TECHNICAL DATA SHEET

PSR-4000 GP01EU Colors

(UL Name: PSR-4000HA/CA-40HA)

LIQUID PHOTOIMAGEABLE SOLDER MASK

- **Screen Print Application**
- **Black, Blue, Red and White Satin Finish**
- **RoHS Compliant**
- **Excellent Coating Properties**
- **Compatible with Lead-Free Processing**
- **Excellent Small Hole Clearing**
- **Wide Processing Window**
- **Fine Dam Resolution**
- **Withstands ENIG & Immersion Tin**
- **Low Odor**

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PROCESSING PARAMETERS FOR PSR-4000 GP01EU COLORS

PSR-4000 GP01EU Colors is a two-component, alkaline developable LPI solder mask products for screen print application. The product is designed to be user friendly with wide processing latitudes, low odor, fast developing and good resistance to alternate metal finishes such as ENIG and immersion Tin. All Taiyo America products comply with the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

PSR-4000 GP01EU COLORS COMPONENTS:

	PSR-4000 GP01EU Colors	/ CA-40 GP01
Mixing Ratio	70 parts	30 parts
Color	Black, Blue Red and White	White

Mixed Properties prior to PMA Dilution	
Solids	80%
Viscosity	220-270ps
Specific Gravity	1.5

MIXING

PSR-4000 GP01EU Colors is supplied in pre-measured containers with a mix ratio by weight of 70 parts, 2.8 kgs, **PSR-4000 GP01EU Colors** and 30 parts, 1.2 kgs, **CA-40 GP01. PSR-4000 GP01EU Colors** can be mixed a mechanical mixer at low speeds to minimize shear thinning for 10 – 15 minutes.

PRE-CLEANING

Prior to solder mask application, the printed circuit board surface needs to be cleaned. Various cleaning methods include Pumice, Aluminum Oxide, Mechanical Brush, and Chemical Clean. All of these methods will provide a clean surface for the application of **PSR-4000 GP01EU Colors**. Hold time after cleaning the printed circuit board should be held to a minimum to reduce the oxidation of the copper surfaces.

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SCREEN PRINTING

Method: Single Sided and Double Sided Screening

- Screen Mesh: 74 – 110
- Screen Mesh Angle: 22.5° Bias
- Screen Tension: 20 - 28 Newtons
- Squeegee: 60 – 80 durometer
- Squeegee Angle: 27 – 35°
- Printing Mode: Flood / Print / Print
- Flood Pressure: 20 – 30 psi
- Printing Speed: 2.0 – 9.9 inches/sec
- Printing Pressure: 60 – 100 psi

TACK DRY CYCLE

The Tack Dry step is required to remove solvent from the solder mask film and produce a firm dry surface. The optimum dwell time and oven temperature will depend on oven type, oven loading, air circulation, exhaust rate, and ramp times. Excessive tack dry times and temperature will result in difficulty developing solder mask from through holes and a reduction in photo speed. Insufficient tack dry will result in artwork marking and/or sticking. Typical tack dry conditions for **PSR-4000 GP01EU Colors** are as follows:

- Oven Temperature: 160 - 175°F (71 - 79°C)
- For Single-Sided (Batch Oven)
  - 1st Side: Dwell Time: 15 - 30 minutes
  - 2nd Side: Dwell Time: 20 - 40 minutes
- For Double-Sided (Conveyorized or Batch Oven)
- Dwell Time: 20 - 70 minutes

EXPOSURE

PSR-4000 GP01EU Colors requires UV exposure to define solder mask dams and features. The spectral sensitivity of **PSR-4000 GP01EU Colors** is in the area of 365 nm. Exposure times will vary by bulb type and age of the bulb. Below are guidelines for exposing **PSR-4000 GP01EU Colors**.

- Exposure Unit: 7 kW or higher
- See table for Energy and Stouffer Step per Color

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PROCESSING PARAMETERS FOR PSR-4000 GP01EU COLORS

EXPOSURE (CONTINUED)

PSR-4000 GP01 EU Colors	Exposure Energy	Stouffer Step Range	Resolution Capabilities*
Black	Minimum 500 mJ/cm^2	9 – 11	4 mil dams
Blue	Minimum 400 mJ/cm^2	10 – 12	3 mil dams
Red	Minimum 400 mJ/cm^2	10 – 12	3 mil dams
White	Minimum 500 mJ/cm^2	10 - 12	4 mil dams

***At coating thicknesses of 30 microns or less.**

DEVELOPMENT

PSR-4000 GP01EU Colors is developed in an aqueous sodium or potassium carbonate solution. Developing can be done in either a horizontal or vertical machine.

- Solution: 1% by wt. Sodium Carbonate or 1.2% Potassium Carbonate
- pH: 10.6 or greater
- Temperature: 85 - 95°F (29 - 35°C)
- Spray Pressure: 25 - 45 psi (1.7 – 3.1 bars)
- Dwell Time in developing chamber: 45 - 120 seconds
- Water rinse is needed to remove developer solution followed by a drying step

PRE CURE (OPTIONAL) This step may be required if the vias remain tented on both sides after developing due to the board design. The added drying cycle will prevent out-gassing of the vias. This phenomenon can cause the solder mask over the vias to peel or pop and may also exhibit a degree of oozing due to the entrapped solvent. The required drying cycle is 80
- 110°C for 40 to 60 minutes. An extended time may be required on the higher aspect ratio.

FINAL CURE

PSR-4000 GP01EU Colors requires a thermal cure to insure optimal final property performance. Thermal curing can be done in a batch oven or conveyorized oven.

- Temperature: 275 – 300°F (135 – 149°C)
- Time at Temperature: 45 – 60 minutes

For Process Optimization please contact your local Taiyo America Representative

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FINAL PROPERTIES FOR PSR-4000 GP01EU COLORS

Item	Test Conditions	Results
CTI (Comparative Tracking Index – Green Satin	ASTM-D-3638-07	600 Volts
Adhesion	Taiyo internal method Cross hatch peeling	100/100
Pencil Hardness	Taiyo internal method No scratch on copper	7H
Halogen Content	JPCA standards of less than 900 ppm Halogens= "Halogen Free"	Blue – 450ppm; Red – 1030ppm; All other colors to be tested
Solder Heat Resistance	Rosin flux 260˚C/10sec, 3cycles	Pass
Solvent Resistance	PGM-Ac, 20˚C, 20 min. Immersion and tape test	Pass
Acid Resistance	10vol%H_2SO_4, 20˚C, 20 min. Immersion and tape test	Pass
Alkaline Resistance	10wt%NaOH, 20˚C, 20 min. Immersion and tape test	Pass
Insulation Resistance	IPC Comb type (B-pattern) Humidification: 25~65˚C cycle 90%%RH, DC100V loading for 7 days Measurement: After the above treatment, loading 500V for 1 minute at room temperature	Initial: $6.6x10^{13}\Omega$ Conditioned: $2.4x10^{12}\Omega$
Dielectric Constant	Taiyo internal method Values at 1MHz Humidification: 25~65˚C cycle 90%%RH for 7 days Measurement: After the above treatment, measured at room temperature	Initial: 4.1 Final 4.7
Dissipation Factor	Taiyo internal method Values at 1MHz Humidification: 25~65˚C cycle 90%%RH for 7 days Measurement: After the above treatment, measured at room temperature	Initial: 0.022 Final: 0.023
Tg	Internal Test (TMA)	130° C
CTE	Internal Test (TMA) alpha 1 / alpha 2	75 / 140
Electrolytic gold plating	Internal lab test: Ni 5µm and Au 1µm	Pass
Electroless gold plating	Internal lab test: Ni 3µm and Au 0.03µm	Pass

Taiyo America, Inc. (TAIYO) warrants its products to be free from defects in materials and workmanship for the specified warranty period **(PSR-4000 GP01EU Colors / CA-40 GP01 Warranty period is 12 Months)** provided the customer has, at all times, stored the ink at a temperature of 68°F or less. TAIYO accepts no responsibility or liability for damages, whether direct, indirect, or consequential, resulting from failure in the performance of its products. If a TAIYO product is found to be defective in material or workmanship, its liability is limited to the purchase price of the product found to be defective. TAIYO MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE. TAIYO'S obligation under this warranty shall not include any transportation charges or costs of installation or any liability for direct, indirect, or consequential damages or delay. If requested by TAIYO, products for which a warranty claim is made are to be returned transportation prepaid to TAIYO'S factory. Any improper use or any alteration of TAIYO'S product by the customer, as in TAIYO'S judgment affects the product materially and adversely, shall void this limited warranty.

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