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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3613B

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Submitted for recognition as an American National Standard

Superseding AMS 3613A

FILM, COPPER CLAD POLYESTER

1. SCOPE:

1.1 Form:

This specification covers a polyester resin in the form of a film clad on one or both sides with copper foil.

1.2 Application:

This product has been used typically as a base material for fabrication of flexible printed wiring for electronic circuit applications operating in the range -65 to +105 °C (-85 to 221 °F), but usage is not limited to such applications.

1.3 Classification:

Product covered by this specification is classified as follows:

Type 1 - Copper clad on one face
Type 2 - Copper clad on both faces

1.3.1 The type supplied shall be the type ordered.

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 3612 Polyester Film, Electrical Grade, General Purpose

Printed in U.S.A.
91-0942/ EG

2.2 ASTM Publications:

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

ASTM B 451	Copper Foil, Strip, and Sheet for Printed Circuits and Carrier Tapes
ASTM D 149	Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
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 1825	Etching and Cleaning Copper-Clad Electrical Insulating Materials and Thermosetting Laminates for Electrical Testing
ASTM D 1876	Peel Resistance of Adhesives (T-Peel Test)

2.3 U.S. Government Publications:

Available from Standardization Documents Order 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 consist of a polyester film to which copper foil is bonded with a suitable adhesive.

3.1.1 Polyester Film: Shall conform to AMS 3612.

3.1.2 (R) Copper Foil: Shall be electrolytically deposited conforming to ASTM B 451.

3.2 (R) Properties:

Product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable. Specimens shall be conditioned in accordance with ASTM D 618, Procedure A, prior to testing. Specimens for determination of dielectric strength (3.2.1), dielectric constant (3.2.2), dissipation factor (3.2.3) and surface resistance (3.2.4) shall have the copper removed in accordance with ASTM D 1825 prior to conditioning. Where requirements vary with thickness, use the value for the next lower thickness for thicknesses not specified.

3.2.1 (R)	Dielectric Strength, minimum Short time test, on 0.0075 inch (0.190 mm) film	2.7 kV per mil (106 kV/mm)	ASTM D 149

3.2.2	Dielectric Constant at 60 Hz, maximum	3.25	ASTM D 150
3.2.3	Dissipation Factor, maximum At 1 MHz At 1 kHz	 0.03 0.006	ASTM D 150
3.2.4	Surface Resistance, minimum	$1x10^{10}$ ohms/square	ASTM D 257
3.2.5	Peel Strength to Copper, minimum	3 pounds force/inch of width (525 N/m of width)	ASTM D 1876

3.3 Quality:

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

3.4 Sizes and Tolerances:

3.4.1 (R) The product shall be supplied in the standard combinations of film and copper thicknesses shown in Table 1 and Table 2; the nominal total thicknesses shown assume a 0.0015 inch (0.038 mm) thick adhesive layer per side clad:

TABLE 1 - Sizes and Tolerances, Clad One Side, Type 1

Nominal Total Thickness Inch	Nominal Total Thickness Millimeter	Polyester Film Thickness Inch	Polyester Film Thickness Millimeter	Copper Foil Weight Ounces per Square Foot	Copper Foil Weight kg/m^2
0.004	0.10	0.001	0.025	1	0.3
0.005	0.13	0.002	0.05	1	0.3
0.006	0.15	0.003	0.08	1	0.3
0.005	0.13	0.001	0.025	2	0.6
0.008	0.20	0.005	0.13	1	0.3
0.007	0.18	0.003	0.08	2	0.6
0.009	0.23	0.005	0.13	2	0.6

TABLE 2 - Sizes and Tolerances, Clad Two Sides, Type 2

Nominal Total Thickness Inch	Nominal Total Thickness Millimeter	Polyester Film Thickness Inch	Polyester Film Thickness Millimeter	Copper Foil Weight Ounces per Square Foot	Copper Foil Weight kg/m^2
0.007	0.18	0.001	0.025	1	0.3
0.008	0.20	0.002	0.05	1	0.3
0.009	0.23	0.003	0.08	1	0.3
0.010	0.25	0.001	0.02	2	0.6
0.011	0.28	0.005	0.13	1	0.3
0.012	0.30	0.003	0.08	2	0.6
0.014	0.36	0.005	0.13	2	0.6

3.4.2 The tolerance on thickness shall be ± 10% of the nominal value, measured by means of a micrometer or dial indicator and reported as the average of five measurements made at least 0.060 inch (1.52 mm) from any edge.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

(R)

The vendor of the product shall supply all samples for vendor's tests 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 dielectric constant (3.2.2), dissipation factor (3.2.3), peel strength (3.2.5), and sizes and tolerances (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests for dielectric strength (3.2.1) and surface resistance (3.2.4) are 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 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.

4.2.3.1 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, contracting officer, or request for procurement.

4.3 Sampling and Testing:
(R)

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 A lot shall be all product produced in a single production run from the same batches of raw materials and presented for vendor's inspection at one time. A lot shall not exceed 1500 square feet (139 m^2).

4.3.2 When a statistical sampling plan has been agreed upon by purchaser and
(R) vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3 and the report of 4.5 shall state that such plan was used.

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 Vendor 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, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample product. Product made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and, when performed, to the periodic test requirements, and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3613B, type number, manufacturer's identification, form or part number, and quantity.

4.6 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.