



THE GUND COMPANY

MANUFACTURERS & FABRICATORS OF ENGINEERED MATERIAL SOLUTIONS

E311 (G-13)

Item:	E311 (G-13) Filament Woven Fiberglass Sheet				
Description:	E311 (G-13) from The Gund Company is a continuous filament woven fiberglass sheet bonded with a special track resistant high temperature epoxy resin. The material has the ability to maintain excellent mechanical, electrical, and physical properties at elevated temperatures to 180°C. E311 (G-13) from The Gund Company can specifically meet 600V track resistance and V-0 flame resistance.				
Standards:	NEMA LI-1 (IM 60000): Grade G-11, G-12, G-13, FR5	MIL-I-24768/28: EN 45545 R22/HL3 and R23/HL3	IEC 60893: EP GC 306, 308, 309, 310, 311		
Availability:	Laminate Sheets:	English Units (in)		SI Units (mm/cm)	
		Thickness:	.079 to 5.0		2 - 127 (mm)
	Sheet Size:	30 x 48 / 48 x 60 / 48 x 120		76 x 122 / 122 x 152 / 122 x 305 (cm)	
Fabricated Parts:	The Gund Company custom fabricates insulation materials to the exact specifications and drawings specified by our customers.				

Key Characteristics	Units - English (SI)	Typical Values
Standard Color	--	Green ²
Density	lbs/in ³ (g/cc)	0.069 (1.9)

² Custom colors available upon request

Engineering Properties

Key Characteristics	Test Method	Units - English (SI)	Typical Values
Tensile Strength (0.125") - LW	ASTM D-638	ksi (MPa)	41 (283)
Compressive Strength - ⊥(0.500")	ASTM D-695	ksi (MPa)	70 (483)
Flexural Modulus (0.062")	ASTM D-790	ksi (GPa)	LW 4,200 (29)
			CW 4,000 (27.6)
Coefficient of Thermal Expansion	--	PPM/°C	10
Comparative Tracking Index (0.125")	IEC 60112	V	600
Dielectric Strength (0.062") Condition A, Oil	ASTM D-149	V/mil	485



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NEMA LI-1 IM 600000 FR5 G-13 Required Properties

Key Characteristics		Test Method	Units	NEMA Required	Typical Values
Breakdown Voltage (0.062") //	Condition A	ASTM D-149	kV	45.0 min	>50
	Condition D-48/50			40.0 min	>50
Permittivity @ 1MHz (0.125")	Condition A	ASTM D-150	--	5.20	4.70
	Condition D-24/30			5.40	4.80
Dissipation Factor@ 1MHz (0.187")	Condition A	ASTM D-150	--	0.025 max	0.014
	Condition D-48/50			0.035 max	0.017
IZOD Impact Strength (0.125")	LW Condition E-48/50	ASTM D-256	ft.-lb/in Notched	7.0 min	11
	CW Condition E-48/50			5.5 min	10
Flexural Strength (0.062")	LW Condition A	ASTM D-790	ksi (MPa)	60.0 (414) min	80.0 (552)
	LW Condition A			50.0 (345) min	70.0 (486)
	LW Condition E-150-T150			30.0 (207) min	40.0 (276)
Bonding Strength (0.500")	Condition A	ASTM D-229	Lb (kg)	1,600 min	2,200 (998)
	Condition D-48/50			1,500 min	2,000 (907)
Moisture Absorption (0.062")		ASTM D-570	%	0.25 max	0.01
Flammability		UL 94	Class	VO	VO*

* From 3 mm

IEC 60893 EPGC 311 Required Properties

Key Characteristics		Test Method	Units	IEC Requirement	Typical Values
Flexural Strength	LW Condition A	ISO 178	MPa	340 min	486
	LW Condition E-150/T-150			170 min	276
Charpy Impact Strength		ISO 180	kJ/m ²	34 min	45
Perpendicular Electric Strength (90°C in Oil, 1.5mm)		IEC 60243-1	kV/mm	13 min	15
Parallel Breakdown Voltage (Stepped 90°C in Oil, 3mm)		IEC 60243-1	kV	35 min	>45
Insulation Resistance (After Water Immersion)		IEC 60167	MΩ	5 X 10 ⁴ min	>10 ⁷
Thermal Endurance		IEC 60216	°C	180	180
Water Absorption (4mm)		ISO 62	mg	19 max	4.2
Flammability		UL94	Class	VO	VO*

* From 3 mm

Data supplied above are typical values and are not to be considered specification values. All of the information, suggestions and recommendations pertaining to the properties and uses of the products herein are based upon tests and data believed to be accurate; however, the final determination regarding suitability of any material described herein for the contemplated application, the manner of such use, and whether the use infringes any patents is the sole responsibility of the user. There is no warranty, expressed or implied, including, without limitation warranty of merchantability or fitness for a particular purpose. Under no circumstances shall we be liable for incidental or consequential loss or damage.