

DuPont™ Riston® 9000 Series

DATA SHEET & PROCESSING INFORMATION

Photopolymer Dry Film Resist for Acid Etching, Alkaline Etching, Plating, and Photochemical Machining

Product Features/Applications

- Negative working, aqueous processable dry film photoresist.
- Available in 20 micron (0.8 mil), 33 micron (1.3 mil), 38 micron (1.5 mil), 50 micron (2.0 mil), and 75 micron (3.0 mil) thicknesses.
- Suitable for pattern plate applications on scrubbed and unscrubbed electroless copper.
- Suitable for print and etch applications with acid or alkaline etching.
- Suitable for some photochemical machining applications.
- Suitable for tent-and-etch applications.
- Compatible with double-treat copper surfaces.

Processing Data

This Data Sheet documents specific process information for Riston® 9000 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, see publication (TB-9944)



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PART 1: Copper Surfaces and Surface Preparation

For prelamination cleaning, see General Processing Guide.

Riston® 9000 is compatible with the following surfaces and surface preparations:

- Vendor copper (standard foil, fine grain foils, reverse treated foils).
 - Scrubbed
 - Chemically cleaned
 - Electrochemically cleaned.
- Electroless copper:
 - Unscrubbed
 - Pumice and brush scrubbed
- Double Treat copper

Antitarnishes:

The following antitarnishes have been used successfully per manufacturers' processing recommendations:

- Duratech PCL
- Enthone Entek Cu56

(others may give equally acceptable results)

PART 2: Lamination

Lamination Conditions

DuPont HRL-24 & HRL-24/YieldMaster® Film Laminator

- Pre-Heat (optional):
- Lamination Roll Temp.: 100-125 °C (212-260°F)

Note: Expected Board Exit Temperature:

Innerlayers:	60-70°C (140-160°F)
Outerlayers:	(Cu/Sn or Cu/SnPb): 45-55°C (110-130°F)
Outerlayers(Gold Plate):	50-55°C (120-130°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 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 clogged nozzles.

Lamination Conditions for Automatic Sheet Laminators

- Pre-heat: Optional
- Seal Bar Temp.: 50-80°C (120-175°F)
- Lam. Roll Temp.: 100-125°C (212-260°F)

Note: Expected Board Exit Temperature:

Innerlayers:	60-70°C (140-160°F)
Outerlayers:	(Cu/Sn or Cu/SnPb): 45-55°C (110-130°F)
Outerlayers(Gold Plate):	50-55°C (120-130°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): 5 – 15 cc/min.

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

Note: For Hakuto type laminators, a lamination roll temperature range of 105-130°C (220-265°F) is recommended.

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 caused by high temperatures. 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® 9000 can be exposed on all standard equipment used in the printed circuit board industry. Choose lamps that compliment the peak resist wavelength response of 350 to 380 nm.

Resolution down to 75 microns (3.0 mil) lines and spaces is possible with Riston® 9000 in optimized production environments.

Recommended Exposure Range

	Riston 9008	Riston 9013	Riston 9015	Riston 9020	Riston 9030
RST	10 – 18	10 - 18	10 – 18	10 – 18	10 – 18
SST	7 - 10	7 - 10	7 - 10	7 - 10	7 - 10
mJ/cm ²	30 – 60	40 – 90	40 – 100	55 – 120	55 - 130

Suggestions:

- Start with RST 13-14 for fine line applications, (100 microns L/S).
- Start with RST 15-16 for ≥ 125 microns L/S.

Note:

- RST = DuPont Riston® 25-Step Density Tablet (read as highest resist step)
- SST = Stouffer 21-Step Sensitivity Guide (read as highest resist step)
- Exposure energy (mJ/cm²) from APM Radiometer Model 87 on a DuPont PC-130 exposure unit.

PART 4: Development

Riston® 9000 Series can be developed in sodium or potassium carbonate with good productivity. It has been formulated to require little or no antifoam in development.

Development Recommendation

- **Spray Pressure:** 1.4-2.4 bar (20-35 psig) (high impact direct-fan or cone nozzle preferred).
- **Chemistry:**
 - Na₂CO₃: 0.7-1.0 wt%; 0.85 wt% preferred
 - Na₂CO₃·H₂O: 0.8-1.1 wt%; 1.0 wt% preferred
 - K₂CO₃: 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 buildup 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 % (65 % preferred)
- **Dwell Times** (approximate)
 - Riston® 9015: 28 seconds
 - Riston® 9020: 37 seconds
 - Riston® 9030: 52 seconds
- **Resist Loading:**
 - Feed & Bleed: 2-12 mil-ft²/gal; 0.06-0.37 m²/liter for 9008, 0.04 - 0.23m²/liter for 9013, 0.03-0.20 m²/liter for 9015, 0.02 - 0.15 m²/ liter for 9020, and 0.02-0.10 m²/liter for 9030.
 - Batch Processing: 0 -12 mil-ft²/gal; 0 - 0.37m²/liter for 9008, 0 - 0.23m²/liter for 9013, 0 - 0.20 m²/liter for 9015, 0 - 0.15 m²/liter for 9020, and 0 - 0.10 m²/liter for 9030.
- **Rinse water:** hard water (150-250 ppm CaCO₃ equivalent), preferred. Rinse water may be artificially hardened. Consult your DuPont Technical Representative for details.
- **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 \leq 10.2, or when active carbonate has fallen to \leq 60% of total carbonate.

Note: Dwell Time ranges were established in Chemcut type C-2000 developer equipment, using sodium carbonate and 2 - 10 mil-ft²/gal loading, with all other variables set within the preferred ranges mentioned above.

Defoamers

Riston® 9000 Series are formulated for no antifoam requirement.

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 equally well.

PART 5: Plating

(acid copper sulfate; tin/lead; tin; nickel; gold)

(Follow plating vendors' recommendations)

Recommendations: Preplate Cleaning Process Sequence

- Acid Cleaner : 43-54°C (110-130°F); 2-3 minutes
- Spray and/or Tank Rinse: 1- 2 minutes
- Microetch to remove 0.13-0.25 µm (5-10 microinches) copper (time: as required)
- Spray and/or Tank Rinse: 1- 2 minutes
- Sulfuric acid (5-10 vol%) dip; 1-2 minutes
- (Optional: spray rinse; 1-2 minutes)

Recommended Acid Hot Soak Cleaners:

Electrochem AC-7A:

12-13 vol%; 43-49°C (110-120°F) 5-10 min

Note: Other cleaners may perform equally well.

PART 6: Etching

- Riston® 9000 Series Resists are compatible with most acid etchants; e.g., cupric chloride (free HCl normality \leq 3.0 N), hydrogen peroxide/sulfuric, and ferric chloride.
- Riston® 9000 is compatible with most alkaline ammoniacal etch processes.

Note: The replenisher flood rinse should be well vented (air flow toward etch chamber) to minimize attack from ammonia vapors.

PART 7: Stripping

Riston® 9000 film is formulated to dissolve slowly in stripping solution after breaking up into pieces. This can greatly increase the life of stripping solution and reduce costs, if the resist can be removed before dissolving.

Stripping Recommendations

- **Chemistry:**
 - NaOH: 1.5 - 3.0wt%
 - KOH: 1.5 - 2.5wt%
 - Proprietary Strippers: concentration per vendor recommendation.
- **Spray Pressures:** 1.4-2.4 bar (20-35 psig)
- **Spray Nozzles:** High Impact direct fan.
- **Breakpoint:** 50% or lower
- **Stripper Dwell Times** (seconds) at 55°C (130°F) (approximate). Dwell time is total time spent in the stripper, given a 50% breakpoint.
- **Defoamers:** Follow recommendations in Developer Section.

Proprietary Strippers

The following proprietary stripper have been used successfully for Riston®9000:

- Ardrex PC-4055
- Ardrex PC-4077
- Dexter RS1677 (Delta Strip 775)
- ADF-12 (Electrochemicals)

Others may perform equally well.

Generic mixtures of 3% NaOH (or KOH) plus 3% MEA (monoethanolamine) have also been used successfully.

Storage & Safe Lighting

See recommendations in the General Processing Guide DS98-41.

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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