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MacDermid Enthone

TECHNICAL DATA SHEET
Semiconductor Solutions

# ENTHONE M SERIES

## Permanent Epoxy Marking Ink

Product Code: 135446

## DESCRIPTION

**ENTHONE M-Series** inks are permanent, two component, epoxy-based marking inks. They may be used with a selection of catalysts which cure at elevated and/or room temperatures. When properly applied and cured, **ENTHONE M-Series** inks have excellent adhesion to glass, metal and thermosetting plastics. They have excellent chemical and thermal resistance properties.

**ENTHONE M-Series** marking inks are used in the electronic, aerospace, automotive, appliance and decorative packaging industries. Uses include the permanent marking of semiconductor components, printed circuit boards, connectors, dials, nameplates, panels, chassis, glass and thermoplastics.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

## PHYSICAL PROPERTIES

### COLOR NUMBERS AND MIX RATIOS

| | | | Mix Ratios | |
|---|---|---|---|---|
| | | | Catalyst Additions Parts by Weight per 100 Parts Ink | |
| Ink Number | Color | Recommended Catalyst | All Catalysts (except Catalyst 5) | Catalyst 5 Only |
| M 2 N | Red (Cadmium) | * | 4.0 | 6.5 |
| M 4 N | Yellow (Cadmium) | * | 5.0 | 7.5 |
| M 5 N | Green (Cadmium) | * | 5.0 | 7.5 |
| M 6 N | Blue | * | 5.0 | 7.5 |
| M 9 N | White | * | 5.0 | 7.5 |
| M 0 N | Black [1] | * | 5.0 | 7.5 |
| M 0 NC | Inorganic Black | B-13/28 | 5.0 | NR |

* Use any catalyst listed in Catalyst Description Section

[1] Not intended for electrical applications

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## CATALYST DESCRIPTION

| Catalyst | Description | Cure | Average Pot Life (hours) |
|---|---|---|---|
| 20/A | Basic air cure catalyst. Cures at room temperature in 5 to7 days. Tack free after 1 to 2 hours. May also be heat cured. | R.T. or Heat | 2 |
| B-3 | Basic heat cure only catalyst. Higher cure temperatures decrease cure time. | Heat | 4 |
| 5 | Long pot life. Excellent adhesion properties. Special mix ratios are required for this heat cure only catalyst (refer to Color Numbers and Mix Ratios Section). | Heat | 24 Max* |
| B-13/28 | Accelerated air cure catalyst. Cures at room temperature in 3 days. Shorter pot life. | R.T. or Heat | 1 |
| 45 | Long pot life. This heat cure only catalyst contains adhesion promoters. Provides excellent adhesion to glass and metals with good water resistance. Slightly decreases solvent resistance. | Heat | 12 |
| 77 | Adhesion promoting catalyst. Cures at room temperature in 5-7 days. Provides similar characteristics as Catalyst 45. Maximum adhesion is achieved by heat cure @ 65.6 to 93.3 °C (150 to 200 °F). | R.T. or Heat | 1 |

* Note: When using Catalyst #5 discard ink after 24 hours

## MAKE UP PROCEDURE

### MIXING INSTRUCTIONS

Measure ink and catalyst at the proper mix ratio (refer to Color Numbers and Mix Ratios Section). Both the ink and catalyst should be weighed accurately. Excessive and insufficient amounts of catalyst are detrimental to cured ink film properties. Mix thoroughly without introducing excessive amounts of air. Avoid the use of paper or wax coated cups. Stir from bottom of the container.

### OBSERVE INDUCTION PERIOD

All catalysts: 30 minutes

Catalysts 45 and 5: 60 minutes

Allow ink/catalyst mixture to stand for at least 30 minutes prior to application. This provides an induction period ensuring a homogenous mix of resin and catalyst and allows any entrapped air to escape from the mixture. The average pot life begins after the induction period.

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## APPLICATION

**ENTHONE M Series inks** may be applied by hand stamping, machine marking, screen printing, spraying, and roller printing. To ensure optimum adhesion, it is imperative that the surface to be printed is clean and free of any residues or particulates.

## OPTIONAL ADDITIONS

Additions of thinner or flow agents should always follow the induction period. If the induction period is not observed, the thinner or flow agent may interfere with the catalyzation process and could affect the final cured properties.

## POT LIFE

Pot life will vary with the catalyst used (refer to Catalyst Description Section). To avoid waste, mix only an amount which can be consumed before the end of the pot life. High ambient temperatures will shorten the pot life. Solvent additions will increase the pot life. Catalyst 45 and 5 have the longest pot life (12 hr and 24 hr max respectively), however cure temperature requirements must be observed (see Recommended Cure Section). Catalyst # 5 has special pricing (Contact your local distributor for pricing information).

## SHELF LIFE

| | |
|---|---|
| **ENTHONE M Series Inks:** | 3 years from date of manufacture |
| All Catalysts: | 2 years from date of manufacture |

NOTE**:** Catalysts are hygroscopic. Containers should be kept tightly closed after each use to prevent moisture contamination.

## METHODS OF APPLICATION

### MACHINE MARKING

Minimum pressure is recommended for transfer-pad or flat-bed printers. Adjust rollers to 0.5 mL (0.0125 mm) clearance prior to the addition of ink. Increase the depth of the ink on the roll feeds until ink is transferred. Additions of AD2003 retarder may be used during the print run.

### HAND STAMPING

Use a brayer to roll out a thin film of ink onto a glass or metal plate. Transfer the ink from plate to the part with a rubber, neoprene, or urethane stamp. Minimum pressure provides a sharp image definition. Disposable stamp pads made of finely textured polyurethane foam or foam rubber may also be used. Because the ink begins to solidify at the end of its pot life, stamp pads cannot be reused.

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## SCREEN PRINTING

Monofilament polyester fabrics with a mesh count of 180 to 330 may be used. Mesh tension should be to the fabric manufacturer's recommendations. Stencils may be applied by direct, indirect, or direct/indirect methods. Squeegee material should be 70 to 80 durometer, sharp and free of nicks. Squeegee durometer, pressure, angle and print speed should be adjusted according to overall printing parameters to ensure high quality print definition.

## SPRAYING

Following the induction period, thin with AD2002 or a blend of 80% PM glycol ether and 20% methyl isobutyl ketone at 25 to 40% by volume, depending on air pressure and orifice of spray unit.

Thinner additions will extend the pot life considerably.

## THINNING

If thinning is required, add small amounts of AD2001 thinner. Additions should be made after the induction period. Thinner additions extend the pot life.

## RETARDING

Small amounts of AD2003 or carbitol acetate are recommended. Additions should only be made after the induction period has been observed.

## CLEANING / REMOVAL

Clean equipment before the ink dries and partially cures. Use Enthone Screen Cleaners, PC7804, or PC7886. Requires post water rinsing to remove surfactants.

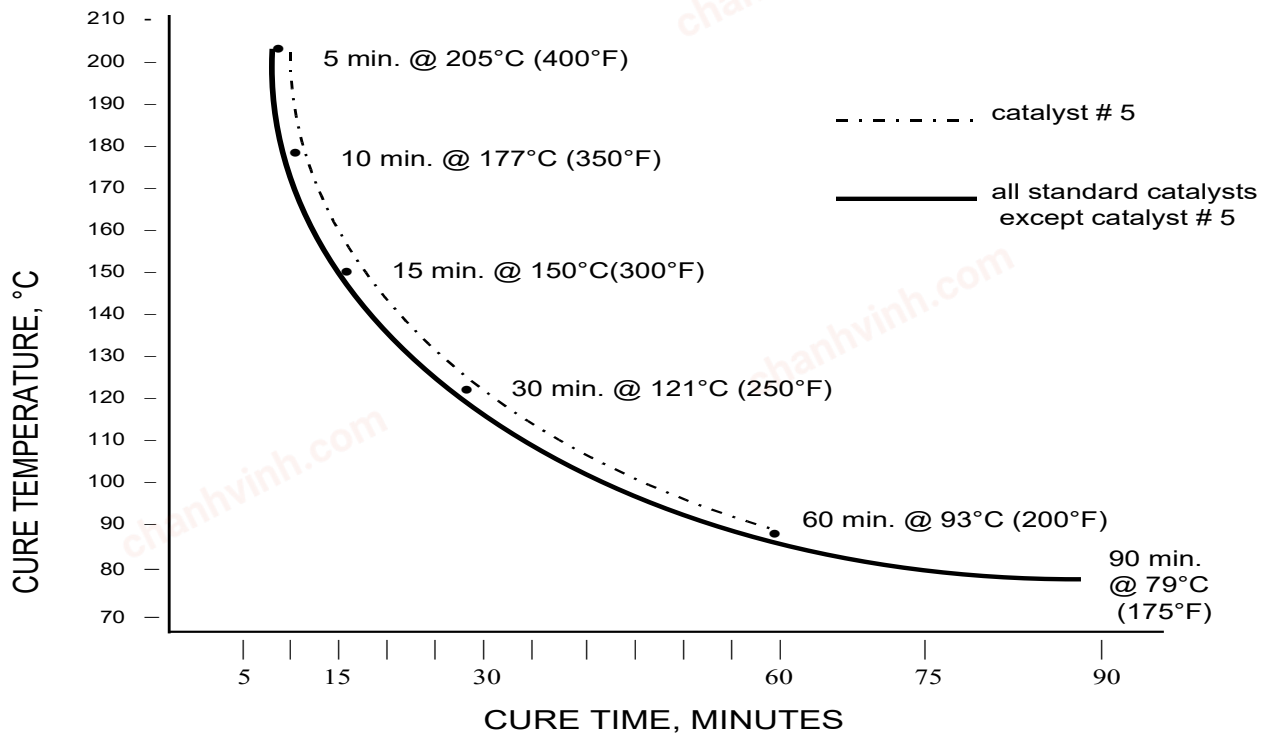
Localized Equipment Cleaning: Use AD2001, AD2002, AD2003, or other strong oxygenated solvents without surfactants that require post water rinsing.

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## RECOMMENDED CURE

CURE SCHEDULE



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## ADDITIONAL CURE INFORMATION

Cure schedules denote times/temperatures for curing ink film only. Allow additional time for the substrate to reach the actual cure temperature. Convection ovens should have sufficient exhaust and air movement to ensure solvent removal.

Cure temperatures above 79 °C (175 °F) are required for Catalysts B-3 or 45.

Cure temperatures above 93 °C (200 °F) are required for Catalyst 5.

Air cure Catalysts 20/A, B-13/28 and 77 provide a tack-free ink surface after 1 to 1.5 hours, depending on the ink film thickness. A tack-free surface is not an indication of cure. When using an ambient cure, articles should be racked and/or spaced to allow air circulation for the designated cure schedule. Do not box, bag, or package until the recommended cure time has been observed. Hot air blasts can be used to expedite handling. These catalysts may be fully or partially heat cured. Heat cure enhances the final cured properties. **ENTHONE M Series** marking inks may also be cured by infrared radiation.

Recommended cured ink film thickness should be between 0.7 to 1.4 mils (0.017 to 0.035mm).

An extended cure of 30 min. @ 150 °C (300 °F) will result in low out-gassing properties.

## CURED ELECTRICAL PROPERTIES

| Property | Value ** | Test Method |
|---|---|---|
| Insulation resistance, ohms | | Mil-I-43553A |
| @ 25 °C, initial reading | | ¶ 3.10 4.5.2.5 |
| M 0 N | >1.0 x $10^{12}$ | |
| M 0 NC | >1.0 x $10^{12}$ | |
| All Other Colors | >1.0 x $10^{12}$ | |
| Insulation resistance, ohms | | Mil-I-43553A |
| after humidity conditioning | | ¶ 3.10 4.5.2.5 |
| @ 77 ±10 °F and 95% RH for 48 hours | | |
| M 0 N | 1.5 x $10^{9}$ | |
| M 0 NC | >1.0 x $10^{10}$ | |
| All Other Colors | >1.0 x $10^{10}$ | |

**All test samples were cured at 121 °C (250 °F) for 30 minutes. Variations in the cure schedule will affect electrical properties.

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## QUALIFICATIONS

Qualification information to Mil-I-43553 & replacement C.I.D. A-A-56032 available upon request. Please contact your local representative.

## ELECTROLESS NICKEL IMMERSION GOLD (ENIG) PROCESSING

In printed wiring board applications with electroless nickel immersion gold (ENIG) as the final surface finish ink application must occur after the ENIG process. Processing the **ENTHONE M Series inks** through ENIG will hold up to the ENIG process, however during high heat assembly operations color change effects will occur with the white ink. Other colors can also be affected to a lesser extent. Please contact your local representative for additional information.

## ACCESSORY PRODUCTS

| | |
|---|---|
| **AD2001** | Thinner for nominal adjustments in viscosity. Incrementally add 3 to 6% by |
| **AD2002** | Thinner for spray applications. Add 25 to 40% by volume. |
| **AD2003** | Retarder to extend open time. Incrementally add 3 to 6% by weight. |
| **AD3002** | Flow agent to eliminate crawling, pin-holing and bubbling. Incrementally add 2 to 4% by weight. Mix gently to avoid over mixing. |

## PACKAGING

**ENTHONE M Series** marking inks are available in 6 fl. oz. ratio pack kits. These kits consist of the ink packaged in ½ pint metal containers with ratio packaged catalyst in glass vials. White and black inks are also available in quart, non-ratio packaged units. Quarts are sold with ¼ pint catalyst units. Catalyst 5 is available as a special order and is not included in the price of the ink, as are the other catalysts. Catalyst 5 is available individually for quarts units only.

M 0 N black, M 0 NC nonconductive black, and M 9 N white are also available in premeasured 10cc “bi-packs” with selected catalysts. M 0 N and M 9 N are available with either Catalyst 20/A or Catalyst B-3. M 0 NC is available with either Catalyst B-13/28 or Catalyst B-3.

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## SAFETY & WARNING

It is recommended that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use.

**Safety Data Sheets are available.**

## WASTE TREATMENT

Prior to using any recommendations or suggestions for waste treatment, the user is required to know the appropriate local/state/federal regulations for on-site or off-site treatment which may require permits. If there is any conflict regarding our recommendations, local/state/federal regulations take precedent.

## ORDER INFORMATION

| Product | Code |
|---|---|
| Enthone M Series Ink | |

## CONTACT INFORMATION

**To confirm this document is the most recent version, please contact techinfo@MacDermidAlpha.com**

www.macdermidalpha.com

| North America | Europe | Asia |
|---|---|---|
| 3950 Johns Creek Ct, Suite 300<br>Suwanee, GA 30024 USA<br>908.791.2300 | Unit 2, Genesis Business Park<br>Albert Drive<br>Woking, Surrey, GU21 5RW, UK<br>44.01483.758400 | 14 Joo Koon Crescent, Singapore 629014<br>65.6430.0700 |

Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE. Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588

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