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400 COMMONWEALTH DRIVE WARRENDALE PA 15096

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 1478

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Revised

**DEODORIZER, AIRCRAFT, DEACTANT-TYPE
Aerosol Packaged**

1. SCOPE:

- 1.1 Form: This specification covers one type of a biodegradable, deactant-type deodorizer in the form of an aerosol-packaged liquid.
- 1.2 Application: Primarily for use as a deodorizer in aircraft cabins, galleys, and laboratories to control odor by chemical reaction rather than by masking.

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 except that the latest issue of APHA publications in effect on date of invitation to bid or request for proposal shall apply.

- 2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2820 - Aerosol Packaging
AMS 2825 - Material Safety Data Sheets
AMS 4049 - Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075; -T6 Sheet, -T651 Plate)

2.1.2 Aerospace Recommended Practices:

ARP 1512 - Corrosion of Aluminum Alloys by Aircraft Maintenance Chemicals, Sandwich Test

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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 D445 - Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
- ASTM D471 - Rubber Property - Effect of Liquids
- ASTM D891 - Specific Gravity of Industrial Aromatic Hydrocarbons and Related Materials
- ASTM D1331 - Surface and Interfacial Tension of Solutions of Surface-Active Agents
- ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM D2667 - Biodegradability of Alkylbenzene Sulfonates
- ASTM D2778 - Solvent Extraction of Organic Matter from Water
- ASTM E70 - pH of Aqueous Solutions with the Glass Electrode
- ASTM F483 - Total Immersion Corrosion Test for Aircraft Maintenance Chemicals
- 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

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

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

2.4 APHA Publications: Available from American Public Health Association, 1015 Eighteenth Street, N.W., Washington, DC 20036.

Standard Methods for the Examination of Water and Waste Water

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by analytical methods agreed upon by purchaser and vendor:

| | min | max |
|--|------|------|
| Isopropyl Alcohol, Anhydrous, U.S.P. Grade | 9.6 | 10.4 |
| Propylene Glycol, Food Grade | 14.5 | 15.5 |
| Metazene (80%) (See 8.2.1) | 1.9 | 2.1 |
| Rho-D-Ban 905A or 906A (See 8.2.2) | 0.1 | 0.2 |
| Lemon Oil, Food Grade U.S.P. (See 8.2.3) | 0.4 | 0.8 |
| Freon F-11 or equivalent | 29.0 | 31.0 |
| Freon F-12 or equivalent | 41.5 | 43.5 |

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- 3.2 Properties: Deodorizer shall conform to the following requirements; tests shall be performed on the deodorizer supplied in concentrated form and at use dilution recommended by the manufacturer and in accordance with specified test methods using a test suspension prepared by spraying the contents of several aerosol cans into a clean container to provide not less than 1 qt (1 L) of suspension, agitating the aerosol cans frequently to exhaust all particulate matter:
- 3.2.1 Product As-Received in Concentrated Form:
- 3.2.1.1 Specific Gravity: Shall be 1.00 - 1.05, determined in accordance with ASTM D891.
- 3.2.1.2 Flash Point: Shall be not lower than 93°C (200°F), determined in accordance with ASTM D56.
- 3.2.1.3 Color: Shall be colorless, unless otherwise ordered.
- 3.2.1.4 Effect on Painted Surfaces: The product 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 F502.
- 3.2.1.5 Biodegradability: The product shall show not less than 90% surfactant reduction to be adequately biodegradable, determined in accordance with ASTM D2667.
- 3.2.1.6 Volatile Oil Content: Shall be 0.4 - 0.8%, determined in accordance with ASTM D2778.
- 3.2.1.7 Storage Stability: The product shall be stable in storage for not less than 12 months at room temperature. Product shall remain free of lumps and skin formation, shall remain homogeneous, and shall retain a faint, pleasant odor. Samples prepared as in 3.2.1.7.1 shall show no evidence of layering, separation, settling, or crystallization after being subjected to five freeze-thaw cycles as in 3.2.1.7.2. The product shall also be tested in accordance with ASTM F503 and the results reported.
- 3.2.1.7.1 Two 6-oz (175-mL) samples of the product shall be placed in two 8-oz (235-mL) clear glass bottles, sealed, and, from that time until test is completed, handled so as to minimize movement of the sample.
- 3.2.1.7.2 Samples shall be exposed for not less than 12 hr at -25°C (-10°F) or lower as necessary to completely freeze the sample. At the end of the 12 hr, samples shall be removed to a room temperature environment and allowed to thaw completely. This shall be considered as one freeze-thaw cycle.
- 3.2.1.8 Environmental Properties: Environmental standards vary from area to area and, therefore, acceptance standards for the following properties shall be as agreed upon by purchaser and vendor.

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- 3.2.1.8.1 Total Alkalinity or Acidity: Shall be determined as ppm CaCO_3 in accordance with APHA Method 201.
- 3.2.1.8.2 Chemical Oxygen Demand: Shall be determined in accordance with APHA Method 220 using the dichromate reflux procedure.
- 3.2.1.8.3 Biological Oxygen Demand: The five-day biological oxygen demand at 20°C (68°F) shall be determined in accordance with APHA Method 219, using filtered raw sewage seed.
- 3.2.1.8.4 Total Inorganic Phosphate: Shall be determined in accordance with APHA Method 223E, stannous chloride procedure.
- 3.2.1.8.5 Phenols: Shall be determined by distilling 500 mL of the product in accordance with APHA Method 222B, followed by chloroform extraction in accordance with APHA Method 222C.
- 3.2.1.8.6 Heavy Metals: Chromium, copper, cadmium, mercury, nickel, silver, and zinc contents shall be determined in accordance with APHA Method 211.
- 3.2.2 Product in Diluted Form: Shall be as follows, determined on product diluted with distilled or deionized water to the midpoint of the use dilution concentration range recommended by the manufacturer:
- 3.2.2.1 Viscosity: Shall not exceed by more than 10% the viscosity of deionized or distilled water at 10°C (50°F) and 30°C (86°F), determined in accordance with ASTM D445.
- 3.2.2.2 Foam Volume: Shall not exceed 5 mL when 100mL of diluted product is shaken in a 200 mL graduate for 15 sec \pm 1 and allowed to stand for 60 sec \pm 1.
- 3.2.2.3 Surface Tension: The product shall have wetting characteristics such that it reduces the surface tension of water to below 45 dynes/cm (4.5 Pa), determined in accordance with ASTM D1331 at $25^\circ\text{C} \pm 3$ ($77^\circ\text{F} \pm 5$).
- 3.2.3 Product Tested Both as a Concentrate and Diluted as in 3.2.2:
- 3.2.3.1 pH: Shall be 7.0 - 8.0, determined in accordance with ASTM E70.
- 3.2.3.2 Effect on Unpainted Surfaces: There shall be no visible stains or residue on AMS 4049 aluminum alloy panels, determined in accordance with ASTM F485.
- 3.2.3.3 Corrosion of Metal Surfaces:
- 3.2.3.3.1 Sandwich Corrosion: Specimens of AMS 4049 aluminum alloy, after test, shall show a rating not worse than 1, determined in accordance with ARP 1512.

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- 3.2.3.3.2 Total Immersion Corrosion: The product shall neither show evidence of corrosion of the panels nor cause a weight change greater than 0.3 mg/cm^2 per 24 hr for any single panel of AMS 4049 aluminum alloy, determined in accordance with ASTM F483.
- 3.2.3.4 Temperature Stability: The product shall show no chemical or physical deterioration, including evidence of discoloration, layering, or other change denoting loss of stability after being exposed for 120 hr \pm 1 to $2^\circ\text{C} \pm 3$ ($35^\circ\text{F} \pm 5$) and to $50^\circ\text{C} \pm 5$ ($120^\circ\text{F} \pm 10$). The product shall also be tested in accordance with ASTM F503 and the results reported.
- 3.2.3.5 Fabric Stain Test: The product shall not appreciably stain 2 x 2 in. (50 x 50 mm) test samples of white 100% cotton, light-colored nylon, and light-colored wool when spotted with the product. The spotted fabric samples shall be allowed to dry at $60^\circ\text{C} \pm 3$ ($140^\circ\text{F} \pm 5$) and washed with a commercial detergent. Presence of any stain remaining on any of the three types of fabrics shall be reported.
- 3.2.3.6 Effect on Rubber and Plastic: The product shall neither cause swelling greater than 10%, determined in accordance with ASTM D471, nor cause staining, discoloration, or evidence of degradation of rubber or plastic materials normally incorporated in aircraft lavatory fixtures, using the materials listed in 3.2.3.6.1 and tested as in 3.2.3.6.2. When specified by purchaser, tensile strength and elongation of exposed test specimens, determined in accordance with ASTM D471, shall be not lower than 75% of tensile strength and elongation values determined on unexposed test specimens.
- 3.2.3.6.1 Test specimens shall be of ethylene propylene (EPT), fluorosilicone, silicone, chloroprene, NBR, and fluorocarbon rubbers; of acetal, polysulfone, nylon, and polycarbonate plastics; of epoxy-glass fabric laminates; and of glass fabric.
- 3.2.3.6.2 Duplicate test strips of each material shall be placed in test tubes containing the product. Test strips for determination of volume change and, when specified, change in tensile strength and elongation shall be completely immersed in the solution. Test strips for determination of staining, discoloration, and visual evidence of degradation shall be immersed so that the bottom half of each strip is in the solution and the top half is in air. The test tubes shall be capped and stored at ambient temperature for 30 days. After this exposure, the immersed and unimmersed areas of each partially immersed specimen shall be compared visually for evidence of deleterious effects. Volume change and, when specified, tensile strength and elongation shall be determined on the totally immersed specimens and the values compared with those of unimmersed specimens.
- 3.2.4 Aerosol Spray Cans:
- 3.2.4.1 Sprayability and Leakage:

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- 3.2.4.1.1 All aerosol pressure cans shall be equipped with a spray nozzle. The nozzle shall provide a fine, steady spray and shall deposit the deodorizer evenly on a flat or vertical surface. No chunks of solids shall be expelled and no clogging of the nozzle shall occur. After clearing the nozzle in accordance with manufacturer's instructions, there shall be no perceptible leakage.
- 3.2.4.1.2 The characteristics of the spray pattern and the performance of the spray nozzle shall be evaluated by vigorously shaking the can for not less than 30 sec with the container pellet sounding on each shake and spraying a pattern on large sheets of newspaper or similar surface to determine the coverage and evenness of the spray. After spraying several patterns, the nozzle shall be examined for evidence of chunks of solids and clogging. The nozzle shall then be cleared by inverting the can and spraying until only gas escapes. The can shall then be immersed for not less than 15 min. in water at $52^{\circ} - 54^{\circ}\text{C}$ ($125^{\circ} - 130^{\circ}\text{F}$); there shall be no visible evidence of leakage from, or distortion of, the aerosol container. The aerosol can shall then be immersed in water at $25^{\circ}\text{C} \pm 3$ ($77^{\circ}\text{F} \pm 5$) until the temperature of the can has stabilized and, after vigorous shaking, two more patterns shall be sprayed. The spray characteristics shall not have visibly changed and there shall be no chunking of particles or clogging of the nozzle.
- 3.2.4.2.1 Caution: Do not heat the pressurized can over 55°C (130°F).
- 3.2.4.2 Complete Expulsion: The complete usable portion of the contents shall have been expelled before the propellant is expended. The expelled contents shall be not less than 5 fl oz (150 cm^3) and the particle content shall conform to the aerosol spray requirements. Vigorously shake for not less than 30 sec each unused can to be tested, with the container pellet sounding on each shake, and expel the contents in a series of short blasts into a clean glass container graduated in ounces (cm^3) in such a manner that the entire contents of the can will be retained in the glass container. The aerosol can may be immersed periodically in water at $25^{\circ}\text{C} \pm 3$ ($77^{\circ}\text{F} \pm 5$) to maintain the can and its contents at room temperature. Repeat the vigorous shaking and short blasts until there is no further escape of gas. Examine the spray nozzle for chunking of particles and clogging during the test.
- 3.3 Quality: Deodorizer, as received by purchaser, shall be homogenous, shall have a faint, pleasant odor, and shall be free from skins and lumps and from foreign materials detrimental to usage of the deodorizer.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests 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 sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), specific gravity (3.2.1.1), flash point (3.2.1.2), pH (3.2.3.1), and quality (3.3) are classified as acceptance tests and shall be performed on each lot.
- 4.2.2 Periodic Tests: Tests to determine conformance to requirements for color (3.2.1.3), effect on painted surfaces (3.2.1.4), biodegradability (3.2.1.5), volatile oil content (3.2.1.6), environmental properties (3.2.1.8), viscosity (3.2.2.1), foam volume (3.2.2.2), surface tension (3.2.2.3), effect on unpainted surfaces (3.2.3.2), corrosion of metal surfaces (3.2.3.3), temperature stability (3.2.3.4), and fabric stain (3.2.3.5) are classified as periodic tests and shall be performed at a frequency selected by the manufacturer 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 prior to or on the initial shipment of the product to a purchaser, when a change in material or processing, or both, 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, preproduction 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 ASTM D1568, unless otherwise specified by purchaser; a lot shall be all deodorizer produced in a single production run from the same batches of raw materials under the same fixed conditions, or shall be all deodorizer subjected to the same unit chemical or physical process intended to make the final product homogeneous, and presented for vendor's inspection at one time.
- 4.4 Approval:
- 4.4.1 Sample deodorizer shall be approved by purchaser before deodorizer for production use is supplied, unless such approval be waived by purchaser. Results of tests on production deodorizer 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 deodorizer which are essentially the same as those used on the approved sample deodorizer. If necessary to make any change in ingredients or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients or processing and, when requested by purchaser, sample deodorizer. Production deodorizer made by the revised procedure shall not be shipped prior to receipt of reapproval.