



Global Thermoset Composite Solutions

Sheet Products - Property Comparison

			MC223	NP310	NP310BW	NP310E
			Cotton (Canvas)			
			Phenolic			
PHYSICAL PROPERTIES						
Specific Gravity (0.500")		-	1.44	1.37	1.47	1.37
Rockwell Hardness (0.250" Build-up)		M Scale	105	100	100	100
Moisture Absorption (0.062")	Condition D ₁ -24/23	%	1.20	3.50	2.50	2.00
Flexural Strength (0.062")	Condition A Lengthwise / Crosswise	psi	18,000 / --	18,000 / 17,000	-- / --	17,500 / 15,000
	Condition E-1/150 T150 Lengthwise / Crosswise		-- / --	-- / --	-- / --	-- / --
Flexural Modulus (0.062")	Lengthwise / Crosswise	kpsi	-- / --	1,600 / 1,500	-- / --	1,600 / 1,500
Tensile Strength (0.125")	Lengthwise / Crosswise	psi	12,000 / --	12,000 / 9,700	43,000 / --	11,000 / 9,000
Izod Impact Strength (0.500")	Condition E-48/50 Lengthwise / Crosswise	ft-lb/in (notched)	2.00 / 1.20	3.10 / 2.70	-- / --	1.70 / 1.50
Compressive Strength (0.500")	Flatwise	psi	38,000	34,000	43,000	34,000
Bonding Strength (0.500")	Condition A	lb	1,700	2,500	1,200	2,500
	Condition D-48/50		--	2,300	--	2,100
Shear Strength (0.062")	Perpendicular	psi	13,000	14,000	--	14,000
THERMAL PROPERTIES						
Temperature Index ¹	Electrical / Mechanical	°C	115 / 125	115 / 125	-- / 150	115 / 125
Coefficient of Thermal Expansion (0.125")	X-axis / Y-axis	"/"°Cx10 ⁻⁶	-- / --	20.0 / 22.0	-- / --	20.0 / 22.0
Flammability Rating U.L. 94 (0.062")	Condition A	Class	HB	HB	HB	HB
ELECTRICAL PROPERTIES						
Dissipation Factor (0.062")	Condition D ₁ -24/23	-	--	--	--	--
Permittivity (0.062")	Condition D ₁ -24/23	-	--	--	--	--
Breakdown Voltage (0.062")	Condition A	kV	--	20	--	40
	Condition D-48/50		--	5	--	3
Electric Strength (0.062")	Condition A	V/mil	--	400	--	550
	Condition D-48/50		--	150	--	300
Arc Resistance D495 (0.125")	Condition A	sec	--	15	--	15
Comparative Tracking Index D3638 (0.125")		V	--	155	--	--

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NOTE b: All testing per ASTM D348 unless otherwise noted.

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Sheet Products - Property Comparison

			NP310HT	NP310U	NP313	NP313HT
			Cotton (Canvas)			
			Phenolic		Phenolic - MoS2	
PHYSICAL PROPERTIES						
Specific Gravity (0.500")		-	1.37	1.35	1.40	1.40
Rockwell Hardness (0.250" Build-up)		M Scale	100	100	100	100
Moisture Absorption (0.062")	Condition D ₁ -24/23	%	3.40	2.00	1.95	--
Flexural Strength (0.062")	Condition A Lengthwise / Crosswise	psi	18,000 / 18,000	23,000 / 13,500	19,000 / 17,000	-- / --
	Condition E-1/150 T150 Lengthwise / Crosswise		-- / --	-- / --	-- / --	-- / --
Flexural Modulus (0.062")	Lengthwise / Crosswise	kpsi	2,500 / 2,400	900 / 1,000	1,200 / 1,000	-- / --
Tensile Strength (0.125")	Lengthwise / Crosswise	psi	-- / --	7,500 / 6,000	11,000 / 9,000	16,000 / 9,000
Izod Impact Strength (0.500")	Condition E-48/50 Lengthwise / Crosswise	ft-lb/in (notched)	2.35 / 2.02	1.50 / 1.00	1.70 / 1.40	3.50 / 2.70
Compressive Strength (0.500")	Flatwise	psi	35,000	28,000	36,000	49,000
Bonding Strength (0.500")	Condition A	lb	2,700	1,900	1,900	2,300
	Condition D-48/50		2,400	--	--	--
Shear Strength (0.062")	Perpendicular	psi	--	13,000	13,500	--
THERMAL PROPERTIES						
Temperature Index ¹	Electrical / Mechanical	°C	-- / 145	125 / 125	-- / 145	-- / 145
Coefficient of Thermal Expansion (0.125")	X-axis / Y-axis	"/"°Cx10 ⁻⁶	-- / --	20.0 / 22.0	18.0 / 24.0	10.0 / 15.0
Flammability Rating U.L. 94 (0.062")	Condition A	Class	HB	HB	HB	HB
ELECTRICAL PROPERTIES						
Dissipation Factor (0.062")	Condition D ₁ -24/23	-	--	--	--	--
Permittivity (0.062")	Condition D ₁ -24/23	-	--	--	--	--
Breakdown Voltage (0.062")	Condition A	kV	55	50	--	--
	Condition D-48/50		--	3	--	--
Electric Strength (0.062")	Condition A	V/mil	527	550	--	--
	Condition D-48/50		--	300	--	--
Arc Resistance D495 (0.125")	Condition A	sec	--	15	--	--
Comparative Tracking Index D3638 (0.125")		V	--	150	--	--

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Global Thermoset Composite Solutions

Sheet Products - Property Comparison

			NP315	NP318	NP319
			Cotton (Canvas)		
			Phenolic - Graphite	Phenolic	Phenolic - Graphite
PHYSICAL PROPERTIES					
Specific Gravity (0.500")		-	1.40	1.35	1.41
Rockwell Hardness (0.250" Build-up)		M Scale	90	90	100
Moisture Absorption (0.062")	Condition D ₁ -24/23	%	2.20	4.20	2.50
Flexural Strength (0.062")	Condition A Lengthwise / Crosswise	psi	19,000 / 15,000	17,000 / 14,000	20,000 / 18,000
	Condition E-1/150 T150 Lengthwise / Crosswise		-- / --	-- / --	-- / --
Flexural Modulus (0.062")	Lengthwise / Crosswise	kpsi	1,200 / 1,000	1,100 / 900	1,300 / 1,000
Tensile Strength (0.125")	Lengthwise / Crosswise	psi	10,000 / 7,000	10,000 / 6,000	11,000 / 9,000
Izod Impact Strength (0.500")	Condition E-48/50 Lengthwise / Crosswise	ft-lb/in (notched)	1.70 / 1.40	2.50 / 2.00	-- / --
Compressive Strength (0.500")	Flatwise	psi	38,000	25,000	36,000
Bonding Strength (0.500")	Condition A	lb	1,800	1,800	2,000
	Condition D-48/50		--	--	--
Shear Strength (0.062")	Perpendicular	psi	13,000	12,000	13,000
THERMAL PROPERTIES					
Temperature Index ¹	Electrical / Mechanical	°C	-- / 125	125 / 125	-- / 145
Coefficient of Thermal Expansion (0.125")	X-axis / Y-axis	"/"/°Cx10 ⁻⁶	18.0 / 24.0	-- / --	18.0 / 22.0
Flammability Rating U.L. 94 (0.062")	Condition A	Class	HB	HB	HB
ELECTRICAL PROPERTIES					
Dissipation Factor (0.062")	Condition D ₁ -24/23	-	--	--	--
Permittivity (0.062")	Condition D ₁ -24/23	-	--	--	--
Breakdown Voltage (0.062")	Condition A	kV	--	65	--
	Condition D-48/50		--	4	--
Electric Strength (0.062")	Condition A	V/mil	--	480	--
	Condition D-48/50		--	350	--
Arc Resistance D495 (0.125")	Condition A	sec	--	10	--
Comparative Tracking Index D3638 (0.125")		V	--	150	--

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Global Thermoset Composite Solutions

Sheet Products - Property Comparison

			MC320LE	NP320	NP320E	NP320U
			Cotton (Fine Weave Linen)			
			Phenolic			
PHYSICAL PROPERTIES						
Specific Gravity (0.500")		-	1.38	1.34	1.34	1.34
Rockwell Hardness (0.250" Build-up)		M Scale	102	100	100	95
Moisture Absorption (0.062")	Condition D ₁ -24/23	%	0.87	2.30	1.90	3.00
Flexural Strength (0.062")	Condition A Lengthwise / Crosswise	psi	24,000 / --	24,500 / 18,500	22,000 / 16,000	19,000 / 13,500
	Condition E-1/150 T150 Lengthwise / Crosswise		-- / --	-- / --	-- / --	-- / --
Flexural Modulus (0.062")	Lengthwise / Crosswise	kpsi	-- / --	1,700 / 1,300	1,600 / 1,200	1,500 / 1,100
Tensile Strength (0.125")	Lengthwise / Crosswise	psi	18,800 / --	14,000 / 10,000	13,000 / 9,000	13,000 / 9,000
Izod Impact Strength (0.500")	Condition E-48/50 Lengthwise / Crosswise	ft-lb/in (notched)	2.00 / 1.70	1.70 / 1.35	1.35 / 1.10	1.10 / 0.86
Compressive Strength (0.500")	Flatwise	psi	38,000	38,000	36,000	30,000
Bonding Strength (0.500")	Condition A	lb	1,700	2,000	1,900	1,700
	Condition D-48/50		--	--	--	--
Shear Strength (0.062")	Perpendicular	psi	14,000	13,500	13,500	12,000
THERMAL PROPERTIES						
Temperature Index ¹	Electrical / Mechanical	°C	115 / 125	115 / 125	125 / 125	115 / 125
Coefficient of Thermal Expansion (0.125")	X-axis / Y-axis	"/"°Cx10 ⁻⁶	-- / --	18.0 / 19.0	18.0 / 19.0	20.0 / 22.0
Flammability Rating U.L. 94 (0.062")	Condition A	Class	HB	HB	HB	HB
ELECTRICAL PROPERTIES						
Dissipation Factor (0.062")	Condition D ₁ -24/23	-	0.044	0.070	0.065	0.054
Permittivity (0.062")	Condition D ₁ -24/23	-	5.30	5.80	5.50	6.60
Breakdown Voltage (0.062")	Condition A	kV	70	45	50	50
	Condition D-48/50		--	2	5	5
Electric Strength (0.062")	Condition A	V/mil	--	575	625	625
	Condition D-48/50		--	450	500	500
Arc Resistance D495 (0.125")	Condition A	sec	130	15	15	15
Comparative Tracking Index D3638 (0.125")		V	--	170	170	170

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Sheet Products - Property Comparison

			NP322	NP324	NP324FR	NP325
			Cotton (Fine Weave Linen)			
			Phenolic - MoS2	Phenolic-PTFE	Phenolic-PTFE	Phenolic - Graphite
PHYSICAL PROPERTIES						
Specific Gravity (0.500")		-	1.39	--	--	1.39
Rockwell Hardness (0.250" Build-up)		M Scale	103	--	--	100
Moisture Absorption (0.062")	Condition D ₁ -24/23	%	2.40	1.19	1.51	1.50
Flexural Strength (0.062")	Condition A Lengthwise / Crosswise	psi	23,800 / 18,000	22,000 / 21,500	25,000 / 21,000	20,100 / 19,200
	Condition E-1/150 T150 Lengthwise / Crosswise		-- / --	-- / --	-- / --	-- / --
Flexural Modulus (0.062")	Lengthwise / Crosswise	kpsi	1,500 / 1,100	-- / --	-- / --	1,500 / 1,100
Tensile Strength (0.125")	Lengthwise / Crosswise	psi	14,000 / 9,700	-- / --	-- / --	13,500 / 9,500
Izod Impact Strength (0.500")	Condition E-48/50 Lengthwise / Crosswise	ft-lb/in (notched)	1.60 / 1.30	1.96 / 1.46	2.20 / 2.00	1.42 / 1.35
Compressive Strength (0.500")	Flatwise	psi	39,000	--	--	35,000
Bonding Strength (0.500")	Condition A	lb	1,900	1,370	1,230	1,900
	Condition D-48/50		--	1,250	1,150	--
Shear Strength (0.062")	Perpendicular	psi	14,500	--	--	14,500
THERMAL PROPERTIES						
Temperature Index ¹	Electrical / Mechanical	°C	130 / 130	-- / --	-- / --	-- / 125
Coefficient of Thermal Expansion (0.125")	X-axis / Y-axis	"/"/°Cx10 ⁻⁶	10.0 / 12.0	-- / --	-- / --	10.0 / 12.0
Flammability Rating U.L. 94 (0.062")	Condition A	Class	HB	HB	HB	HB
ELECTRICAL PROPERTIES						
Dissipation Factor (0.062")	Condition D ₁ -24/23	-	--	--	--	--
Permittivity (0.062")	Condition D ₁ -24/23	-	--	--	--	--
Breakdown Voltage (0.062")	Condition A	kV	30	25	60	--
	Condition D-48/50		5	--	--	--
Electric Strength (0.062")	Condition A	V/mil	--	--	--	--
	Condition D-48/50		--	--	--	--
Arc Resistance D495 (0.125")	Condition A	sec	--	--	--	--
Comparative Tracking Index D3638 (0.125")		V	--	--	--	--

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Sheet Products - Property Comparison

			NP329	NP342	NP342LS
			Cotton (Fine Weave Linen)		
			Melamine	Phenolic	
PHYSICAL PROPERTIES					
Specific Gravity (0.500")		-	1.47	1.35	1.35
Rockwell Hardness (0.250" Build-up)		M Scale	110	100	100
Moisture Absorption (0.062")	Condition D ₁ -24/23	%	1.80	1.80	--
Flexural Strength (0.062")	Condition A Lengthwise / Crosswise	psi	29,000 / 26,000	25,000 / 22,700	-- / -
	Condition E-1/150 T150 Lengthwise / Crosswise		-- / --	-- / --	-- / --
Flexural Modulus (0.062")	Lengthwise / Crosswise	kpsi	1,800 / 1,400	1,700 / 1,300	-- / --
Tensile Strength (0.125")	Lengthwise / Crosswise	psi	16,000 / 9,700	12,700 / 10,900	-- / --
Izod Impact Strength (0.500")	Condition E-48/50 Lengthwise / Crosswise	ft-lb/in (notched)	1.90 / 1.75	1.60 / 1.40	-- / --
Compressive Strength (0.500")	Flatwise	psi	34,000	35,000	37,000
Bonding Strength (0.500")	Condition A	lb	1,900	1,900	--
	Condition D-48/50		--	--	1,250
Shear Strength (0.062")	Perpendicular	psi	13,000	14,000	--
THERMAL PROPERTIES					
Temperature Index ¹	Electrical / Mechanical	°C	-- / 130	-- / 125	125 / 125
Coefficient of Thermal Expansion (0.125")	X-axis / Y-axis	"/"/°C x 10 ⁻⁶	18.0 / 19.0	20.0 / 22.0	-- / --
Flammability Rating U.L. 94 (0.062")	Condition A	Class	HB	HB	HB
ELECTRICAL PROPERTIES					
Dissipation Factor (0.062")	Condition D ₁ -24/23	-	0.050	--	--
Permittivity (0.062")	Condition D ₁ -24/23	-	7.00	--	--
Breakdown Voltage (0.062")	Condition A	kV	20	40	--
	Condition D-48/50		5	3	--
Electric Strength (0.062")	Condition A	V/mil	500	550	--
	Condition D-48/50		300	300	--
Arc Resistance D495 (0.125")	Condition A	sec	120	--	--
Comparative Tracking Index D3638 (0.125")		V	200	--	--

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