Technical Data Sheet

# LOCTITE® 4501™

May 2005

## PRODUCT DESCRIPTION

LOCTITE® 4501™ provides the following product characteristics:

| | |
|---|---|
| **Technology** | Cyanoacrylate |
| Chemical Type | Ethyl cyanoacrylate |
| Appearance (uncured) | Transparent, colorless to straw colored liquid[LMS] |
| Components | One part - requires no mixing |
| Viscosity | Low |
| **Cure** | Humidity |
| **Application** | Bonding |
| Key Substrates | Plastics and Rubbers |

LOCTITE® 4501™ is a wicking viscosity, fast curing, single component cyanoacrylate adhesive. It is specifically formulated to maintain its cure speed for longer periods of time compared to standard grade cyanoacrylate adhesives. Rapid bonding of a wide range of metal, plastics or elastomeric materials, particularly suited for bonding porous or absorbent materials such as wood, paper, leather or fabric.

## TYPICAL PROPERTIES OF UNCURED MATERIAL

| | |
|---|---|
| Specific Gravity @ 25 °C | 1.1 |
| Viscosity, Cone & Plate, mPa·s (cP): | |
| Temperature: 25 °C, Shear Rate: 3,000 $s^{-1}$ | 10 to 25[LMS] |
| Flash Point - See SDS | |

## TYPICAL CURING PERFORMANCE

Under normal conditions, the atmospheric moisture initiates the curing process. Although full functional strength is developed in a relatively short time, curing continues for at least 24 hours before full chemical/solvent resistance is developed.

### 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, seconds: | |
|---|---|
| Steel (grit blasted) | <5 |
| Aluminum (grit blasted) | <5 |
| Zinc dichromate | 5 to 10 |
| Neoprene | <5 |
| Rubber, nitrile | 5 to 10 |
| Polycarbonate | 5 to 10 |
| ABS | <5 |
| PVC | 5 to 10 |
| Phenolic | <5 |
| Wood (pine) | 5 to 10 |
| Wood (oak) | 10 to 20 |

### Cure Speed vs. Bond Gap

The rate of cure will depend on the bondline gap. Thin bond lines result in high cure speeds, increasing the bond gap will decrease the rate of cure.

### Cure Speed vs. Humidity

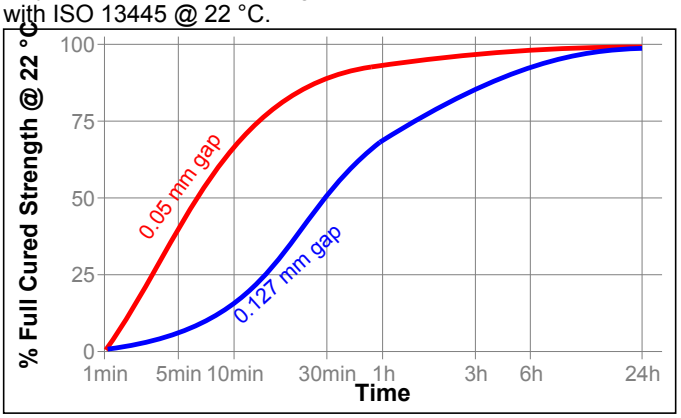
The rate of cure will depend on the ambient relative humidity. Higher relative humidity levels result in more rapid speed of cure. Although testing is required in each application, relative humidity levels below 20 % may result in significantly longer cure times.

### Cure Speed vs. Activator

Where cure speed is unacceptably long due to large gaps, applying activator to the surface will improve cure speed. However, this can reduce ultimate strength of the bond and therefore testing is recommended to confirm effect.

### Cure Speed vs. Time

The graph below shows the strength developed over time on polycarbonate. The testing was conducted in accordance with ISO 13445 @ 22 °C.




## TYPICAL PROPERTIES OF CURED MATERIAL

After 24 hours @ 22 °C

| | |
|---|---|
| **Physical Properties**: | |
| Coefficient of Thermal Expansion, ISO 11359-2, $K^{-1}$: | |
| Pre Tg | $93\times10^{-6}$ |
| Glass Transition Temperature, ASTM E 228, °C | 115 |
| **Electrical Properties**: | |
| Volume Resistivity, IEC 60093, Ω·cm | $12\times10^{15}$ |
| Surface Resistivity, IEC 60093, Ω | $19\times10^{15}$ |
| Dielectric Breakdown Strength, IEC 60243-1, kV/mm | 31 |
| Dielectric Constant / Dissipation Factor, IEC 60250: | |
| 1 kHz | 3.1 / 0.029 |
| 10 kHz | 2.96 / 0.027 |

## TYPICAL PERFORMANCE OF CURED MATERIAL

**Adhesive Properties**

After 10 seconds @ 22 °C

Tensile Strength, ISO 6922:

| | | |
|---|---|---|
| Buna-N | N/mm² | ≥6.0[LMS] |
| | (psi) | (≥870) |

After 48 hours @ 22 °C

Lap Shear Strength, ISO 4587:

| | | |
|---|---|---|
| Steel (grit blasted) | N/mm² | 17 to 18 |
| | (psi) | (2,470 to 2,610) |
| Aluminum (grit blasted) | N/mm² | 15.5 to 16.9 |
| | (psi) | (2,250 to 2,450) |
| Zinc dichromate | N/mm² | 4.0 to 5.2 |
| | (psi) | (580 to 760) |
| Neoprene | N/mm² | 0.6 to 0.8 |
| | (psi) | (80 to 120) |
| Nitrile | N/mm² | 0.2 to 0.5 |
| | (psi) | (30 to 70) |

Block Shear Strength, ISO 13445:

| | | |
|---|---|---|
| ABS | N/mm² | 13.8 to 23.3 |
| | (psi) | (2,000 to 4,100) |
| PVC | N/mm² | 24.0 to 29.5 |
| | (psi) | (3,480 to 4,280) |
| Polycarbonate | N/mm² | 22.1 to 33.1 |
| | (psi) | (3,200 to 4,800) |
| Phenolic | N/mm² | 8.5 to 11.9 |
| | (psi) | (1,230 to 1,720) |

## TYPICAL ENVIRONMENTAL RESISTANCE

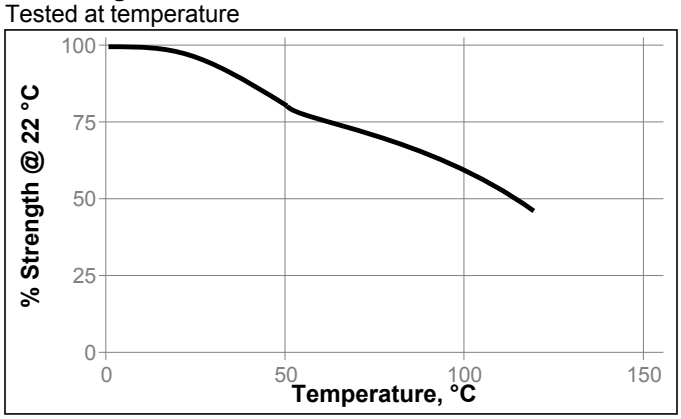
Cured for 48 hours @ 22 °C

Lap Shear Strength, ISO 4587:

Mild Steel (grit blasted)

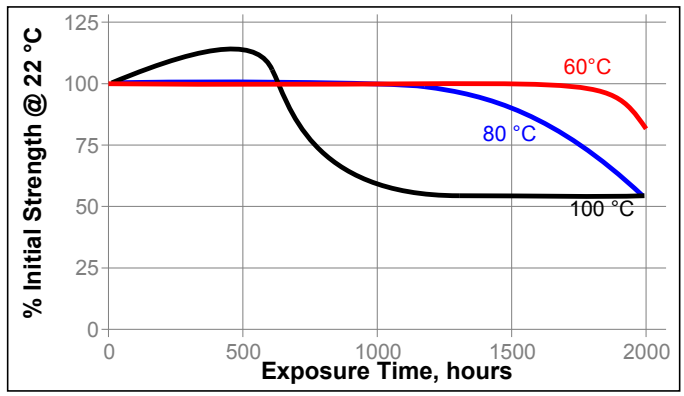
### Hot Strength

Tested at temperature




### Heat Aging

Aged at temperature indicated and tested @ 22 °C




### Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

| | | % of initial strength | |
|---|---|---|---|
| **Environment** | **°C** | **100 h** | **500 h** |
| Motor oil (MIL-L-46152) | 40 | 140 | 130 |
| Gasoline | 22 | 125 | 120 |
| Isopropanol | 22 | 115 | 115 |
| Salt fog, 5% salt, 95% R.H. | 40 | 95 | 75 |
| Salt fog, 5% salt, 95% R.H. on polycarbonate | 40 | 135 | 100 |
| Heat/humidity 95% RH | 40 | 100 | 80 |
| Heat/humidity 95% RH on polycarbonate | 40 | 140 | 125 |

## 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. For best performance bond surfaces should be clean and free from grease.
2. This product performs best in thin bond gaps (0.05 mm).
3. Excess adhesive can be dissolved with Loctite cleanup solvents, nitromethane or acetone.

**Loctite Material Specification[LMS]**

LMS dated March 03, 2003. 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 1.1