



# AEROSPACE MATERIAL

## AMS 3613

### Society of Automotive Engineers, Inc. SPECIFICATION

TWO PENNSYLVANIA PLAZA, NEW YORK, N. Y. 10001

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Revised

#### POLYESTER FILM, COPPER CLAD for Electronic Applications

#### 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: Primarily as a base material for fabrication of flexible printed wiring for electronic circuit applications to be operated between -65 and +105 C (-85 and 221 F).
- 1.3 Classification: This specification covers two types of copper clad polyester film, as follows; the type supplied shall be as specified on the drawing or purchase order:

Type I - Copper clad on one face  
Type II - Copper clad on both faces

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) 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., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods  
AMS 3612 - Polyester Film, Electrical Grade, General Purpose

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

ASTM D149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies  
ASTM D150 - A-C Loss Characteristics and Dielectric Constant (Permittivity) of Solid Electrical Insulating Materials  
ASTM D257 - D-C Resistance or Conductance of Insulating Materials  
ASTM D1876 - Peel Resistance of Adhesives (T-Peel Test)

- 2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Ave., Philadelphia, Pennsylvania 19120.

2.3.1 Military Specifications:

MIL-F-55561 - Foil, Copper, Cladding for Printed Wiring Boards

#### 3. TECHNICAL REQUIREMENTS:

- 3.1 Material: Shall consist of a polyester film to which is bonded, with a suitable adhesive, copper foil on one (type I) or both (Type II) sides.

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3.1.1 Polyester Film: Shall conform to AMS 3612.

3.1.2 Copper Foil: Shall be electrolytically deposited, conforming to MIL-F-55561, Type 1.

3.2 Properties: The 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. Tests shall be performed at 23 - 29 C (73.4 - 84.2 F), unless otherwise specified.

3.2.1 Electrical Properties:

3.2.1.1	Volume Resistivity, ohm-cm, min	$1 \times 10^{15}$	ASTM D257
3.2.1.2	Dielectric Strength, min		
	V per mil	1600	ASTM D149, (Condition A)
	(v/mm)	(63,000)	(0.0075 in. (1.905 mm) film)
3.2.1.3	Dielectric Constant at 60 Hz max	3.25	ASTM D150
3.2.1.4	Dissipation Factor, max		ASTM D150
	At 1 MHz	0.03	
	At 1 kHz	0.006	
3.2.1.5	Surface Resistance, ohm, min	$1 \times 10^{10}$	ASTM D257

3.2.2 Physical Properties:

3.2.2.1	Peel Strength to Copper, min		ASTM D1876
	lb per in. of width	3	
	(N-m/mm of width)	(2.07)	

3.3 Quality: The product shall be uniform in quality and free from foreign materials, visible pits, and scratches and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.4 Sizes and Tolerances:

3.4.1 The product shall be supplied in the following standard combinations of film and copper thicknesses; the nominal total thicknesses shown assume a 0.0015 in. (0.0381 mm) thick adhesive layer per side clad:

Nominal Total Thickness		Polyester Film Thickness		Copper Foil Weight	
Inch	(Millimeter)	Inch	(Millimeter)	oz per sq ft	g/dm <sup>2</sup>
Clad One Side (Type I)					
0.004	(0.102)	0.001	(0.025)	1	(3.2)
0.005	(0.127)	0.002	(0.051)	1	(3.2)
0.006	(0.152)	0.003	(0.076)	1	(3.2)
0.006	(0.152)	0.001	(0.025)	2	(6.3)
0.008	(0.203)	0.005	(0.127)	1	(3.2)
0.008	(0.203)	0.003	(0.076)	2	(6.3)
0.010	(0.254)	0.005	(0.127)	2	(6.3)

3.4.1 (Continued)

Nominal Total Thickness		Polyester Film Thickness		Copper Foil Weight	
Inch	(Millimeter)	Inch	(Millimeter)	oz per sq ft	g/dm <sup>2</sup>
Clad Two Sides (Type II)					
0.007	(0.178)	0.001	(0.025)	1	(3.2)
0.008	(0.203)	0.002	(0.051)	1	(3.2)
0.010	(0.254)	0.003	(0.076)	1	(3.2)
0.010	(0.254)	0.001	(0.025)	2	(6.3)
0.012	(0.305)	0.005	(0.127)	1	(3.2)
0.012	(0.305)	0.003	(0.076)	2	(6.3)
0.014	(0.356)	0.005	(0.127)	2	(6.3)

3.5 The tolerance on thickness shall be  $\pm 10\%$  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 in. (1.524 mm) from any edge.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as routine control tests.

4.3 Sampling: A sample size shall consist of three specimens from each lot of material. A lot shall consist of all material manufactured in a single continuous production run.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests made on the product to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, material specification number, vendor's material designation, form or part number, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, supplier's compound number, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: 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 and no additional testing shall be permitted. Results of all tests shall be reported.