

## Ultra Light-Weld® 9702 Optical Display Adhesive

**APPLICATIONS**

- Optical Display Lamination
- Touch Screens

**FEATURES & BENEFITS**

- UV/Visible Light Cure
- Excellent Re-Workability
- Non-Yellowing
- Low Shrinkage

**OTHER FEATURES**

- Bonds to a Variety Of Surfaces
- Medium Viscosity Performance
- Good Thermal Shock Resistance

Dymax Ultra Light-Weld® 9702 optical display adhesive is designed for use in flat panel displays where re-workability and non-yellowing characteristics are important. Ultra Light-Weld® 9702 materials cure upon exposure to light and contain no nonreactive solvents. Their ability to cure in seconds enables faster processing, greater output, and lower processing costs. When cured with Dymax focused-beam lamps, flood lamps, or spot lamps, they deliver optimum speed and performance for optical display lamination. Dymax lamps offer the optimum balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with the RoHS Directives 2002/95/EC and 2003/11/EC.

UNCURED PROPERTIES *		
Property	Value	Test Method
Solvent Content	No Nonreactive Solvents	N/A
Chemical Class	Acrylated Urethane	N/A
Appearance	Light Yellow Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	0.93	ASTM D1875
Viscosity, cP (20 rpm)	950 (nominal)	DSTM 502 <sup>‡</sup>

CURED MECHANICAL PROPERTIES *		
Property	Value	Test Method
Durometer Hardness	00-70	ASTM D2240
Tensile at Break, MPa [psi]	0.89 [129]	ASTM D638
Elongation at Break, %	137	ASTM D638
Modulus of Elasticity, MPa [psi]	0.36 [52]	ASTM D638
Glass Transition T <sub>g</sub> , °C	1	DSTM 256 <sup>‡</sup>
CTE <sub>α1</sub> , μm/m/°C	105	DSTM 610 <sup>‡</sup>
CTE <sub>α2</sub> , μm/m/°C	355	DSTM 610 <sup>‡</sup>

OTHER CURED PROPERTIES *		
Property	Value	Test Method
Refractive Index (20°C)	1.49	ASTM D542
Boiling Water Absorption, % (2 h)	0.35	ASTM D570
Water Absorption, % (25°C, 24 h)	0.42	ASTM D570
Volumetric Shrinkage, %	4.2	DSTM 611 <sup>‡</sup>

\* Not Specifications

N/A Not Applicable

‡ DSTM Refers to Dymax Standard Test Method

ELECTRICAL PROPERTIES *		
Property	Value	Test Method
Dielectric Constant (1 MHz)	3.44	ASTM D150
Dielectric Constant (1 kHz)	5.00	ASTM D150
Dissipation Factor (1 MHz)	0.04	ASTM D150
Dissipation Factor (1 kHz)	0.04	ASTM D150
Dielectric Breakdown Voltage, kV/mm [V/mil]	20.86 [529.48]	ASTM D149
Volume Resistivity, ohm-cm	9.53 x 10 <sup>14</sup>	ASTM D257
Surface Resistivity, ohm	2.24 x 10 <sup>14</sup>	ASTM D257

ADHESION	
Substrate	
PC	
PET	
PMMA	
Glass	
Stainless Steel	

OPTICAL PROPERTIES *		
Property	Value	Test Method
% Transmittance at 570 nm	100	DSTM 501 <sup>‡</sup>
Yellowness (b*) initial (5 mil thick)	0.12	DSTM 612 <sup>‡</sup>
Yellowness (b*) after 85°C/85% RH, 500 h (5 mil thick)	0.10	DSTM 612 <sup>‡</sup>
Yellowness (b*) after 5 min exposure to 60 mW/cm <sup>2</sup> UV (5 mil thick)	0.17	DSTM 612 <sup>‡</sup>
% Haze	0.58	ASTM D1003



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**Dymax Corporation**  
860.482.1010  
info@dymax.com  
[www.dymax.com](http://www.dymax.com)

**Dymax Oligomers & Coatings**  
860.626.7006  
oligomers&coatings@dymax.com  
[www.dymax-oc.com](http://www.dymax-oc.com)

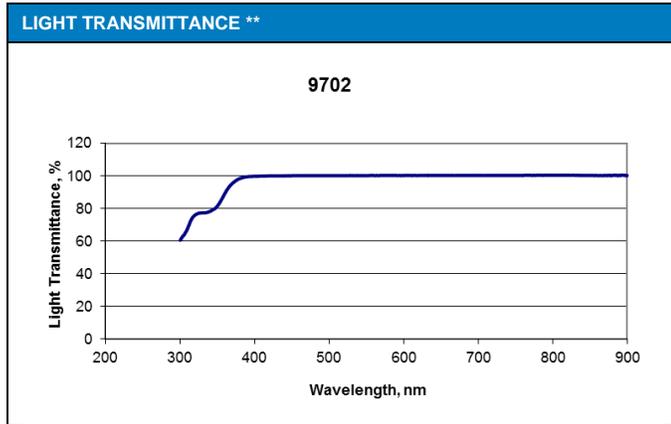
**Dymax Europe GmbH**  
+49 (0) 611.962.7900  
info\_de@dymax.com  
[www.dymax.de](http://www.dymax.de)

**Dymax UV Adhesives & Equipment (Shenzhen) Co Ltd**  
+86.755.83485759  
dymaxasia@dymax.com  
[www.dymax.com.cn](http://www.dymax.com.cn)

**Dymax UV Adhesives & Equipment (Shanghai) Co Ltd**  
+86.21.37285759  
dymaxasia@dymax.com  
[www.dymax.com.cn](http://www.dymax.com.cn)

**Dymax Asia (H.K.) Limited**  
+852.2460.7038  
dymaxasia@dymax.com  
[www.dymax.com.cn](http://www.dymax.com.cn)

**Dymax Korea LLC**  
82.2.784.3434  
info@dymax.kr  
[www.dymax.co.kr](http://www.dymax.co.kr)



\*\* Measured at 0.03 mm [0.001in] per DSTM-501<sup>‡</sup>  
<sup>‡</sup> DSTM Refers to Dymax Standard Test Method

**UV CURING GUIDELINES**

Thickness (mil) <sup>A</sup>	5	20
Intensity (mW/cm <sup>2</sup> )	Time or Belt Speed <sup>B</sup>	
60 <sup>C</sup>	25 s	30 s
150 <sup>C</sup>	15 s	25 s
230 <sup>C</sup>	15 s	20 s
2,500 (Fusion D Bulb) <sup>D</sup>	1.5 m/min [5 ft/min]	0.9 m/min [3 ft/min]

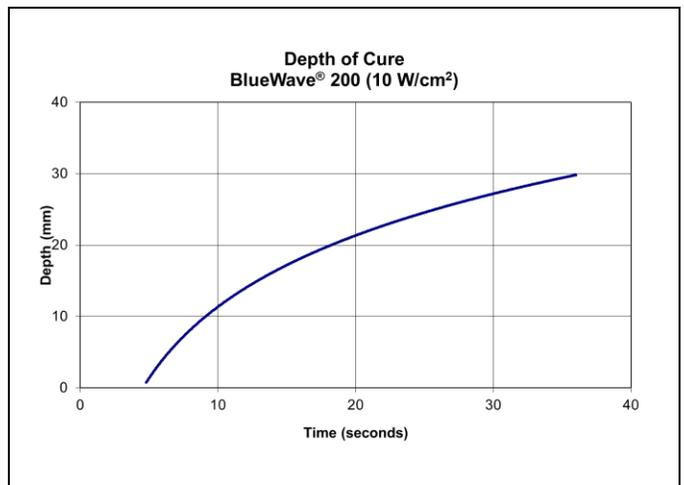
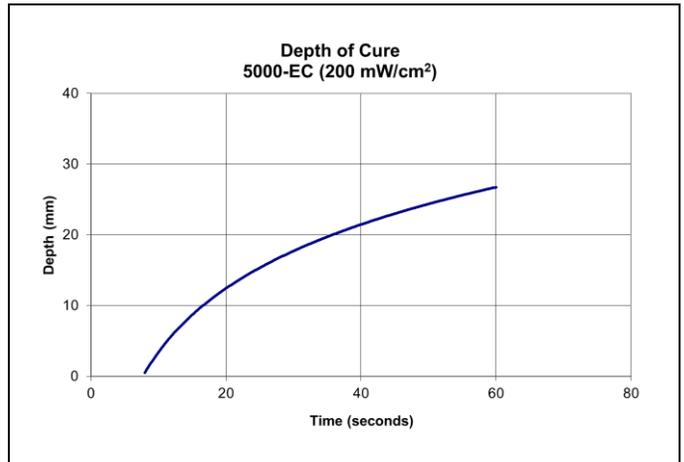
- A** For applications requiring higher thicknesses, please contact Dymax Application Engineering.
- B** Curing through light-blocking substrates may require longer cure times if they obstruct wavelengths used for light curing (320-400 nm for UV light curing, 320-450 nm for UV/Visible light curing). These curing times/belt speeds are typical for curing thin films through 100% light-transmitting substrates.
- C** Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.
- D** 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™ 150 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.

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<sup>2</sup>) 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 and automatic applicators or other equipment as required. Questions relating to dispensing and curing systems for specific applications should be referred to Dymax Application Engineering.

**CLEAN UP**

Uncured material may be removed from dispensing components and parts with organic solvents. Clean up 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 minimum six-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.

**RECOMMENDED DYMAX LITERATURE**

<b>LIT010A</b>	Guide to Selecting and Using UV Light-Curing Systems
<b>LIT019</b>	Light-Curable Materials for Electronic Assembly
<b>LIT051A</b>	UVCS UV Light-Curing Conveyor Systems
<b>LIT077</b>	Chemical Safety
<b>LIT133</b>	UV Light-Curing System Safety Considerations
<b>LIT159</b>	ACCU-CAL™ 50 Radiometer
<b>LIT206</b>	Flood and Focused-Beam UV Light-Curing Systems
<b>LIT218</b>	BlueWave® 200 UV Light-Curing Spot Lamp
<b>LIT238</b>	BlueWave® 75 UV Light-Curing Spot Lamp
<b>LIT267</b>	BlueWave® LED Prime UVA Spot-Curing Lamp
<b>LIT276</b>	ACCU-CAL™ 50-LED Radiometer
<b>LIT284</b>	BlueWave® LED DX-1000 Curing System
<b>LIT290</b>	ACCU-CAL™ 150 Radiometer

Literature is available through our website, [www.dymax.com](http://www.dymax.com), or by calling any Dymax location.