



LOCTITE® 3556™

June 2008

PRODUCT DESCRIPTION

LOCTITE® 3556™ provides the following product characteristics:

| | |
|-----------------------------|--|
| Technology | Acrylic |
| Chemical Type | Acrylated urethane |
| Appearance (uncured) | Transparent yellow liquid with green tint ^{LMS} |
| Fluorescence | Positive ^{LMS} |
| Components | One component - requires no mixing |
| Viscosity | Medium |
| Cure | Visible light |
| Application | Bonding and Potting |

LOCTITE® 3556™ cures rapidly when exposed to visible light of sufficient intensity. The rapid cure characteristics of this product make it ideal for potting applications which require a fast and large depth of cure. The ability of this product to fluoresce under black light facilitates inspection of bonded assemblies for adhesive presence. LOCTITE® 3556™ is suitable for a wide variety of applications that require bonding polycarbonate to itself and a variety of other substrates, while not inducing stress cracking under typical molded stress levels. Suitable for use in the assembly of **disposable medical devices**.

ISO-10993

An ISO 10993 Test Protocol is an integral part of the Quality Program for LOCTITE® 3556™. LOCTITE® 3556™ has been qualified to Loctite's ISO 10993 Protocol as a means to assist in the selection of products for use in the medical device industry. Certificates of Compliance are available at www.loctite.com or through the Henkel Loctite Quality Department.

TYPICAL PROPERTIES OF UNCURED MATERIAL

| | |
|---|-------------------------------|
| Specific Gravity @ 25 °C | 1.11 |
| Flash Point - See MSDS | |
| Viscosity, Cone & Plate, 25 °C, mPa·s (cP): | |
| Shear rate 50 s ⁻¹ | 3,500 to 6,500 ^{LMS} |

TYPICAL CURING PERFORMANCE

LOCTITE® 3556™ can be cured by irradiation with visible light greater than 400 nm wavelength of sufficient intensity. Cure rate and ultimate depth of cure depend on light intensity, spectral distribution of the light source, exposure time and light transmittance of the substrate through which the light must pass.

Stress Cracking

Liquid adhesive is applied to a medical grade polycarbonate bar 6.4 cm by 13 mm by 3 mm which is then flexed to induce a known stress level. The time until stress cracking is observed.

| | |
|--|---------|
| Stress Cracking, ASTM D 3929, minutes: | |
| 13.8 N/mm ² stress on bar | >15 |
| 17.2 N/mm ² stress on bar | 5 to 15 |

Fixture Time

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm².

| | |
|--|----|
| UV Fixture Time, Polycarbonate, seconds: | |
| 500 mW/cm ² , measured @ >400 nm using a Indigo™ Cure Jet | <5 |
| 500 mW/cm ² , using a Loctite® 7720™ Visible Wand System | <5 |
| 225 mW/cm ² , measured @ >400 nm using a LOCTITE® Indigo™ 7418 Visible Flood Source | <5 |

Tack Free Time

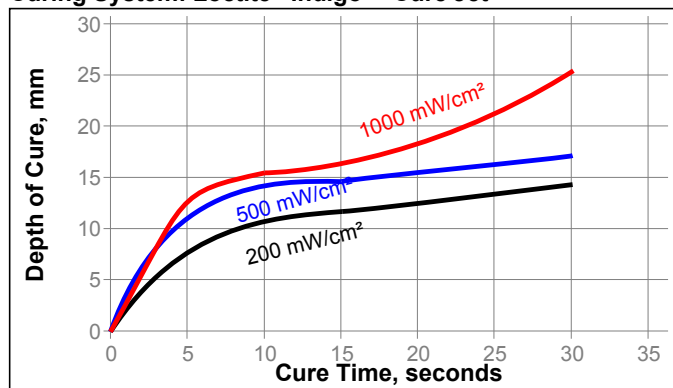
Tack Free Time is the time required to achieve a tack free surface

| | |
|--|----------------------|
| Tack Free Time, seconds: | |
| 280 mW/cm ² , measured @ >400 nm using a LOCTITE® Indigo™ 7418 Visible Flood Source | a ≤10 ^{LMS} |
| 500 mW/cm ² , measured @ >400 nm using a Loctite® 7720™ Visible Wand System | <5 |

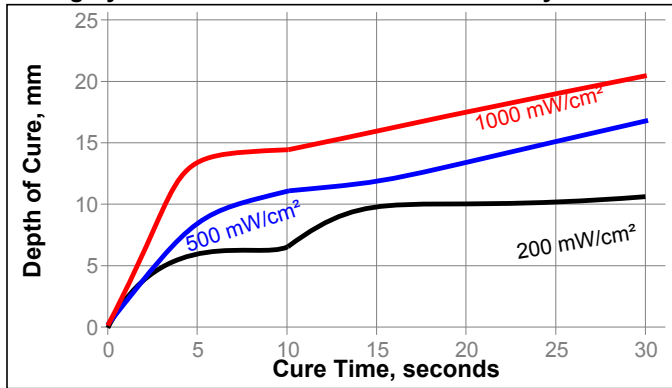
Depth of Cure vs. Irradiance

The graphs below show the increase in depth of cure with time at various irradiances as measured from the thickness of the cured product formed in a 25 mm diameter Delrin block.

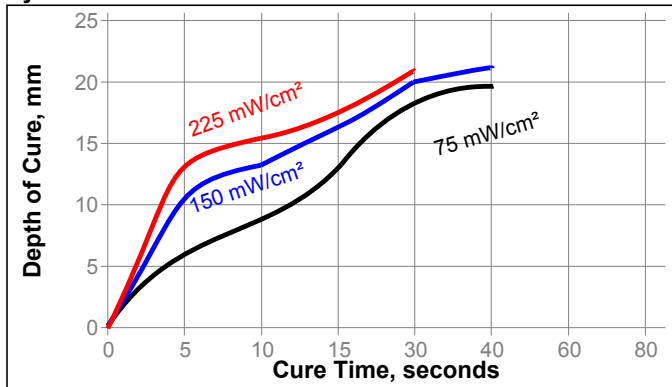
Curing System: Loctite® Indigo™ Cure Jet



Curing System: Loctite® 7720™ Visible Wand System



Curing System: Loctite® Indigo™ 7418 Visible Flood System



TYPICAL PROPERTIES OF CURED MATERIAL

Cured @ 225 mW/cm², for 30 seconds per side using a LOCTITE® Indigo™ 7418 Visible Flood Source with a spectral output of > 400 nm

Physical Properties

| | |
|--|---|
| Linear Shrinkage, ASTM D 792, % | 2.8 |
| Volume Shrinkage, ASTM D 792, % | 8.2 |
| Shore Hardness, ISO 868, Durometer D | 68 |
| Refractive Index | 1.51 |
| Water Absorption, ISO 62, %: | |
| 2 hours in boiling water | 9.6 |
| Elongation, at break, ISO 527-3, % | 33 |
| Glass Transition Temperature (Tg), ISO 11359-2, °C | 60 |
| Coefficient of Thermal Expansion, ISO 11359-2, K ⁻¹ : | |
| Pre Tg | 62×10 ⁻⁶ |
| Post Tg | 142×10 ⁻⁶ |
| Tensile Strength, at break, ISO 527-3 | N/mm ² 30 (psi) (4,320) |
| Tensile Modulus, ISO 527-3 | N/mm ² 1,060 (psi) (154,000) |

Electrical Properties

| | |
|---|----------------------|
| Surface Resistivity, IEC 60093, Ω | 2.6×10 ¹⁵ |
| Volume Resistivity, IEC 60093, Ω·cm | 2.5×10 ¹⁵ |
| Dielectric Breakdown Strength, IEC 60093, kV/mm | 33 |

Dielectric Constant / Dissipation Factor, IEC 60250:

| | |
|---------|------------|
| 1 Kz | 3.5 / 0.02 |
| 100 kHz | 3.4 / 0.02 |
| 1 MHz | 3.3 / 0.03 |

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured @ 225 mW/cm², for 30 seconds using a LOCTITE® Indigo™ 7418 Visible Flood Source with a spectral output of > 400 nm

Lap Shear Strength, ISO 4587:

| | |
|---|---------------------------------|
| Polycarbonate (UV absorbing) to Stainless steel | N/mm ² 4 (psi) (630) |
|---|---------------------------------|

Block Shear Strength, ISO 13445:

| | |
|--|------------------------------------|
| Polycarbonate (UV absorbing) to Polycarbonate (UV absorbing) | N/mm ² 35 (psi) (5,070) |
| Nylon to Polycarbonate (UV absorbing) | N/mm ² 4 (psi) (590) |
| ABS to Polycarbonate (UV absorbing) | N/mm ² 29 (psi) (4,220) |
| PVC to Polycarbonate (UV absorbing) | N/mm ² 37 (psi) (5,370) |

Cured @ 280 mW/cm², measured @ >400 nm for 10 seconds using a LOCTITE® Indigo™ 7418 Visible Flood Source

Block Shear Strength, ISO 13445:

| | |
|------------------------------|--|
| Polycarbonate (UV absorbing) | N/mm ² ≥12.41 ^{LMS} (psi) (≥1,800) |
|------------------------------|--|

Cured @ 500 mW/cm², measured @ >400 nm for 10 seconds using a Indigo™ Cure Jet

Needle Pullout Strength:

| | | |
|---------------|------------------|------------------|
| Material | 22 Gauge Cannula | 27 Gauge Cannula |
| ABS | N 89 (lb) (20) | N 53 (lb) (12) |
| Polycarbonate | N 73 (lb) (16) | N 54 (lb) (12) |
| Polystyrene | N 20 (lb) (5) | N 13 (lb) (3) |

TYPICAL ENVIRONMENTAL RESISTANCE

Cured @ 400 mW/cm², for 30 seconds using a Visible Arc Light Source with a spectral output of > 400 nm

Block Shear Strength, ISO 13445, % of initial strength:

Polycarbonate (UV absorbing)

Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

| Environment | °C | % of initial strength | | | |
|-----------------------|-----|-----------------------|-------|-------|--------|
| | | 2 h | 170 h | 500 h | 1000 h |
| Air | 70 | ----- | 98 | 98 | 50 |
| Air | 95 | ----- | 121 | 113 | 13 |
| Water | 100 | 51 | ----- | ----- | ----- |
| Water immersion | 50 | ----- | 29 | 5 | 3 |
| Isopropanol immersion | 22 | ----- | 75 | 71 | 50 |
| Heat/humidity 95% RH | 38 | ----- | 80 | 82 | 31 |

Effects of Sterilization

In general, products similar in composition to LOCTITE® 3556™ subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kiloGrays cumulative) show excellent bond strength retention. LOCTITE® 3556™ maintains bond strength after 1 cycle of steam autoclave. It is recommended that customers test specific parts after subjecting them to the preferred sterilization method. Consult with Loctite® for a product recommendation if your device will see more than 3 sterilization cycles.

Sterilization Resistance of Needle Assemblies

Sterilized as indicated and tested @ 22 °C

Needle Pullout Strength, % of initial strength:

| | Gamma 30kGy | ETO 1 Cycle | Autoclave 1 Cycle |
|------------------|----------------|----------------|----------------------|
| Polycarbonate: | | | |
| 22 Gauge Cannula | 224 | 181 | 157 |
| 27 Gauge Cannula | 156 | 155 | 147 |

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials

For safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

Directions for use:

1. This product is visible light sensitive; exposure to daylight, UV light and artificial lighting should be kept to a minimum during storage and handling.
2. The product should be dispensed from applicators with black feedlines.
3. For best performance bond surfaces should be clean and free from grease.
4. Cure rate is dependent on lamp intensity, distance from light source, depth of cure needed or bondline gap and light transmittance of the substrate through which the radiation must pass.
5. Cooling should be provided for temperature sensitive substrates such as thermoplastics.
6. Plastic grades should be checked for risk of stress cracking when exposed to liquid adhesive.
7. Excess uncured adhesive can be wiped away with organic solvent (e.g. Acetone).
8. Bonds should be allowed to cool before subjecting to any service loads.

Loctite Material Specification^{LMS}

LMS dated August 15, 2007. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

Storage

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties.

Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions

(°C x 1.8) + 32 = °F
 kV/mm x 25.4 = V/mil
 mm / 25.4 = inches
 µm / 25.4 = mil
 N x 0.225 = lb
 N/mm x 5.71 = lb/in
 N/mm² x 145 = psi
 MPa x 145 = psi
 N·m x 8.851 = lb·in
 N·m x 0.738 = lb·ft
 N·mm x 0.142 = oz·in
 mPa·s = cP

Note

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Reference 0.1