

Limited Fire Hazard Electrical Laminate

Grade: EM42

Data Sheet

Issue: 2004-02

#### DESCRIPTION

Micam's EM42 is constructed from a combination of woven and non-woven glass, all layers being impregnated with a filled epoxide resin. It is produced by a high temperature, high pressure, long duration pressing process which produces a void-free laminate of near theoretical density.

#### GENERAL CHARACTERISTICS

EM42 is a cream coloured laminate available in thicknesses from 0.8mm to 100mm and in sheet sizes 1220mm x 914mm and 2440mm x 1220mm. Other sheet sizes are available on request. EM42 exhibits both excellent reaction to fire and fire resistance. It is a flame retardant, low smoke and low toxic fume, (halogen and phosphorus free), material when exposed to fire and it will act as a barrier to the passage of fire. It also has exceptional resistance to penetration when exposed to high power DC arcing and will therefore act as an arc barrier. It has good mechanical and electrical insulation properties, exhibiting a high Comparative Tracking Index and is specifically formulated to ensure excellent machining characteristics. MICAM offer a machining and fabrication service.

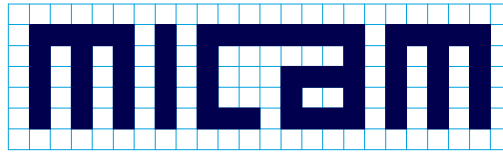
GENERAL PROPERTIES	UNITS	VALUE	TEST METHOD
RELATIVE DENSITY		2.0	ISO1183-A
WATER ABSORPTION	mg (3mm)	12	ISO 62-1
TEMPERATURE RATING	Class	B (130°C)	IEC 60085
THERMAL CO-EFFICIENT OF EXPANSION	K <sup>-1</sup>	1.2 x 10 <sup>-5</sup>	ASTM D696
THERMAL CONDUCTIVITY	Wm <sup>-1</sup> K <sup>-1</sup>	1.67	ASTM C177

ELECTRICAL PROPERTIES	UNITS	VALUE	TEST METHOD
INSULATION RESISTANCE	MΩ	>10 <sup>4</sup>	IEC 60167
INSULATION RESISTANCE	Ω	>10 <sup>10</sup>	IEC 60167
VOLUME RESISTIVITY	Ωcm	>10 <sup>11</sup>	IEC 60093
SURFACE RESISTIVITY	Ω	>10 <sup>11</sup>	IEC 60093
DISSIPATION FACTOR (LOSS TANGENT) AT 1 MHz	-	0.022	IEC 250
PERMITTIVITY (DIELECTRIC CONSTANT) AT 1 MHz	-	4.2	IEC 250
DIELECTRIC STRENGTH FLATWISE	MVm <sup>-1</sup> (3 mm)	9.5	IEC 60243-1
COMPARATIVE TRACKING INDEX	V	>600	IEC 112

MECHANICAL PROPERTIES	UNITS	VALUE	TEST METHOD
FLEXURAL STRENGTH (X,Y)	MPa	180	ISO 178
FLEXURAL STRENGTH (Z)	MPa	200	ISO 178
FLEXURAL MODULUS (X,Y)	GPa	16	ISO 178
FLEXURAL MODULUS (Z)	GPa	40	ISO 178
TENSILE STRENGTH (X,Y)	MPa	120	ISO 527
TENSILE STRENGTH (Z)	MPa	30	ISO 527
TENSILE MODULUS (X,Y)	GPa	25	ISO 527
TENSILE MODULUS (Z)	GPa	6	ISO 527
IMPACT STRENGTH	kJm <sup>-2</sup>	40	ISO180/2A
SHEAR STRENGTH (X,Y)	MPa	40	EN60893-2
SHEAR STRENGTH (Z)	MPa	20	EN60893-2
SHEAR MODULUS (X,Y)	GPa	3	EN60893-2
SHEAR MODULUS (Z)	GPa	2.5	EN60893-2
COMPRESSIVE STRENGTH (X,Y)	MPa	250	ISO 604
COMPRESSIVE STRENGTH (Z)	MPa	100	ISO 604
COMPRESSIVE MODULUS (X,Y)	GPa	17	ISO 604
COMPRESSIVE MODULUS (Z)	GPa	10	ISO 604
POISSON'S RATIO (BY CALCULATION)	-	0.29	-



The information contained herein has been obtained under laboratory conditions and are typical or average values and do not constitute a specification, guarantee or warranty. Results may vary under different processing conditions or in combination with other materials. The data is believed to be reliable but all suggestions or recommendations for use are made without guarantee. You should thoroughly and independently evaluate materials for your planned application and determine suitability under your own processing conditions before commercialization.



**REACTION TO FIRE**

EM42 exhibits exceptionally good reaction to fire performance. The methods quoted in the table above are, in some cases, one example of several identical or closely similar methods under which the same level of performance can be expected. In some cases identical methods are referenced in different standards and used to generate different parameters and requirements.

FIRE PERFORMANCE	UNITS	VALUE	TEST METHOD
FLAMMABILITY TEMPERATURE INDEX	°C	FTI >350	BS EN ISO 4539-3 (LUL C2809)
LIMITING OXYGEN INDEX	%	LOI >95	NF P 92-507 (RATP 192 455)
IGNITABILITY	s	<2s at 960C	NF C 20-455 (RATP 192 455)
SPREAD OF FLAME	Class	Class 1 (0mm spread)	BS 476-7 (WARRES 55743)
FIRE PROPAGATION	°C/minute	i1 0.0, I 5.6	BS 476-6 (WARRES 55744)
SMOKE EMISSION	m <sup>2</sup> g <sup>-1</sup>	Ao 0.002	BS 6853 D.8.3 (LUL C2968)
SMOKE EMISSION	m <sup>2</sup> /"burn area"	Ao(ON) 4.0, Ao(OFF) 4.8	BS 6853 D.8.4 (LUL C3007)
SMOKE EMISSION	m <sup>2</sup> m <sup>-2</sup> , m <sup>2</sup> m <sup>-2</sup> minute*	Dm 150, VOF4 13.4	NF X 10-702 (SNPE 91-204B)
TOXIC FUME EMISSION	Index	ITC 2.75	NF X 70-100 (SNPE 91-204A)

\* The Dm value is actually dimensionless. The m<sup>2</sup>m<sup>-2</sup> form has been used to emphasise the dimensional linkages to the other smoke emission tests.

On the basis of the results achieved EM42 complies with the following standards, (amongst others):

Class O	Building Regulations - England & Wales
Category Ib	BS 6853 Table 3
Category Ia	BS 6853 Table 6
Category Ia	BS 6853 Table 7
I0/F0	NF F 16-101; -102

**FIRE RESISTANCE**

Fire resistance is a design/system property and not solely a material property. EM42 exhibits fire resistance both perpendicular to and parallel to, the laminate plane. At 12mm it has achieved in excess of 30 minutes integrity and 15 minutes insulation in an electrical busbar penetration of a fire partition (Prometheus 7/9/99) and at 100mm it has achieved over 60 minutes integrity and 60 minutes insulation (LPC TE 89432). In LPC TE 89432 the test was terminated without failure of the material. The projected integrity period was too large to estimate but the projected insulation period was in excess of 120 minutes.

**DC POWER ARC RESISTANCE**

DC power arc resistance is a design/system property and not solely a material property. EM42 exhibits high power arc resistance and has found application on several DC traction railway systems. It is a material selected by London Underground Ltd for arc resisting applications. A specific information sheet, available from MICAM, exists for this specialised area of use.

**GENERAL APPLICATIONS**

EM42 is suitable for use for electrical/mechanical applications specifically where there is a need for fire or arc performance. It is therefore ideally suited to passenger transport applications and use in enclosed or underground areas. When exposed to fire EM42 leads to low levels of corrosion, (compared to standard flame retardant epoxide systems). The machinability of EM42 is exceptional and it is often used purely for this reason even where there is no fire or arc dimension to the application.

**SYSTEM APPROVAL**

Approved by NSAI to I.S. EN ISO 9001:2000 Reg. No. 19.0675.



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