



400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 1535

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Revised

CLEANER FOR PLASTIC TRANSPARENCIES

1. SCOPE:

- 1.1 Form: This specification covers a cleaner for plastic transparencies in the form of a liquid.
- 1.2 Application: Primarily for removing soils, contaminants, and residues from interior and exterior surfaces of aircraft windows by manual application.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) and Aerospace Recommended Practices (ARP) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

- 2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

AMS 4041 - Aluminum Alloy Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024 and 1-1/2% Alclad 2024-T3 Flat Sheet; 1-1/2% Alclad 2024-T351 Plate)

AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (Alclad 7075; -T6 Sheet, -T651 Plate)

AMS 4376 - Magnesium Alloy Plate, 3.0Al - 1.0Zn (AZ31B-H26)

2.1.2 Aerospace Recommended Practices:

ARP 1511 - Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals

- 2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D56 - Flash Point by Tag Closed Tester

ASTM D1015 - Freezing Points of High-Purity Hydrocarbons

ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates

ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals

ASTM F484 - Stress Cracking of Acrylic Plastics in Contact with Liquid and Semi-Liquid Compounds

ASTM F485 - Effects of Cleaners on Unpainted Aircraft Surfaces

ASTM F502 - Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces

ASTM F503 - Preparing Aircraft Cleaning Compounds, Liquid Type, for Storage Stability Testing

ASTM F519 - Hydrogen Embrittlement Testing of Aerospace Materials

- 2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120 except as specified in 2.3.4 and 2.3.5.

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2.3.1 Federal Specifications:

- P-P-560 - Polish, Plastic
 QQ-A-250/5 - Aluminum Alloy Alclad 2024 Plate and Sheet
 QQ-A-250/13 - Aluminum Alloy Alclad 7075 Plate and Sheet

2.3.2 Military Specifications:

- MIL-P-5425 - Plastic, Sheet, Acrylic, Heat Resistant
 MIL-P-8184 - Plastic Sheet, Acrylic, Modified
 MIL-P-25690 - Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
 MIL-P-83310 - Plastic Sheet, Polycarbonate, Transparent

2.3.3 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

2.3.4 U.S. Department of Labor, Occupational Safety and Health Administration Forms: Available from regional offices of U.S. Department of Labor, Bureau of Labor Standards.

OSHA Form 20 - Material Safety Data Sheet

2.3.5 Department of Defense Forms: Available from the local or cognizant DOD Contract Administration Services component.

DD Form 1813 - Material Safety Data Sheet

3. TECHNICAL REQUIREMENTS:3.1 Material: The composition of the cleaner shall be optional with the manufacturer but shall contain ingredients producing antistatic properties as specified in P-P-560 and meeting the requirements of 3.2.3.2 Properties: Cleaner shall conform to the following requirements; tests shall be performed in accordance with specified test methods on the product supplied, both the concentrated form and at use dilution recommended by the manufacturer:3.2.1 Corrosion of Metal Surfaces:3.2.1.1 Total Immersion Corrosion: The cleaner shall neither show evidence of corrosion nor cause a weight change of any single test panel greater than the following, determined in accordance with ASTM F483:

Test Panel	Weight Change (mg/cm ²)/24 hr
AMS 4041 or QQ-A-250/5 Aluminum Alloy	0.3
AMS 4049 or QQ-A-250/13 Aluminum Alloy	0.4
AMS 4376 Magnesium Alloy	0.8

3.2.1.2 Low-Embrittling Cadmium Plate: Test panels coated with low-embrittling cadmium plate shall not show a weight change greater than 1.0 (mg/cm²)/24 hr, determined in accordance with ARP 1511.

- 3.2.2 Effect on Transparent Plastics: The cleaner shall not craze, stain, or discolor MIL-P-5425, MIL-P-8184, or MIL-P-25690 acrylic plastic when tested in accordance with ASTM F484. The cleaner, likewise, shall not craze, stain, or discolor MIL-P-83310 polycarbonate plastic or polysulfone plastics, determined in accordance with test procedures specified in ASTM F484 on specimens stressed to an outer fiber stress of 3000 psi (21 MPa) for 8 hr $\pm$ 0.25.
- 3.2.3 Effect on Painted Surfaces: The cleaner shall neither decrease the hardness of polyurethane or other paint films specified by purchaser by more than two pencil hardness levels nor shall it produce any streaking, discoloration, or blistering of the paint film, determined in accordance with ASTM F502.
- 3.2.4 Effect on Unpainted Surfaces: The cleaner, tested in accordance with ASTM F485, shall neither produce streaking nor leave any stains requiring polishing to remove.
- 3.2.5 Hydrogen Embrittlement: The product shall be non-embrittling, determined in accordance with ASTM F519, Method 1a, 1c, or 2a.
- 3.2.6 Flash Point: Shall be not lower than 70°C (158°F), determined in accordance with ASTM D56.
- 3.2.7 Freeze Point: Shall be determined in accordance with ASTM D1015 and the results reported.
- 3.2.8 Storage Stability: The cleaner shall neither show separation from exposure to heat or cold nor show an increase in turbidity greater than a control sample equally diluted to use concentration with deionized water, determined in accordance with ASTM F503.
- 3.3 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 the cleaner shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the cleaner conforms to the requirements of this specification.
- 4.2 Classification of Tests:
- 4.2.1 Acceptance Tests: Tests to determine conformance to requirements for effect on transparent plastics (3.2.2) and effect on unpainted surfaces (3.2.4) are classified as acceptance tests and shall be performed to represent each lot of cleaner.
- 4.2.2 Periodic Tests: Tests to determine conformance to requirements for corrosion of metal surfaces (3.2.1), effect on painted surfaces (3.2.3), hydrogen embrittlement (3.2.5), flash point (3.2.6), freeze point (3.2.7), and storage stability (3.2.8) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.
- 4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed on the initial shipment of cleaner to a purchaser, when a change in material or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.
- 4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, pre-production test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.
- 4.3 Sampling: Shall be in accordance with all applicable requirements of ASTM D1568, unless otherwise specified by purchaser; a lot shall be all cleaner produced in one continuous manufacturing operation from the same lots of raw materials and presented for vendor's inspection at one time.

4.4 Approval:

- 4.4.1 Sample cleaner shall be approved by purchaser before cleaner for production use is supplied, unless such approval be waived. Results of tests on production cleaner shall be essentially equivalent to those on the approved sample.
- 4.4.2 Vendor shall use ingredients, manufacturing procedures, and methods of inspection on production cleaner which are essentially the same as those used on the approved sample cleaner. If any change is necessary in ingredients or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material or processing and, when requested, sample cleaner. Production cleaner made by the revised procedure shall not be shipped prior to receipt of reapproval.
- 4.5 Reports: Unless waived by purchaser, the vendor of cleaner shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the acceptance test requirements and, when performed, the results of tests to determine conformance to the periodic test requirements and stating that the cleaner conforms to the other technical requirements of this specification. This report shall include the purchase order number, material specification number, manufacturer's identification, lot number, and quantity.
 - 4.5.1 Reports of preproduction test results shall include an executed copy of OSHA Form 20 or DD Form 1813 Material Safety Data Sheet, or equivalent, covering product formulation. All requests for modification of formulation shall be accompanied by a similar form for the proposed formulation.
- 4.6 Resampling and Retesting: If any sample used in the above tests fails to meet the specified requirements, disposition of the cleaner 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 cleaner represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

- 5.1 Identification: Each container shall be legibly marked to show not less than AMS 1535, purchase order number, manufacturer's identification, lot number, and quantity.
- 5.2 Packaging:
 - 5.2.1 Cleaner shall be packaged in suitable containers of a type and size agreed upon by purchaser and vendor.
 - 5.2.2 Containers of cleaner shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the cleaner to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
 - 5.2.3 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.2.1 and 5.2.2 will be acceptable if it meets the requirements of Level C.
- 6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
- 7. REJECTIONS: Cleaner not conforming to this specification or to authorized modifications will be subject to rejection.