

LOCTITE® 4304™

December 2008

PRODUCT DESCRIPTION

LOCTITE® 4304™ provides the following product characteristics:

Technology	Cyanoacrylate/UV
Chemical Type	Ethyl cyanoacrylate with photoinitiator
Appearance (uncured)	Transparent, light yellow-green to dark blue-green liquid ^{LMS}
Components	One part - requires no mixing
Viscosity	Low
Cure	Ultraviolet (UV)/ visible light
Secondary Cure	Humidity
Application	Bonding
Key Substrates	Plastics, Rubbers and Metals

LOCTITE® 4304™ is designed for bonding applications that require very rapid fixturing, fillet cure or surface cure. The UV light cure properties facilitate rapid curing of exposed surface areas thereby minimizing blooming and providing an alternative to solvent borne accelerators. Suitable for use in the assembly of **disposable medical devices**.

ISO-10993

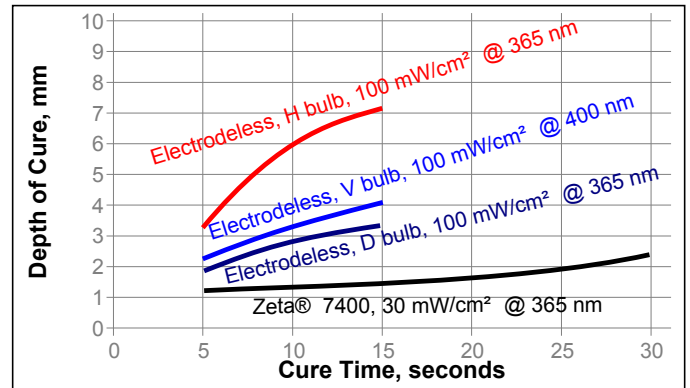
An ISO 10993 Test Protocol is an integral part of the Quality Program for LOCTITE® 4304™. LOCTITE® 4304™ has been qualified to Henkel's ISO 10993 Protocol as a means to assist in the selection of products for use in the medical device industry. Certificates of Compliance are available on Henkel's website or through the Henkel Quality Department.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.07
Flash Point - See SDS	
Viscosity, Cone & Plate, 25 °C, mPa·s (cP):	
PHYSICA MK22 @ 3,000 s ⁻¹	10 to 35 ^{LMS}

TYPICAL CURING PERFORMANCE

Primary Cure Mechanism, UV Depth of Cure



Tack Free Time / Surface Cure

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

UV/Visible Light Sources:

Electrodeless, V bulb:	
100 mW/cm ² , measured @ 400 nm	≤5
Electrodeless, H bulb:	
30 mW/cm ² , measured @ 365 nm	≤10 ^{LMS}
100 mW/cm ² , measured @ 365 nm	≤5
Electrodeless, D bulb:	
100 mW/cm ² , measured @ 365 nm	≤5
Zeta® 7400:	
30 mW/cm ² , measured @ 365 nm	≤5

Effect of Substrate Transparency and Light Source

Zeta® 7400, 30 mW/cm², measured @ 365 nm, for 10 seconds
Electrodeless, V bulb, 100 mW/cm², measured @ 400 nm for 10 seconds

Block Shear Strength, ISO 13445

Material	Bulb	Post UV Cure		
UV Blocking Polycarbonate	Zeta® 7400	2 minutes @ 22 °C	N/mm ² (psi)	12.0 (1,740)
		24 hours @ 22 °C	N/mm ² (psi)	17.4 (2,525)
	Electrodeless, V bulb	2 minutes @ 22 °C	N/mm ² (psi)	16.3 (2,365)
		24 hours @ 22 °C	N/mm ² (psi)	15.5 (2,250)

UV Transmitting Polycarbonate	Zeta® 7400	2 minutes @ 22 °C	N/mm ² 14.4 (psi) (2,090)
	Zeta® 7400	24 hours @ 22 °C	N/mm ² 18.2 (psi) (2,640)
	Electrodeless ss, V bulb	2 minutes @ 22 °C	N/mm ² 16.4 (psi) (2,380)
	Electrodeless ss, V bulb	24 hours @ 22 °C	N/mm ² 17.3 (psi) (2,510)

Cured @ 100 mW/cm² , measured @ 365 nm, for 10 seconds per side using an Electrodeless system, V bulb plus 24 hours @ 22 °C, (Cured sheets 0.63 mm thick)

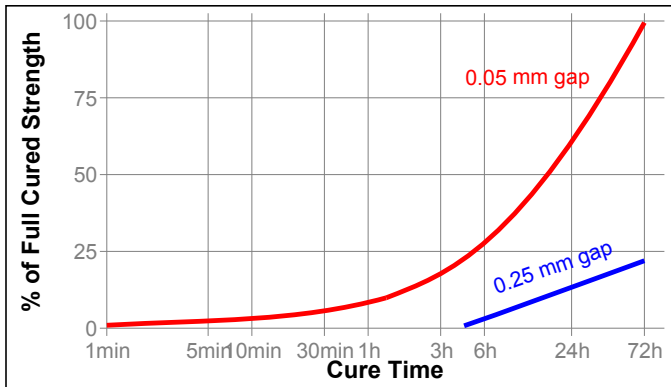
Electrical Properties:

Dielectric Breakdown Strength, IEC 60243-1, kV/mm	33
Surface Resistivity, IEC 60093, Ω	1.70×10 ¹⁵
Volume Resistivity, IEC 60093, Ω·cm	6.43×10 ¹⁵
Dielectric Constant / Dissipation Factor, IEC 60250:	
0.1 kHz	4.01 / 0.039
1 kHz	3.73 / 0.041
10 kHz	3.55 / 0.037

Secondary Cure Mechanism, Humidity

Cure speed vs. gap

UV transmitting acrylic blocks (non UV cure)



Cure Speed vs. Substrate

The rate of cure will depend on the substrate used. The table below shows the fixture time achieved on different materials at 22 °C / 50 % relative humidity. This is defined as the time to develop a shear strength of 0.1 N/mm². Fixture time measurements relate to non-UV cure.

Fixture Time, seconds:

ABS	5 to 10
Acrylic	10 to 20
Aluminum (etched)	≤5
Neoprene	≤5
Phenolic	60 to 75
Polycarbonate	10 to 20
Polyethylene	≥300
Polyethylene (Primer 770)	≤5
Polypropylene	≥300
Polypropylene (Primer 770)	≤5
PVC	70 to 85
Steel (grit blasted)	30 to 45

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 72 hours @ 22 °C (non-UV cure)

Block Shear Strength, ISO 13445:

ABS	N/mm ² 34 (psi) (4,930)
Acrylic	N/mm ² 13 (psi) (1,885)
Aluminum (etched)	N/mm ² 18 (psi) (2,610)
Neoprene	N/mm ² 0.7 (psi) (100)
Phenolic	N/mm ² 7 (psi) (1,015)
Polycarbonate	N/mm ² 29 (psi) (4,205)
Polyethylene	N/mm ² 0.4 (psi) (60)
Polypropylene	N/mm ² 0.4 (psi) (60)
PVC	N/mm ² 33 (psi) (4,785)
Steel (grit blasted)	N/mm ² 18 (psi) (2,610)

Cured @ 30 mW/cm² , measured @ 365 nm, for 10 seconds

Block Shear Strength, ISO 13445:

Polycarbonate	N/mm ² ≥9 ^{LMS} (psi) (≥1,305)
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TYPICAL ENVIRONMENTAL RESISTANCE

Cured @ 30 mW/cm² , measured @ 365 nm, for 10 seconds using a Zeta® 7400 light source plus 24 hours post cure @ 22 °C

Block Shear Strength, ISO 13445:

Polycarbonate

TYPICAL PROPERTIES OF CURED MATERIAL

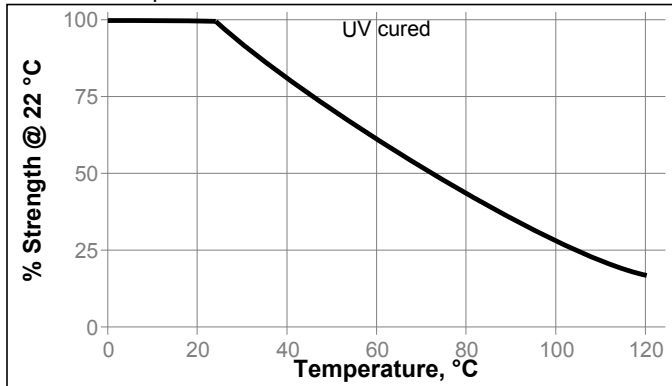
Cured @ 100 mW/cm² , measured @ 400 nm for 10 seconds per side, using an Electrodeless system, V bulb, plus 24 hours post cure @ 22 °C

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K ⁻¹	73.9×10 ⁻⁶
Glass Transition Temperature, ASTM E 228, °C	106
Volume Shrinkage, ASTM D 792, %	12.8
Shore Hardness, ISO 868, Durometer D	72
Elongation, at break, ISO 527-3, %	9
Tensile Strength, at break, ISO 527-3	N/mm ² 36 (psi) (5,220)
Tensile Modulus, ISO 527-3	N/mm ² 1,630 (psi) (237,000)

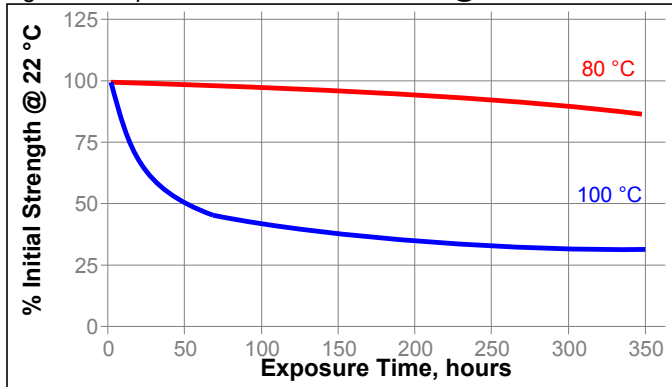
Hot Strength

Tested at temperature



Heat Aging

Aged at temperature indicated and tested @ 22 °C



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

Environment	°C	% of initial strength		
		24 h	170 h	500 h
Motor oil (MIL-L-46152)	22	110	105	110
Water	22	105	110	110
Isopropanol	22	115	110	120
Humidity, 100% RH	40	115	130	160

Effects of Sterilization

In general, products similar in composition to LOCTITE® 4304™ subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kiloGrays cumulative) show excellent bond strength retention. LOCTITE® 4304™ 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.

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. This product is light sensitive; exposure to daylight, UV light and artificial lighting should be kept to a minimum during storage and handling.
2. For best performance bond surfaces should be clean and free from grease.
3. This product performs best in thin bond gaps (0.05 mm).
4. Excess adhesive can be dissolved with Loctite cleanup solvents, nitromethane or acetone.

Loctite Material Specification^{LMS}

LMS dated November 17, 2004. 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 2.3