Technical Data Sheet

LOCTITE 3016

January 2014

PRODUCT DESCRIPTION

LOCTITE 3016 provides the following product characteristics:

Technology	Acrylic/Epoxy
Chemical Type	Acrylic/Epoxy
Appearance (uncured)	Yellow/brown liquid[LMS]
Components	One part - requires no mixing
Viscosity	Medium
Cure	Ultraviolet (UV) light
Secondary Cure	Heat
Application	Sealing

LOCTITE 3016 is an acrylic/epoxy hybrid sealant for electronic devices. UV light is used to immobilize the product on the part and limit "flow-in". Full cure requires heat after UV fixture. This product gives excellent adhesion on a wide range of materials typically used in electronic devices. Typical applications include the sealing of contact pins into base and base into housing of electronic devices such as relays, potentiometers, trimmers, thermostat switches, etc.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.1
Density, DIN EN542 @ 25 °C, g/ml	1.1
Flash Point - See SDS	
Viscosity @ 25°C, mPa·s (cP):	
Haake cone & plate:	
Haake PK 100, PK 1, 2° Cone @ 36 s^{-1}	3,000 to 6,000[LMS]

TYPICAL CURING PERFORMANCE

LOCTITE 3016 cures when exposed to UV radiation of 250 to 365 nm wavelength. UV light is used to immobilize the product on the part and limit "flow-in". The speed of cure will depend on the UV intensity as measured at the product surface. Typical cure condition is 10 - 40 seconds at 100mW/cm² using a medium pressure, quartz envelope, mercury vapour UV lamp. Recommended conditions for curing are exposure to heat above 100°C (typically 5 to 10 minutes @ 125 °C or 30 minutes @ 100 °C). Higher cure temperatures such as 150 °C can be used to shorten cure times. Rate of cure and final strength will depend on the residence time at the cure temperature.

Isothermal DSC Conversion

10 minutes @ 125 °C, %	85 to 100[LMS]

Skin Over Time

Skin over time is the time the surface of the adhesive forms a skin upon exposure to atmospheric moisture at 25 ± 2 °C, 50 ± 5% RH.

Skin Over Time, seconds:	
100 mW/cm² , measured @ 365 nm	30[LMS]

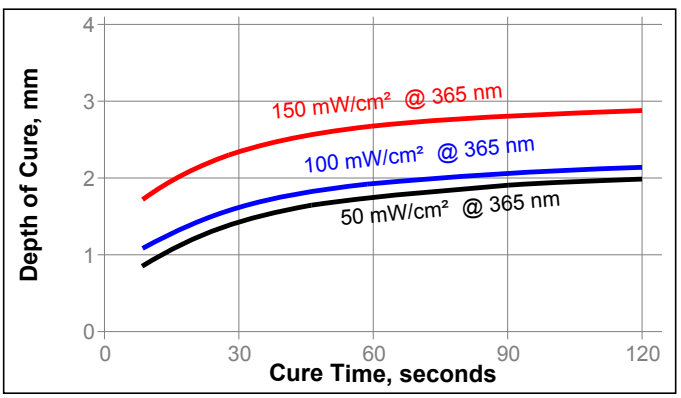
Immobilization Time vs. UV Intensity

UV exposure changes the product to a soft, pliable form which cannot flow. The time to prevent immediate flow of a 0.1 mm thick film applied to a vertical glass is used as an indication of immobilization time.

Immobilization Time, seconds:	
50 mW/cm² @ 365 nm	3
100 mW/cm² @ 365 nm	3
150 mW/cm² @ 365 nm	1

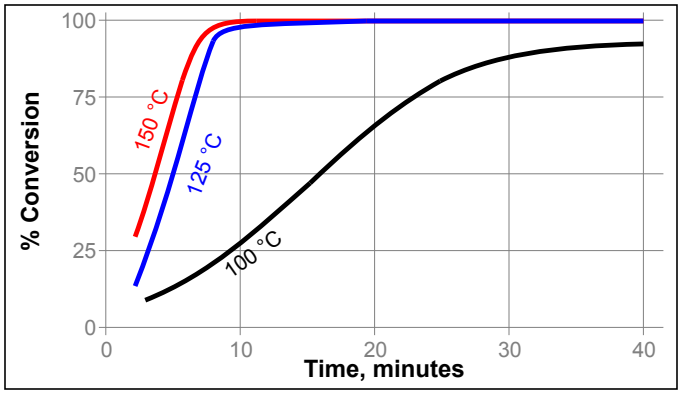
Depth of Cure vs. Intensity

The graph below shows the increase in depth of cure with time at different intensities as measured from the thickness of the cured pellet formed in a 15 mm diameter PTFE die.



Cure Speed vs. Temperature

The graph below shows the rate at which the product is converted to a cured material at different temperatures, as measured by Differential Scanning Calorimetry.



TYPICAL PROPERTIES OF CURED MATERIAL

Cured @ 100 mW/cm² , measured @ 365 nm, for 30 seconds plus 1 hour @ 135 °C

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}		50×10^{-6}
Coefficient of Thermal Conductivity, ISO 8302, W/(m·K)		0.1
Glass Transition Temperature, ASTM D 4065, °C		98
Shore Hardness, ISO 868, Durometer D		80
Shrinkage, %		0.8
Water Absorption, ISO 62, %:		
2 hours in water @ 100 °C		4.0
2 weeks in water @ 22 °C		0.75
Elongation, at break, ISO 527-3, %		2.5
Tensile Strength, ISO 527-3	N/mm² (psi)	30 (4,350)
Tensile Modulus, ISO 527-3	N/mm² (psi)	2,500 (362,500)

Electrical Properties:

Volume Resistivity, IEC 60093, Ω·cm	10×10^{13}
Surface Resistivity, IEC 60093, Ω	10×10^{16}
Dielectric Breakdown Strength, IEC 60243-1, kV/mm	58
Dielectric Constant / Dissipation Factor, IEC 60250:	
Cured @ 25 °C:	
1 kHz	3.3 / 0.01
10 kHz	3.2 / 0.02
1 MHz	3.1 / 0.03
10 MHz	3.0 / 0.03

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 1 hour @ 135 °C.

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm² (psi)	26 (3,770)

TYPICAL ENVIRONMENTAL RESISTANCE

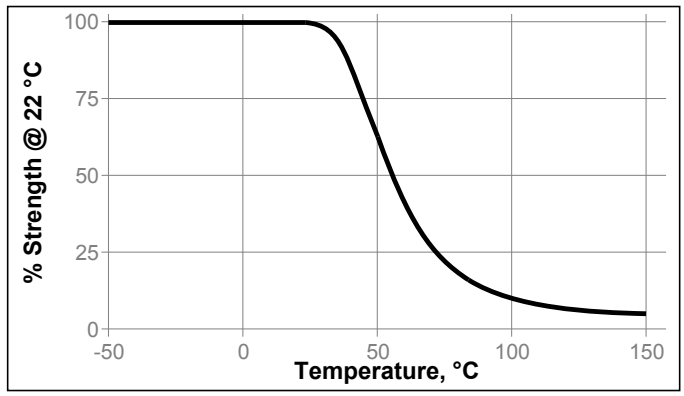
Hot Strength

Tested at temperature

Cured for 1 hour @ 135 °C followed by 7 days @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22°C.

Cured @ 100 mW/cm² , measured @ 365 nm, for 30 seconds plus 1 hour @ 135 °C

Tensile Strength, ISO 6922

		% of initial strength		
Environment	**°C**	**100 h**	**500 h**	**1000 h**
Air	22	100	130	140
Air	150	190	140	140
98% RH	40	140	120	120
Water	87	100	90	90
Motor oil	125	125	135	145
Auto trans. fluid	87	120	100	85

Resistance to Process Conditions

Cured @ 100 mW/cm² , measured @ 365 nm, for 40 seconds followed by 5 minutes @ 150 °C

QC II Sealability in Flourinert FC40 for 10 minutes @ 80 °C:

Test relay: 10 pins into PES base & base into PBT housing:

Sealability, 10 parts, % no leakage:

Initial	100
Dipped in flux followed by 10 second dip of relay pins into solder @ 260 °C	100
Thermal Shock, IEC 68-2-1/2, 2 hours @ -40 °C + 16 hours @ 85 °C, 5 cycles	100

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 Safety Data Sheet (SDS).

Directions for use:

1. After storage in a refrigerator the adhesive must be allowed to equilibrate to room temperature before use, typically 24 hours.
2. Sufficient product should be applied to the part to seal the gap.
3. The sealant should be exposed to UV light as soon as possible after application.
4. In some cases it is necessary to use a vent hole in the housing to prevent air bubbles in the sealant due to heat build up.
5. The parts should immediately be put through an oven where the temperature does not fall below 100°C.
6. Rapid heat up time is essential.
7. The parts should be cooled to room temperature.
8. If a vent hole was used this can subsequently be sealed with a UV curing sealant.
9. In some cases, moisture trapped in the plastic components can affect sealing performance. This can be avoided by drying out the parts at temperature before sealing.

Loctite Material Specification[LMS]

LMS dated August 25, 2000. 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: 2 °C to 8 °C. Storage below 2 °C or greater than 8 °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:

The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. The product can have a variety of different applications as well as differing application and working conditions in your environment that are beyond our control. Henkel is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product.
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Reference 1.2