LAMINATE, COMPOSITE SUBSTRATE, UNCLAD EPOXY GLASS, SELF-EXTINGUISHING — **WSF-M99L17-A2**

LAMINATE, COMPOSITE SUBSTRATE, UNCLAD EPOXY PAPER, SELF-EXTINGUISHING — **WSF-M99L17-A3**

LAMINATE, COMPOSITE SUBSTRATE, UNCLAD, POLYESTER GLASS, SELF-EXTINGUISHING — **WSF-M99L17-A4**

1. SCOPE

The materials defined by these specifications are epoxy/glass or epoxy/paper, unclad laminates which are flame resistant and capable of being additively copper plated.

2. APPLICATION

These specifications were released originally for materials used in fabricating single and double sided printed circuit boards for electronic modules using additive copper plating.

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).

3.4 CONSTRUCTION

3.4.1 WSF-M99L17-A2

The composite substrate shall consist of laminated sheets of woven glass impregnated with fire retardant epoxy as specified by ASTM D 709, type IV, Grade FR-4.

3.4.2 WSF-M99L17-A3

The composite substrate shall consist of laminated sheets of cellulosic paper impregnated with fire retardant epoxy as specified by ASTM D 709, Type I, Grade FR-3.

3.4.3 WSF-M99L17-A4

The composite substrate shall consist of laminated sheets of non-woven glass impregnated with fire retardant polyester as specified by ASTM D 1867, Type IV, Grade FR-6.

3.4.4

Dimensional	A2	A3	A4
Thickness, mm	1.47 +/- 0.13	1.40 +/- 0.13	1.40 +/- 0.13

Date	Action	Revisions
2003 07 24	Revised	Para 3.0 inserted; Para 3.1, 3.2, 3.3, 3.6, 3.7, 4 deleted
1993 02 11	NGA1E10269419001	Revised 3.5.8, updated 3.7 R. Gordon
1991 04 26		Released J.B. Huebner

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3.4.5 Panel Size (A2, A3, & A4)

Length tolerance	+/- 1.57 mm
Width tolerance	+/- 0.79 mm

3.4.6 Dimensional Stability, mm/mm change (Between holes after conditioning for 1 hr at 160 +/- 2 °C

	0.0002	0.0006	0.0006

3.4.7 Bow and Twist, mm/mm, max (IPC TM-650, Method 2.4.22)

As received	0.007	0.007	0.008
After conditioning for 1h at 160 +/- 2 °C	0.008	0.008	0.010

3.5 ORIGINAL PROPERTIES

3.5.1 Flexural Strength, min MPa (ASTM D790)

Longitudinal	412.0	137.3	137.9
Transverse	343.4	110.0	151.7

3.5.2 Surface Resistivity, min, ohms/cm (ASTM D 257)

As received	1E11	1E10	1E12
After conditioning for 96 h at 35 +/- 2 °C and 90% R.H.	1E10	1E9	1E11

3.5.3 Volume Resistivity, min, ohms/cm (IPC TM-650, Method 2.5.17.1)

As received	1E12	1E11	1E13
After conditioning for 96 h At 35 +/- 2 °C and 90% R.H.	1E11	1E10	1E12

3.5.4 Solder Float Resistance (A2, A3, A4) (IPC AM-361, Method 4.7.5)

As received	No delamination, blistering, crazing, measling, or burning
After conditioning for 15 s At 260 +/- 3 °C on solder bath	No delamination, blistering, crazing, measling, or burning

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