 Plate
AMS4045	Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, 7075: (-T6 Sheet, -T651 Plate), Solution and Precipitation 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
AMS4376	Plate, Magnesium Alloy, 3.0Al - 1.0Zn - 0.20Mn (AZ31B-H26), Cold Rolled and Partially Annealed
AMS4911	Titanium Alloy, Sheet, Strip, and Plate, 6Al - 4V, Annealed
AMS5044	Steel, Sheet and Strip, 0.15 Carbon, Maximum, Half Hard Temper
AMS5046	Carbon Steel, Sheet, Strip, and Plate, (SAE 1020 and 1025), Annealed
AMS-P-83310	Plastic Sheet, Polycarbonate, Transparent

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 D 93	Flash Point by Pensky-Martens Closed Cup Tester
ASTM D 471	Rubber Property - Effect of Liquids
ASTM D 1193	Reagent Water
ASTM D 1568	Sampling and Chemical Analysis of Alkylbenzene Sulfonates
ASTM F 483	Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
ASTM F 484	Stress Cracking of Acrylic Plastics in Contact with Liquid or Semi-Liquid Compounds
ASTM F 485	Effects of Cleaners on Unpainted Aircraft Surfaces
ASTM F 502	Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces
ASTM F 519	Mechanical Hydrogen Embrittlement Testing of Plating Processes and Aircraft Maintenance Chemicals
ASTM F 1080	Determining the Consistency of Viscous Liquids Using a Consistometer
ASTM F 1104	Preparing Aircraft Cleaning Compounds, Liquid Type, Water Base, for Storage Stability Testing
ASTM F 1110	Sandwich Corrosion Test
ASTM F 1111	Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

2.3 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

MIL-PRF-25690	Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-STD-870	Cadmium Plating, Low Embrittlement, Electrodeposition

3. TECHNICAL REQUIREMENTS

3.1 Material

The composition of the cleaner shall be optional with the manufacturer, but should contain water, biodegradable surfactants, emulsifiers, inhibitors and thickeners to produce a thickened or gel-type product meeting the requirements of 3.2. Cleaner shall not contain aliphatic or aromatic solvents, such as kerosene solvents.

3.2 Properties

Cleaner shall conform to the following requirements; tests shall be performed in accordance with specified test methods on the product supplied in concentrated form:

3.2.1 Consistency

Cleaner shall flow to a point between 13 and 23 centimeters in 10 seconds, determined in accordance with ASTM F 1080.

3.3 Corrosion of Metal Surfaces

3.3.1.1 Sandwich Corrosion

Specimens of AMS4045 and AMS4049, after testing in accordance with ASTM F 1110, shall not show a corrosion rating worse than one or worse than that on control panels tested using ASTM D 1193, Type IV, water.

3.3.1.2 Total Immersion Corrosion

Cleaner shall neither cause evidence of corrosion nor a weight change of any test panel greater than shown in Table 1, determined in accordance with ASTM F 483:

TABLE 1 - MAXIMUM WEIGHT CHANGE

Panel	Weight Change mg/cm ² per 24 hours
AMS4037 Aluminum Alloy, anodized as in AMS2470	0.3
AMS4041 Aluminum Alloy	0.3
AMS4049 Aluminum Alloy	0.3
AMS4376 Magnesium Alloy, dichromate treated as in AMS2475	0.2
AMS4911 Titanium Alloy	0.1
AMS5044 Steel	0.8

3.3.1.3 Low-Embrittling Cadmium Plate

Panels coated with low-embrittling cadmium plate shall not show a weight change greater than 0.3 mg/cm² per 24 hours, determined in accordance with ASTM F 1111.

3.3.2 Hydrogen Embrittlement

The product shall be non-embrittling, determined in accordance with ASTM F 519, utilizing Type 1a, 1c, or 2a specimens, cadmium plated in accordance with MIL-STD-870, Class 1, Type I. Type 1a and 1c specimens shall be loaded to 45% of the predetermined notch fracture strength, and Type 2a specimens loaded to 80% of the yield strength. The entire 2a stressed specimen, or just the notched area of the 1a and 1c stressed specimen, shall be immersed continuously in the solution under test for 150 hours at a temperature between 68 to 86 °F (20 to 30 °C).

3.3.3 Flash Point

Shall not be lower than 140 °F (60 °C), determined in accordance with ASTM D 93.

3.3.4 Effect on Plastics

There shall be no crazing or staining of MIL-PRF-25690 stretched acrylic plastic or AMS-P-83310 polycarbonate plastics, determined in accordance with ASTM F 484.

3.3.5 Effect on Painted Surfaces

Cleaner shall neither produce a decrease in film hardness greater than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F 502.

3.3.6 Effect on Unpainted Surfaces

Cleaner, tested in accordance with ASTM F 485, shall neither produce streaking nor leave any stains requiring polishing to remove.

3.3.7 Effect on Natural Rubber

Cleaner shall not produce a change in volume swell of natural rubber greater than 2% after 8 hours immersion, determined in accordance with ASTM D 471.

3.3.8 Stability

3.3.8.1 Heat Stability

Cleaner shall show no separation or stratification at $122\text{ }^{\circ}\text{F} \pm 18$ ($50\text{ }^{\circ}\text{C} \pm 10$), determined in accordance with ASTM F 1104.

3.3.8.2 Cold Stability

Cleaner shall show no stratification or separation at $18\text{ }^{\circ}\text{F} \pm 3$ ($-8\text{ }^{\circ}\text{C} \pm 2$), determined in accordance with ASTM F 1104. If product freezes, it shall, on thawing, return to its original state without agitation.

3.3.8.3 Accelerated Storage Stability

The cleaner shall exhibit no change in appearance, shall not separate, and shall not cause any visual corrosion of the steel strip, when tested as follows: Polish an AMS5046 steel strip, nominally 0.04 x 0.50 x 6.0 inches (1.0 x 12.7 x 152 mm), using 240 grit silicon carbide paper. Clean the specimen using absorbent paper tissue, wiping first with methyl ethyl ketone and then with isopropanol. Dry the specimen, place it in a clean glass pressure bottle, add enough cleaner to cover half of the strip, cap the bottle, roll it on its side to coat the strip, and immerse bottle in a water or oil bath. Program the temperature of the bath for $140\text{ }^{\circ}\text{F} \pm 2$ ($60\text{ }^{\circ}\text{C} \pm 1$) for 8 hours ± 0.25 followed by 16 hours ± 0.5 without heating. After five 24 hour cycles and without agitation, examine the cleaner and the steel strip.

3.3.9 Performance

The product, when used in accordance with manufacturer's recommendations, shall remove normally accumulated soils from aircraft landing gears, wheel wells, and flap cavities. No visible residue shall remain on any surface tested.

3.4 Quality

The cleaner, as received by purchaser, shall be homogeneous, uniform in color, and free from skins and lumps and from foreign materials detrimental to usage of the cleaner.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of cleaner shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cleaner conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Effect on plastics (3.2.5) and effect on unpainted surfaces (3.2.7) are acceptance tests and shall be performed on each lot of cleaner.

4.2.2 Periodic Tests

Corrosion of metal surfaces (3.2.2), hydrogen embrittlement (3.2.3), flash point (3.2.4), effect on natural rubber (3.2.8), stability (3.2.9), and performance (3.2.10) are periodic tests and shall be performed at a frequency selected by the manufacturer unless frequency of testing is specified by purchaser.