N9000

PTFE Laminates and Bonding Films

Manufactured at Neltec®, the N9000 PTFE laminate system is the next generation material system designed for critical microwave components, antennas, power amplifiers and subassemblies. Extensive R&D capability has produced passive intermodulation performance up to 25% better than other non-woven or woven PTFE laminates currently available. Foil adhesion is 50-100% greater than competitive glass reinforced PTFE laminates and 200-300% greater than ceramic loaded PTFE laminates on the market today. Superior mechanical and electrical performance make the N9000 PTFE laminate system the material of choice for your lowest loss, high frequency applications.

Product Application Environments

Application	NY	NX	NH	IM
Automotive Applications	◆	◆	◆	
Wireless Communications		◆	◆	
Cellular Base Station Antennas	◆	◆	◆	◆
Dual Band Hi Power Passive Circuits	◆	◆	◆	◆
High Speed Computing			◆	
Digital/Microwave Hybrid Multilayer PCB Assemblies	◆	◆	◆	
Millimeter Wave Components	◆	◆		
Power Amplifiers	◆	◆	◆	
Telecommunications	◆	◆	◆	

The N9000 PTFE laminate system is designed for critical microwave components and antennas in commercial, consumer and military applications. Neltec's woven laminate technology offers superior dimensional stability when compared to non-woven PTFE laminates. Reduced dimensional movement means double and triple etching are not necessary for precision circuit etching.

Neltec is the first company to offer a reinforced PTFE laminate with a dielectric constant less than 2.17 and a loss tangent less than .0009 at 10 GHz (N9208) for very low loss antenna applications. Additionally, the enhanced N9000 IM™ materials reduce passive intermodulation issues in antenna and high power designs. The N9000 IM™ materials offer two-tone passive intermodulation performance of typically -155 dBc which is 8-20 Db lower than other PTFE materials currently available.

The N9000 laminate system offers superior solvent absorption resistance compared to ceramic-loaded PTFE. There are no dielectric constant changes in the N9000 due to solvent absorption issues and no additional baking cycles are needed during processing.

Neltec offers all N9000 materials in sheets up to 80 inches long (2.03 meters). Neltec's PTFE expertise coupled with our global manufacturing capability make the N9000 system the PTFE material of choice for demanding microwave applications.

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Neltec Europe SAS (33) 380-10-10-00
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N9000 Series - Typical Engineering Values

Typical Parameter	Test Method	9208	9217	9220	9233	9240	9245
		NY SERIES					
Dielectric Constant at 10 GHz (Dk)	IPC-TM-650, 2.5.5.5	2.08±.02	2.17±.02	2.20±.02	2.33±.02	2.40±.04	2.45±.04
Dissipation Factor at 10 GHz (Df)	IPC-TM-650, 2.5.5.5	0.0006	0.0008	0.0009	0.0011	0.0016	0.0016
Passive Intermodulation Formulation Availability		Yes					
Passive Intermodulation Performance		-155 dBc					
Dielectric Breakdown	IPC-TM-650, 2.5.6	50kV					
Volume Resistivity	IPC-TM-650, 2.5.17	10^9 M /cm					
Surface Resistivity	IPC-TM-650, 2.5.17	10^7 M					
Arc Resistance	ASTM D-495	180 sec.					
Flexural Strength Lengthwise	IPC-TM-650, 2.4.4	82.7 MPa					
Flexural Strength Crosswise	IPC-TM-650, 2.4.4	68.9 MPa					
Copper Peel Strength	IPC-TM-650, 2.4.8	2.33 kN/m					
18, 35, and 70μm copper (1/2 oz, 1 oz, and 2 oz copper)							
After Thermal Shock (30 sec. at 260°C)		2.31 kN/m					
Moisture Absorption	IPC-TM-650, 2.6.2.1	0.02%					
Specific Gravity	ASTM D-792, A	2.23 g/cm^3					
Thermal Conductivity	ASTM E-1225	0.272 W/m/K					
Coefficient of Thermal Expansion (CTE)	IPC-TM-650, 2.4.41						
X		25 ppm/°C					
Y		35 ppm/°C					
Z		260 ppm/°C					
Flammability	IPC-TM-650, 2.3.10	V-0					

For non-standard dielectric constants, please contact the factory or your local Neltec representative.

Available Laminate Thicknesses

Series	Product	0.005 0.127	0.010 0.254	0.015 0.381	0.020 0.508	0.030 0.762	0.031 0.787	0.045 1.143	0.060 1.524	0.062 1.575	0.125 3.175
NY	9208					**X**			**X**		S
NY	9217	S	S	S	S	S	S	S	S	S	S
NY	9220	**X**	**X**	**X**	**X**	S	**X**	S	S	**X**	S
NY	9233	**X**	**X**	**X**	**X**	S	**X**	S	S	**X**	S
NX	9240	S	S	S	S	S	S	S	S	S	S
NX	9245	S	S	S	S	S	S	S	S	S	S
NX	9250	S	S	S	**X**	**X**	**X**	S	S	**X**	S
NX	9255	S	S	S	**X**	**X**	**X**	S	S	**X**	S
NX	9260	S	S	S	**X**	**X**	**X**	S	S	**X**	S
NH	9294	**X**	**X**	S							
NX	9294				**X**	**X**	S	S	**X**	S	S
NH	9300	S	**X**	S							
NX	9300				**X**	**X**	S	S	**X**	S	S
NH	9320	S	S	S	S						
NX	9320					S	**X**	S	S	**X**	S
NH	9338	**X**	**X**	S	**X**	**X**	S	S	**X**	S	S
NH	9348	**X**	**X**	S	**X**	**X**	S	S	**X**	S	S
NH	9350		S	S	S	S	S	S	S		S

inches
mm

Constructions

NY: PTFE/woven-glass composite. Low glass:PTFE ratio for lowest loss applications.

NX: PTFE/woven-glass composite. Medium glass:PTFE ratio for increased mechanical strength.

NH: PTFE/woven-glass/ceramic composite. Medium glass:PTFE ratio with ceramic added for thermal stability and Dk uniformity at higher Dks.

X - indicates the material is available with expedited delivery or a stocking program is available

S - indicates the material is avaiable with standard delivery and normal leadtimes.

9250	9255	9260	9294	9300	9320	9294	9300	9320	9338	9348	9350
NX SERIES						NH SERIES					
2.50±.04	2.55±.04	2.60±.04	2.94±.04	3.00±.04	3.20±.04	2.94±.07	3.00±.07	3.20±.07	3.38±.10	3.48±.10	3.50±.10
0.0017	0.0018	0.0019	0.0022	0.0023	0.0024	0.0022	0.0023	0.0024	0.0025	0.0030	0.0030
Yes						Yes					
-155 dBc						-155 dBc					
50kV						45kV					
10^8 M /cm						10^8 M /cm					
10^7 M						10^7 M					
180 sec.						180 sec.					
158.6 MPa						158.6 MPa					
131.0 MPa						131.0 MPa					
2.33 kN/m						2.33 kN/m					
2.31 kN/m						2.31 kN/m					
0.05%						0.08%					
2.25 g/cm^3						2.459 g/cm^3					
0.251 W/m/K						0.230 W/m/K					
12 ppm/°C						9 ppm/°C					
18 ppm/°C						12 ppm/°C					
150 ppm/°C						71 ppm/°C					
V-0						V-0					

Ordering Information

Please specify the product and/or Dk, material thickness, copper thickness, copper type, and panel size. Request Passive Intermodulation Formulation when necessary for antenna applications.

Example: 9220, .010" thick, 1 oz two sides, ED copper, 12"x18" or Dk=2.20, .010" thick, 1 oz copper two sides, ED copper, 12"x18". For Passive Intermodulation Formulation material, add the IM suffix, i.e.: 9220IM.

Cladding - Copper Foil

Foil Thickness			Copper Type	
Foil Weight	Microns	inches	Electro-Deposited (ED)	Rolled-Annealed
.25 oz	9	0.00034	CQ	ˇ
.33 oz	12	0.00045	CT	ˇ
.50 oz	18	0.00067	CH	MH
1 oz	35	0.00134	C1	M1
2 oz	70	0.00268	C2	ˇ

Other copper foils are available by special order request. Please contact your Neltec representative for details.

Cladding - Heavy Backed Metal

Plate Thickness		Plate Material		
mm	inches	Aluminum	Copper	Brass
0.800	0.032	X	X	X
1.000	0.039	X	X	X
1.200	0.047	X	X	X
1.500	0.059	X	X	X
1.575	0.062	X	X	X
2.000	0.079	X	X	X
2.362	0.093	X	X	X
2.500	0.098	X	X	X
3.000	0.118	X	X	X
3.175	0.125	X	X	X
4.000	0.157	X	X	X
4.750	0.187	X	X	X
5.000	0.197	X	X	X
6.000	0.236	X	X	X
6.350	0.250	X	X	X
7.000	0.276	X	X	X
8.000	0.315	X	X	X

Neltec's Controlled RF Materials

N4350-13 RF Controlled Dk/Df Modified Epoxy
Dk 3.50 / Df 0.0070

N4380-13 RF Controlled Dk/Df Modified Epoxy
Dk 3.80 / Df 0.0065

N9000-13 RF PTFE and Epoxy Composite
Dk 3.00 / Df 0.0040
Dk 3.20 / Df 0.0045
Dk 3.38 / Df 0.0046
Dk 3.50 / Df 0.0055

NH9000 Woven, Glass / Ceramic Loaded PTFE
Dk 2.94 - 3.50 / Df 0.0022 - 0.0030

NX9000 Woven Glass Reinforced PTFE
Dk 2.40 - 3.20 / Df 0.0016 - 0.0024

NY9000 Woven Glass Reinforced PTFE
Dk 2.08 - 2.33 / Df 0.0006 - 0.0011

Controlled RF Materials Application Comparison

Application	NY9000	NX9000	NH9000	IM	N4380-13 RF	N9000-13 RF
Automotive Applications	◆	◆	◆		◆	◆
Wireless Communications		◆	◆		◆	◆
Cellular Base Station Antennas	◆	◆	◆	◆		
802.11 a, b and g Antennas					◆	◆
Dual Band Hi Power Passive Circuits	◆	◆	◆	◆		
High Speed Computing			◆		◆	◆
Digital/Microwave Hybrid Multilayer PCB Assemblies	◆	◆	◆		◆	◆
Millimeter Wave Components	◆	◆				
Power Amplifiers	◆	◆	◆		◆	◆
LNB's	◆	◆			◆	
Telecommunications	◆	◆	◆		◆	◆