Loctite® Liquid Optically Clear Adhesives
for Touch Panels & Displays
Engineering Services

Henkel offers complete engineering services for projects demanding expertise and support beyond the limits of industrial standard technical services. As a result, our engineers provide the following value-added services.

- On-site engineering assistance and consultation
- Joint product development programs
- Contract lab services and testing
- Prototype testing
- Custom formulations

Sustainability

Achieving more with less

Our commitment to leadership in sustainability is deeply embedded in our values. With our revised Sustainability Strategy for 2030, we are building on our strong track record. At the same time, we are aiming to address one of the central future challenges: to decouple growth from resource consumption. At the heart of this strategy is therefore the simple, yet challenging, ambition: to achieve more with less. It aims to create more value for our customers, consumers, communities and the company alike, while simultaneously reducing the environmental footprint.
The Perfect Partnership of Design, Engineering and Innovation

You and Loctite®

We are the global technology leader with extensive network to support customers’ value chain.

Best-in-Class Technical Support

Our professional engineering support empowers our customers to improve their quality and efficiency.

Design Partnership

Our large experienced team of engineers provide documented design and application support.

Global Capabilities

We are the world’s most trusted provider of bonding, sealing and coating solutions.

We enable innovative designs, improve productivity and reduce costs for handheld devices and displays.

Innovative & Sustainable Solutions

We enable customers’ innovation to meet fast design changes and development with green solutions.

Cost Saving & Reliability

Our superior adhesives and equipment improve productivity, durability and reduce overall cost.
Benefits of LOCA

In mobile devices, laptops, tablets, monitors and television sets, the majority of the designs today do not have a touch panel and have at least one air gap between the cover glass and the LCD module. Over the next several years, the touch interface will become ubiquitous in displays and manufacturers will strive to improve the customer experience by:

- **Improving the viewing experience** — with LOCA and A/R glass you can increase contrast ratio by 400% in sunlight. Henkel has minimized loss due to reflection by matching the refractive index (1.5) to glass and PMMA.
- **Increasing display ruggedness** — for large gaps up to 1 mm, you can increase the falling ball impact resistance by up to 3X.
- **Extending battery life** — by reducing light loss due to reflection, the end user can get a superior viewing experience with less power consumption greatly extending battery life.
- **Extending display product life** — LOCA makes a display more durable to heat, moisture and temperature cycling.
- **Enabling thinner designs** — LOCA will absorb the impact of a given load when compared to an assembly with an air gap, allowing for thinner designs while protecting the display surface.

The primary function of an optically clear adhesive in a touch panel is to eliminate reflection loss and/or glare caused by air gaps between touch panel layers. Today the majority of touch panels are small (< 4’’), resistive and capacitive touch panels that are used in mobile devices. These small touch panels are normally assembled using an optically clear double sided tape.

But the touch panel market is rapidly changing. As the average touch panel size increases with tablets and monitors becoming more common and the performance requirements of optically clear adhesives increases, Table 1 illustrates the clear performance and manufacturing advantages of LOCA over OCA tape which will drive the rapid adoption of LOCA over the next several years.

### Table 1: Performance comparison: LOCA vs. OCA Tape

<table>
<thead>
<tr>
<th></th>
<th>LOCA</th>
<th>OCA Tape</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adhesion / Reliability</strong></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Inventory</strong></td>
<td>Size independent</td>
<td>Various pre die cut needed</td>
</tr>
<tr>
<td><strong>Repairability</strong></td>
<td>Repair can be done at pre-curing stage</td>
<td>Cannot be done</td>
</tr>
<tr>
<td><strong>Large Panel</strong></td>
<td>More suitable</td>
<td>Less suitable</td>
</tr>
<tr>
<td><strong>Gap Filling (Edge of Ink Coating)</strong></td>
<td>Excellent</td>
<td>General / poor</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td>Adhesive application, assembly at ambient or vacuum, pre-cure and full cure</td>
<td>Roller lamination and autoclave</td>
</tr>
<tr>
<td><strong>Surface Preparation</strong></td>
<td>Less demanding</td>
<td>More demanding</td>
</tr>
<tr>
<td><strong>Assembly Line</strong></td>
<td>Can be fully automated</td>
<td>Semi-automated</td>
</tr>
</tbody>
</table>
Typical Applications

Cover Lens Bonding

Touch Panel Sensor Assembly

Direct Bonding

SEE PAGE 7

SEE PAGE 6

SEE PAGE 8
Touch Panel Sensor Assembly

Overview

Sometimes the touch panel sensor for a projected capacitive touch panel consists of two layers of ITO coated glass that are laminated together with a LOCA. Normally this is not needed as the two ITO layers can be deposited on one layer of glass. In the near future, touch panel sensor functionality will also migrate onto the cover lens (on-lens) or the LCD module (on-cell and in-cell). These applications will then require LOCA for direct bonding. For more details on direct bonding, please refer to page 8.

Common Materials
• ITO Glass

Typical Gaps
• 150 micron

Key Performance Requirements
• Low viscosity
• Low durometer
• High adhesion to glass
• > 99% transmission
• < 1% haze
• Yellowness (b*) < 1
• Low shrinkage
• Long term resistance to UV light, 85 °C, 60 °C / 90% RH and thermal shock

Typical Assembly Process
While many different processes are used today, the typical process consists of the following steps:
1. Align touch panels
2. Apply adhesive
3. Flip and assemble or Vacuum de-gas before assembly (generally required for medium to large size panels)
4. Pre-cure with UV / LED wands
5. Confirm touch panel alignment
6. Full cure with UV / LED chamber or conveyor

For more information on Loctite® process equipment, please refer to pages 10 and 11.

Recommended Adhesives
• High impact resistance — Loctite® 3196
• High strength — Loctite® 3195

For more technical details, please refer to page 9.
Cover Lens Bonding

Overview
To optimize the viewing experience, it is necessary to fill the air gap between the touch panel sensor and the cover lens. This is normally a close fitting application similar to the touch panel sensor assembly.

Common Materials
• Glass / ITO Glass
• PMMA

Typical Gaps
• 150 micron

Key Performance Requirements
• Low viscosity
• Low durometer
• High adhesion to glass and plastic
• > 99% transmission
• < 1% haze
• Yellowness (b*) < 1
• Low shrinkage
• Long term resistance to UV light, 85 °C, 60 °C / 90% RH and thermal shock

Typical Assembly Process
While many different processes are used today, the typical process consists of the following steps:
1. Align touch panel sensor and cover lens
2. Apply adhesive to touch panel sensor
3. Flip and assemble onto cover lens or Vacuum de-gas before assembly (generally required for medium to large size panels)
4. Pre-cure with UV / LED wands
5. Confirm cover lens and touch panel alignment
6. Full cure with UV / LED chamber or conveyor
7. Secondary cure – used to cure the shadowed areas between the cover lens ink and flexible printed circuit. Typically either 60 °C heat cure for 1 hour or 24 hour moisture cure.

For more information on Loctite® process equipment, please refer to pages 10 and 11.

Recommended Adhesives
• High impact resistance — Loctite® 3196
• High strength — Loctite® 3195
• Secondary heat cure — Loctite® 3192
• Secondary moisture cure — Loctite® 5192

For more technical details, please refer to page 9.
Direct Bonding

Overview

Direct bonding is necessary to achieve the highest amount of contrast, particularly for outdoor applications, and to bring the image close to the viewer. Normally higher bondline gaps are required to protect the LCD module from degradation due to expansion and contraction and/or impact. The higher gaps normally require that a high viscosity dam is used to increase the edge definition.

Common Materials
- ITO Glass
- Glass or PMMA
- Polarizer film on LCD Module

Typical Gaps
- 300 micron

Key Performance Requirements
- Low viscosity
- Extremely low durometer
- High adhesion to glass & plastic
- > 99% transmission
- < 1% haze
- Yellowness (b*) < 1
- Low shrinkage
- Long term resistance to UV light, 85 °C, 60 °C / 90% RH and thermal shock
- Resistant to mura

Typical Assembly Process
While many different processes are used today, the typical process consists of the following steps:
1. Align LCD module and cover lens
2. Apply dam adhesive around the perimeter of the LCD surface
3. Cure dam with UV / LED wand or conveyor
4. Apply adhesive pattern to the cover lens
5. Flip and assemble cover lens onto LCD module or Vacuum de-gas before assembly (generally required for medium to large size panels)
6. Pre-cure with UV / LED wands
7. Confirm cover lens and LCD module alignment
8. Full cure with UV / LED chamber or conveyor
9. Secondary cure – used to cure the shadowed areas between the cover lens ink and the surface of the LCD. Typically either 60 °C heat cure for 1 hour or 24 hour moisture cure.

For more information on Loctite® process equipment, please refer to pages 10 and 11.

Recommended Adhesives
- Generally recommended
  - Loctite® 3195 fill with Loctite® 3195DM
  - Loctite® 3196 fill with Loctite® 3195DM
- Secondary moisture cure
  - Loctite® 5192 fill with Loctite® 5192DM

For more technical details, please refer to page 9.
## Product Selector Guide

### Product Selection Tree

**Application**
- Touch Panel / Cover Lens
  - Direct Bonding

**Substrates**
- Glass - Glass
- Glass - Plastic

**Secondary Cure**
- Not Required
- Required

**Products**
- 3195 (High Strength)
- 3192 (Heat Cure)
- 3193 (PMMA)
- 3195/3195DM (High Strength)
- 5192/5192DM (Moisture Cure)
- 3196 (High Impact)
- 5192 (Moisture Cure)
- 3196/3195DM (High Impact)

### Product Selector Guide

<table>
<thead>
<tr>
<th>Products</th>
<th>Loctite® 3192</th>
<th>Loctite® 3193*</th>
<th>Loctite® 3195</th>
<th>Loctite® 3195DM</th>
<th>Loctite® 3196</th>
<th>Loctite® 5192</th>
<th>Loctite® 5192DM</th>
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</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Acrylic</td>
<td>Acrylic</td>
<td>Acrylic</td>
<td>Acrylic</td>
<td>Acrylic</td>
<td>Silicone</td>
<td>Silicone</td>
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<tr>
<td>Curing Method</td>
<td>UV + Heat</td>
<td>UV</td>
<td>UV</td>
<td>UV</td>
<td>UV</td>
<td>UV / Moisture</td>
<td>UV</td>
</tr>
<tr>
<td>Viscosity (cPs @ 25 °C)</td>
<td>4,500</td>
<td>3,000</td>
<td>3,500</td>
<td>40,000</td>
<td>3,600</td>
<td>6,400</td>
<td>47,000</td>
</tr>
<tr>
<td>Shore Hardness</td>
<td>0050</td>
<td>0060</td>
<td>0025</td>
<td>0050</td>
<td>0011</td>
<td>0071</td>
<td>0030</td>
</tr>
<tr>
<td>Elongation</td>
<td>&gt; 70%</td>
<td>&gt; 800%</td>
<td>&gt; 150%</td>
<td>&gt; 100%</td>
<td>&gt; 200%</td>
<td>&gt; 135%</td>
<td>&gt; 150%</td>
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<tr>
<td>Refractive Index</td>
<td>1.49</td>
<td>1.48</td>
<td>1.51</td>
<td>1.51</td>
<td>1.51</td>
<td>1.41</td>
<td>1.41</td>
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<tr>
<td>Transmittance (%)</td>
<td>99.00</td>
<td>99.10</td>
<td>98.90</td>
<td>98.90</td>
<td>99.70</td>
<td>99.00</td>
<td>99.30</td>
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<tr>
<td>Shrinkage (% by Volume)</td>
<td>&lt; 3</td>
<td>&lt; 3</td>
<td>&lt; 2</td>
<td>&lt; 1.6</td>
<td>&lt; 1.6</td>
<td>&lt; 0.55</td>
<td>&lt; 2</td>
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<tr>
<td>Adhesion on Glass (MPa)</td>
<td>1.0</td>
<td>1.0</td>
<td>1.22</td>
<td>0.91</td>
<td>0.55</td>
<td>0.4</td>
<td>0.64</td>
</tr>
<tr>
<td>yellowness (b*)</td>
<td>0.3</td>
<td>0.3</td>
<td>0.4</td>
<td>0.5</td>
<td>0.2</td>
<td>0.19</td>
<td>0.33</td>
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<tr>
<td>Haze (%)</td>
<td>0.10</td>
<td>0.10</td>
<td>0.07</td>
<td>0.13</td>
<td>0.07</td>
<td>0.04</td>
<td>0.17</td>
</tr>
<tr>
<td>Ordering Information</td>
<td>55 ml</td>
<td>1578031</td>
<td>1577094</td>
<td>1544701</td>
<td>1565002</td>
<td>1593427</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>1 kg</td>
<td>1559815</td>
<td>1559814</td>
<td>1541655</td>
<td>1564703</td>
<td>1591827</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>-</td>
<td>-</td>
<td>1610586 (2 kg)</td>
<td>-</td>
<td>-</td>
<td>16062815 (50 ml)</td>
</tr>
</tbody>
</table>

* Loctite® 3193 has high peel strength on various plastic substrates [N/mm]:
  - PMMA 2.41
  - PC 2.45
  - PET 2.77
Loctite® LOCA Process Equipment

Dispensing Light Cure Acrylics

1. Fluid Supply
   - Loctite® Diaphragm Supply Pump
     - LOCA Use: Benchtop fluid reservoir for dispensing light cure acrylics from 1 liter bottles (1 liter net fill).
     - Prevents Bubbles: No fluid / air contact. Unique diaphragm pump pressurizes fluid for delivery to applicator valve “without” using pressurized air. Effectively minimizes degree of air dissolving into adhesive.
     - Low Level Detection: Fluid level sensor provides output signal when adhesive level in bottle is low, thereby preventing air from being pumped into fluid lines.
     - Pneumatically Controlled: Pump start / stop initiated by customer-supplied air signals (solenoide valve).
     - Fluid Output Pressure: 0.2 - 7.0 bar
     - Fluid Viscosity: 5,000 cps max
     - Applicator Valve: Required, ideally suited for use with Loctite® Light Cure Dispense Valve 98009, sold separately.

2. Fluid Applicator
   - Loctite® Light Cure Dispensing Valve
     - LOCA Use: Fluid valve for precise ON/OFF fluid control. Can be coupled with the Loctite® Diaphragm Supply Pump, or any pressure reservoir.
     - Prevents Bubbles: Air impermeable, sealed acetal copolymer valve chamber, prevents air infiltration.
     - Positive Shut-Off: Zero suck back design, eliminates risk of creating bubbles during shut-off.
     - Long Life: Diaphragm design has no sliding seals in fluid path.
     - High Resolution Stroke Adjustment: Allows precise adjustment of flow.
     - Fail Safe: Spring close, air signal to open.
     - Field Serviceable: Simple rebuild kits available.
     - Compact Size: Easily fits in confined spaces (28.5 mm long × 26.9 mm diameter).
     - Max Fluid Pressure Rating: 4 bar

3. Syringe Dispenser
   - Loctite® Digital Syringe Dispensing System
     - LOCA Use: For dispensing light cure acrylics directly from syringe barrels (no applicator valve required).
     - Digital Time Control
     - Vacuum Suck-Back: Effectively controls product dripping or stringing.
     - Modes: Manual, incremental, or timed; allows a choice of adhesive dispensing methods.
     - Teach Mode: Convenient way to set dispense time, user locks time after approving test dose.
     - Cycle Counter: Clearly displayed on the LCD screen.
     - Integration: Easily adaptable to PLC or PC based automation controls.

Required: Diaphragm Pump + Bottle Cap
Diaphragm Pump - item number 97809
Bottle Cap (1 Liter Bottle) - item number 1135959

Item number 98009

Henkel LOCA Process Automation Partners

In addition to providing Loctite® dispensing and curing equipment, Henkel also has a portfolio of LOCA process partners. These partners provide processing solutions ranging from manual workcells to fully automated production lines.

Henkel has worked with these partners to develop and understand their full capabilities, and has tested Loctite® LOCA with their equipment.

After evaluating your applications, we are ready to refer you to a process partner that is bested suited for your needs.
# Curing Light Cure Acrylics

## 1 Tack Curing

**Loctite® LED Spot Cure System**

**LOCA Use:** Curing light ideally suited for spot tacking on selected display area, creating fixture strength prior to transporting to final cure.

<table>
<thead>
<tr>
<th>Curing Spectrum</th>
<th>UV-A (365 nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curing Area</td>
<td>6 mm diameter</td>
</tr>
<tr>
<td>Curing Distance</td>
<td>0 - 22 mm</td>
</tr>
<tr>
<td>Curing Intensity</td>
<td>1,400 mW/cm²</td>
</tr>
<tr>
<td>Duty Cycle Rating</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Integration**

Easily adaptable to PLC or PC based automation controls.

**Controller**

Operates 1 - 4 LED heads. Provides selection for digitally timed or manually controlled curing.

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## 2a Finish Curing – Surface

**Loctite® LED Flood Cure System**

**LOCA Use:** Curing light ideally suited for final curing on full display area.

<table>
<thead>
<tr>
<th>Curing Spectrum</th>
<th>UV-A (375 nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curing Area</td>
<td>100 mm × 100 mm</td>
</tr>
<tr>
<td>Curing Distance</td>
<td>25 - 75 mm</td>
</tr>
<tr>
<td>Curing Intensity</td>
<td>Industry unique design has individually reflectorized LED’s, optimally focused to deliver maximum intensity at the listed &quot;practical&quot; working distance.</td>
</tr>
<tr>
<td>Curing Intensity</td>
<td>150 - 350 mW/cm²</td>
</tr>
<tr>
<td>Edge-to-Edge Stackable</td>
<td>Allows use of multiple arrays to create a continuous 100 mm band of light without shadow areas.</td>
</tr>
<tr>
<td>Duty Cycle Rating</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Advanced Internal Diagnostics**

Continuously monitors LED performance and temperature, and provides digital and visual fault outputs in the rare event of a problem.

**System**

- LED Head + Controller
- Controller, 4 Channel: item number 1154634
- LED Head, 6 mm: item number 1138499

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## 2b Finish Curing – Edges

**Loctite® LED Line Cure System**

**LOCA Use:** Curing light ideally suited for final curing on the display edges (if edge curing is required).

<table>
<thead>
<tr>
<th>Curing Spectrum</th>
<th>UV-A (365 nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curing Area</td>
<td>5 mm × 80 mm (at 20 mm distance)</td>
</tr>
<tr>
<td>Curing Distance</td>
<td>5 - 20 mm</td>
</tr>
<tr>
<td>Curing Intensity</td>
<td>600 mW/cm² (with Booster Lens: 1,300 mW/cm²)</td>
</tr>
<tr>
<td>Edge-to-Edge Stackable</td>
<td>Allows use of multiple arrays to create a continuous line of light without shadow areas.</td>
</tr>
<tr>
<td>Duty Cycle Rating</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Integration**

Easily adaptable to PLC or PC based automation control.

**Controller**

Operates 1 - 4 LED line arrays. Provides digitally timed or manually controlled curing.

**Advanced Internal Diagnostics**

Continuously monitors LED performance and temperature, and provides digital and visual fault outputs in the rare event of a problem.

**System**

- Line Array + Controller + Cable
- 365 nm Line Array: item number 148499 (optional Booster Lens: 1500901)
- Controller, 4 Channel: item number 1447728 (optional Footswitch: 97201)
- Cable: item number 1483215

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## Benefits of All Loctite® LED Curing Systems

- **Air Cooled**
  - Self contained system (no water cooling required).

- **Instant ON / OFF**
  - Requires no warm-up time. Allows turning off between cure cycles, reducing energy costs.

- **Long Life**
  - Up to 10 times vs. traditional arc-lamps.

- **Cold Light**
  - Light output has no Infra-Red (IR) content, minimizing part heating and warping.

- **100% Usable Output**
  - Unlike traditional arc-lamps, 100% of light output is within the adhesive’s curing spectrum.