

### PRODUCT DESCRIPTION

RS-2000 is a dual component, alkaline developable liquid photo-imageable solder mask for single and double sided screen printing and air spray application.

It is designed for on-contact exposure and development in aqueous sodium or potassium carbonate.

This advanced material presents good definition characteristics, high photosensitivity, excellent adhesion and optimal resistance to all common finishes processes.

RS-2000 is formulated for the manufacture of Rigid PCB as permanent protective coatings.

RS-2000 products exhibit the following performance properties:

- Wide process latitude enabling fine image reproduction with clean PTH/Via development.
- Excellent reliability.
- High productivity with yields in order of 14-18 m<sup>2</sup>/kg (depending on application).
- Superior chemical and electrical properties of RS-2000 guarantee excellent resistance to all common process finishes.
- RS-2000 is compatible with UV and thermal legend inks.
- Resistant to downstream processing chemicals including no-clean fluxes, cleaners, solvents, etc.
- Completely ecological.
- Fully compatible with all assembly rework processes.
- Meets or exceeds IPC SM 840-E specifications.

**UL CERTIFICATE – file n° QMJU2.E310593**

## PHISICAL – CHEMICAL PROPERTIES

PROPERTIES	VALUE
COLOUR	Ink: Various
	Hardener: White
MIXING RATIO	Ink/Hardener = 80/20 (for RS-2000 CBKM-F) Ink/Hardener = 75/25 (for all other products)
VISCOSITY (INK + HARDNER)	180 ± 30 Ps a 25°C – Viscotester VT-04F
SOLID CONTENT	75 ~ 78% w/w
DENSITY AFTER MIXING	1.3 ± 0.2 g/cm <sup>3</sup>
POT LIFE	Maximum 24 h at 25°C in a dark place
SHELF LIFE	6 months (5 ~ 25°C) in original package

## INK PREPARATION

RS-2000 is supplied as pre-weighed, two component products. Briefly premix the individual components prior to addition of the catalyst into the ink.

Thoroughly blend until a homogenous mixture is obtained (See "Mixing ratio" in table reported above).

Allow the mix to sit for ~ 15 minutes in its sealed container prior to use. Briefly remix prior to use.

The pot life of the mixed material is 24 hours provided the material is stored in its original sealed containers. Keep away from heat and strong light sources.

## RECOMMENDED PROCESS FLOW & OPERATING PARAMETERS

	24 hours conditioning time at working room temperature, before use, is recommended
<b>Mixing</b>	The product is supplied as two components that has to be mixed with mixing ratio ink/hardener 75/25
	Conditioning time, after mixing, is recommended: 20 ~ 30 min
	In case add solvent, OPSR Thinner, to obtain desired viscosity value
<b>Surface Treatment</b>	Brushing (Rz = 1.5 ~ 3.0 µm; Ra = 0.1 ~ 0.3 µm)
	Microetch (Etch rate ≥ 1.0 µm)
	Pumice (Pumice grade FFF 10 ~ 15%)
<b><i>Double side printing, cure separately</i></b>	
<b>Screen Side 1</b>	43 - 55 T polyester treats/cm
<b>Pre-baking</b>	70° ~ 75°C (158 ~ 167°F) for 15 ~ 20 min (Hot air convection oven with good air ventilation)
<b>Cooling</b>	After 15 minutes at room temperature second side processing is possible
<b>Screen Side 2</b>	43 - 55 T polyester treats/cm
<b>Pre-baking</b>	70° ~ 75°C (158 ~ 167°F) for 15 ~ 20 min (Hot air convection oven with good air ventilation)
<b>Cooling</b>	After 20 minutes at room temperature exposure is possible
<b><i>Cure both sides at one time</i></b>	
<b>Pre-baking</b>	35 ~ 50 minutes at 70° ~ 75°C (158 ~ 167°F) (Hot air convection oven with good air ventilation)
<b>Cooling</b>	After 20 minutes at room temperature exposure is possible
<b>Exposure</b>	Metal Halide Lamp (5 ~ 7 KW)
	700 ~ 1000 mJ/cm <sup>2</sup> for white colour Stouffer 21 steps 8 ~ 10
	250 ~ 700 mJ/cm <sup>2</sup> for all other colours Stouffer 21 steps 8 ~ 12
<b>Hold Time</b>	Minimum 10 min.
<b>Developing</b>	1.0 ~ 1.5% Na <sub>2</sub> CO <sub>3</sub> /K <sub>2</sub> CO <sub>3</sub> Solution at 29 ~ 32°C Dwell time 50 ~ 60 sec
	Spray Pressure 1.5 ~ 2.5 Kg/cm <sup>2</sup>
<b>Rinsing</b>	City Water at 25 ~ 28°C Spray pressure 1.0 ~ 1.5 Kg/cm <sup>2</sup>
<b>Final Cure</b>	60 minutes at 150 ~ 160°C

## DRYING CYCLES

TEMPERATURE	72 ~ 75°C	72 ~ 75°C	72 ~ 75°C	72 ~ 75°C
TIME (minutes)	40	50	60	70
IMAGING EFFECT	OK	OK	OK	NG

Note: In double side processing, curing separately, the side 1 drying should be sufficiently tack-free to resist fingerprinting.

Care should be taken when handling panels to prevent damage to side 1 during second side coating.

Allow panels to cool to room temperature prior to imaging.

## HOLD TIME AFTER DRYING

The hold time after drying depends on the operative parameters used during the pre-baking process.

## IMAGING

A 5 kW or greater UV vacuum frame exposure unit without UV filter should be used and UV spectra at 280-420 nm (360 nm peak) is required in order to properly expose and polymerize.

Also, the amount of energy required to fully polymerize the coverlay film will vary depending upon film colour, thickness and proprietary formulation: proper exposure is determined through the use of a 21 step Stouffer step tablet.

A properly exposed RS-2000 will exhibit a Stouffer step reading of solid  $\geq 8$  steps.

*The procedure for Stouffer step analysis is as follows:*

1. Ensure the Developing process is running properly (i.e. temperature, concentration, spray pressure, etc.).
2. Coat a number of copper clad panels with RS-2000 and tack dry to completion.
3. Set developer speed to obtain 30% breakpoint.
4. Once the developer process is set, set the exposure energy to obtain a solid Stouffer step reading of 8 solid.
5. The Stouffer step reading should be monitored on a regular basis as part of an SPC program of process control.

## SENSITIVE PROPERTIES

PROJECT	INK THICKNESS	DEVELOP TIME	EXP. ENERGY	STOUFFER STEP	EXP. ENERGY	STOUFFER STEP
			White Colour		All Other Colour	
STOUFFER STEP 21 STEPS	25 µm	60 sec	800 mJ/cm <sup>2</sup>	~ 9	300 mJ/cm <sup>2</sup>	8 ~ 10
			900 mJ/cm <sup>2</sup>	~ 10	400 mJ/cm <sup>2</sup>	9 ~ 11
			1000 mJ/cm <sup>2</sup>	~ 11	500 mJ/cm <sup>2</sup>	10 ~ 12

## DEVELOPMENT

Typical conditions utilized in horizontal or vertical spray units are as follows:

	OPTIMUM	RANGE
<b>Na<sub>2</sub>CO<sub>3</sub> / K<sub>2</sub>CO<sub>3</sub></b>	1.0%	0.8 ~ 1.2%
<b>Temperature</b>	30°C (90°F)	29 ~ 35°C (86 – 95°F)
<b>Spray Pressure</b>	2.0 bar (30 psi)	1.5 ~ 2.5 bar (20 ~ 60 psi)
<b>Dwell Time</b>	As measured	50 ~ 60 sec
<b>Rinse Water</b>	City water	
<b>Rinse Pressure</b>	1.5 bar (20 psi)	1.0 ~ 2.5 bar (15 ~ 60 psi)
<b>Rinse Temperature</b>	25°C (77°F)	24 ~ 28°C (75 ~ 82°F)
<b>Drying</b>	Warm turbine air or air knife drying	

The developer solution should be periodically analyzed for carbonate concentration to ensure proper solution makeup is maintained.

It should be measured and monitored on a regular basis.

Adjust the carbonate concentration in accordance with the analysis result.

## REWORK

Rework of misregistered images may be accomplished by stripping the solder mask film in 5 ~ 10% NaOH at 50°C (122°F), prior to final cure.

## FINAL CURING

	COATING THICKNESS	CICLE
<b>Final Curing</b>	≤ 30 μm wet	140 ~ 160°C x 50 ~ 60 min
	≥ 30 μm wet	80°C x 30 min / 110°C x 30 min / 160°C x 60 min

Optimum thermal curing is attained by baking the panels for 60 minutes at 150°C (300°F).

## RS-2000 PROPERTIES

TESTED ITEMS	RESULT	REMARK
<b>Pencil Hardness</b>	> di 6H	IPC-TM-650 TM-2.4.27.2 JIS K5400
<b>Adhesion</b>	100/100	IPC-TM-650 TM-2.4.28.1 JIS K5400
<b>Abrasion</b>	OK	IPC-SM-840-E 3.5.1 Taber class 3
<b>Solder Resistance</b>	OK	IPC-SM-840-E 3.7.2
<b>Resistance To Molten Solder</b>	OK	260°C, 10 sec, 6 times
<b>Hydrolysis Stability</b>	OK	IPC-SM-840-E 3.6.2 Class H
<b>Flammability</b>	V0	UL94
<b>Chemical Resistance</b>	OK	IPC-SM-840-E 3.6.1
		Water: T <sub>amb</sub> – 60 min
		Sulphuric Acid 10%: 20°C – 60 min
		Sodium Hydroxide 10%: 20°C – 60 min
<b>Solvents Resistance</b>	OK	IPC-SM-840-E 3.6.1
<b>Insulation Resistance</b>	> 1 x 10 <sup>11</sup> Ohm	IPC-SM-840-E 3.8.2 class H before and after soldering process
<b>Moisture Insulation Resistance</b>	OK	IPC-SM-840-E 3.9.1 class H
<b>Ion Migration Resistance</b>	OK	IPC-SM-840-E 3.9.2 class H
<b>Voltage Breakdown</b>	2 ÷ 3 KV	IPC-SM-840-E 3.8.1 (min 500 VDC/mil)
<b>Thermal Shock</b>	OK	IPC-SM-840-E 3.9.3 SH
<b>HASL</b>	OK	
<b>ENIG</b>	OK	

## **STORAGE AND SHELF LIFE**

RS-2000 products may be stored at ambient temperatures.

Avoid elevated temperature (> 37°C or > 100°F) and direct sunlight.

RS-2000 products exhibit a minimum of 6 months shelf life if the above conditions are met.

## **HANDLING PRECAUTIONS**

BEFORE HANDLING ANY CHEMICAL PRODUCTS, IT IS IMPORTANT TO READ THE APPROPRIATE MATERIAL SAFETY DATA SHEET.

**In case of order please indicate this code:**

CODE	PACK SIZE	NAME	COLOUR	FINISHING
<b>HT 8001</b>	1 Kg	RS-2000 6GL	Green	Glossy
<b>HT 8004</b>	1 Kg	RS-2000 Y	Yellow	Glossy
<b>HT 8005</b>	1 Kg	RS-2000 R	Red	Glossy
<b>HT 8006</b>	1 Kg	RS-2000 BL	Blue	Glossy
<b>HT 8007</b>	1 Kg	RS-2000 BK	Black	Glossy
<b>HT 8021</b>	1 Kg	RS-2000 CBKM-F	Black	Matt
<b>HT 8009</b>	1 Kg	RS-2000 3GLM	Green	Matt
<b>HT 8002</b>	1 Kg	RS-2000 W-1(B)	White	Glossy
<b>HT 8015</b>	1 kg	RS-2000 W	White	Glossy
<b>HT 8016</b>	1 Kg	RS-2000 WDM	White	Matt
<b>HT 8027</b>	1 Kg	RS-2000 W-16A	White	Glossy

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Claims on account of weight, loss of or damage to the goods in transit ( so far as seller is liable) shall be made in writing to the seller within the period of 30 days of receipt thereof.

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