

ENTHONE® 60 - Series

Two Component Legend Ink

DESCRIPTION

ENTHONE® 60 - Series is a permanent, two component, epoxy-based, thermal cure, screen printing ink. It is designed to print legend on printed wiring boards over bare copper, base laminate or any solder mask coating. 60 - Series has a minimum mixed pot life of two (2) weeks at ambient temperature.

ENTHONE® 60 - Series cures to a semi-matte finish. It provides superior performance - meets or exceeds Bellcore Legend Ink requirements, passes several IPC-SM-840B, Class 3 solder mask requirements and meets most of the requirements of Commercial Item Description A-A56032A. 60 - Series has unsurpassed adhesion to all solder masks or base epoxy laminates and demonstrates adhesion pull-strength values exceeding most photoimageable solder masks.

ENTHONE® 60 - Series will withstand multiple soldering operations with no degradation in color. It may be applied to either side of the circuit board before hot air solder leveling. 60 - Series yellow may also be used for laser marking bar codes that can be easily read by bar code scanners.

AVAILABLE COLORS / PACKAGE SIZES

ENTHONE® 60 - Series part A is available in white (60-100), and yellow (60-200). The part B (Catalyst 60), is supplied with the ink. The part A is available in quarts and gallons. The quart units are supplied with ½ pint of catalyst, and the gallon units are supplied with 1 pint of catalyst. These units are ratio packed so the catalyst can be directly added to the ink without weighing. These units are packed at approximately 95% of total volume to allow for mixing room when the catalyst is added to the ink. Pricing has been set to reflect the total volume being slightly less than a true quart or gallon. If a smaller amount of ink is required follow the weighing and mixing instructions below.

MIXING INSTRUCTIONS

ENTHONE® 60 - Series mix ratio is 10 parts by weight of the Part A : 1 part by weight of the Part B (10 to 1 ratio). Accurately weigh ink and catalyst to the proper mix ratio. Allow a 10-15 minute induction period prior to application.

POT LIFE

ENTHONE® 60 - Series has an exceptionally long pot life. Mixed material will remain unreactive at ambient temperature, 25°C (77°F), for long periods, often exceeding four (4) weeks.

APPLICATION

ENTHONE® 60 - Series is applied by screen printing.

Fabric Standard polyester mesh counts ranging from 180 - 260 threads per inch are recommended. Coarser mesh counts will deposit a thicker coating to better encapsulate high traces, provide more opacity and yield a higher visual contrast. Finer mesh counts will deposit a thinner coating with a higher print resolution. Mesh counts of 200 – 220 threads per inch will generally yield optimum results. Screen mesh tension should be uniform and to the fabric manufacturer's recommendation.

Squeegee Squeegees should be 70 durometer, sharp and free of nicks.

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APPLICATION (cont'd)

- Thinning 60 - Series is intended to be used without thinning. However, flow properties may be adjusted with small amounts of ENTHONE® AD2001 or AD2003.
- Retarding 60 - Series has been formulated with a slow evaporating solvent that results in long open times. However, if retarding is necessary ENTHONE® AD2003 may be used.
- Removal ENTHONE® SC1710 screen cleaner, ENTHONE® AD2001 or AD2003 will clean screens and equipment before the ink cures. ENTHONE® SC1710 contains water and should be used when completely stripping the screen.

CURE SCHEDULE

ENTHONE® 60 - Series contains solvents which volatilize during the cure cycle. Convection ovens must have sufficient ventilation (>380 cfm) and exhaust to remove the evaporating solvent vapors.

Convection Oven Curing 30 ± 5 minutes at 150°C (300°F)

UNCURED PROPERTIES

<u>Property</u>	<u>Part A</u>	<u>Part B</u>	<u>Mixture (A+B)</u>	<u>Test Method</u>
Color	White	Tan		*
Weight per Gallon, pounds	12.85	9.14		*
Shelf Life @ room temperature, months	24	24		
Fineness of Grind, microns (particles)	10	10		*
Mixing Ratio (parts by weight)	10	1		
(parts by volume)	100	14		
Flash Point, °F, (°C)	175 (79)	155 (68)		Setaflash
Volatile Organic Content (VOC)				
Calculated, gm/liter	173	339		
Calculated, lb./gal	1.44	2.84		

* Test Methods available upon request

CURED PROPERTIES (including IPC-SM-840B, Class 3* & Bellcore Legend Ink values)

Cure Schedule: 30 minutes @ 150°C (300°F), 200 mesh polyester screen

Color	White
Adhesion, %Loss on IPC checker board pattern before solder immersion	
on bare copper	0
on gold	0
on nickel	0
on tin lead	0
on base laminate	0
Adhesion, %Loss on IPC checker board pattern after solder immersion	
on bare copper	0
Adhesion, %Loss on IPC checker board pattern after solder immersion	
on gold	0
Adhesion, %Loss on IPC checker board pattern after solder immersion	
on nickel	0
on tin lead	50
on base laminate	0

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CURED PROPERTIES (cont'd)

Pencil Hardness	5H
Resistance to Solvents	Pass
Resistance to Solder	
30 seconds immersion	Pass
Dielectric Strength, volts/mil	534
Insulation Resistance, ohms	$>2.0 \times 10^{12}$
Moisture Insulation Resistance, ohms	Pass
65°C, 90%+RH	
after 1 day	2.6×10^9
after 2 days	2.2×10^9
after 5 days	2.6×10^9
after 6 days	2.9×10^9
after 7 days	3.2×10^9
Recovery (2 hours @ R.T.)	3.1×10^{12}
Hydrolytic Stability/Aging	Pass
Electromigration	
IPC-SM840B, Class 3	Pass
Bellcore Legend Requirements	Pass

* 60 - Series passes many of the solder mask requirements of IPC-SM-840B, however, legend ink requirements are not included in this standard.

ADHESION PROPERTIES

Lap Shear Strength	
on bare laminate	2,783 psi
on bare copper	1,600 psi
Cross Hatch/Tape Test	
before solder immersion	
on bare laminate	Pass
on bare copper	Pass
after solder immersion	
on bare laminate	Pass
on bare copper	Pass
Solder Immersion	
(5 cycles of 5 seconds in solder @ 260°C)	Pass
Cross Hatch/Tape Test	Pass

COMMERCIAL ITEM DESCRIPTION A-A-56032A

Pot Life	Pass
Curing	Pass
Cure for handling (<i>exception</i>)	<u>Does not meet</u> - (30 minutes @ 65.5°C (150°F).
Adhesion	Pass
Abrasion Resistance, revolutions	467
Chemical Resistance @ 30°C	
30 minutes in water	Pass
30 minutes in methanol	Pass
30 minutes in ethanol	Pass
Chemical Resistance @ 30°C	

COMMERCIAL ITEM DESCRIPTION A-A-56032A (cont'd)

30 minutes in cleaning solvent	
Methylene chloride	Pass
D-limonene	Pass
1,1,1 trichloroethane	Pass
Resistance to Solder (260°C)	Pass
Resistance to Flux	Pass
Salt Spray Resistance	Pass
Light Fastness	Pass
Stability	Pass
Fungus Resistance	Pass

SHELF LIFE

ENTHONE® 60 - Series, Part A has a twenty-four (24) month shelf life and Part B has a twelve (12) month shelf life both from the date of manufacture when stored at ambient temperature.

STORAGE AND HANDLING

ENTHONE® 60 - Series should be stored at or below room temperature, 25°C (77°F) or below. Keep away from heat and out of direct sunlight. Do not freeze.

MATERIAL SAFETY DATA SHEETS

For more detailed information on the toxicological properties of the products described herein, reference can be made to the Material Safety Data Sheet (MSDS) for each product. If you do not have the proper MSDS, it can be requested from: Enthone Inc., attention: Regulatory Affairs Department, P.O. Box 1900, New Haven, CT 06508. For emergency assistance call CHEMTREC (800) 424-9300.

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