



# LOCTITE® 415

August 2004

## PRODUCT DESCRIPTION

LOCTITE® 415 provides the following product characteristics:

<b>Technology</b>	Cyanoacrylate
<b>Chemical Type</b>	Methyl cyanoacrylate
<b>Appearance (uncured)</b>	Clear to slightly hazy, colorless liquid <small>LMS</small>
<b>Components</b>	One part - requires no mixing
<b>Viscosity</b>	High
<b>Cure</b>	Humidity
<b>Application</b>	Bonding
<b>Key Substrates</b>	Metals, Rubbers and Plastics

LOCTITE® 415 is a general purpose adhesive and is particularly suited to bonding of metal substrates.

## TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.1
Viscosity, Cone & Plate, mPa·s (cP):	
Temperature: 25 °C, Shear Rate: 100 s <sup>-1</sup>	900 to 1,500 <sup>LMS</sup>
Viscosity, Brookfield - LVF, 25 °C, mPa·s (cP):	
Spindle 2, speed 12 rpm	1,100 to 1,600
Vapour Pressure, hPa	<1
Flash Point - See MSDS	

## 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/mm<sup>2</sup>.

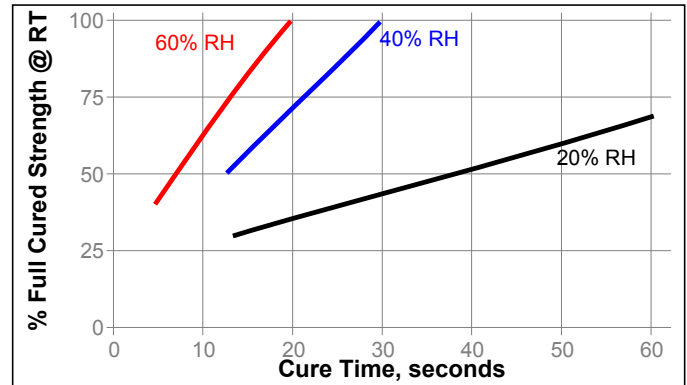
Fixture Time, ISO 4587, seconds:	
Steel (degreased)	30 to 60
Aluminum	40 to 80
Zinc dichromate	30 to 90
Neoprene	<10
Rubber, nitrile	<10
ABS	20 to 50
PVC	30 to 90
Polycarbonate	30 to 90
Phenolic	10 to 40

### 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 following graph shows the tensile strength developed with time on Buna N rubber at different levels of humidity.



### 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

After 24 hours @ 22 °C

### Physical Properties:

Coefficient of Thermal Expansion, ASTM D 696, K <sup>-1</sup>	100×10 <sup>-6</sup>
Coefficient of Thermal Conductivity, ASTM C 177, W/(m·K)	0.1

### Electrical Properties:

Dielectric Constant / Dissipation Factor, ASTM D 150:	
0.1 kHz	2 to 3.3 / <0.02
1 kHz	2 to 3.5 / <0.02
10 kHz	2 to 3.5 / <0.02
Volume Resistivity, ASTM D 257, Ω·cm	2×10 <sup>15</sup> to 10×10 <sup>15</sup>
Surface Resistivity, ASTM D 257, Ω	10×10 <sup>15</sup> to 80×10 <sup>15</sup>
Dielectric Breakdown Strength, ASTM D 149, kV/mm	25

## TYPICAL PERFORMANCE OF CURED MATERIAL

### Adhesive Properties

Cured for 24 hours @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm <sup>2</sup>	20 to 30
	(psi)	(2,900 to 4,350)
Aluminum (grit blasted)	N/mm <sup>2</sup>	15 to 22
	(psi)	(2,175 to 3,190)
Zinc dichromate	N/mm <sup>2</sup>	4 to 12
	(psi)	(580 to 1,740)
ABS	N/mm <sup>2</sup>	6 to 20
	(psi)	(870 to 2,900)
PVC	N/mm <sup>2</sup>	6 to 20
	(psi)	(870 to 2,900)
Polycarbonate	N/mm <sup>2</sup>	5 to 20
	(psi)	(725 to 2,900)
Phenolic	N/mm <sup>2</sup>	5 to 15
	(psi)	(725 to 2,175)
Neoprene	N/mm <sup>2</sup>	5 to 15
	(psi)	(725 to 2,175)
Nitrile	N/mm <sup>2</sup>	5 to 15
	(psi)	(725 to 2,175)

## Tensile Strength, ISO 6922:

Steel (grit blasted)	N/mm <sup>2</sup>	12 to 25
	(psi)	(1,740 to 3,625)
Buna-N	N/mm <sup>2</sup>	5 to 15
	(psi)	(725 to 2,175)

## "T" Peel Strength, ISO 11339:

Steel (degreased)	N/mm	<0.5
	(lb/in)	(<2.8)

Cured for 30 seconds @ 22 °C

## Tensile Strength, ISO 6922:

Buna-N	N/mm <sup>2</sup>	≥6.0 <sup>LMS</sup>
	(psi)	(≥870)

## TYPICAL ENVIRONMENTAL RESISTANCE

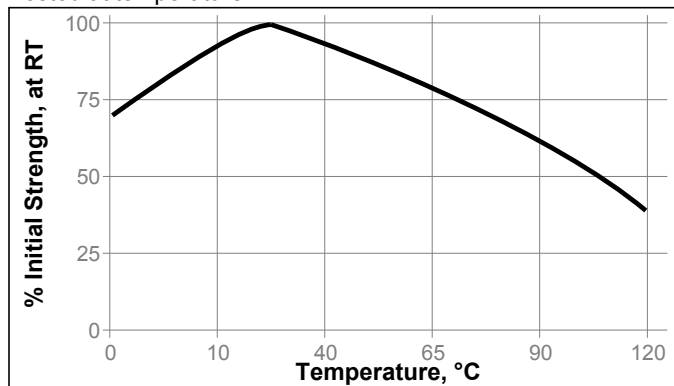
After 1 week @ 22 °C

## Lap Shear Strength, ISO 4587:

Mild steel (grit blasted)

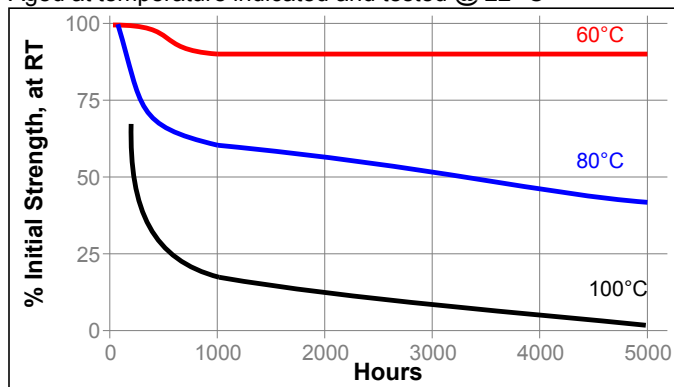
## Hot Strength

Tested at temperature



## Heat Aging

Aged at temperature indicated and tested @ 22 °C



## Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

Environment	°C	% of initial strength		
		100 h	500 h	1000 h
Motor Oil	40	100	100	100
Gasoline	22	95	95	95
Isopropanol	22	95	95	95
Ethanol	22	100	100	100
Freon TA	22	95	95	95
1,1,1 Trichloroethane	22	95	95	95
Heat/Humidity 95% RH	40	70	50	40
Heat/Humidity 95% RH on Polycarbonate	40	95	95	95

## 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. 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<sup>LMS</sup>

LMS dated July 02, 2002. 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  
 N x 0.225 = lb  
 N/mm x 5.71 = lb/in  
 N/mm<sup>2</sup> x 145 = psi  
 MPa x 145 = psi  
 N·m x 8.851 = lb·in  
 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.

**Trademark usage**

LOCTITE is a trademark of Henkel Corporation

Reference 1.1