SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS3613 REV. D

Issued 1971-11
Revised 2010-11

Superseding AMS3613C

Film, Copper Clad Polyester

RATIONALE

This document has been revised to remove specific military requirements described in former sections 4.2.3.1, 5.1.4, and 8.3. MIL-STD-2073-1 was removed from section 2.3 since it was associated with the 5.1.4 deletion.

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

The 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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS3612 Polyester Film, Electrical Grade, General Purpose

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

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)

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 AMS3612.

3.1.2 Copper Foil

Shall be electrolytically deposited conforming to ASTM B 451.

3.2 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.

TABLE 1 - PROPERTIES

Paragraph	Property	Requirement	Test Method
3.2.1	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		ASTM D 150
	At 1 MHz	0.03	
	At 1 kHz	0.006	
3.2.4	Surface Resistance, minimum	1×10^{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 The product shall be supplied in the standard combinations of film and copper thicknesses shown in Table 2 and Table 3; the nominal total thicknesses shown assume a 0.0015 inch (0.038 mm) thick adhesive layer per side clad:

TABLE 2 - 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 3 - 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

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

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.

4.3 Sampling and Testing

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 tone 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 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. Production made by the revised procedure shall not be shipped prior to receipt of reapproval.