# Multi-Cure® 984-LVUF
# Ultra-Fluorescing Conformal Coating

## APPLICATIONS

- Conformal Coating

## FEATURES

- UV/Visible Light Cure
- Secondary Heat Cure
- Solvent Free
- One Part, No Mixing or Dilution Required
- Flexible for Enhanced Thermal Shock Performance

## OTHER FEATURES

- MIL-I-46058C Listed
- IPC-CC-830-B Approved
- UL 746C Qualified
- UL 94V-0 Recognized

Multi-Cure® 984-LVUF is a highly fluorescing, single-component, 100%-solids conformal coating specifically formulated for rapid room-temperature cure when exposed to UV light. 984-LVUF retains high fluorescence after curing. Thin-layer coatings cure almost instantly to a depth of 7 mils and fluoresce upon exposure to "black" light. Multi-Cure® 984-LVUF also exhibits adhesion to a variety of metal, ceramic, and glass-filled epoxy surfaces. 984-LVUF is a moderately low-viscosity coating which can be cured by exposure to UV light and secondarily cured with heat for shadowed areas on densely populated circuit boards. Dymax Multi-Cure® materials contain no nonreactive solvents and cure upon exposure to light. Their ability to cure in seconds enables faster processing, greater output, and lower processing costs. When cured with Dymax light-curing spot lamps, focused-beam lamps, or flood lamps, they deliver optimum speed and performance for conformal coating. Dymax lamps offer the ideal balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with the RoHS2 directives 2015/863/EU and 2011/65/EU.

## UNCURED PROPERTIES *

| Property | Value | Test Method |
|---|---|---|
| Solvent Content | No Nonreactive Solvents | N/A |
| Chemical Class | Acrylated Urethane | N/A |
| Appearance | Colorless Transparent Liquid | N/A |
| Soluble in | Organic Solvents | N/A |
| Density, g/ml | 1.14 | ASTM D1875 |
| Viscosity, cP (20 rpm) | 160 | ASTM D1084 |

## CURED MECHANICAL PROPERTIES *

| Property | Value | Test Method |
|---|---|---|
| Durometer Hardness | D85 | ASTM D2240 |
| Tensile at Break, MPa [psi] | 55.8 [8100] | ASTM D638 |
| Elongation at Break, % | 4.0 | ASTM D638 |
| Modulus of Elasticity, MPa [psi] | 724 [105,100] | ASTM D638 |
| Glass Transition $T_g$, ˚C | 84 | DSTM 256‡ |
| CTE$\alpha_1$, µm/m/˚C | 70 | DSTM 610‡ |
| CTE$\alpha_2$, µm/m/˚C | 227 | DSTM 610‡ |

## OTHER CURED PROPERTIES *

| Property | Value | Test Method |
|---|---|---|
| Refractive Index (20˚ C) | 1.49 | ASTM D542 |
| Boiling Water Absorption, % (2 hr) | 1.3 | ASTM D570 |
| Water Absorption, % (25˚C, 24 hr) | 0.2 | ASTM D570 |
| Linear Shrinkage, % | 0.1 | DSTM 614‡ |

| | |
|---|---|
| * | No Specifications |
| N/A | Not Applicable |
| ‡ | DSTM Refers to Dymax Standard Test Method |

## ELECTRICAL PROPERTIES *

| Property | Value | Test Method |
|---|---|---|
| Dielectric Constant (1 MHz) | 3.4 | ASTM D1304 |
| Dissipation Factor (1 MHz) | 0.03 | ASTM D1304 |
| Dielectric Withstand Voltage, V | 1800 | ASTM D1304 |
| Volume Resistivity, ohm-cm | $35.8*10^{12}$ | ASTM D1304 |
| Surface Resistivity, ohms | $384*10^{12}$ | ASTM D1304 |

## ADHESION

| Substrate | Recommendation |
|---|---|
| Lead Frame | ✓ |
| Ceramic | ✓ |
| PCB | ✓ |
| Flex | ✓ |
| Silicon | ✓ |

✓ Recommended    o Limited Applications
st Requires Surface Treatment (e.g. plasma, corona treatment, etc.)

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## CURING GUIDELINES

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm$^2$ [10 psi] between glass slides. Actual cure time typically is 3 to 5 times fixture time.

| Dymax Curing System (Intensity) | Fixture Time or Belt Speed [A] |
|---|---|
| **2000-EC** (50 mW/cm$^2$)[B] | 1 sec |
| **5000-EC** (200 mW/cm$^2$)[B] | 1 sec |
| **BlueWave® 75** (5.0 W/cm$^2$)[B] | 0.2 sec |
| **BlueWave® 200** (10 W/cm$^2$)[B] | 0.2 sec |
| **UVCS Conveyor with one 5000-EC** (200 mW/cm$^2$)[C] | 8.2 m/min<br>[27 ft/min] |
| **UVCS Conveyor with Fusion F300S** (2.5 W/cm$^2$)[C] | 8.2 m/min<br>[27 ft/min] |

[A] *Curing through light-blocking substrates may require longer cure times if they obstruct wavelengths used for light curing (320-400 nm for UV light curing, 320-450 nm for UV/Visible light curing). These fixture times/belt speeds are typical for curing thin films through 100% light-transmitting substrates.*

[B] *Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.*

[C] *At 53 mm [2.1 in] focal distance. Maximum speed of conveyor is 8.2 m/min [27 ft/min]. Intensity was measured over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 100 Radiometer.*

Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light exposure no longer improves cured properties. Higher intensities or longer cures (up to 5x) generally will not degrade Dymax light-curable materials.

### SECONDARY HEAT CURE

Heat can be used as a secondary cure mechanism where the adhesive cannot be cured with light. Light curing must be done prior to heat cure. The following heat-cure schedule may be used:

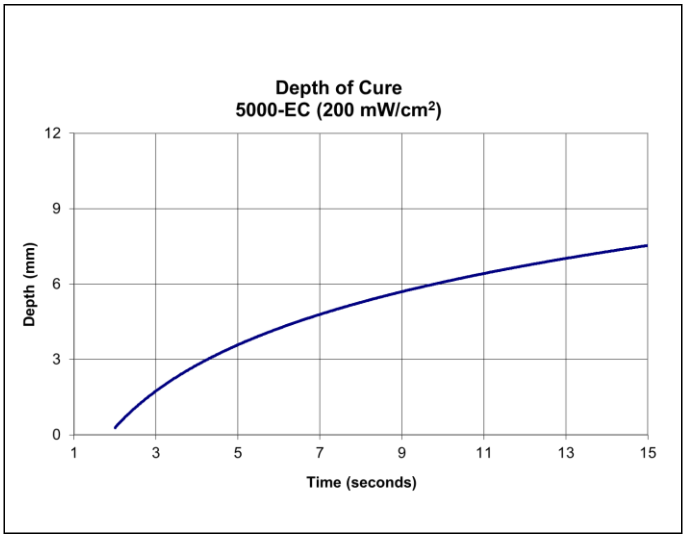
| Temperature | Time* |
|---|---|
| 110˚C [230˚F] | 60 minutes |
| 120˚C [250˚F] | 30 minutes |
| 150˚C [300˚F] | 15 minutes |

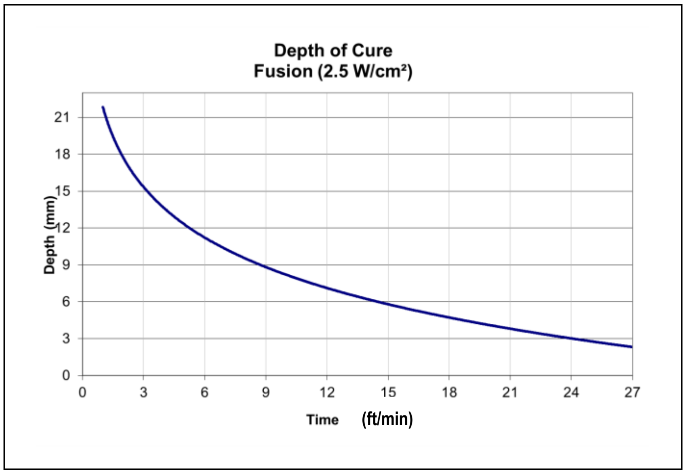
*Note: Actual heat-cure time may vary due to part configuration, volume of adhesive applied, and oven efficiency.

Dymax recommends that customers employ a safety factor by curing longer and/or at higher intensities than required for full cure. Although Dymax Application Engineering can provide technical support and assist with process development, each customer ultimately must determine and qualify the appropriate curing parameters required for their unique application.

## DEPTH OF CURE

The graphs below show the increase in depth of cure as a function of exposure time with two different lamps at different intensities. A 9.5 mm [0.37 in] diameter specimen was cured in a polypropylene mold and cooled to room temperature. It was then released from the mold and the cure depth was measured.





## OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV and visible light. Exposure to ambient and artificial light should be kept to a minimum before curing. Dispensing components including needles and fluid lines should be 100% light blocking, not just UV blocking.
2. All surfaces in contact with the material should be clean and free from flux residue, grease, mold release, or other contaminants prior to dispensing the material.
3. Cure speed is dependent upon many variables, including lamp intensity, distance from the light source, required depth of cure, thickness, and percent light transmission of components between the material and light source.
4. Oxygen in the atmosphere may inhibit surface cure. Surfaces exposed to air may require high-intensity (>100 mW/cm$^2$) UV light to produce a dry surface cure. Flooding the curing area with an inert gas, such as nitrogen, can also reduce the effects of oxygen inhibition.
5. Parts should be allowed to cool after cure before testing and subjecting to any loads or electrical testing.
6. In rare cases, stress cracking may occur in assembled parts. Three options may be explored to eliminate this problem. One option is to heat anneal the parts to remove molded-in stresses. A second option is to open any gap between mating parts to reduce stress caused by an interference fit. The third option is to minimize the amount of time the liquid material remains in contact with the substrate(s) prior to curing.
7. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
8. At the point of curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.

## DISPENSING THE MATERIAL

This material may be dispensed with a variety of manual, semi-automated and fully automated fluid delivery systems. Small area applications including beads and small dots can be achieved using hand-held dispensers; for example, Dymax offers dispensing systems like our SD-100 syringe dispenser and our Model 400 needle valve systems. The valve system can be used in a manual, semi-automated or fully automated application. Dymax has several other dispensing systems that may be suitable for use with conformal coating materials as well. Questions relating to and defining the best fluid delivery system and curing equipment for specific applications should be discussed with the Dymax Application Engineering Team.

## CLEANUP

Uncured material may be removed from dispensing components and parts with organic solvents. Cured material will be impervious to many solvents and difficult to remove. Cleanup of cured material may require mechanical methods of removal.

## PERFORMANCE AFTER TEMPERATURE EXPOSURE

Dymax light-curable materials typically have a lower thermal limit of -54˚C [-65˚F] and an upper limit of 150˚C [300˚F]. Many Dymax products can withstand temperatures outside of this range for short periods of time, including typical wave solder processes and reflow profiles. Please contact Dymax Application Engineering for assistance.

## STORAGE AND SHELF LIFE

Store the material in a cool, dark place when not in use. Do not expose to light. This product may polymerize upon prolonged exposure to ambient and artificial light. Keep covered when not in use. This material has a 12-month shelf life from date of shipment, unless otherwise specified, when stored between 10˚C [50˚F] and 32˚C [90˚F] in the original, unopened container.

## GENERAL INFORMATION

This product is intended for industrial use only. Keep out of the reach of children. Avoid breathing vapors. Avoid contact with skin, eyes, and clothing. Wear impervious gloves. Repeated or continuous skin contact with uncured material may cause irritation. Remove material from skin with soap and water. Never use organic solvents to remove material from skin and eyes. For more information on the safe handling of this material, please refer to the Material Safety Data Sheet before use.