



# THE GUND COMPANY

Manufacturers & fabricators of engineered material solutions

Item:	NEMA Grade G-3 Glass Phenolic Laminate		
Description:	NEMA Grade G-3 material is a woven glass fabric laminate with a high temperature phenolic resin. Glass phenolic insulating materials offer good flexural, compressive, and impact strength at elevated temperatures as well as good moisture resistance.		
Standards:	NEMA LI-1: Grade G-3	IEC 60893: PF GC 201	MIL-I-24678/18-GPG
Availability:		English Units (in)	SI Units (mm/cm)
	Laminate Sheets:	Thickness:	.008 to 4.0 (mm)
		Sheet Sizes:	36 x 48 to 48 x 108 91.4 x 122 to 122 x 274.3 (cm)
	Tubes:	NEMA G-3 convolute tubes are available from The Gund Company in nearly any custom size of inside and outside diameter, per customer requirements	
	Fabricated Parts:	The Gund Company custom fabricates insulation materials to the exact specifications and drawings of our customers	

Key Characteristics	Units - English (SI)	Typical Values
Standard Color	--	Brown, Black <sup>1</sup>
Density	lb/in <sup>3</sup> (g/cc)	1.9

<sup>1</sup> Custom colors are available upon request

## Additional Engineering Properties

Key Characteristics	Test Method	Units - English (SI)	Typical Values
Tensile Strength (0.125") Length-Wise	ASTM D-638	ksi (MPa)	40 (276)
Compressive Strength, Flat-Wise (0.500")	ASTM D-695	ksi (MPa)	76 (524)
Flexural Modulus (0.062")	ASTM D-790	ksi (MPa)	3,000 (21,000)
Shear Strength (punch type, 0.062")	ASTM D-732	ksi (MPa)	21.5 (148)
Coefficient of Thermal Expansion	ASTM E-228	" / °C x 10 <sup>6</sup>	15
Temperature Index (Electrical/Mechanical)	ASTM D-2304	°C	140/170
Arc Resistance (0.125")	ASTM D-495	Seconds	100
Comparative Tracking Index (0.125") <sup>2</sup>	IEC 60112	V	165
Dielectric Strength (Condition A)	ASTM D-149	kV/mm	14.8

<sup>2</sup>ASTM D-3638 & IEC 112 are the same test method - IEC 60112 is slightly different, but the results are similar.

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**Material Data Sheet**

## NEMA LI-1 G-3 Required Properties

Key Characteristics		Test Method	Units	NEMA Required	Typical Values
IZOD Strength (0.50")	Length-Wise	ASTM E-48/50	ft - lb	6.5	12
	Cross-Wise			5.5	8.5
Flexural Strength (0.062")	Length-Wise	ASTM D-790	ksi (MPa)	40 (276)	55 (379)
	Cross-Wise			30 (207)	49 (338)
Bond Strength (0.500")	Condition A	ASTM D-229	lb/kg	850 (385)	1,500 (681)
Moisture Absorption (0.062")	Condition D 24/23	ASTM D-570	%	2.7	0.5
Flammability Rating		UL94	--	HB	HB

## IEC 60893-3-2 PFGC 201 Required Properties

Key Characteristics	Test Method	Units	IEC Requirement	Typical Values
Flexural Strength	ISO 178	MPa	140	380
Charpy Impact Strength	ISO 179	kJ/m <sup>2</sup>	25	40
Perpendicular Electric Strength (90°C in Oil, 1.5mm)	IEC 60243-1	kV/mm	5.7	6.7
Parallel Breakdown Voltage (Stepped, 90°C in Oil, 3mm)	IEC 60243-1	kV	20	22
Insulation Resistance (After Water Immersion)	--	MΩ	1 x 10 <sup>2</sup>	3.5 x 10 <sup>2</sup>
Moisture Absorption (3 mm)	--	mg	153 max	130