

LOCTITE[®] 4211

June 2004

PRODUCT DESCRIPTION

LOCTITE[®] 4211 provides the following product characteristics:

Technology	Cyanoacrylate
Chemical Type	Ethyl cyanoacrylate
Appearance (uncured)	Black liquid ^{LMS}
Components	One part - requires no mixing
Viscosity	High
Cure	Humidity
Application	Bonding
Key Substrates	Metals , Plastics and Rubbers

LOCTITE[®] 4211 is an adhesive toughened with elastomers for impact and peel strength along with improved resistance to heat and humidity.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.05
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):	
Spindle 3, speed 20 rpm,	1,700 to 3,450 ^{LMS}
Spindle 3, speed 2.5 rpm	6,000 to 13,500 ^{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 (degreased)	210
Aluminum	90
Zinc dichromate	240
Neoprene	20
Rubber, nitrile	10
ABS	15
PVC	35
Polycarbonate	60
Phenolic	180
Melamine (G-9)	90

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. 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, ISO 11359-2, K ⁻¹	90×10 ⁻⁶
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Electrical Properties:

Dielectric Constant / Dissipation Factor, IEC 60250:	
0.1 kHz	4.0 / <0.04
1 kHz	3.8 / <0.04
1,000 kHz	3.3 / <0.03
Volume Resistivity, IEC 60093, Ω·cm	8×10 ¹⁵
Surface Resistivity, IEC 60093, Ω	180×10 ¹⁵
Dielectric Breakdown Strength, IEC 60243-1, 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 ² 25
	(psi) (3,625)
Aluminum (etched)	N/mm ² 17
	(psi) (2,465)
Zinc dichromate	N/mm ² 11
	(psi) (1,595)
G-10 Epoxy	N/mm ² 10
	(psi) (1,450)
Epoxy G-11	N/mm ² 8
	(psi) (1,160)
Polybutylene Terephthalate	N/mm ² 3
	(psi) (435)

Cured for 48 hours @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm ² ≥16.5 ^{LMS}
	(psi) (≥2,395)

Cured for 24 hours @ 22 °C, followed by 24 hours @ 121 °C, tested @ 121 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm ² ≥6.9 ^{LMS}
	(psi) (≥1,000)

Cured for 24 hours @ 22 °C, followed by 24 hours @ 121 °C, tested @ 22 °C

Lap Shear Strength, ISO 4587:

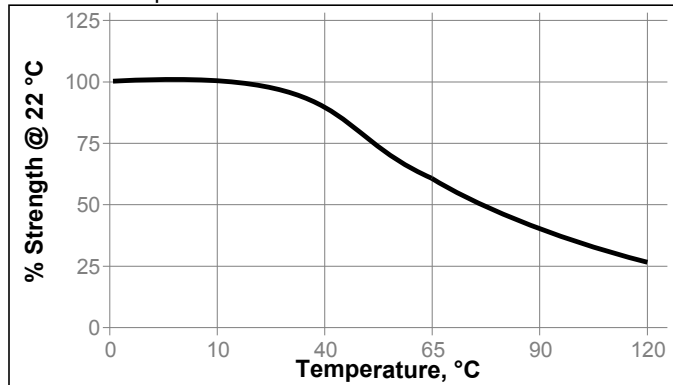
Steel (grit blasted)	N/mm ² ≥20.7 ^{LMS}
	(psi) (≥3,000)

TYPICAL ENVIRONMENTAL RESISTANCE

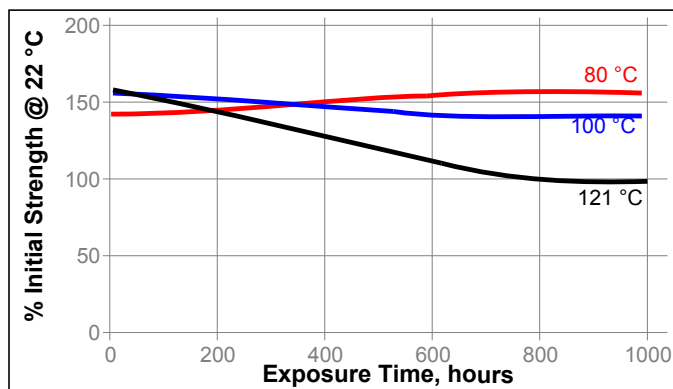
After 1 week @ 22 °C
Lap Shear Strength, ISO 4587:
Mild steel (grit blasted)

Hot Strength

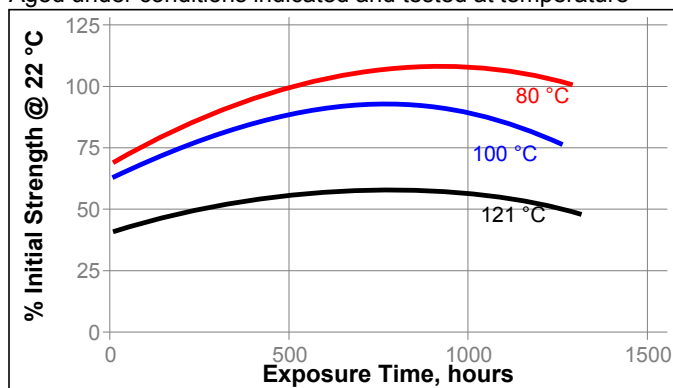
Tested at temperature

**Heat Aging**

Aged at temperature indicated and tested @ 22 °C

**Heat Aging/Hot Strength**

Aged under conditions indicated and tested at temperature

**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 September 01, 1995. 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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