

Fuel Cell Line Card



all4-GP North America Inc. – Manufacturing Solutions

PROCESS EQUIPMENT, CONSUMABLES & ADHESIVES FOR PEM, SOFC & MCFC

Membrane Electrode Screen Printing



Vacuum Assist
Semi & Fully Automated
Gravure Printing
Optional Heated Bed



Multizone Drying Oven for Membrane Electrode Assembly



Suitable for High Solvent Materials
8 Heating Zones & 2 Cooling Zones
Max Temp 200°C
ESD SAFE



Catalyst Doping with Conveyorized Spray Coater

Catalyst Doping & Resist Coating
Negative pressure exhaust system
with optional hepa filters
Scalable from prototype
to full size production



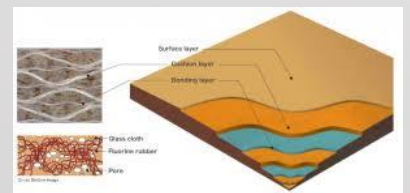
Membrane Lamination Systems

Single or Multiple Opening
Single or Multiple Press Stack
Optional Vacuum Chamber
Manual or Automated Loading



Lamination Press Pads

Reusable pad for pressure and thermal
management during the lamination
press



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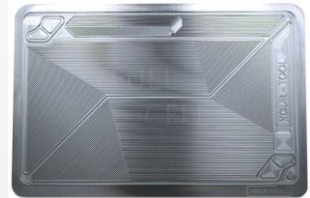


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Bipolar Plate Routing

Horizontal & Vertical Substates
Metals and Graphite



Bipolar Plate Chemical Milling

Full Wet Process Line
Etcher, Developer, Stripping,
Cleaning, Deburring



Direct Imaging, Photoplotting, Exposure for Wet Process

Semi & Fully Automated Loading



Batch & Conveyor Ovens

Convection
Single & dual chamber
Vacuum
Nitrogen
High Temperature
Clean-Room
Various rack systems



Plasma Treatment

Board, Roll to Wire PCB & Roll to Roll
Drill Hole & Surface Cleaning
Roughness & Cleaning
Tension & Speed Control
Isolated Plasma Reaction Zone



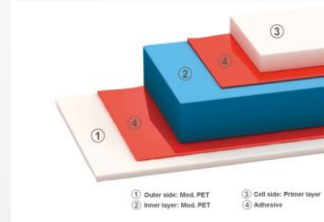
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Copper Clad Polyimide Foil



Available on reels or as sheets
Flexible and semi-flexible base materials

Dry Film Lamination

Modular Design
25micron to 6mm possible

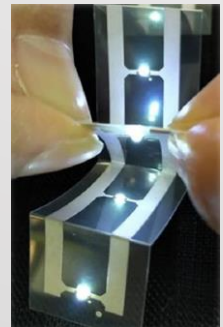


ADHESIVES

Encapsulants, Solder Replacement, Thermal Management

ELECTRICALLY CONDUCTIVE EPOXIES

Processing	Cold-curing		Hot-curing	
	1K	2K	1K	2K
Components				
Electronics applications high-strength	-	VP 1244	EC 101 L frozen EC 151 L frozen EC 112 L frozen EC 242 frozen	EC 101 EC 151 L
Electronics applications flexible	PU 1000	-	-	EC 201
Solar industry	-	-	SB 1227 frozen SB 1242 frozen	SB 1227 SB 1242
Electromagnetic shielding	-	-	-	EC 262-2



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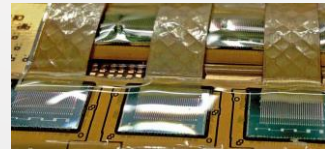
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ADHESIVES

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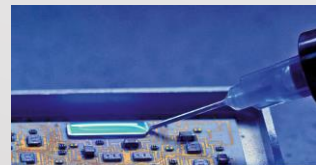
AUTOCLAVABLE / MOISTURE RESISTANT POTTING EPOXIES

Processing	Cold-curing		Hot-curing	
	2C	1C	1C	2C
Components	2C	1C	1C	2C
Optically transparent, high-strength	EP 601	EP 501	–	–
Optically transparent, flexible	EP 610	–	–	–
Highest temperature and chemical resistance	EP 660	–	–	EP 642
Biocompatible	EP 601	–	–	EP 630 EP 653 EP 655-T
Biocompatible and autoclavable	–	–	–	EP 630 EP 653 EP 655-T



UV CURE ADHESIVES

Curing mechanism	Pure UV-curing		Dual-curing	
	Acrylate & hybrids	Epoxy	Acrylate & hybrids	Epoxy
High-strength	UV 2101 UV 2108 UV 2133 UV 2195 UV 2144	UV 2237	UV 2137 DC UV 2157 DC UV 2322 DC UV 2341 DC	UV 2249 DC UV 2214 DC
Flexible	UV 2181 ME UV 2121	–	–	UV 2257 DC
Biocompatible	UV 2108 UV 2181 ME	–	–	–



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THERMALY CONDUCTIVE EPOXIES

Processing	Cold-cured	Hot-cured			
		1K		2K	
Components	2K	1K		2K	
Electrically insulating	Yes	Yes	No	Yes	No
<1 W/mK	TC 451 TC 417 TC 437	TC 351	–	TC 430	–
1-2 W/mK	TC 418 TC 432	–	TC 304 TC 301	TC 420 TC 418	–
2-4 W/mK	TC 423	–	–	TC 433 TC 423	–
>4 W/mK	–	–	EC 242 frozen	–	VP 2026

