

# DuPont™ Riston® Special FX500 Series

DATA SHEET & PROCESSING INFORMATION

For Fine Line Print and Etch Photochemical Machining and PWB Applications

## Product Features/ Applications

- Negative working, aqueous processable dry film photoresist.
- Available in 15, 30, and 38 micron thickness.
- Designed particularly for fine line print and etch applications with acid etching.
- Suitable for most fine feature photochemical machining applications such as lead frames.



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## PART 1A: Copper Surfaces and Surface Preparation

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

Riston® FX500 is compatible with the following copper surfaces and surface preparations:

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

## PART 1B: Photochemical Machining Surfaces and Surface Preparation

Riston® FX500 is compatible with the following photochemical machining surfaces and surface preparations:

**Note:** Wet lamination tends to improve resist adhesion on most photochemical machining metals. A prebake of 120°C for 10 minutes is recommended to drive off any absorbed hydrogen or other gases unless the bake causes unacceptable oxidation of the metal surface. For additional detail refer to Technical Bulletin TB-9629.

- **Aluminum**
  - Not anodized: Hot alkaline cleaner (40-50°C), 3-6% sodium hydroxide microetch, 35% nitric acid smut removal.
  - Anodized: Mild, neutral soak cleaner.
- **Chromium**
  - Hot alkaline cleaner (40-50°C).
- **Copper Alloys / Brass**
  - Mild alkaline or acid cleaner as is used for printed circuit board cleaning.
- **Gold**

Hot alkaline cleaner (40-50°C) followed by 2-5% sulfuric acid dip.

- **Magnesium**
  - Mild alkaline cleaner. Mechanical cleaning with pumice may be used if necessary and the final surface finish allows.
- **Nickel**
  - Commercially available degreaser. Mechanical cleaning with pumice may be used if needed. A 5% hydrochloric or sulfuric acid dip followed by drying can be used to activate the surface.
- **Silver**
  - If the surface finish is not critical, mechanically clean with pumice. Otherwise use an alkaline soak cleaner and neutralize with dilute sulfuric or citric acid.

- **Zinc**
  - If the surface finish is not critical, mechanically clean with pumice. Otherwise use an alkaline soak cleaner and rinse well.
- **Stainless Steel**
  - Alkaline soak clean and neutralize with dilute sulfuric acid. Wet lamination is particularly recommended for stainless steel.

## PART 2: Lamination

### Lamination Conditions for DuPont HRL-24 & HRL-24/ Yieldmaster® Film Laminator

- Pre-heat: Optional
- Lamination Roll
  - Temperature: 100-120°C (212-248°F)

**Note:** Expected Board Exit Temperature:

Innerlayers:	60-70°C (140-160°F)
Outerlayers (gold plate):	50-55°C (120-130°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 General Processing Guide)

- Roll Speed: 0.6-1.5 m/min (2-5 ft/min)
- Air Assist Pressure: 0-2.8 bar (0-40 psig)

**Note:** for pressure • 1.4 bar use heavy-duty rolls.

- Total Water Flow Rate (Yieldmaster® models only): 3-15 cc/min.

**Note:** use distilled water; hard water is acceptable but may cause scale build up and clog nozzles.

### Lamination Conditions for Automatic Sheet Laminators

- Pre-heat: Optional
- Seal Bar Temp.: 50-70°C (122-158°F)
- Lamination Roll
  - Temperature: 100-120°C (212-248°F)

**Note:** Expected Board Exit Temperature:

Innerlayers:	60-70°C (140-160°F)
Outerlayers (gold plate):	50-55°C (120-130°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 General Processing Guide)

- 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)
- Total Water Flow Rate  
(Yieldmaster® models only): 3-15 cc/min

**Note:** Use distilled water; hard water is acceptable but may cause scale build up and clog nozzles.

### General Suggestions

- Start with roll temperatures of 110 to 115°C and adjust as necessary.
- Ensure that any panel holes are completely dry before resist lamination.
- Resist wrinkling can be caused by high temperatures. Decrease roll temperature or eliminate pre-heat.
- 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 the highest recommended lamination roll temperature.
- Maximum recommended hold time with wet lamination is 24 hours.

### PART 3: Exposure

Riston® FX500 can be exposed on all standard equipment used in the printed circuit board industry. Choose lamps that complement the peak resist response of 350 to 380 nm. Resolution down to 30 microns (1.2 mil) lines and spaces is possible with Riston® FX500 in optimized production environments and 25 microns (1.0 mil) in laboratory environments.

Recommended Exposure Range			
	FX515	FX530	FX540
Riston®	6-18	6-18	6-18
RST	6 – 9	6 – 10	6 – 10
mJ/cm <sup>2</sup>	16 – 65	35 – 140	50 - 150

Note:

- RST  
= DuPont Riston® 25-Step Density Tablet

- SST  
= Stouffer 21-Step Sensitivity Guide

## PART 4: Development

### Development Recommendations

<b>Spray Pressure:</b>	1.4-2.1 bar (20-30 psig). High impact direct-fan or cone nozzles preferred.	
<b>Chemistry:</b>		
Na <sub>2</sub> CO <sub>3</sub>	0.7-1.0 wt%; 0.85 wt% preferred.	
Na <sub>2</sub> CO <sub>3</sub> ·H <sub>2</sub> O	0.8-1.1 wt%; 1.0 wt% preferred.	
K <sub>2</sub> CO <sub>3</sub>	0.8-1.1 wt%; 1.0 wt% preferred.	
Temperature	27-35°C (80-95°F); 30°C (85°F) preferred.	
Breakpoint	50-65% (60% preferred)	
Dwell Times (approx.)	Riston® FX515:	13 - 18 secs.
	Riston® FX530:	26 - 34 secs.
	Riston® FX540:	32 - 42 secs.

### Resist Loading:

Feed and Bleed 2-12 mil-ft<sup>2</sup>/gal; 0.08-0.49 m<sup>2</sup>/ liter for 15 micron film thickness.

Batch Processing 0-16 mil-ft<sup>2</sup>/gal; 0-0.65 m<sup>2</sup>/ liter for 15 micron film thickness.

**Rinse Water:** Hard water (150-250 ppm CaCO<sub>3</sub> equivalent). Softer water can be hardened by the addition of magnesium sulfate or calcium chloride or a first soft water rinse can be followed by a dilute acid rinse followed by a water rinse.

### Rinse Spray Nozzles:

High Impact, Direct Fan Nozzles preferred.

### Drying:

Blow dry thoroughly; hot air preferred.

### Feed & Bleed Control:

Set pH controller range from 10.5 to 10.7 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 ≤ 60% of total carbonate.

### Maximum hold time before stripping:

5 days.

**Note:** Dwell Time ranges were established in Tokyo Chemical Machinery 1200 NLE type developer equipment, using fresh sodium carbonate, with all other variables set within the preferred ranges mentioned above.

## Defoamers

Riston® FX500 could require the use of a defoamer. If required, add 0.3-0.8 ml/liter (1-3 ml/gallon) of one of these antifoams:

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

Others may work equally well.

## PART 5: Etching

Riston® FX515 is compatible with most acid etchants; e.g., cupric chloride (free HCl normality  $\leq 3.0$  N), H<sub>2</sub>O<sub>2</sub>/H<sub>2</sub>SO<sub>4</sub>, and ferric chloride.

## PART 6: Stripping

Riston® FX500 is formulated to dissolve slowly in stripping solution after breaking up into pieces. This can greatly increase the life of the stripping solution and reduce costs if the resist can be removed before dissolving.

### Stripping Recommendations

#### Chemistry:

NaOH: 1.5-3.0 wt%; faster stripping at 3.0 wt%  
KOH: 1.5-3.0 wt%; faster stripping at 3.0 wt%

#### Proprietary Strippers:

Concentration per vendor recommendation.

Spray Pressures: 1.4-2.1 bar (20-30 psig).  
Spray Nozzles: High impact direct fan.  
Breakpoint: 50% or lower.

Stripper Dwell Times (seconds) at 55°C (130°F). Dwell time is the total time spent in the stripper, given a 50% breakpoint.

Chemistry	FX515	FX530	FX540
3.0 wt% NaOH	20-30	45 - 60	70 - 90
1.5 wt% KOH	40-70	60 - 80	100 - 140

Defoamers: Follow recommendations in Development Section.  
Proprietary Strippers: For more information please contact your local representative.

- Generic mixtures of 3% NaOH (or KOH) plus 3% MEA (monoethanolamine).

## Storage & Safe Lighting

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

## Processing Data

This Data Sheet documents specific process information for Riston® FX500 Series. 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® processing see the General Processing Guide (DS98-41). For additional information on DuPont's products for Printed Wiring Board fabrication, visit our web site at <http://www.dupont.com/pcm>.

## Safe Handling

Consult the Material Safety Data Sheet (MSDS) for Riston® 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 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, please contact your local representative.

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