



LAMINATE - COPPER CLAD GLASS FIBER REINFORCED POLYESTER

ESF-M99L14-A

1. SCOPE

The material defined by this specification is a thermosetting resin glass mat reinforced copper clad laminate which is self-extinguishing. It has 2 ounce copper bonded to one surface.

2. APPLICATION

This specification was released originally for material used to make printed circuits such as the speed control circuit.

3. REQUIREMENTS

3.0 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.1 LAMINATE BASE PROPERTIES - 1/16 in (1.6 mm) THICK

3.1.1	Water Absorption, max (ASTM D 570)	1.2%
3.1.2	Flexural Strength, min (ASTM D 790)	15,000 psi (103 MPa)
3.1.3	Impact Strength, Izod, min (ASTM D 256 - Notched)	3.0 ft lb/in (160 J/m)
3.1.4	Compressive Strength, min (ASTM D 695)	25,000 psi (172 MPa)
3.1.5	Dielectric Strength, min (ASTM D 229 Short Time)	500 V/mil (19.7 kV/mm)
3.1.6	Arc Resistance, min (ASTM D 495)	100 s
3.1.7	Specific Gravity, min (ASTM D 792)	1.7
3.1.8	Deflection Temperature, min (ASTM D 648)	264 psi (1820 kPa) 205 °C 66 psi (455 kPa) 260 °C

3.2 COPPER FOIL PROPERTIES

3.2.1	Purity, min (ASTM E 53)	99.8% copper (silver included)
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Date	Action	Revisions
2003 07 25	Revised	Para 3.0 inserted; Para 3.5 & 4 deleted
1978 06 05		Metricated & Retyped CF4A-RD567168-18
1964 04 20		Released F6-1327

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3.2.2 Thickness
(ASTM D 374, Method "C")

As specified on engineering drawing

3.3 COMPOSITE REQUIREMENTS

3.3.1 Bond Strength, min

7.0 lb/in (1.2 N/mm) of width

Test Method:

Peel sufficient copper from the substrate to allow gripping with a clamp. Suspend laminate horizontally with peeled copper foil perpendicular to the laminate and pointing downward. Suspend a weight (including clamp) equivalent to 7.0 pounds per inch (1.2 N/mm) of width from the end of the foil. There shall be no loosening of the bond or any further peeling of the foil from the substrate after 10 minutes.

3.3.2 High Temperature Resistance Shall not blister

After 20 min at 210 °C and 25 cycles of 1 h at -29 °C and 1 h at 149 °C there shall be no evidence of blistering and there shall be no more warp than specified on Engineering Drawing. This test may be run on parts or samples representative of parts.

3.3.3 Overall Thickness

To be specified on engineering drawing

3.4 **FLAMMABILITY**
(ASTM D 635)

Self-extinguishing