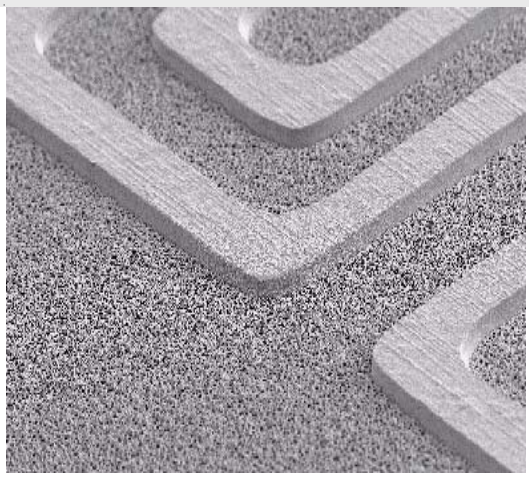
DuPont™ Riston® LaserSeries LDI500

DATA SHEET & PROCESSING INFORMATION

Hi-Speed Direct Imaging Resist



Product Features/ Applications

- High speed photoresist especially developed for exposure using UV laser direct imaging.
- Negative working, aqueous processable dry film.
- Compatible with YieldMaster® 2000 wet Lamination systems.
- Available in 30 micron (1.2 mil), 40 micron (1.5 mil), and 50 micron (2.0 mil) thicknesses.
- Suitable for print and etch application, either acid or alkaline etching.
- Suitable for pattern plate applications on scrubbed and unscrubbed electroless copper and most direct plate surfaces.
- Suitable for most photochemical machining (chemical milling) applications.
- Suitable for tent-and-etch applications.

Processing Data

This Data Sheet documents specific process information for Riston® LDI500. Data quoted in this guide have been generated using production equipment as well as laboratory test methods and are offered as a guideline. Actual production parameters will depend upon the equipment, chemistries, and process controls in use; and should be selected for best performance. For more background on general Riston® LDI500 processing see the General Processing Guide (DS98-41).

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PART 1: Copper Surfaces and Surface Preparation

Riston® LDI500 has very strong resistance to lifting on all surfaces.

Riston® LDI500 is designed to be compatible with the following surfaces and surface preparations:

- Vendor copper (standard foil, fine grain foils, reverse treated foils)
- Electroless copper:
  - Unscrubbed
  - Pumice and brush scrubbed
- Direct metallization surfaces:
  - Panel plated copper (including conveyorized plating such as Uniplate® or "Segmenta")
- Double Treat Copper

Antitarnishes:

The following antitarnishes have been used successfully per manufacturers' processing recommendations: Data not yet available.

For prelamination cleaning, see the General Processing Guide and its references.

PART 2: Lamination

Riston® LDI500 has been formulated for excellent conformation in hot roll lamination

Expected Board Exit Temperature:

Lamination Conditions for DuPont HRL-24 Film Laminator	
Pre-Heat	Optional
Lam. Roll Temp	100-120°C (212-239°F)
Roll Speed	0.6-1.5 m/min (2-5 ft/min)
Air Assist Pressure	0-2.8 bar (0-40 psig)
Note: for > bar use heavy-duty rolls	

Innerlayers: 60-70°C (140-160°F)
Outerlayers (Cu/Sn or Cu/Sn-Pb): 45-55°C (110-130°F)

(For information on how to use Board Exit Temperature for process control, see the General Processing Guide)

Lamination Conditions for Automatic Sheet Laminators	
Pre-Heat	Optional
Seal. Bar Temp	50-80°C (123-177°F)
Lam. Roll Temp	100-115°C (212-239°F)
Seal Bar Pressure	3.5-4.5 bar (50-65 psig)
Lam. Roll Pressure	3.0-5.0 bar (43-72 psig)
Seal Time	1-4 seconds
Lamination Speed	1.5-3 m/min (5/10 ft/min)

Expected Board Exit Temperature:

Innerlayers: 60-70°C (140-160°F)
Outerlayers (Cu/Sn or Cu/Sn-Pb): 45-55°C (110-130°F)

(For information on how to use Board Exit Temperature for process control, see the General Processing Guide)

General Suggestions

- Start with Roll temperatures of 110 to 115°C and adjust as necessary.
- Reduced lamination roll pressure and/or temperature may be required in tenting applications to avoid tent breakage and resist flow into through-holes.
- Ensure that panel holes are completely dry before resist lamination.
- Resist wrinkling can be aggravated by high temperature or panel preheating. Decrease roll temperature or eliminate preheat.
- Panels may be exposed immediately after lamination, however, allow enough time for panels to cool to room temperature before exposure.
- Note comments under Safe Handling with respect to exceeding highest recommended lamination roll temperature.

PART 3: Exposure

Riston® LDI500 has been specially formulated for exposure using UV laser direct imaging equipment. The peak resist response is in the range of 350 to 380 nm.

Riston® LDI500 has been optimized to give exceptional line edge quality and resolution in laser direct imaging. Not only does it allow for faster throughput, but also better image quality than most of the slower photospeed standard resists.
Resolution below 50 µm (2 mil) lines and spaces is possible with Riston® LDI500 in optimized production environments.

Suggestions:
- Actual energy required may vary from one imager to another.
- Set up the process mid point where the resist gives 1:1 line width reproduction of CAD data after development. The working range is midpoint - 30% to midpoint +50% energy.

***Note*:** Approximate exposure energy (mJ/cm^2) is calculated from laser power, polygon speed and transmission efficiency of the laser printer. On contact printers, the energy can be accurately measured with International Light Radiometer Model ZL400A with Super Slim UV Probe.

Riston® LDI500 can also be exposed on some standard equipment used in the printed circuit board industry. Due to the high photospeed, performance in high power exposure units (5-8 kW) could be limited depending on the accuracy of the shutter mechanism or lamp on/off switch.

Recommended Exposure Range

	LDI530	LDI540	LDI550
mJ/cm^2	8-10	9 - 11	10-12

PART 4: Development

Riston® LDI500 can be developed in sodium or potassium carbonate with good productivity. It has wide development latitude with respect to developer concentration, breakpoint, and rinse water hardness.

Development Recommendation

- **Spray Pressure:** 1.4-2.4 bar (20-35 psig) (high impact direct-fan or cone nozzle preferred).
- **Chemistry:**
  - Na_2CO_3: 0.7-1.0 wt%; 0.85 wt% preferred
  - $Na_2CO_3 \cdot H_2O$: 0.8-1.1 wt%; 1.0 wt% preferred
  - K_2CO_3 0.75 -1.0 wt%; 0.9 wt% preferred

***Note*:** The use of buffered development solutions, containing KOH (Potassium Hydroxide) or NaOH (Sodium Hydroxide), is not recommended with DuPont Riston® Photoresists. These solutions can lead to excessive foaming and high dissolved photoresist loading, compromising sidewall quality and photoresist resolution. Also, use of buffered chemistries can increase residue build-up in the developer, resulting in increased weekly equipment clean-out costs.

- **Temperature:** 27-35°C (80-95°F); 30°C (85°F) preferred
- **Breakpoint:** 50-70 % (60 % preferred)
- **Dwell Time**s (approximate)
  Riston® LDI530 (30µm): 29-41 sec.
  Riston® LDI50 (40µm): 32-45 sec.
  Riston® LDI550 (50µm): 35-49 sec.
- **Resist Loading:**
  Feed & Bleed: <12 mil-ft^2/gal; <0.17 m^2/liter
  Batch Processing: to 16 mil-ft^2/gal; to 0.4m^2/liter for 40µm film thickness
- **Rinse Water**: hard water (150-250 ppm $CaCO_3$ equivalent preferred), or soft water are acceptable.
- **Rinse Spray Nozzles**: High Impact, direct fan nozzles preferred
- **Drying:** Blow dry thoroughly; Hot air preferred
- **Feed & Bleed Control**: Set pH controller to a set point of 10.6 for best results, or maintain active carbonate at 65-78% of total carbonate, or use board count to maintain the recommended resist loading.

- **Batch Processing Control:**
  Dump when reaching pH~10.2, or when active carbonate has fallen to ~50% of total carbonate.

***Note*:** Dwell Time ranges were established in Chemcut type developer equipment, using potassium / sodium carbonate and 2-10 mil-ft²/gal (0.05-0.25 m²/liter for a one mil thick resist) loading, with all other variables set within the preferred ranges mentioned above.

Defoamers

Riston® LDI500 could require the use of a defoamer. If required, add 0.8 ml/liter (3 ml/gallon) of these antifoams:

Alpha Metals PC 4772D
Pluronic 31R1
Dexter 1210 & 120F
Alpha Metals 754

Others may work as well.

PART 5: Plating
(Acid Copper Sulfate; Tin/Lead; Tin; Nickel; Gold) (Follow plating vendors' recommendations)

Riston® LDI500 can be used for pattern plate processes with acid copper, tin/lead, tin, nickel and gold plating baths. Results so far show that Riston® LDI500 has very strong resistance to lifting and underplating. However, at this time only limited test data exist. These processing guidelines will be updated as soon as new information becomes available.

Recommendations: Preplate Cleaning Process Sequence

- Acid Cleaner : 30-55°C (85-130°F); 2-3 minutes
- Spray Rinse: 1-2 minutes
- Microetch to remove 0.15-0.26 µm (5-10 µ") copper (time: as required)
- Spray Rinse: 1-2 minutes
- Sulfuric acid (5-10 vol%) dip: 1-2 minutes
- Optional spray rinse: 1-2 minutes

PART 6: Etching

- Riston® LDI500 is highly resistant to most alkaline etch processes.
- Riston® LDI500 is compatible with most acid etchants, e.g., cupric chloride (free HCl normality ≤ 3.0 N), H_2O_2/H_2SO_4 and ferric chloride.

PART 7: Stripping

Riston® LDI500 is formulated for easy stripping between plated lines. It is recommended to use continuous removal of resist skins, e.g., with a sloped screen or drum filter and conveyor, to avoid spray nozzle and filter plugging.

Stripping Recommendations

- **Chemistry:**
  NaOH: 1.5 - 3.0 wt%; faster stripping at 3 wt%
  KOH: 1.5 - 3.0 wt%; faster stripping at 3 wt%
  Proprietary Strippers: concentration per vendor recommendation
- **Spray Pressures:** 1.5-2.5 bar (26-44 psig)
- **Spray Nozzles:** High Impact direct fan
- **Breakpoint:** 50% or lower
- **Stripper Dwell Times:** (seconds) at 55°C (130°F) Dwell time is total time spent in the stripper, given a 50% breakpoint.

Chemistry	LDI530
3.0 wt% NaOH	50-80
1.5 wt% NaOH	100-120

- **Defoamers:** Follow recommendations in Developer Section.

Storage & Safe Lighting

See recommendations in the General Processing Guide (DS98-41).

Safe Handling

Consult the Material Safety Data Sheet (MSDS) for Riston® LDI500 dry film photoresist vapors. The vapor MSDS for this film was prepared using the highest lamination roll temperature recommended for use. If you choose to exceed this temperature, be aware that the amount of vapor may increase and that the identity of the materials vaporized may vary from those in the MSDS. For more Safe Handling information, see publication Technical Bulletin TB-9944 "Handling Procedure for DuPont Photopolymer Films".

Waste Disposal

For questions concerning disposal of photoresist waste refer to the latest DuPont literature and Federal, State, and Local Regulations.

For further information on DuPont™ LaserSeries, please contact your local representative.

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