

Nelco N9000

PTFE Laminates

The N9000 PTFE laminate system is designed for critical microwave components, antennas, power amplifiers and subassemblies. Superior mechanical and electrical performance make the N9000 PTFE laminate system the material of choice for your lowest loss, high frequency applications.

Key Features

Complete spectrum of controlled dielectric constants

- Dk of 2.08 through Dk of 4.50
- The first reinforced PTFE laminate with a dielectric constant less than 2.17 for very low loss antenna designs
- Available in sheets up to 80 inches long (2.03 meters) by 48 inches wide (1.22 meters)

Enhanced N9000 IM materials available

- Enables reduced passive intermodulation in antenna and high power designs - up to up to 25% better than other PTFE laminates available
- Offers two-tone passive intermodulation performance of less than -155 dBc which is typically 8-20 Db lower than other PTFE materials available.

Consistent Quality

- Statistic Process Control "SPC" methods provide consistent dielectric values from sheet to sheet and lot to lot
- Nelco facilities are ISO 9001:2000 quality certified and comply to ISO 14001:2004 environmental regulations
- Meets UL 94V-0 specifications
- All Nelco materials are RoHS compliant.

Optimized N9000 PTFE processing

- Foil adhesion is 50-100% greater than competitive glass reinforced PTFE laminates and 200-300% greater than other ceramic loaded hydrocarbon laminates.
- Superior solvent absorption resistance compared to ceramic-loaded PTFE.
- Reduced dielectric constant changes due to solvent absorption and no additional baking cycles are needed during processing



Applications

- Cellular Base Station Antennas
- Wireless Communications
- Power Amplifiers
- Dual Band Hi Power Passive Circuits
- Automotive Applications
- Digital/Microwave Hybrid Multilayer PCB Assemblies
- Millimeter Wave Components
- Telecommunications

Global Availability

Nelco RF and microwave materials are available worldwide. Contact us at the numbers below or visit our website for more information.

Neltec, Arizona	+1.480.967.5600
Nelco, Asia Pacific	+65.6861.7117
Neltec, SA	+33.562.98.52.90
www.parkelectro.com	info@parkelectro.com

Park's UL file number: E36295

Nelco N9000 Series - Typical Engineering Values

Typical Parameter	Test Method	9208	9217	9220	9233	9240	9245	9250	9255	9260
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	2.50±.04	2.55±.04	2.60±.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	0.0017	0.0018	0.0019
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)		2.31 kN/m								
After Thermal Shock (30 sec. at 260°C)		0.02%								
Moisture Absorption	IPC-TM-650, 2.6.2.1	2.23 g / cm ³								
Specific Gravity	ASTM D-792, A	0.272 W / m / K								
Thermal Conductivity	ASTM E-1225	25 ppm / °C								
Coefficient of Thermal Expansion (CTE)	IPC-TM-650, 2.4.41	35 ppm / °C								
X		260 ppm / °C								
Y		V-0								
Z										
Flammability	IPC-TM-650, 2.3.10									

Cladding - Copper Foil

Foil Weight	Foil Thickness	Copper Type
.25 oz	9 Microns	Electro-Deposited (ED)
.33 oz	12 Microns	CQ
.50 oz	18 Microns	CT
1 oz	35 Microns	CH RH
2 oz	70 Microns	C1 R1
		C2 R2

Cladding - Heavy Backed Metal

Plate Thickness	Plate Thickness	Plate Thickness
mm	inches	mm
inches	mm	inches
0.800	0.032	2.362
1.000	0.039	2.500
1.200	0.047	3.000
1.500	0.059	3.175
1.575	0.062	4.000
2.000	0.079	4.750
		0.187
		0.197
		0.236
		0.250
		0.276
		0.315

Heavy cladding plate material available in aluminum or brass for all NY and NX constructions.
Rolled annealed available upon request.

Nelco N9000 Series - Typical Engineering Values

Typical Parameter	9270	9294	9300	9320	9294	9300	9320	9338	9348	9350	9410	9450
Dielectric Constant at 10 GHz (Dk)	2.70±.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	4.10±.10	4.50±.10
Dissipation Factor at 10 GHz (Df)	0.0020	0.0022	0.0023	0.0024	0.0022	0.0023	0.0024	0.0025	0.0030	0.0030	0.0030	0.0030
PIM Formulation Availability	Yes											
Passive Intermodulation Performance	-155 dBc											
Dielectric Breakdown	50kV											
Volume Resistivity	10 ⁹ M / cm											
Surface Resistivity	10 ⁷ M											
Arc Resistance	180 sec.											
Flexural Strength Lengthwise	82.7 MPa											
Flexural Strength Crosswise	68.9 MPa											
Copper Peel Strength - 18, 35, 70 μm (1/2 oz, 1 oz, and 2 oz copper)	2.33 kN/m											
After Thermal Shock (30 sec. at 260°C)	2.31 kN/m											
Moisture Absorption	0.02%											
Specific Gravity	2.23 g/cm ³											
Thermal Conductivity	0.272 W/m/K											
Coefficient of Thermal Expansion (CTE)	25 ppm/°C											
X	35 ppm/°C											
Y	260 ppm/°C											
Z	V-0											
Flammability	V-0											

For non-standard dielectric constants or additional copper foil options, please contact the factory or your local Nelco representative.

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.

Nelco RF / Microwave Circuitry Materials

Nelco's RF and Microwave Materials

N4350-13 RF Controlled Dk/Df Modified Epoxy
Dk 3.50 / Df 0.0065 at 10 GHz

NH9000 Woven, Glass / Ceramic Loaded PTFE
Dk 2.94 - 4.50 / Df 0.0022 - 0.0030

N4380-13 RF Controlled Dk/Df Modified Epoxy
Dk 3.80 / Df 0.0070 at 10 GHz

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

N9000-13 RF PTFE and Epoxy Composite
Dk 3.00 / Df 0.0040 at 10 GHz
Dk 3.20 / Df 0.0045 at 10 GHz
Dk 3.38 / Df 0.0046 at 10 GHz
Dk 3.50 / Df 0.0055 at 10 GHz

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

Above values at 10 GHz

Nelco N9000 Material - Standard Laminate Thicknesses

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

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.

Park Electrochemical Corp. is a global advanced materials company which develops and manufactures high-technology digital and RF/microwave printed circuit materials and advanced composite materials. The company operates under the Nelco® and Nelcote™ names.

All test data provided are typical values and not intended to be specification values. For review of critical specification tolerances, please contact a Nelco representative directly. Nelco reserves the right to change these typical values as a natural process of refining our testing equipment and techniques.

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*CAF resistance has been established to greater than 500 hours using a specific OEM coupon design and test procedure. For details on this or other CAF tests, please visit www.parkelectro.com.

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