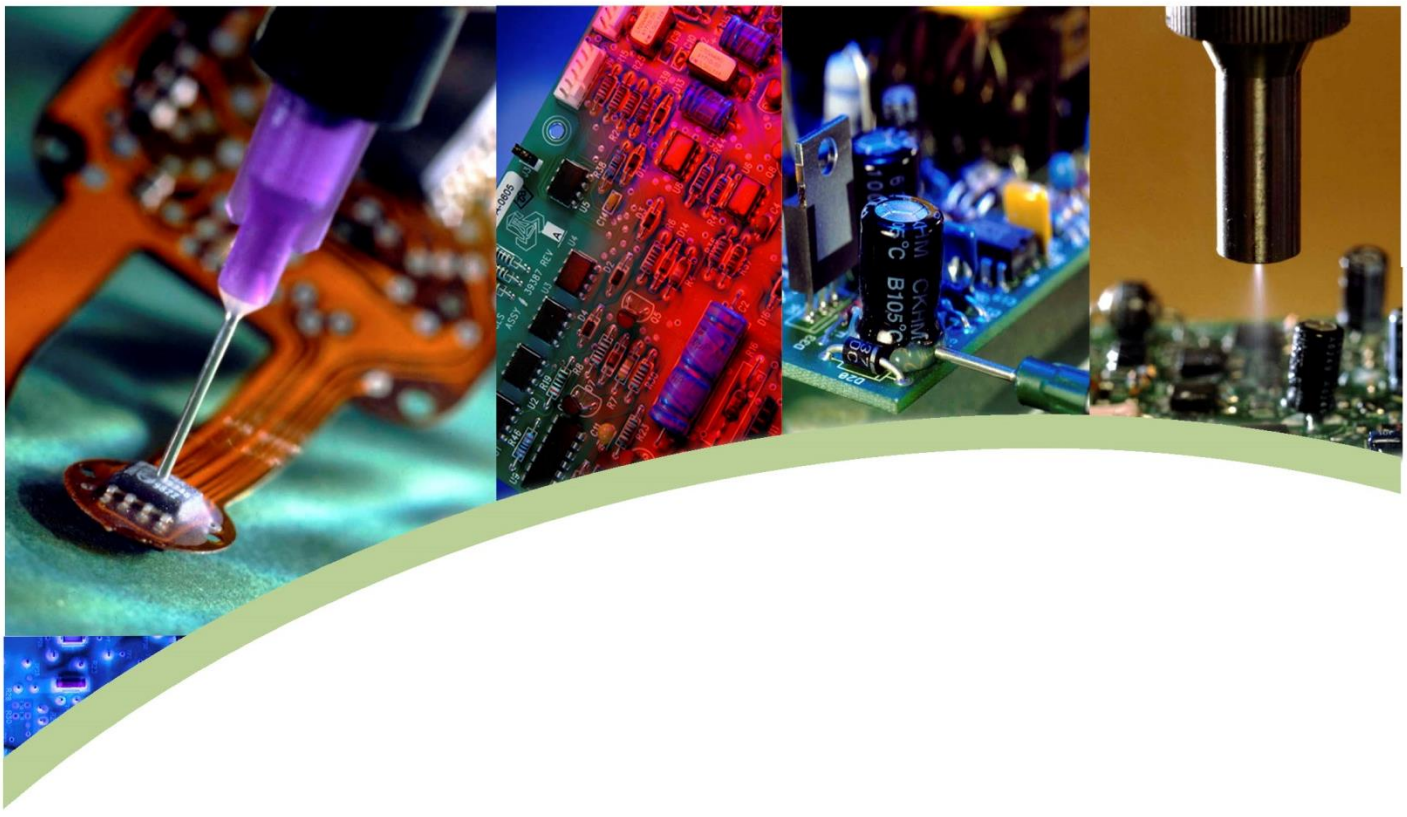


# Electronics Assembly

## UV Light-Curable Adhesives, Coatings, and Encapsulants for Electronic Assembly

DYMAX®



# The Dymax Edge

## Oligomers. Adhesives. Coatings. Equipment. One priceless resource. That's the Dymax Edge.

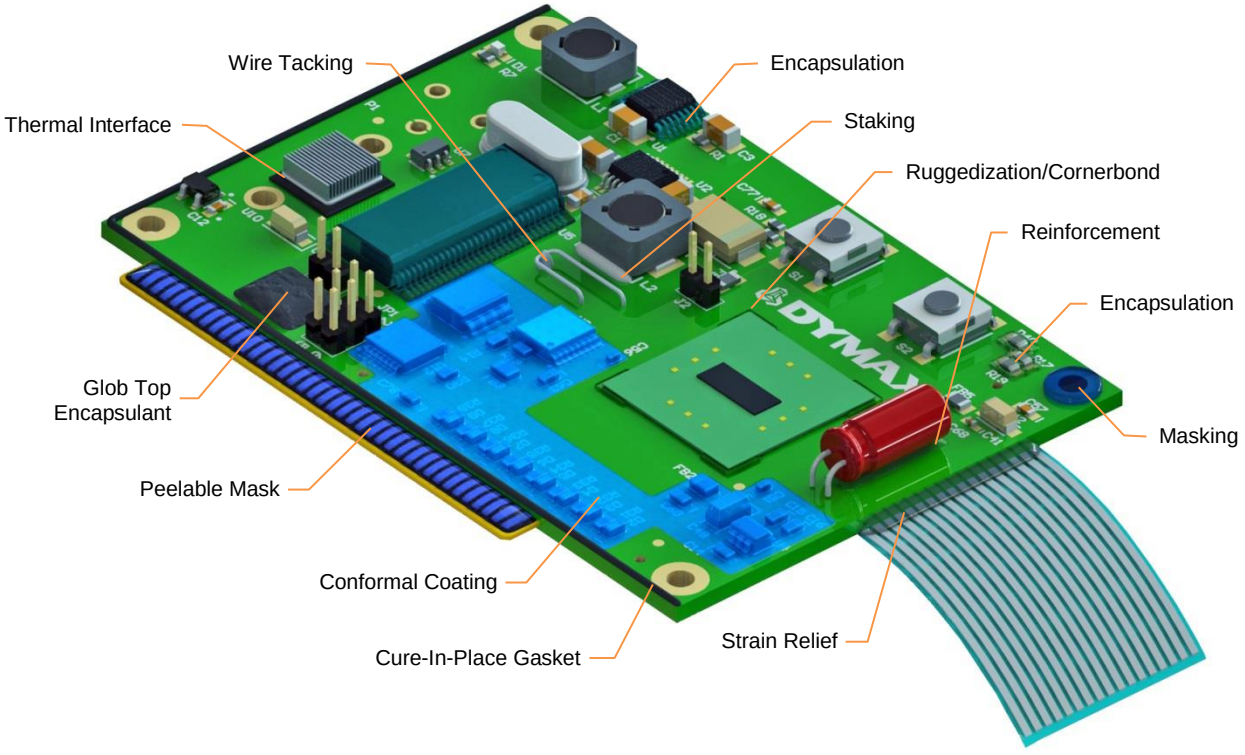
At Dymax, we're committed to providing our customers with the solutions they need for their specific application challenges. Inherent in the Dymax Edge approach is the commitment to view a customer's challenge differently by listening, focusing, and using an entire toolbox of resources and expertise to deliver the most efficient solution. This expertise isn't limited to the formulation of chemistry or the calibration of a machine. Rather, it's defined by a depth and breadth of knowledge that allows us to devise innovative solutions based on an optimal balance of material, chemistry, and equipment. The Dymax Edge is more than the combined resources of product, technology, and service. It's the fundamental belief that you best serve a customer when you look at the need from their perspective, not yours.

DYMAX EDGE®

LISTEN. ENVISION. DELIVER.

# Dymax Materials for Electronics Assembly

Dymax one-part, solvent-free, UV light-curable electronic materials cure in seconds upon exposure to UV/Visible light and can be used in a wide variety of applications for circuit protection and electronic assembly. The products are electrically insulating and are designed for various operations including conformal coating, encapsulation, bonding, keypad coatings, thermal management, masking, and display bonding and lamination. Most products are available in multiple-viscosity grades, so the material flow may be tailored to the individual application. For shadowed areas, several cure options are available, including Dual-Cure light/moisture cure and Multi-Cure® light/heat cure technologies. IPC approved, MIL-I-46058C, and UL listed self-extinguishing grades are also available.




## Environmental Benefits of Dymax Light-Curable Materials

Dymax understands that safe, ecologically friendly products benefit our customers, the environment, and us. We have created materials with attributes that lower product costs, life-cycle costs, and ecological impact. These attributes include:

- Solvent-free materials
- Halogen-free materials
- RoHS compliance
- REACH - no substance of very high concern (SVHC)
- Eco-friendly, one-component materials

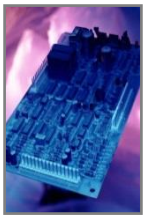
Dymax Halogen-Free conformal coatings, encapsulants, and adhesives are documented by an independent laboratory to meet or exceed standards set forth in IEC 61249-2-21. This international directive defines halogen-free as <900 ppm for chlorine, <900 ppm for bromine and <1,500 ppm total level of both combined. The current test method used for certification is BS EN 14582:2007.

# Conformal Coatings

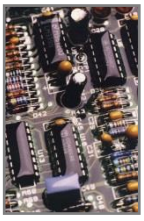
## Reliable Board Protection in Seconds

| Product Number* | Description | Nominal Viscosity (cP) | Durometer Hardness | Modulus of Elasticity MPa [psi] | Dielectric Strength (Volts/mil) | Approvals | Halogen Free? |
|---|---|---|---|---|---|---|---|
| 9481-E | ▪ Room-temperature secondary moisture cure for shadowed areas<br>▪ Highest chemical and abrasion resistance<br>▪ Low viscosity for thin coatings | 125 | D75 | 150 [21,800] | >1,500 | MIL-I-46058 listed<br>IPC-CC-830 approved<br>UL recognized | HF HALOGEN FREE |
| 9482 | ▪ Room-temperature secondary moisture cure for shadowed areas<br>▪ Superior re-workability<br>▪ Chemical and thermal shock resistance | 1,100 | D70 | 275 [40,000] | 1,100 | – | HF HALOGEN FREE |
| 984-LVUF | ▪ Isocyanate free<br>▪ Rigid for high chemical and abrasion resistance<br>▪ Secondary heat cure for shadowed areas | 150 | D80 | 410 [60,000] | 1,800 | MIL-I-46058 listed<br>IPC-CC-830 approved<br>UL recognized | HF HALOGEN FREE |
| 987 | ▪ Isocyanate free<br>▪ High chemical and abrasion resistance<br>▪ Secondary heat cure for shadowed areas | 150 | D85 | 900 [130,000] | >1,500 | MIL-I-46058 listed<br>IPC-CC-830 approved | HF HALOGEN FREE |
| 9-20351-UR | ▪ Isocyanate free<br>▪ Easy one-pass coverage of high-profile leads and tall components without seeping into shadowed areas<br>▪ Secondary heat cure for shadowed areas | 13,500 | D60 | 19 [2,700] | 500 | – | HF HALOGEN FREE |
| 9-20557 | ▪ Isocyanate free<br>▪ Medium viscosity for wetting components<br>▪ Low modulus for thermal cycling performance<br>▪ Secondary heat cure for shadowed areas | 2,300 | D60 | 89 [13,000] | >1,500 | MIL-I-46058C listed<br>IPC-CC-830 approved<br>UL recognized | HF HALOGEN FREE |
| 9-20557-LV | ▪ Isocyanate free<br>▪ Low viscosity for thin coatings<br>▪ Low modulus for enhanced thermal cycling performance<br>▪ Secondary heat cure for shadowed areas | 850 | D70 | 379 [55,000] | >1,500 | MIL-I-46058C listed<br>IPC-CC-830 approved | HF HALOGEN FREE |

**Other grades are available for specific applications requiring physical properties different from standard products listed here.*
*NOTE: Consult Dymax Conformal Coating Validation Report for more detailed information on conformal coatings.*


Blue Fluorescing Coatings


Ultra-Red™ Fluorescing Coatings


Coatings with Secondary Heat or Moisture Cure

- *Solvent free*
- *Tack-free UV cures in seconds*
- *Excellent environmental resistance*
- *Black grades available*
- *Adhesion to flex circuit substrates (FPC)*
- *Low stress under thermal cycling*
- *Rigid and flexible coatings available*
- *Variety of available viscosities*

# Thermal Interface Adhesives

## Efficient Thermal Transfer Between Heat Sinks and Electronics

| Product Number | Description | Applications | Thermal Conductivity | Nominal Viscosity (cP) | Halogen Free? |
|---|---|---|---|---|---|
| 9-20801 | ▪ Light cure in seconds<br>▪ Secondary activator or heat cure for shadowed areas*<br>▪ Highly thixotropic for optimal placement | ▪ Mounting heat sinks on PCBs<br>▪ LED heat dissipation | 0.9 W/m*K | 110,000 | HF HALOGEN FREE |

**Dymax 501-E is the recommended activator for shadowed areas*

Bonding Heat Sinks

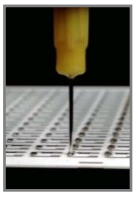
- *Sets in seconds with light exposure*
- *Cure shadow areas with activator or heat*
- *High-strength bonds*
- *Low stress for mismatched CTE's*
- *Room-temperature storage and cure*

# Chip Encapsulants and Wire Bonders

## For Superior Protection on Flexible and Rigid Platforms

| Product Number | Description | Applications | Durometer Hardness | Nominal Viscosity (cP) | Elongation at Break (%) | Modulus of Elasticity MPa [psi] | Halogen Free? |
|---|---|---|---|---|---|---|---|
| 9001-E-v3.1 | ▪ UV/Visible light cure for fastest processing<br>▪ Secondary heat cure for shadowed areas<br>▪ Multiple viscosities available for optimal flow and coverage<br>▪ Low modulus for wire bonding | ▪ Chip-on-board<br>▪ Chip-on-flex<br>▪ Chip-on-glass<br>▪ Wire bonding<br>▪ Bare-die encapsulation | D45 | 4,500 | 150 | 17 [2,500] | HF HALOGEN FREE |
| 9001-E-v3.5 | | | | 17,000 | | | |
| 9001-E-v3.7 | | | | 50,000 | | | |
| 9008 | ▪ Flexible<br>▪ Highly moisture-resistant bonds to diverse surfaces such as polyimide, DAP, glass, epoxy board, metal, PET<br>▪ High adhesion, even at -40°C | ▪ Chip-on-flex encapsulation<br>▪ Flex circuit bonding and attachment to PCB and glass | A85 | 4,500 | 300 | – | HF HALOGEN FREE |
| 9101 | ▪ UV/Visible light cure with secondary moisture cure<br>▪ Flexible<br>▪ Moisture and thermal resistance | ▪ Chip-on-board<br>▪ Chip-on-flex<br>▪ Chip-on-glass<br>▪ Wire bonding | D30-D50 | 7,000 | 38 | 17.5 [2,550] | HF HALOGEN FREE |
| 9102 | | | | 17,000 | 34 | 18.4 [2,670] | |
| 9103 | | | | 25,000 | 36 | 17.6 [2,560] | |

Secondary Heat or Moisture Cure



Chip Encapsulants

Flex Circuit Encapsulants/ Wire Bonding

Black Encapsulants

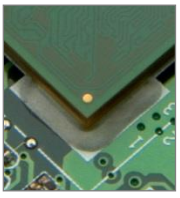
- *100% solvent free*
- *Instant UV/Visible cures*
- *High ionic purity*
- *Tenacious adhesion to flex circuit substrates (polyimide and PET)*
- *Low stress under thermal cycling*
- *Electrically insulating*
- *Room-temperature storage*
- *Thermal shock and moisture resistance*

# Ruggedization

## Photocurable Technology Offers Lower Costs and Increased Productivity

| Product Number | Description and Applications | Nominal Viscosity (cP) | Durometer Hardness | Tensile @ Break MPa [psi] | Cure Depth mm [in] | Halogen Free? |
|---|---|---|---|---|---|---|
| 9309-SC | ▪ Highly thixotropic<br>▪ Formulated with See-Cure technology for easy visual confirmation of full cure | 45,000 | D57 | 22 [3,000] | 6.5 [0.26] | HF HALOGEN FREE |
| 9422-SC | ▪ Highly thixotropic for optimal placement and wetting of components<br>▪ Formulated with See-Cure technology for easy visual confirmation of full cure | 38,000 | D50 | 16 [2,300] | 6.5 [0.26] | HF HALOGEN FREE |

Ruggedizing



Leadless Component Edgebonding/ Cornerbonding

- *Fast dispense and cure*
- *Simple visual inspection (See-Cure blue-to-colorless change)*
- *Reduce stress on interconnects during push, pull, shock, drop, and vibration*
- *Easy rework*
- *Holds shape after dispense*
- *Improved bond strength for die and pry testing*
- *Engineered bead shape for wetting both board surface and component edge without seeping into shadowed area*
- *Jettable*

# Removable Masks

| Product Number | Description and Applications | Cure Depth (mm [in]) | Durometer Hardness | Cure Speed* (sec) | Viscosity (cP) | Halogen Free? |
|---|---|---|---|---|---|---|
| 9-20479-B | ▪ Peelable<br>▪ Wave-solder resistant<br>▪ Blue<br>▪ Excellent viscosity for machine dispensing | 6.4 [0.25] | A70 | 10 | 150,000 | HF HALOGEN FREE |
| 9-318-F | ▪ Peelable<br>▪ Fluoresces for easy inspection<br>▪ Very fast curing | 6.4 [0.25] | A55 | <4 | 50,000 | HF HALOGEN FREE |

**Cure speed depends on the intensity and distance from the light source. Cure speed was measured at an intensity of 175 mW/cm$^2$.*

Fluorescing Mask

Removable Mask

Peelable Mask

- *100% solids*
- *UV/Visible cure in seconds*
- *No ionic contamination*
- *Fluorescing and blue grades*
- *One part*

# Acrylated Urethane Potting and Sealing

## For Shallow Potting in 10-30 Seconds or Less – Highest Adhesion to Substrates

| Product Number | Description and Applications | Recommended Substrates | UV Cure* Speed (sec)/ Depth (mm [in]) | Durometer Hardness | Nominal Viscosity (cP) | Halogen Free? |
|---|---|---|---|---|---|---|
| 921-T | ▪ Connectors, thermal switches<br>▪ Tamperproofing<br>▪ Translucent bonds with high adhesion | ABS, filled nylon, metal, glass | 30/6.4 [0.25] | D75 | 3,500 | HF HALOGEN FREE |
| 921-VT | | | | | 11,000 | |
| 921-Gel | | | | | 25,000 | |
| 9001-E V3.1 | ▪ Sensors<br>▪ Flexible<br>▪ Excellent adhesion to engineering plastics | ABS, PC, PVC, FR-4, metals | 15/6.4 [0.25] | D45 | 4,500 | HF HALOGEN FREE |
| 9001-E V3.5 | | | | | 17,000 | |
| 9001-E V3.7 | | | | | 50,000 | |

**UV cure speed depends on the intensity reaching the surface of the resin. Cure speed was measured at an intensity of 175 mW/cm$^2$.*


Cable Potting


Deep Layer Potting


Chip Potting

- *Full UV/Visible cure in seconds*
- *Solvent free*
- *High adhesion to substrates*
- *Flexible and rigid products available*

# LED Encapsulating

## Bonding, Potting, and Sealing in Seconds

| Product Number | Description | Applications | Linear Shrinkage (%) | Nominal Viscosity (cP) | Halogen Free? |
|---|---|---|---|---|---|
| LIGHT-CAP® 9622 | ▪ UV/Visible light cure in seconds<br>▪ No mixing required<br>▪ Heat resistant to 100°C<br>▪ Resistant to long-term UV exposure<br>▪ High light transmittance<br>▪ Durometer between silicone and epoxy | ▪ Instant casting of LEDs<br>▪ Rapid forming of protective optical lens | 0.79 | 12,000 | HF HALOGEN FREE |

LED Airport Flight Display


LED Light

- *One component, no mixing required*
- *Enhances light transmittance*
- *Resistant to heat-induced yellowing*
- *Fast cure*
- *Solvent free*
- *Optically clear*

# Display Bonding and Laminating

| Product Number | Description | Applications | Volumetric Shrinkage (%) | Nominal Viscosity (cP) | HalogenFree? |
|---|---|---|---|---|---|
| 9701 | ▪ Excellent re-workability<br>▪ Good thermal shock resistance<br>▪ Low shrinkage<br>▪ Non-yellowing | Optical display lamination and touch screen bonding | 4.9 | 200 | HF HALOGEN FREE |
| 9702 | ▪ Excellent re-workability<br>▪ Good thermal shock resistance<br>▪ Low shrinkage<br>▪ Non-yellowing | Optical display lamination and touch screen bonding | 4.2 | 950 | HF HALOGEN FREE |
| 9703 | ▪ Excellent re-workability<br>▪ Good thermal shock resistance<br>▪ Low shrinkage<br>▪ Non-yellowing | Optical display lamination and edge damming | 4.2 | 30,000 | HF HALOGEN FREE |

Touch Screen Lamination with 9700-Series Adhesives

Touch Screen or Cover Window Optical Bonding

- *One component, no mixing required*
- *Flexible*
- *Resistant to yellowing*
- *Fast cure*
- *Bonds various substrates*
- *High optical clarity*

# Wire Tacking

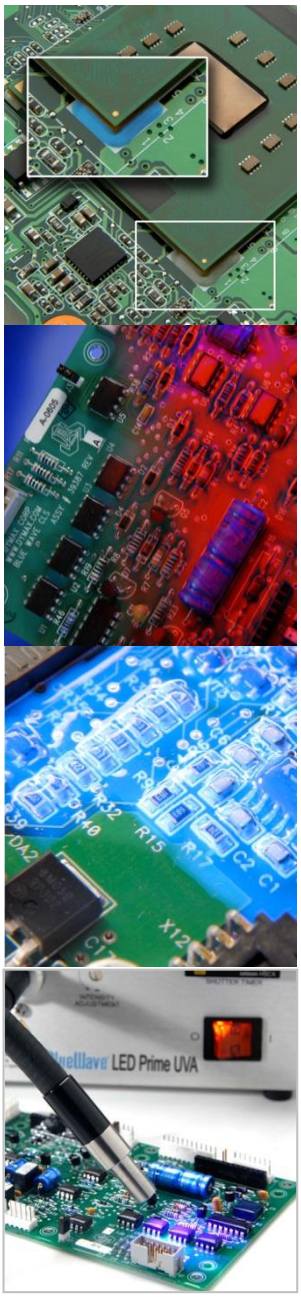
**Photocurable Technology Offers Lower Costs and Increased Productivity**

| Product Number | Description | Nominal Viscosity (cP) | Durometer Hardness | Tensile @ Break MPa [psi] | Halogen Free? |
|---|---|---|---|---|---|
| 9-911 Rev A | ▪ On-demand cure for optimal positioning<br>▪ Exposed areas cure in seconds for immediate strength | 36,000 | D80 | 28 [4,000] | HF HALOGEN FREE |

Wire Tacking

- *Instant UV cure*
- *One part*
- *Solvent free*
- *Unlimited pot life*
- *Fluorescing additive for in-line quality control*
- *Excellent adhesion to solder masks and wires*
- *Thermal shock and moisture resistance*

# Dymax Adhesive Technologies




## See-Cure Technology

Dymax light-curable adhesives with patented See-Cure technology have built-in cure validation that makes it easy for operators or simple automated inspection equipment to confirm cure without investing in additional specialized equipment. See-Cure technology is an indicator of cure that intentionally transitions the color of the adhesive after it has cured and builds a visible safety factor into the assembly process.

## Ultra-Red™ Fluorescing Technology

Ultra-Red™ fluorescing technology, formulated into Dymax adhesives, enhances bond-line inspection processes and product authentication. The adhesives remain clear until exposed to low-intensity UV light at which point they fluoresce bright red. This is particularly effective while bonding plastics that naturally fluoresce blue, such as PVC and PET. Ultra-Red technology also produces a unique spectral signature that can be used by manufacturers for product authentication.

## Multi-Cure® Light/Heat-Cure Technology

Multi-Cure adhesives combine the high-speed cure of UV or UV/Visible light with secondary cure mechanisms that enhance polymerization. Secondary cure mechanisms, which include thermal (heat) cure or activator cure, are useful when light can only reach a portion of the bond line, or when tacking a part prior to thermal cure to allow easier handling and transport during the manufacturing process.

## Dual-Cure Light/Moisture-Cure Technology

Dual-Cure coatings are formulated to ensure complete cure in applications where shadowed areas on high-density circuit boards are a concern. Previously, areas shadowed from light were managed by selective coating – eliminating the need to cure in shadowed areas – or a secondary heat-cure process. Shadowed areas cure over time with moisture, eliminating the need for that second process step or concerns of component life degradation due to temperature exposure.

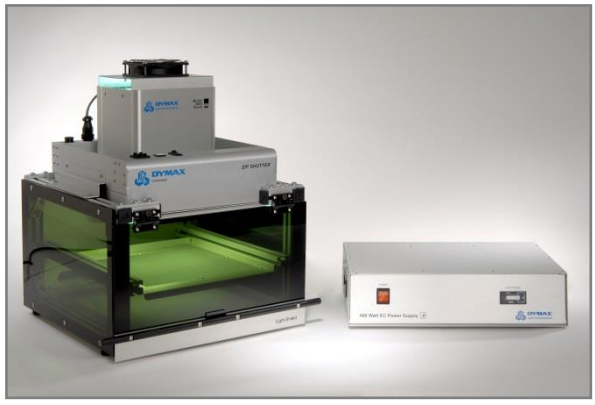
## LED Light-Curable Adhesives

Dymax offers specially formulated LED light-curable adhesives for use with Dymax LED UV/Visible light-curing systems. The adhesives range from fast to ultra-fast cure speeds in order to accommodate specific electronic assembly needs.

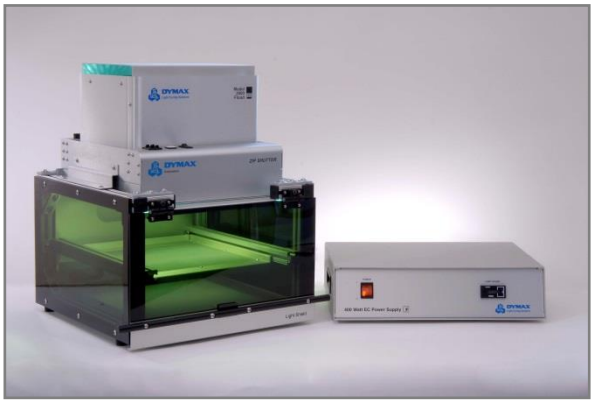
# Flood Chambers and Conveyor Curing Systems

## for Electronic and Photonic Applications

Successful UV processing demands that the curing equipment be matched to the resin to optimize both performance and cost savings. Dymax manufactures UV light-curable resins and UV light-curing equipment and specializes in the optimization of UV light-curing processes. Our technical specialists are ready to help you optimize your process, and maximize your profit and product performance. For resin and equipment selection assistance please contact Dymax Application Engineering.



**Dymax 5000 Flood Lamp Systems**
***Most Popular and Versatile***
Ideal for potting, sealing, and encapsulating applications



**Dymax 2000 Flood Lamp Systems**
***Largest Cure Area***
Ideal for LED and masking applications

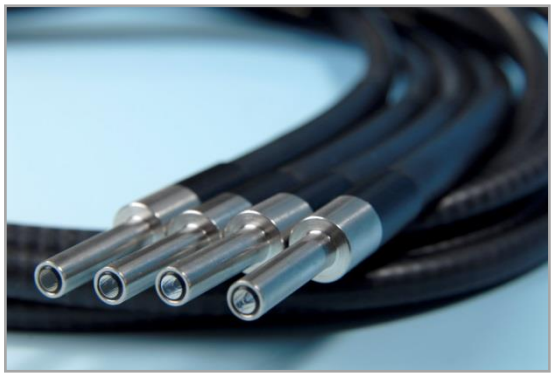
**Dymax UVCS Series UV Curing Conveyor Systems with 5000-EC Lamps**
Ideal for conformal coating applications


**Dymax Heavy-Duty UV Curing WIDECURE Conveyor Systems**
Ideal for curing adhesives, coatings, and inks

# UV Light-Curing Spot Lamps
## for Electronic and Photonic Applications


**Dymax BlueWave® 200 Version 3.0**
UV-Curing Spot Lamp
Ideal for fastest processing of small curing areas


**Dymax BlueWave® LED Prime UVA**
Visible Spot Light-Curing System
Ideal for cool spot curing coatings



**Liquid Lightguides**
Come in an assortment of sizes and split wand configurations


**ACCU-CAL™ 50 Radiometer**
Ideal for process monitoring

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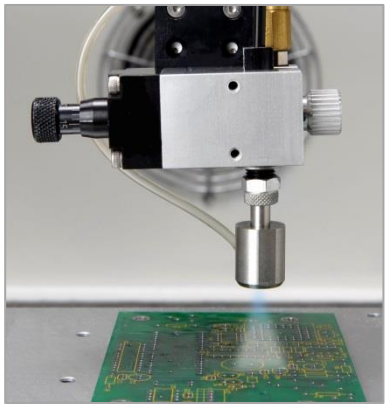
# Dispensing Systems

Dymax has developed high-quality, field-proven dispense systems to fit many types of adhesive and fluid dispensing applications. These systems include various automated and manual dispensing valves, spray valves and guns, controllers, material reservoirs, and related components for seamless integration into assembly processes. The systems provide accurate, consistent dispense for a range of low- to high-viscosity fluids. Dispensing systems with adjustable suck-back control and dispensing valves that offer contaminate-free dispensing are available.




Reduced environmental impact and energy conservation are core pillars of the Dymax mission. Over the last 30 years, Dymax light-curable materials and curing equipment have become the industry standard for fast, environmentally conscious assembly. Dymax products replace technologies that contain hazardous ingredients, produce waste, or require higher amounts of energy to process. Dymax understands that safe ecologically friendly products benefit our customers, the environment, and us. We have created materials with attributes that lower product costs, life-cycle costs, and ecological impact.

Dymax Eco underlines the Dymax commitment to the environment. Information for Environmental Health and Safety officers, government officials, and engineers to assist in making informed decisions when comparing assembly processes is available by visiting www.dymax.com/eco.



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