

Technical Data Sheets for Laminates - Call (888) 995-7767 for Customer Service

Properties	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
	Glass Reinforced	Glass Reinforced	Melamne	Silicone Glass	Paper	Paper	Paper	Canvas	Linen
Tensile Strength									
•Lengthwise, PSI	40,000	40,000	37,000	23,000	20,000	16,000	15,000	9,500	12,500
•Crosswise, PSI	35,000	35,000	30,000	18,000	16,000	13,000	12,000	7,500	88,750
Compressive Strength	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Flatwise, PSI	60,000	60,000	70,000	45,000	36,000	34,000	32,000	37,000	37,000
•Edgewise, PSI	35,000	35,000	25,000	14,000	19,000	23,000	25,500	23,500	25,000
Flexural Strength									
•Lengthwise, PSI	55,000	55,000	55,000	23,000	25,000	15,000	13,500	17,000	15,000
•Crosswise, PSI	45,000	45,000	35,000	20,000	22,000	14,000	11,800	15,000	13,750
Modulus of Elasticity in Flex	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Lengthwise, PSI	2,700,000	2,700,000	2,500,000	1,400,000	1,800,000	1,400,000	1,300,000	950,000	1,050,000
•Crosswise, PSI	2,200,000	2,200,000	2,000,000	1,200,000	1,300,000	1,100,000	1,000,000	850,000	850,000
Shear Strength, PSI	19,000	19,000	20,000	17,000	12,000	11,000	10,000	11,500	11,750
Izod Impact	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Flatwise, ft lb per inch of notch	7	7	12	8.5	4	1.3	1	3.2, 2.3	2.5, 1.8
•Edgewise, ft lb per inch of notch	5.5	5.5	8	7.5	0.5	0.35	0.35	1.9, 1.4	1.1, 1
Rockwell Hardness (M Scale)	110	110	120	100	110	105	110	104	105
Specific Gravity	1.82	1.82	1.9	1.68	1.36	1.34	1.32	1.35	1.34
Coefficient of Thermal Expansion	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•cm/cm/ deg C x 10 -5	0.9	0.9	1	1	6	2	1.4	2	2
Water Absorption	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•.062" Thick, % per 24 hrs	0.25	0.25	0.8	0.3	6	2	1.4	2.2	2.5
•.125" Thick, % per 24 hrs	0.15	0.15	0.7	0.2	3.3	1.3	0.95	1.6	1.6
•.500" Thick, % per 24 hrs	0.1	0.1	0.4	0.15	1.1	0.55	0.45	0.75	0.7
Dielectric Strength, volt/mil	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Perpendicular to Laminations; short									
•.062" Thick	500	500	400	400	700	700	650	200/500	200/500
•.125" Thick	400	400	350	350	500	500	470	150/360	150/360
Dissipation Factor	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Condition A, 1 megacycle	0.025	0.025	0.017	0.003	0.06	0.045	0.038	.1, .055	.1, .055
Dielectric Constant	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Condition A, 1 megacycle	5.2	5.2	7.12	4.2	6	5.5	5.3	5.8	5.8
Insulation Resistance	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•Condition, 96 hrs at 90% relative humidity (in mega ohms)	200,000	200,000	10,000	200,000	-	-	-	-	-
Flame Resistance									
•Underwriter Labs, Classification	94V-O	94V-O	94V-O	94V-O	94HB	94HB	94HB	94HB	94HB
Bond Strength, in lbs	2,000	16,000	1,700	650	700	800	950	1,800	1,600
Maximum Continuous Operating Temperature	G10 FR4	G11 FR5	G9	G7	X	XX	XXX	C/CE	L/LE
•All Phenolics can withstand -100F	285°F	300°F	285°F	465°F	285°F	285°F	285°F	265°F	265°F