LOCTITE® 460™

January 2009

PRODUCT DESCRIPTION

LOCTITE® 460™ provides the following product characteristics:

Technology	Cyanoacrylate
Chemical Type	Alkoxyethyl cyanoacrylate
Appearance (uncured)	Transparent, colorless to straw colored liquid[LMS]
Components	One part - requires no mixing
Viscosity	Medium
Cure	Humidity
Application	Bonding
Key Substrates	Metals, Plastics and Elastomers

LOCTITE® 460™ has low odor and low blooming properties and is particularly suitable for applications where vapor control is difficult. The product provides rapid bonding of a wide range of materials, including metals, plastics and elastomers. LOCTITE® 460™ is particularly suited for bonding porous or absorbent materials such as wood, paper, leather and fabric.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.1
Flash Point - See MSDS	
Viscosity, Cone & Plate, mPa·s (cP):	
Temperature: 25 °C, Shear Rate: 3,000 s^{-1}	25 to 55[LMS]
Viscosity, Brookfield - LVF, 25 °C, mPa·s (cP):	
Spindle 1, speed 30 rpm	30 to 60

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	240 to 300
Aluminum	<3
Zinc dichromate	20 to 45
Neoprene	5 to 10
Rubber, nitrile	<3
ABS	5 to 10
PVC	20 to 40
Polycarbonate	15 to 25
Phenolic	10 to 15
Wood (pine)	10 to 30
Leather	5 to 10
Paper	2 to 5

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. The best results are achieved when the relative humidity in the working environment is 40% to 60% at 22°C. Lower humidity leads to slower cure. Higher humidity accelerates it, but may impair the final strength of the bond.

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.

TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 1 week @ 22 °C

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}	361×10^{-6}
Coefficient of Thermal Conductivity ISO 8302, W/(m·K)	0.2
Glass Transition Temperature, ISO 11359-2, °C	120

Electrical Properties:

Volume Resistivity, IEC 60093, Ω·cm	63×10^{15}
Surface Resistivity, IEC 60093, Ω	12.3×10^{15}
Dielectric Breakdown Strength, IEC 60243-1, kV/mm	25
Dielectric Constant / Dissipation Factor, IEC 60250:	
1 kHz	3.8 / 0.03
1 MHz	3.4 / 0.02
10 MHz	3.3 / 0.04

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 10 seconds @ 22 °C

Tensile Strength, ISO 6922:

Buna-N	N/mm²	≥4.5[LMS]
	(psi)	(≥652)

Cured for 72 hours @ 22 °C

Tensile Strength, ISO 6922:

Buna-N	N/mm²	9 to 17
	(psi)	(1,300 to 2,500)
Steel	N/mm²	8 to 15
	(psi)	(1,200 to 2,200)

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm²	17 to 26
	(psi)	(2,500 to 3,800)

Aluminum (etched)	N/mm² (psi)	6 to 16 (870 to 2,300)
Zinc dichromate	N/mm² (psi)	1 to 6 (150 to 870)
ABS	N/mm² (psi)	7 to 9 (1,000 to 1,300)
PVC	N/mm² (psi)	4 to 7 (580 to 1,000)
Phenolic	N/mm² (psi)	0.5 to 4 (70 to 580)
Polycarbonate	N/mm² (psi)	5 to 10 (730 to 1,500)
Nitrile	N/mm² (psi)	1.0 to 1.5 (150 to 220)
Neoprene	N/mm² (psi)	1 to 2 (150 to 290)

TYPICAL ENVIRONMENTAL RESISTANCE

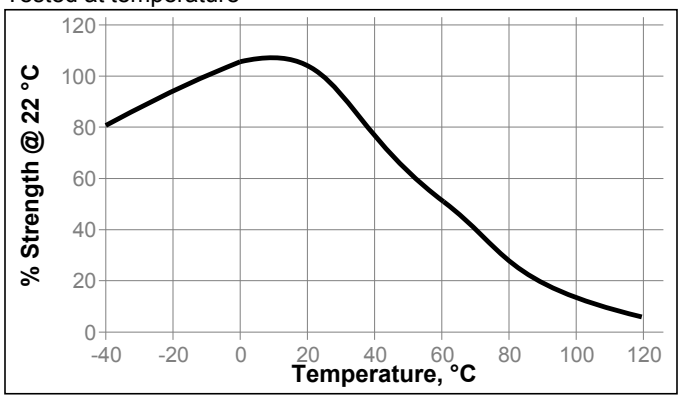
Cured for 1 week @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)

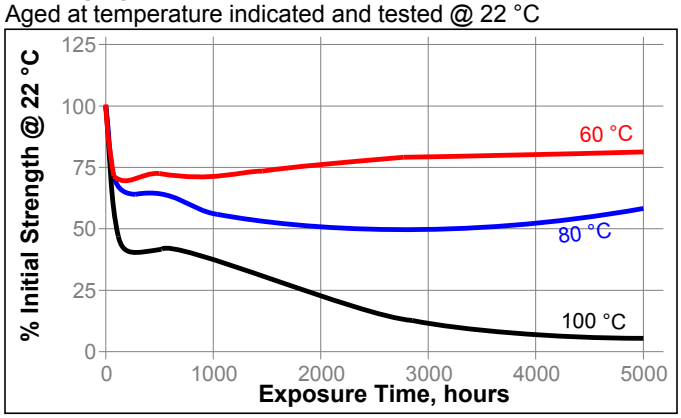
Hot Strength

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**	**1000 h**	**5000 h**
Motor oil	40	95	80	70	65
Unleaded gasoline	22	95	95	80	80
Ethanol	22	115	130	105	125
Isopropanol	22	115	120	115	135
Water	22	75	40	15	5
98% RH	40	50	45	25	5

Lap Shear Strength, ISO 4587:

Polycarbonate

		% of initial strength			
Environment	**°C**	**100 h**	**500 h**	**100 h**	**5000 h**
Air	22	110	110	105	110
98% RH	40	100	110	115	115

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. Bond areas should be clean and free from grease. Clean all surfaces with a Loctite® cleaning solvent and allow to dry.
2. Loctite® Primer may be applied to the bond area. Avoid applying excess Primer. Allow the Primer to dry.
3. LOCTITE® Activator may be used if necessary. Apply the LOCTITE® Activator to one bond surface (do not apply activator to the primed surface where Primer is also used). Allow the Activator to dry.
4. Apply adhesive to one of the bond surfaces (do not apply the adhesive to the activated surface). Do not use items like tissue or a brush to spread the adhesive. Assemble the parts within a few seconds. The parts should be accurately located, as the short fixture time leaves little opportunity for adjustment.
5. LOCTITE® Activator can be used to cure fillets of product outside the bond area. Spray or drop the activator on the excess product.
6. Bonds should be held fixed or clamped until adhesive has fixtured.
7. Product should be allowed to develop full strength before subjecting to any service loads (typically 24 to 72 hours after assembly, depending on bond gap, materials and ambient conditions).

Loctite Material Specification[LMS]
LMS dated January 10, 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 data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Henkel Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.

Reference 2.2