

TECHNICAL DATA SHEET

Fiberglass Laminates

Is a fiberglass epoxy laminate usually specified when extremely high strength and consistent dimensional stability over temperature is required. G-10 is used for terminal boards, high humidity applications, electrical and electronic test equipment and electric rotor insulation. G-10 can be extremely difficult to cut and machine however, at Laminated Plastics G-10 is our specialty. G-10 is slightly stronger while G-11 is a better insulator and can withstand higher temperatures. FR-4 is a fire-retardant G-10 glass-epoxy laminate that is used primarily in the printed circuit board industry. G-10 and similar fiberglass reinforced thermosets are sometimes known as garolite.

GENERAL DESCRIPTION

Phenolic Laminates are produced by applying heat and pressure to layers of paper, canvas, linen or glass cloth impregnated with synthetic thermosetting resins. When heat and pressure are applied to the layers, a chemical reaction (polymerization) transforms the separate layers into a single laminated material with a "set" shape that cannot be softened again -- therefore, these materials are called "Thermosets". A variety of resin types and cloth materials can be used to manufacture thermoset laminates with a range of mechanical, thermal, and electrical properties.

TYPICAL PROPERTIES of GLASS LAMINATES (SHEET FORM)

(mechanical properties of rod and tube forms may differ)

ASTM or UL test	Property	G-3	G-5/G-9	G-7	G-10	G-11
PHYSICAL						
D792	Density (lb/in ³) (g/cm ³)	0.065 1.80	0.067 1.85	0.065 1.80	0.065 1.80	0.065 1.80
D570	Water Absorption, 24 hrs (%)	2.65	0.60	0.10	0.10	0.20
MECHANICAL						
D638	Tensile Strength (psi) -lengthwise -crosswise	42,000 34,000	61,600 51,100	20,000 -	45,000 38,000	43,000 37,000
D790	Flexural Strength (psi) -lengthwise -crosswise	40,500 34,000	61,600 51,100	30,000 -	75,000 65,000	80,000 70,000
D790	Flexural Modulus (Kpsi) -lengthwise -crosswise	1,800 1,400	2,000 1,700	1,600 -	2,700 2,400	3,000 2,700
D256	IZOD Notched Impact (ft-lb/in) -lengthwise -crosswise	12.0 11.0	12.5 8.5	13.0 -	14.0 12.0	12.0 9.0
D695	Compressive Strength (psi)	55,000	65,000	50,000	65,000	63,000
D785	Hardness, Rockwell M	M110	M115	M105	M110	M112
THERMAL						
D696	Coefficient of Linear Thermal Expansion (x 10 ⁻⁵ in./in./°F) -lengthwise -crosswise	0.83 1.00	0.83 1.00	0.72 0.90	0.55 0.66	0.72 0.83
-	Max Operating Temp (°F / °C)	340 / 170	285 / 140	430 / 220	284 / 140	329 / 165
C177	Thermal Conductivity (BTU-in/ft ² -hr-°F) (x 10 ⁻⁴ cal/cm-sec-°C)	2.0 7.0	2.0 7.0	2.0 7.0	2.0 7.0	2.0 7.0
UL94	Flammability Rating	H-B	V-0	H-B	H-B	H-B
ELECTRICAL						
D149	Dielectric Strength (V/mil) short time, 1/8" thick	460	300	350	800	900
D150	Dielectric Constant at 1 MHz	7.3	6.3	4.5	5.0	4.5
D150	Dissipation Factor at 1 MHz	0.023	0.019	0.018	0.019	0.020
D495	Arc Resistance (sec)	180	180	240	100	120

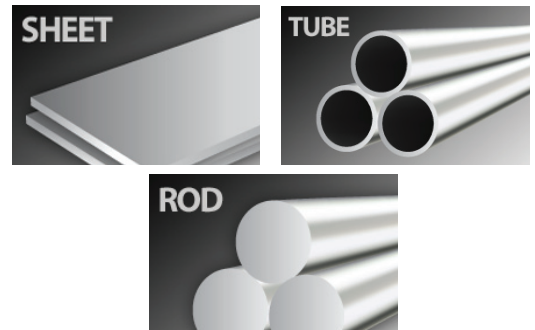
Benefits

Laminated Plastics specializes in fabricating G-10
Good electrical properties
Extremely high strength over temperature
High dimensional stability over temperature
Humidity resistant

Applications

Terminal boards
Electrical
Electronic test equipment
Electric rotor insulation
High humidity applications

SHAPES AVAILABLE



NOTE: The information contained herein are typical values intended for reference and comparison purposes only. They should NOT be used as a basis for design specifications or quality control. Contact us for manufacturers' complete material property datasheets.
All values at 73°F (23°C) unless otherwise noted.