

HUNTSMAN

**High Performance, Photoimageable Solder Mask
3 Components, Solvent Developable**

Technical Data Sheet

PROBIMER[®] 52

Curtain Coating System

- **Matte Surface Finish**
- **Excellent Adhesion to a Wide Variety of Metal Surfaces and Substrates.**
- **Outstanding Electrical, Physical and Mechanical Properties.**

Probimer[®] 52

Solder Mask and Protective Coating

General	<p>Probimer 52 (mild solvent) is based on a unique epoxy photopolymer which has a chemical structure that allows curing in two separate and distinct states:</p> <ul style="list-style-type: none"> • Photopolymerization by UV radiation • Heat Curing using a latent epoxy resin hardener (e.g., Hardener HZ 32) <p>Due to its photoresist properties, Probimer 52 provides accurate solder masking and, when fully cured, provides a durable coating meeting all solder mask specifications. The sequence of operations is as follows: Coating → Drying → UV Exposure → Developing → Curing Probimer 52 makes it possible to solder mask large format fine line boards, which would be impossible with the silkscreen technique.</p>
Typical Applications	Photoimageable solder mask and protective coating for the manufacture of printed wiring boards, especially for high density, fine-line, double-sided and multi-layer boards, and surface mount applications.
Features	Two stage cure: Photopolymerization Subsequent application of heat
Cured Properties	Good electrical and thermal properties equivalent to FR-4 glass/epoxy substrate. Good adhesion to substrate with excellent chemical resistance and flame retardancy

Typical Properties	Property	Probimer 52	Probimer Matting Agent: DW 92/ DW 91H	Probimer Hardener HZ 32
	Form:	Liquid	liquid	liquid
	Solvent:	ethoxyethylacetate and methyl cellosolve		methyl cellosolve
	Color	yellow/red brown	light gray	dark blue
	Solids content	49-52%	app. 40%/28%	7.5-9.0%
	Epoxy value:	0.7-1.0 Aeq/kg	NA	NA
	Viscosity @ 25°C	4,000-10,000 mPa s (cP)	130-300 mPa s (cP)	≤5 mPa s (cP)
	Density @ 25°C	1.15g/cm ³	1.25g/cm ³	0.99g/cm ³
	Flash point	39°C (102°F)	36°C (97°F)	41°C (106°F)
	Spectral sensitivity	300-450nm	300-400nm	NA

Coating

The surfaces to be coated should be dry and free from dust, dirt and grease. Depending of the surface finish (Cu, Sn/Pb, Sn, Ni or Au), the boards can be precleaned either by brushing or be chemical cleaning, rinsing and drying. Prior to application, mix components of the Probimer lacquer thoroughly and thin to the necessary viscosity.

Approximate mix ratio using

Probimer Matting agent:	DW 92	DW91H
Probimer 52	5,000g	5,000g
Probimer Matting Agent	3,000g	3,000g
Probimer Hardener HZ 32	1,000g	1,000g
Thinner* approximate	1,000g	n/a

* A mix of 70% Dowanol PM** and 30% diglyme.

Probimer 52 is best applied by curtain coating, i.e., by passing the board at high speed through a falling curtain of coating solution. An even film of Probimer 52 is applied to the conductor and laminate surfaces without filling the component holes. The thickness of the film can be easily and quickly adjusted to cope with the requirements of different specifications.

The most common settings for coating are:

Viscosity (DIN AK4 Cup)	60 seconds
Solids content	38%
Coating speed	90m/min
Curtain thickness	500µm

** Dowanol® PM is a product of Dow Chemical, Midland, Michigan

Drying

The freshly coated film is warm air dried horizontally for approximately 12 minutes before being conveyor tack dried by I/R oven at 120-140°C (245-280°F) for 1.5 minutes or thermal tack dried in a conveyerized tunnel oven at 90 – 95°C (194 – 203°F).

Exposure

Probimer 52 is sensitive to ultraviolet radiation in the 300-450nm range.

Exposure time depends on well-known parameters. Huntsman recommends an exposure unit rated at 7kW, which gives the optimum conditions for exposure while maintaining the photo tool and work piece at 30-35°C. Typical exposure time in this type of unit is in the range of 35-65 seconds.

Developing

Probimer is developed in BLO*, a halogen-free, high-boiling organic solvent. Developing time depends on developer temperature, conveyor speed, and coating thickness.

* Gamma Butyro Lactone

Stripping

If a Probimer 52 film has to be stripped due to damaged coating, improper registration or developing, this should be done as soon as is practical. If immediate stripping is not possible, store the board in a cool place, free from ultraviolet radiation. Stripping is best carried out in BLO in a specially designed stripping tank, at 30-40°C for 10 minutes.

Thermal Curing

Thermal curing is needed to impart good mechanical and chemical properties to the photopolymerized film. Curing may take place either in a static oven or in a conveyORIZED two-zone specially designed oven.

The curing cycle is an oven temperature ramp to 150°C (300°C) over 30 minutes, then bake for 60 minutes at 150°C.

Remember that heat-cured Probimer 52 films cannot be stripped.

Cured Properties

Heat-cured Probimer 52 solder masks and protective coatings exhibit properties comparable to those of a laminating resin used to manufacture printed wiring boards conforming to the NEMA L1, 1971, Grade FR-4 specification

Typical Physical and Chemical Properties When Cured

Solder bath resistance (290°C)	≥10s
Thermal shock test MIL STD 202E	passed
Salt spray test (5% NaCl, 35°C, 200h)	passed
Abrasion resistance IPC SM 840	passed
GPO-Test (BS 6096) General Post Office UK	passed
UL94 V-O	passed
Solvent resistance	>1h
Isopropanol alcohol	>1h
MEK	>1h
1,1,1-trichloroethane	>1h
Methylene chloride	>1h
Toluene	>1h

Electrical Properties

	Test Methods	Unit	Value
Surface resistance: DIN 53482 ASTM D-257			
Initial value		MΩ	10 ⁶ -10 ⁷
after 24h in H ₂ O @ 23°C		MΩ	10 ⁵ -10 ⁶
after 96h @ 35°C/90%/rh		MΩ	10 ⁵ -10 ⁶
Volume resistivity: DIN 53482 ASTM D-257			
Initial value		MΩcm	10 ⁹ -10 ¹⁰
after 24h in H ₂ O @ 23°C		MΩcm	10 ⁷ -10 ⁹
after 96h @ 35°C/90%/rh		MΩcm	10 ⁷ -10 ⁹
Dielectric constant: DIN 53483 ASTM D-150			
(ξ at 1 MHz)			
Initial value			3.5-4.0
after 24h in H ₂ O @ 23°C			3.6-4.2
after 48h in H ₂ O @ 50°C			3.6-4.2

**Dissipation factor: DIN 53483 ASTM
D-150**

(tan δ at 1 MHz)		
Initial value	%	2.0-3.0
after 24h in H ₂ O @ 23°C	%	3.0-4.0
after 48h in H ₂ O @ 50°C	%	3.0-4.5

**Dissipation factor: DIN 53483 ASTM
D-150**

(tan δ at 50 Hz)		
@ 25°C	%	0.8-1.0
@ 50°C	%	1.2-1.5
@ 75°C	%	1.5-2.0
@ 100°C	%	2.5-3.0
@ 120°C	%	5-7

**Dissipation factor: DIN 53483 ASTM
(23°C) D-150**

(tan δ)		
@ 10 ₂ Hz	%	0.6-0.9
@ 10 ₃ Hz	%	0.7-1.0
@ 10 ₄ Hz	%	1.2-1.6
@ 10 ₅ Hz	%	2.0-2.5
@ 10 ₆ Hz	%	2.0-3.0

Safety Precautions

Warning: Harmful if inhaled or absorbed through the skin. Contains ethyl and methyl glycol ether solvents, which have caused adverse reproductive effects in laboratory animals on prolonged exposure. Combustible liquid.

Avoid contact with eyes, skin or clothing
Do not breath vapor, mist or spray
Use with adequate ventilation
Promptly remove wet, contaminated clothing to prevent health and fire hazards.
Destroy contaminated leather and absorbent shoes.
Wash thoroughly after handling.
Read Material Safety Data Sheet Before Using.
For Industrial Use Only.

Handling and Storage

Keep away from sources of ignition or heat.
Ground and bond metal containers for liquid transfer to avoid static spark.
Store in tightly closed containers in cool, well-ventilated area.
Material should be used in an explosion-proof area.

First Aid**In case of contact:**

Eyes: Immediately flush with water for at least 15 minutes.

Skin: Promptly wash thoroughly with mild soap and water.

Inhalation: Remove to fresh air. Give oxygen if breathing is difficult

Ingestion: If conscious, give plenty of water or milk and induce vomiting

Important

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The test data and results set forth herein are based on laboratory work and do not necessarily indicate results that the buyer or user will attain. Full-scale testing and product performance is the responsibility of the buyer and user.

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