TECHNICAL DATA SHEET

LAMINAR® UD900 DRY FILM PHOTOPOLYMER

DESCRIPTION

LAMINAR® UD900 DRY FILM PHOTOPOLYMER is a negative working aqueous resist specifically designed for UV laser direct imaging (LDI) applications. **LAMINAR® UD900** has been formulated for acid etching in the production of Inner layers for printed circuit boards (PCB'S) and also photo chemical milling applications. In addition the product is suitable for pattern plate applications on electroless and electroplated copper.

PHYSICAL CHARACTERISTICS

Film type **Characteristic**	**LAMINAR®** **UD930**	**LAMINAR®** **UD940**	**LAMINAR®** **UD950**	**LAMINAR®** **UD962**	**LAMINAR®** **UD975**
Thickness (µm)	29 ± 2	38 ± 2	49 ± 2	62 ± 2	75 ± 2
Colour unexposed	Green	Green	Green	Green	Green
Colour exposed	Deep blue	Deep blue	Deep blue	Deep blue	Deep blue
Recommended uses	Acid P&E	Acid P&E Acid T&E Plating	Acid P&E Acid T&E Plating	Acid P&E Acid T&E Plating	Plating Thick film applications

PRODUCT CHARACTERISTICS

- Good adhesion to the substrate.
- Fast photo-speed.
- High resolution capability.
- Good post exposure colour contrast for ease of inspection.
- Straight sidewalls.
- Clean developing characteristics.
- Excellent tenting properties.
- Good plating characteristics.
- High chemical resistance to acidic etchants.
- Broad process latitude in each processing step

PROCESSING

SURFACE PREPARATION

The optimum performance of **LAMINAR® UD900** depends on the condition and cleanliness of the copper surface immediately prior to lamination.

LAMINAR® UD900 can be used on the following surface types:

- Wet brushed base copper.
- Chemically cleaned base copper.
- Brush pumiced / aluminium oxide (Al_2O_3) base copper.
- Electroless copper – Data on anti-tarnishes not yet available.
- Electroplated copper.
- Direct metallisation surfaces.

For maximum dry film adhesion the surface to be coated must be clean, dry, and free of contaminants such as chromate conversion coatings (Inner layers), residual water and acid stains. Other contaminants include oil in air-lines, nylon brush smear, fingerprints and airborne contaminants generated by the environment in the wet chemistry area.

Panels that have been prepared for lamination should go directly to the laminating area to avoid the risk of contamination.

LAMINATION

LAMINAR® UD900 series resists can be applied with all types of commercially available laminators. The automatic cut sheet laminator is preferred as it eliminates trim waste and provides an exposed copper border around all four sides of the substrate.

Lamination of **LAMINAR® UD900** must be performed in an environment that is free from dust and dirt. The use of a panel cleaner in the line sequence immediately prior to lamination is strongly recommended to help ensure clean panels during application of the dry film photo resist. The condition and maintenance of the lamination equipment is very important to help achieve consistently high yields.

The dry film photo resist immediately after lamination is soft and susceptible to handling damage. To this end, substrates should be racked to prevent pressure marking of the photo resist. This will also allow substrates to cool to room temperature prior to exposure. Substrates should not be stacked on top of each other, as this can cause trapped particles to imprint the resist from one board to the next. Stacking also tends to trap heat and can adversely impact resist performance during exposure and / or development.

LAMINAR® UD900 has been designed with good flow and fill characteristics. Although specific lamination parameters should be established based on the product type and complexity of the substrate being processed, the table below provides general guidelines for use:

Lamination guidelines:

Manual Hot Roll Laminator:	
Roll temperature	100 - 125°C (212 - 257°F)
Lamination speed	0.8 - 2.0m/min (2.6 - 6.6ft/min)
Lamination pressure	2.5 - 3.0Bar
Automatic Cut Sheet Laminator:	
Roll temperature	100 - 125°C (212 - 257°F)
Lamination speed	1.5 - 3.0m/min (4.9 - 9.8ft/min)
Lamination pressure	2.0 - 5.0Bar* Equipment dependant
Tacking time	1.0 - 4.0seconds
Tack bar temperature	40 - 60°C (140 - 140°F)
Substrate entry temperature	21 - 50°C (070 - 122°F)
Substrate exit temperature (I/L)	55 - 70°C (131 - 158°F [Core thickness dependant]
Substrate exit temperature (O/L)	45 - 60°C (113 - 140°F)

EXPOSURE

LAMINAR® UD900 has been specifically formulated for laser direct imaging and consequently the product is very fast in exposure. As laser direct imaging produces highly collimated light, the line quality and resolution of imaged lines is excellent. **LAMINAR® UD900** allows for both higher production and better line quality than standard photo-resists in laser applications. Resolution below 50µm is possible with **LAMINAR® UD900** in controlled and optimised production environments.

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Energy (mj/cm2)	08 – 12	10 – 16	13 – 21	16 – 26	20 – 32
St21 Resist step	07 – 09	07 – 09	07 – 09	07 – 09	07 – 09
St21 Copper step	08 – 10	08 – 10	08 – 10	08 – 10	08 – 10
St41 Resist step	19 – 27	19 – 27	19 – 27	19 – 27	19 – 27
St41 Copper step	20 – 28	20 – 28	20 – 28	20 – 28	20 – 28

Energy values quoted above are from an Orbotech Paragon™ 8000 LDI system

It may be possible to process **LAMINAR® UD900** on conventional exposure systems used in the PCB and chemical milling industry. Performance however may be limited depending on the control and accuracy of the shutter system. It would be recommended to test the performance of **LAMINAR® UD900** on individual exposure systems before releasing for production use.

To assure optimum line resolution, sidewall quality and photo-tool reproduction, the following conditions should be met:

1. The lamination substrate should be free from dust and dirt.
2. The LDI machine vacuum table should be clean and free from dust and debris.
3. The use of a tacky panel cleaner to eliminate debris from the laminated substrate prior to exposure is recommended.
4. The energy required to expose the resist is the level which reproduces the CAD/CAM data after development with a ± 2.5% deviation. An imaged line perpendicular to the scan direction of the laser should always be measured and compared to the CAM data.
5. A good quality microscope and measuring system should **always** be used.
6. Ideally an installed test design should be used to determine the optimum exposure. This should be imaged once each day and checked to assess both the resist and machine efficiency and quality.

DEVELOPMENT

LAMINAR® UD900 dry film photo resist develops in a totally aqueous solution of sodium or potassium carbonate. Water miscible solvents will be detrimental to the photo-resist and should not be used in the developing process.

Characteristic	Optimum	Range
Sodium carbonate	0.85%	0.70 - 1.00%
Potassium carbonate	1.00%	0.80 - 1.20%
Temperature	28 - 30°C (82 - 86F°)	26 - 32°C (79 - 90°F)
Breakpoint	55 - 60%	50 - 70%
Pressure	Varies for resolution	1.50 - 2.00Bar
Rinse water type	Hard water 150 - 300ppm $CaCO_3$ equivalent	
Rinse temperature	20 - 25°C (68 - 77°F)	15 - 26°C (59 - 79°F)
Drying	Hot air blow off with complete drying	
Developing time (1)	UD930	36 – 46 seconds at 28°C (82°F)
Developing time (2)	UD940	40 – 48 seconds at 28°C (82°F)
Developing time (3)	UD950	44 – 56 seconds at 28°C (82°F)
Developing time (4)	UD962	60 – 74 seconds at 28°C (82°F)
Developing time (5)	UD975	73 – 90 seconds at 28°C (82°F)

The operating temperature of the working solution is extremely important to the development of the resist. Exceeding the recommended temperature range can cause attack of the resist sidewall or foot, resulting in resist lifting or ragged tracks. Operating at a lower temperature can result in attack of the resist due to excessive dwell time in the developing chamber.

The breakpoint should be maintained within the recommended range of the developing chamber length. The breakpoint should be established by marking a clean copper panel with lines using a water soluble marker pen immediately prior to lamination of the dry film photo resist. The breakpoint is defined as the point when the developing solution breaks through the interface between the resist and the copper removing the pen lines from the board surface.

Test panels that simulate the manufacturing process should be processed prior to production to set the proper parameters for the process.

Antifoam:
LAMINAR® UD900 will require the use of a defoamer in developing. This will depend on several factors including water quality, developer chemistry quality, dry film photo resist loading and equipment design.

If antifoam additions are required, AF202, AF33 and AF2750 have been tested and shown to be acceptable and compatible with **LAMINAR® UD900.** Other anti-foams may be acceptable but these should be fully evaluated prior to use.

Anti-foam should be added according to the antifoam data sheet. Antifoam should be continuously added to the developer sump by means of a feed pump.
Note:
Do not use antifoam products containing water miscible solvents as they will attack the dry film photo resist. Some petroleum based antifoams are also known to attack dry film photo resist and should be avoided.

ETCHING

LAMINAR® UD900 is designed for acid etching. The product will withstand acid etchants, such as Cupric and Ferric chloride with free HCL normality <3.0N. **LAMINAR® UD900** is not suitable for alkaline etching.

PLATING

LAMINAR® UD900 has excellent chemical resistance and performs well in acidic electroplating baths including acid copper, tin and tin-lead.

Recommended pre-plate cleaning process sequence:

Process sequence	Temperature / Time etc	
Acid cleaner	30 - 55°C (86 - 131°F)	2 - 3minutes
Spray rinse	1 - 2minutes	
Rinse counter flow (optional)	1 - 2minutes	
Micro-etch	0.25µm (10µ") Cu removed	As required
Spray rinse	1 - 2minutes	
Sulphuric acid	10% by Vol	1 - 2minutes
Spray rinse (optional)	1 - 2minutes	

STRIPPING

LAMINAR® UD900 dry film photo resist can be stripped in conventional immersion or conveyorised equipment using caustic and proprietary chemistries. Increasing the stripper concentration and temperature decreases the stripping time but causes an increase in the size of the stripped flakes. Continuous removal of stripped resist is recommended to avoid spray nozzle and filter plugging, and to increase bath life.

Stripping times of flood exposed boards processed with **LAMINAR® UD900** in tank stripping mode are shown in the table below. Actual stripping times will depend upon equipment configuration, exposure level, hold time prior to stripping etc and hence these figures should be used only as a guide.

Film type Characteristic	LAMINAR® UD930	LAMINAR® UD940	LAMINAR® UD950	LAMINAR® UD962	LAMINAR® UD975
Solution	NaOH	NaOH	NaOH	NaOH	NaOH
Concentration (%)	2 – 5	2 – 5	2 – 5	2 – 5	2 – 5
Temperature (°C)	50	50	50	50	50
Time (seconds)	23 – 40	37 – 72	63 – 105	96 – 160	115 – 195

As with developing, **LAMINAR® UD900** may require a defoamer for stripping. AF80 is recommended for this application and should be added according to the antifoam data sheet recommendations.

Storage

LAMINAR® UD900 should be stored in a limited access area between 5 and 20°C (41 and 68°F) and 50 ± 10% relative humidity. For optimum performance, store in an area not exceeding 15°C (60°F). **LAMINAR® UD900** is sensitive to sunlight and indirect white light. Gold or yellow safelights are required in the immediate work area.

Safety and Handling

BEFORE USING LAMINAR® UD900, PLEASE REFER TO THE CURRENT MATERIAL SAFETY DATA SHEET (MSDS) FOR DETAILED SAFETY, HANDLING AND STORAGE INFORMATION.

LAMINAR® UD900 should be applied in a well ventilated area. Commercial lamination equipment may cause vapours to be generated from the dry film, and these should be removed by conventional exhaust techniques. It is the customer's responsibility to ensure that disposal of this and other ancillary products comply with local, state and national federal guidelines.

Wash thoroughly after handling any dry film photo resist. Contact of the unexposed resist with the skin may cause irritation and should be avoided. Sensitisation may occur in some individuals. If contact occurs, wash thoroughly with soap and water. If irritation occurs and persists consult a physician. Avoid reuse of or contact with the dry film release sheets and cover sheets as they may retain small amounts of unpolymerised photo resist components. During cleaning, developing, stripping and etching operations follow the safety precautions pertaining to the particular solution(s) being used.

Based on our experience, we believe that the above information is accurate, but we offer no guarantee as to the use or application of our products or of this information. We warrant our products to be free from defects in material and workmanship; but because their use is beyond our control, we accept no responsibility or liability for damages, whether direct, indirect or consequential, resulting from failure in performance. In cases where our products are found to be defective in material and workmanship, our liability is limited to the purchase price of the products found to be defective. THIS WARRANTY IS TO THE EXCLUSION OF ALL OTHER WARRANTIES OR GUARANTEES, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, DESCRIPTION, PRODUCTIVENESS OR ANY OTHER MATTER. None of the above information may be construed as a recommendation that our products be used in violation of any patent rights. We accept your orders at our shipping points only on the basis of the above understanding which our employees have no authority to vary.