How to use the Pocket Guide

The "Pocket Guide 2000 to European Products and Services" is designed to provide the printed circuit board designer and fabricator with a quick first reference for the selection of a product or service available from Nelco/Dielektra in Europe.
Further information can be obtained by contacting the nearest location (see back page) or visiting:

www.parknelco.com

Users have the option of being a Web Customer by following the instructions contained in the web site.

Laminate Manufacturing Processes

Nelco/Dielektra has two laminate press system technologies available, they are:

- "State of the Art" conventional hydraulic, vacuum presses at all three European facilities.
  At all locations, pre-press operations are carried out in a clean room environment.
- Nelco/Dielektra Advanced Technology Lamination (DATLAM) is the patented continuous lamination process. DATLAM laminates are manufactured direct from B-stage and copper foil rolls, eliminating pre-lamination handling. Trimming and paneling can be carried out in line, greatly reducing post lamination handling.
  Standard laminate widths include:
  Check with the nearest Nelco-Dielektra location for standard available widths.

Special features of this process include:

- Superior laminate surface.
- Low core thickness variation over the full net laminate area.
- Single ply laminate nominal thickness distribution of typically better than CPK 1.4.
- Clad and unclad laminates to 0.150 mm (0.006") core thickness can be delivered in roll form.
- Flexibility of panel size in the machine direction.

All locations offer a range of fabrication services that include:

- automated and semi automated paneling, edge milling, laminate corner rounding (Cologne and Skelmersdale), ink or impression stamping, post baking and vacuum packaging.

European Product Offering

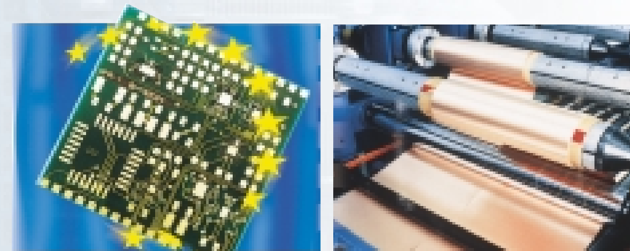
At the core of the European product offering are a variety of resin systems and reinforcements engineered to give optimal performance in a range of applications. All products meet or exceed the relevant industry specifications. UL ratings for all products can be found under File number 169552 in the UL listing book.
The following is a basic description of the grades available:

N4000-2	Standard multifunctional epoxy system, Tg 140°C
N4000-UVB	UV blocker enhanced standard epoxy, Tg 135°C
15193 Prepreg	Nelco/Dielektra standard epoxy resin system, Tg 135°C
DATLAM	Continuously pressed laminate, Tg 140°C
N4000-50	Multifunctional epoxy, Tg 150°C
N4000-6	High Tg multifunctional epoxy system, Tg 180°C
N4000-6T	Thermount®RT™ reinforced dielectrics for microvias,Tg 160°C
N4000-7	Very Low CTE laminate, Tg 155°C
N4000-13*	High speed/low loss dielectrics epoxy, Tg 210°C
N4000-X1/X2	Chip packaging epoxy, Tg 170°C
N4905-Flexlam	Semi-Flexible E-glass reinforced epoxy laminate,Tg 125°C
N5000 BT	BT epoxy, Tg 185°C
N5000-30/32	High performance Chip Packaging BT epoxy,Tg 205°C (DMA)
N6000*	APPE low loss dielectrics, Tg 160°C (DMA)
N7000-1, -2HT	MDA free Polyimide
N7000-3	Fast curing polyimide pre-preg
N8000	Cyanate Ester, Tg 250°C
CARDLAM	Substrates for reel-to-reel chip card manufacturing, Tg 160°C
SMARTLAM	Colored thin laminates for watch prints, Tg 125°C

*N4000-13 and N6000 is available in grade SI™
(reduced DK glass for improved signal intergrity).

New

N4000-6 FC	Fast Cure High Tg epoxy (175°C)
N4000-6 FC LD™	Laser Drillable laminate and pre-preg Tg 175°C Available styles 106 (50 microns) and 1080 (75 microns), 106 (40 microns) and 1080 (60 microns)
N4000-2 EF™	Environmentally Friendly bromine free epoxy



*Note all Tg values measured per DSC unless otherwise indicated.

Standard Laminate Constructions

The following table features our recommended E-glass reinforced laminate constructions based on superior results in the field. These are valid for most of our resin systems. Applications specific constructions may be available when required.

Standard European Laminate Construction List

Thickness		Tolerance		E-Glass styles & ply count
mil	mm	mm	mm	Constructions
2	0.051	± 0.018	± 0.013	106
3	0.076	± 0.018	± 0.013	1080
4	0.101	± 0.018	± 0.013	2114
5	0.127	± 0.025	± 0.018	2114
6	0.152	± 0.025	± 0.018	2157
7	0.178	± 0.038	± 0.025	7628
8	0.203	± 0.038	± 0.025	7628
10	0.254	± 0.038	± 0.025	2 x 2157
12	0.305	± 0.038	± 0.025	2 x 2157
13	0.330	± 0.051	± 0.025	2 x 7628
14	0.356	± 0.051	± 0.038	2 x 7628
15	0.381	± 0.051	± 0.038	2 x 7628
16	0.406	± 0.051	± 0.038	2 x 7628, 1080, or
		± 0.051		2 x 7628
17	0.432	± 0.051	± 0.038	2 x 7628, 2125
18	0.457	± 0.051	± 0.038	2 x 7628, 2125
20	0.508	± 0.064	± 0.051	3 x 7628
21	0.533	± 0.064	± 0.051	3 x 7628
22	0.559	± 0.064	± 0.051	3 x 7628
23	0.584	± 0.064	± 0.051	3 x 7628
24	0.610	± 0.064	± 0.051	3 x 7628, 1080
25	0.635	± 0.064	± 0.051	3 x 7628, 2125
26	0.660	± 0.064	± 0.051	3 x 7628, 2125
27	0.686	± 0.064	± 0.051	4 x 7628
28	0.711	± 0.064	± 0.051	4 x 7628

Prepreg Bonding Materials

Woven E-Glass
Each multilayer laminate system is associated with its own set of prepreg bonding materials to ensure the widest possible relamination process window. There are a wide range of E-glass woven fabrics available and the table below features the current standard styles and typical values.
For assistance in selecting the E-glass style with the resin values best suited for your process and application contact the nearest Customer or Technical Service.

Standard

Glass Type	Pressed Thickness mm	mil
106	0.050	2.0
1080	0.066	2.5
2114	0.090	3.5
2125	0.105	4.1
2116	0.125	5.0
2157	0.15	6.0
7628	0.175	7.0

Quick Cure X-Press Prepreg
X-Press Prepreg with a Tg of 140°C is specially formulated to reduce relamination cycles up to 50%. X-Press has proven to be of great value in prototyping and sequential build applications.

Non Woven Aramid Reinforced Epoxy Prepregs

N4500-6T Thermount®RT™

N4500-6T prepregs and laminates cover a broad spectrum of applications where low CTE (8-12 ppm), extremely low surface waviness (<3 microns) and outstanding laser ablated Microvia quality are required. These prepregs are engineered to be used as outer layer dielectrics in combination with a variety of core substrates.

N4500-6T

Aramid Type	Resin Content %	Resin Flow %	Pressed Thickness* mm	mil
2.0N710	53±2	20±5	0.050	2.0
3.0N710	53±2	20±5	0.076	3.0
4.0N710	53±2	20±5	0.106	4.2

Application Specific Product Groups

BC 2000

BC 2000: Buried Capacitance 2000 is a joint patent of the Hadco Corporation and Unisys whereby the inherent capacitance of an ultra thin dielectric between a power and ground plane within a multilayer is used to eliminate most of the bypass capacitors shielding active components on a PCB. This technology offers many very interesting advantages for the system designer including improved EMI properties in assembled PCB. The special thin core laminate actually becomes an essential component in the design. Nelco/Dielektra is licensed by Hadco to manufacture 0.050 mm (2 mil) tight tolerance BC 2000 laminate in Cologne. Only double treated is used. This material can be supplied guaranteed pre-tested using an industry recognised high voltage breakdown test. Only licensed users can purchase this product.

CARDLAM/SMARTLAM

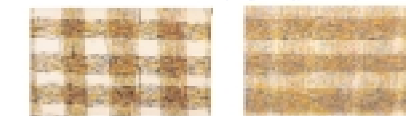
CARDLAM is copper clad or unclad DATLAM processed laminate supplied in roll form (master rolls of 1220 mm/48") featuring a Tg 160°C resin system, a micro rough surface with low waviness and isotropic E-glass reinforcement. This product has been exclusively developed as a carrier substrate for chip- and smartcard circuitry manufacturing. SMARTLAM is G10 laminate with different colour options; manufactured for the watch industry.

FLEXLAM

FLEXLAM E-glass reinforced laminates of 0.050 mm (2 mil), 0.075 mm (3 mil) and 0.125 mm (5 mil) are DATLAM processed with a modified Epoxy resin system enhancing bend radius and bend cycle characteristics in connector and bend-to-fit applications.
The engineered resin system (Tg 125°C) is compatible with standard systems, greatly simplifying PCB fabrication. Foil options include 35 and 50 micron as standard and super flex variants. FLEXLAM is available in panels and rolls (max width 1220 mm/48").

LD™ series (N4000–6FC LD™)

Laser Drillable glass is specially produced to present a more homogenous product during laser via formation. The use of a glass supported via layer (usually surface layers) will greatly improve the



Normal Glass LD Glass

dimensional stability of the printed circuit board (compared to resin coated copper) and provide a tight thickness tolerance dielectric.

European Services

Prefinished Multilayer Blanks (PMB's) (Masslam)

The Nelco/Dielektra facility in Cologne offers a comprehensive advanced PMB service for standard and impedance controlled multilayers from four to twenty-two layers in a range of finished board formats and total thickness´.
AOI inspection of all innerlayers is standard. Customer specific tooling holes are drilled using X-ray registration optimization equipment. This eliminates the need for drill file compensation by the customer. "State of the Art" CAD/CAM systems and E-mail or modem data transfer, ensure timely accurate order processing. Track and space geometry of 0.100 mm (4 mil) are standard.

LASERLAM

The LASERLAM service is a subgroup of the PMB offering featuring CO2 laser ablated single and stepped blind microvias (aspect ratio 1:1). The fabricator then completes through hole drilling, plating and finishing as usual. Three outerlayer dielectrics are available in a variety of thickness' as standard. These include high resin content fine weave E-glass, N4500-6T Thermount® RT™ dielectrics and LD™. Enhanced performance blind microvia designs combining other materials in the product range can also be made in LASERLAM.
Consult our Technical Service for further details.

Product Selection

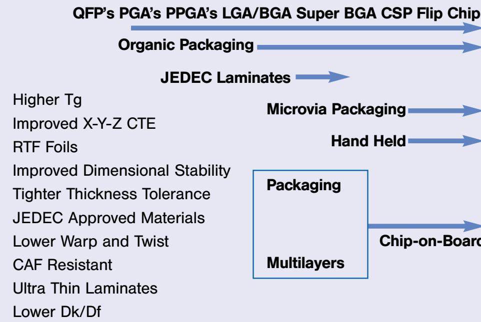
The following table is designed to guide the reader to those product groups that best fit the intended application:

Characteristic	Suitable Products
General purpose epoxy	N4000-2, N4000-50 (Tg = 150°C)
High Speed	N4000-13*, N6000*, N8000
Via hole filling/low recession	N4000-7
Halogen Free	N4000-2 EF™ (other resin systems due 2000)
Buried Capacitance	BC 2000
Higher Temperature	N7000-2HT (UL-VO Polyimide)
Chip Packaging	N5000-30/32, N4000-X1
Laser Via formation	N4500-6T, N4000-6 FC LD™
Flexible	Flexlam
High layer count back planes	N4000-6FC, N4000-7
Low CTE epoxy	N4000-7
Smartcards	SMARTLAM

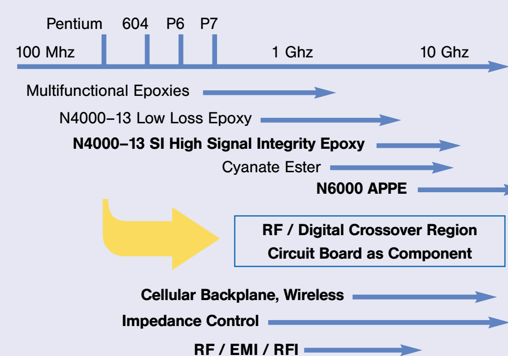
* SI glass available

The Designers´ Corner

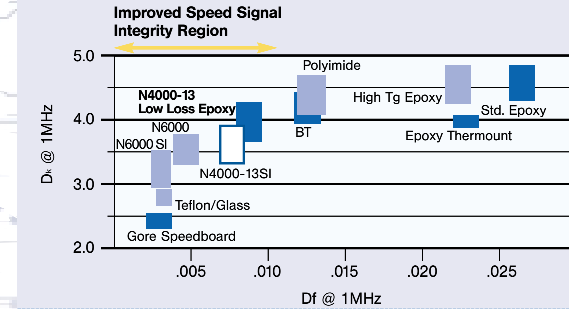
Design on silicon continues to be the key driver influencing MLPCB design and materials development. Advances in IC packaging, on board placement techniques and microvia redistribution technology open a whole new spectrum of design considerations and issues.

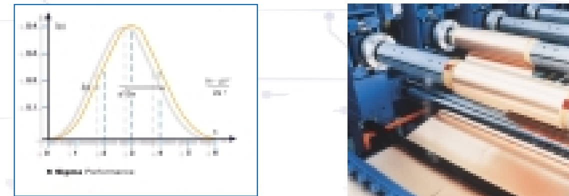


The dramatic increase in IC processor functions and signal speed require next generation dielectrics to match their performance.



Resin Chemistry and Reinforcement's impact on signal integrity.





The product range has been carefully developed to provide the attributes required in a range of design applications.

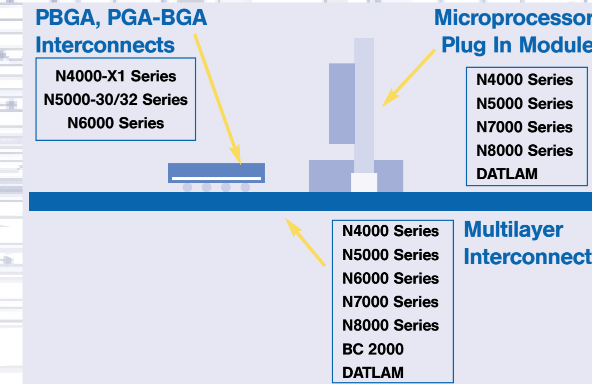
Nelco/Dielektra Product Attributes

Product	Tg (DSC)	D_k	D_f	X/Y CTE
N4000-2	140°C	4.4	.027	13-16
N4000-2EF™	135°C	4.4	.019	13-16
DATLAM	140°C	4.4	.027	12-15
BC 2000	140°C	4.4	.027	12-16
N4000-50	150°C	4.4	.025	12-15
N4000-6	180°C	4.4	.023	12-15
N4000-6FC	175°C	4.4	.023	12-15
N4000-6FC LD™	175°C	4.4	.023	12-15
N4500-6T	160°C	3.9	.024	8-12
N4000-7**	155°C	4.4	.023	11-14
N4000-13	210°C	3.9	.009	10-14
N4000-13 SI™	210°C	3.6	.008	10-14
N4000-X1	170°C	4.4	.024	10-14
N5000	185°C	4.1	.013	10-14
N5000-30/32	205°C*	4.4	.009	10-14
N6000	>160°C*	3.7	.003	10-14
N6000 SI	>160°C*	3.4	.003	10-14
N7000-1, -2HT	260°C	4.3	.013	12-15
N8000	250°C	3.8	.008	11-13
CARDLAM	160°C	4.3	.026	10-14
SMARTLAM	125°C	4.4	.027	12-16

Note: D_k @ 1MHz, 50 % resin content X/Y CTE: ppm/°C (-40 to 125°C) *Tg by DMA

**N4000-7 has special Z-axis properties and is recommended for via filling/plating.
SI™ (signal integrity) is reduced DK glass
Higher frequency values are available on request.
EF™, LD™, and SI™, are trade marks of Park-Nelco

Products for all your interconnection needs:



Nelco/Dielektra has and will continue to maintain an aggressive R&D program. With our R&D center in Cologne Germany, Nelco/Dielektra is well positioned to have the products ready that the European customer base will need to move forward.

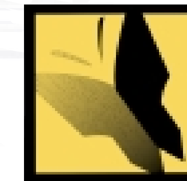
For more information contact Customer or Technical Service at the location nearest to you. We look forward to being of service.

NELCO New England Laminates (U.K.) LTD *[1]
1 Paddock Rd., W. Pimbo
Skelmersdale, Lancashire
England, WN8 9PL
++44-16 95-72 26 91 Phone
++44-16 95-5 0172 Sales-Fax

NELCO SA (FRANCE) *[1]
72 Grande Rue
21310 Mirebeau-Sur-Bèze
++33-3 80-10 10 00 Phone
++33-3 80-10 10 01 Fax

DIELEKTRA GmbH (Germany) *[2]
Kaiserstraße 127
D-51145 Köln
Postfach/P.O. Box 90 05 20
D-51115 Köln
Phone.: ++49(0)22 03/48-524
Fax: ++49(0)22 03/48-4 86
www.parknelco.com
Modem: +49(0)22 03/48-274

*[1] ISO 9002 Certified, *[2] ISO 9001 Certified



"We are committed to the preservation and improvement of the environment. Now and in the future we will apply the best available ways and means to keep our commitment active and up to date."

Notice:
The information contained in this bulletin has been established through careful evaluation of data derived through industry accepted and applied test methodology. Since customer usage and handling practice varies widely, Park Electrochemical Corp. or any of its subsidiaries cannot accept liability for damages resulting from exclusive use of the data herein.

nelco DIELEKTRA
Subsidiary of Park Electrochemical Corp.

nelco DIELEKTRA
Subsidiary of Park Electrochemical Corp.

Pocket Guide 2000

TO EUROPEAN PRODUCTS AND SERVICES

www. parknelco.com