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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3137C

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Superseding AMS 3137B

Submitted for recognition as an American National Standard

RESIN, CONFORMAL COATING, URETHANE ELASTOMER

1. SCOPE:

1.1 Form:

This specification covers a two-component system composed of a non-polyester urethane resin and a hardener, supplied in kit form.

1.2 Application:

This product has been used typically for conformally coating printed-circuit-board assemblies where thin coatings, good moisture resistance, thermal-vacuum stability, mechanical damping characteristics, and elastomeric properties are required for use from -55 to +95 °C (-67 to +203 °F), 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 following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2825 Material Safety Data Sheets
AMS 3601 Plastic Sheet, Copper Faced, Glass Fabric Reinforced Epoxy Resin, Hot Strength Retention

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 150 A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D 257 D-C Resistance or Conductance of Insulating Materials
ASTM D 618 Conditioning Plastics and Electrical Insulating Materials for Testing
ASTM D 792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 2240 Rubber Property-Durometer Hardness
ASTM F 74 Determining Hydrolytic Stability of Plastic Encapsulants for Electronic Devices

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a thermosetting, elastomeric, non-polyester urethane system. The product shall contain no 4,4' -methylene-bis-2-chloroaniline.

3.2 Properties:

The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified test methods, insofar as practicable:

3.2.1 Working Life: The viscosity at 23 °C ± 2 (73 °F ± 4) of the product one hour after mixing shall not exceed twice the original viscosity at that temperature.

3.2.2 Storage Life: The product shall meet the requirements of 3.3 at any time up to six months from date of receipt by purchaser when stored in the original unopened containers at a temperature not higher than 30 °C (85 °F).

3.3 Cured Resin: Shall have the properties shown in Table 1.

TABLE 1 - Cured Resin Properties

Paragraph	Property	Requirement	Test Method
3.3.1	Hardness, Durometer A	40 to 80	ASTM D 2240
3.3.2	Moisture Absorption, max	0.38%	4.5.1
3.3.3	Surface Adhesion	Pass	4.5.2
3.3.4	Thermal-Vacuum Stability, weight loss, max	0.55%	4.5.3
3.3.5	Volume Resistivity, min	1.0×10^{13} ohm-cm	ASTM D 257
3.3.6	Dielectric Constant at 1 MHz, max	3.5	ASTM D 150
3.3.7	Hydrolytic Stability at 85 °C (185 °F) and 95% relative humidity (RH)	Max decrease in 50 days of 20% change in Durometer hardness with no evidence of exudate, tackiness, or embrittlement	ASTM F 74
3.3.8	Specific Gravity	0.95 to 1.1	ASTM D 792

3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, homogeneous, and free from foreign materials and from imperfections detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

The manufacturer of the product shall supply all samples and shall be responsible for performing all required tests. 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 for working life (3.2.1) and for hardness (3.3.1) and specific gravity (3.3.8) of the cured product are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 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, contracting officer, or request for procurement.

4.3 Sampling and Testing:
(R)

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient product shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure, or if not specified therein, not less than three.

4.3.1.1 A lot shall be all resin and hardener produced in a single production run
(R) from the same batches of raw materials under the same fixed conditions, or all material subjected to the same unit chemical and physical process intended to make the final product homogeneous, and presented for manufacturer's inspection at one time.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and supplier.

4.4 Approval:

4.4.1 Sample product shall be approved by purchaser before product for production use is supplied, unless such approval be waived by purchaser. Results of tests on production product shall be essentially equivalent to those on the approved sample.

4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample product. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

Specimens shall be prepared in accordance with manufacturer's instructions.

4.5.1 Moisture Absorption: Three specimens, approximately 1/8 x 3 x 1 inch (3.2 x 76 x 25 mm) shall be placed in a desiccator over dry calcium chloride for not less than 96 hours at 23 °C ± 2 (73 °F ± 4). After conditioning, specimens shall be weighed, exposed to 95% ± 3 relative humidity for 240 hours ± 1, reweighed, and the moisture absorption calculated as the percent increase in weight.

4.5.2 Surface Adhesion: Five test panels shall be prepared from AMS 3601, Type I, laminate having nominal copper thickness of 0.0028 inch (0.071 mm). The panels shall be etched in accordance with AMS 3601 to develop the test pattern shown in Figure 1 of this specification, immersed in 1,1,1 trichloroethane at room temperature, dried at room temperature, immersed in dilute hydrochloric acid (sp gr 1.033) for 10 seconds ± 1, rinsed in distilled water, and dried with clean air or inert gas. Panels shall be coated to a 0.002 inch ± 0.001 (0.05 mm ± 0.02) coating thickness and cured in accordance with resin manufacturer's recommendations. The coated specimens shall be heated in an oven controlled at 105 °C ± 3 (221 °F ± 5) for 30 minutes ± 1, plunged into an alcohol/dry ice bath at -55 °C ± 3 (-67 °F ± 5), left for 10 minutes ± 1, removed, and the alcohol wiped off. Cycling shall continue until the specimens fail or until 10 cycles have been completed. Specimens shall show no evidence of cracks, checks, blisters, or separation from the substrate in 10 cycles or less.

4.5.3 Thermal-Vacuum Stability: Three specimens, approximately 1/8 x 3 x 1 inch (3.2 x 76 x 25 mm) shall be dried in accordance with ASTM D 618, Condition B. The dried specimens shall be weighed and suspended for 168 hours ± 1 in an oven controlled at 85 °C ± 3 (185 °F ± 5) and a pressure not greater than 2 x 10^{-5} mm mercury (26.3 MPa). The specimens shall be removed from the oven, allowed to cool to room temperature in a desiccator in accordance with ASTM D 618, and weighed to determine the percent loss in weight. Specimens shall show no evidence of blistering, flowing, or charring.

4.6 Reports:

The supplier of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3137C, manufacturer's identification, and quantity.

4.6.1 A material safety data sheet conforming to AMS 2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of the product for production use. Each request for modification of product formulation shall be accompanied by a revised data sheet for the proposed formulation.

4.7 Resampling and Retesting:

(R) If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Product shall be supplied in kit form with the base resin formulation plus a separate container of hardener. The containers in each kit shall provide each component in the quantity required for mixing in accordance with manufacturer's recommendations.

5.1.2 A lot of resin may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.

5.1.3 Each container shall bear a label showing not less than AMS 3137C, vendor's identification, lot number, date of manufacture, quantity, directions for mixing, and precautions for storage.

5.1.4 (R) Containers of resin 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 resin to ensure carrier acceptance and safe delivery.

5.1.5 (R) For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-2073-1, Commercial Level, unless Level A is specified in the request for procurement.

6. ACKNOWLEDGMENT:

Supplier shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Revision Indicator:

The (R) symbol is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this specification. If the symbol is next to the specification title, it indicates a complete revision of the specification.