



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc. SPECIFICATION

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 1425

Issued 4-1-81

Revised

DEICING/ANTI-ICING FLUID, AIRCRAFT Ethylene-Glycol Base

1. SCOPE:

1.1 Form: This specification covers an ethylene-glycol base deicing/anti-icing fluid in the form of a concentrated liquid.

1.2 Application: Primarily for use on exterior surfaces of parked aircraft for the prevention and removal of frozen deposits of frost and ice.

1.3 Precautions:

1.3.1 The deicing/anti-icing formulation supplied under requirements of this specification may be mildly toxic and contact with human skin and eyes should be avoided. Prolonged exposure to concentrations exceeding the established threshold limit values (TLV) for the product or its major components should also be avoided.

1.3.2 Although the fluid has a minimum flash point requirement of 100°C (212°F), it should be used with extreme care when applied around heaters or engine exhausts.

1.3.3 Caution should be exercised in the use of glycol-water deicing/anti-icing solutions in and around aircraft having silver or silver-coated electrical/electronic circuitry. Dehydrolysis reactions which result in fire when such glycol-water solutions contact silver or silver-coated circuits such as defectively insulated wires, switches, or circuit breakers which are carrying direct current.

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 2470 - Anodic Treatment of Aluminum Alloys, Chromic Acid Process

AMS 2475 - Protective Treatments, Magnesium Base Alloys

AMS 2825 - Material Safety Data Sheets

AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)

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)

AMS 4911 - Titanium Alloy Sheet, Strip, and Plate (6Al - 4V), Annealed

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade or their use by governmental agencies is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

2.1.2 Aerospace Recommended Practices:

- ARP 1511 - Corrosion of Low-Embrittling Cadmium Plate by Aircraft Maintenance Chemicals
- ARP 1512 - Corrosion of Aluminum Alloys by Aircraft Maintenance Chemicals, Sandwich Test

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

- ASTM A109 - Steel, Carbon, Cold-Rolled Strip
- ASTM D56 - Flash Point by Tag Closed Tester
- ASTM D93 - Flash Point by Pensky-Martens Closed Tester
- ASTM D97 - Pour Point of Petroleum Oils
- ASTM D270 - Sampling Petroleum and Petroleum Products
- ASTM D445 - Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
- ASTM D891 - Specific Gravity of Industrial Aromatic Hydrocarbons and Related Materials
- ASTM D1568 - Sampling and Chemical Analysis of Alkylbenzene Sulfonates
- ASTM D2196 - Rheological Properties of Non-Newtonian Materials
- ASTM D3278 - Flash Point of Liquids by Setaflash Closed Tester
- ASTM E70 - pH of Aqueous Solutions with the Glass Electrode
- 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
- ASTM G30 - Making and Using U-Bend Stress Corrosion Test Specimens

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.**2.3.1 Federal Specifications:**

- QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet
- QQ-A-250/5 - Aluminum Alloy Alclad 2024, Plate and Sheet
- QQ-A-250/13 - Aluminum Alloy Alclad 7075, Plate and Sheet
- QQ-M-44 - Magnesium Alloy Plate and Sheet (AZ31B)
- QQ-S-698 - Steel, Sheet and Strip, Low Carbon

2.3.2 Military Specifications:

- MIL-T-9046 - Titanium and Titanium Alloy, Sheet, Strip and Plate
- MIL-P-25690 - Plastic, Sheets and Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant

2.3.3 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: The composition of the fluid shall be an ethylene-glycol base and shall otherwise be optional with the manufacturer, unless otherwise specified by purchaser. The fluid shall contain additives such as wetting agents, corrosion inhibitors, etc, producing a product meeting the requirements of 3.2.

3.2 Properties: The fluid shall conform to the following requirements; tests shall be performed in accordance with specified test methods:

3.2.1 Fluid As-Received in Concentrated Form: Shall be as follows:

3.2.1.1 Flash Point: Shall be not lower than 100°C (212°F), determined in accordance with ASTM D56, ASTM D93, or ASTM D3278. In case of dispute, flash point determined in accordance with ASTM D56 shall apply.

3.2.1.2 Specific Gravity: Shall be within ±0.015 of the qualification value established as in 4.4.1, determined in accordance with ASTM D891.

3.2.1.3 Storage Stability: The fluid, tested in accordance with ASTM F503, shall neither show separation from exposure to heat or cold nor show an increase in turbidity greater than a control sample equally diluted 1:1 with distilled water.

3.2.2 Fluid Tested Both as a Concentrate and as Diluted Solution: Shall be as follows, determined on the fluid as-received and on a solution of the concentrated fluid diluted 1:1 with distilled water:

3.2.2.1 pH: Shall be within ±0.5 units of the qualification value established as in 4.4.1, determined in accordance with ASTM E70.

3.2.2.2 Pour Point: Shall be not greater than +5°C (+10°F) from the qualification value established as in 4.4.1, determined in accordance with ASTM D97.

3.2.2.3 Viscosity: Shall be within ±5% of the qualification value at -10°C (14°F), at 0°C (32°F), and at 50°C (122°F) established as in 4.4.1 for maximum and minimum values, determined in accordance with ASTM D445.

3.2.2.4 Corrosion of Metal Surfaces:

3.2.2.4.1 Sandwich Corrosion: Specimens, after test, shall show a rating not worse than 2, determined in accordance with ARP 1512.

3.2.2.4.2 Total Immersion Corrosion: The fluid 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 4037 or QQ-A-250/4 Aluminum Alloy, anodized as in AMS 2470	0.3
AMS 4041 or QQ-A-250/5 Aluminum Alloy (Optional)	0.3
AMS 4049 or QQ-A-250/13 Aluminum Alloy	0.3
AMS 4376 or QQ-M-44, Alloy AZ31B, Magnesium Alloy, dichromate treated as in AMS 2475	0.2
AMS 4911 or MIL-T-9046, Type III, Composition C, Titanium Alloy	0.1
ASTM A109, Temper No. 1, or QQ-S-698, Condition 1, Carbon Steel	0.8

- 3.2.2.4.3 Low-Embrittling Cadmium Plate: Test panels coated with low-embrittling cadmium plate shall not show a weight change greater than $0.3 \text{ (mg/cm}^2\text{)}/24 \text{ hr}$, determined in accordance with ARP 1511.
- 3.2.2.4.4 Stress-Corrosion Resistance: The fluid shall not cause cracks in AMS 4911 titanium alloy, determined in accordance with ASTM G30 using U-bend specimens in accordance with ASTM G30, Example 1. The 3-in. (75-mm) dimension of the specimens shall be parallel to the direction of rolling (longitudinal). Specimens shall be stressed in two steps. First stage stressing shall be by brake forming over a 0.28 in. (7.0 mm) mandrel in one pass to $65 \text{ deg} \pm 5$. Six test specimens shall be exposed to the test fluid; 3 specimens exposed to diluted fluid and three specimens to concentrated fluid. Specimens shall be immersed in the test fluid, withdrawn, air dried, heated for $8 \text{ hr} \pm 0.25$ at $425^\circ\text{C} \pm 5$ ($800^\circ\text{F} \pm 9$), cooled to room temperature, and examined at 20X magnification for cracks. Two control specimens shall be similarly tested without exposure to test fluid.
- 3.2.2.5 Hydrogen Embrittlement: The fluid shall be non-embrittling, determined in accordance with ASTM F519, Type 1a, 1c, or 2a.
- 3.2.2.6 Effect on Transparent Plastic: The fluid, heated to $65^\circ\text{C} \pm 5$ ($150^\circ\text{F} \pm 10$), shall not craze, stain, or discolor MIL-P-25690 stretched acrylic plastic, determined in accordance with ASTM F484.
- 3.2.2.7 Effect on Painted Surfaces: The fluid, heated to $65^\circ\text{C} \pm 5$ ($150^\circ\text{F} \pm 10$), shall neither decrease the paint film hardness 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.
- 3.2.2.8 Effect on Unpainted Surfaces: The fluid, tested in accordance with ASTM F485, shall neither produce streaking nor leave any stains requiring polishing to remove.
- 3.2.2.9 Rheological Properties: When specified by purchaser, the fluid shall exhibit a non-Newtonian flow behavior over the temperature range 0° to 20°C (32° to 68°F) such that the fluid can be classified as a pseudo-plastic fluid over this temperature range, determined in accordance with ASTM D2196. Standards for acceptance shall be as agreed upon by purchaser and vendor.
- 3.2.3 Performance: The fluid, used in accordance with manufacturer's recommendations, shall remove normally accumulated frozen deposits of frost and ice from the exterior surface of parked aircraft and shall provide protection against refreezing for up to 8 hours.
- 3.3 Quality: The fluid, as received by purchaser, shall be homogeneous, uniform in color, and free from skins, lumps, and foreign materials detrimental to usage of the fluid.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the fluid 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 such confirmatory testing as he deems necessary to ensure that the fluid conforms to the requirements of this specification.
- 4.2 Classification of Tests:
- 4.2.1 Acceptance Tests: Tests to determine conformance to requirements for flash point (3.2.1.1), specific gravity (3.2.1.2), and pH (3.2.2.1) are classified as acceptance tests and shall be performed on each lot.