Technical Data Sheet

LOCTITE® 4011™

December 2020

PRODUCT DESCRIPTION

LOCTITE® 4011™ 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	Metals , Plastics and Elastomers

LOCTITE® 4011™ is designed for the assembly of difficult-to-bond materials which require uniform stress distribution and strong tension and/or shear strength. LOCTITE® 4011™ is particularly suited for bonding porous or absorbent materials such as wood, paper, leather and fabric. Suitable for use in the assembly of **disposable medical devices**. The product provides rapid bonding of a wide range of materials, including metals, plastics and elastomers.

ISO-10993

LOCTITE® 4011™ has been tested to Henkel's test protocols based on ISO 10993 biocompatibility standards, as a means to assist in the selection of products for use in the medical device industry.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.06
Flash Point - See SDS	
Viscosity, Cone & Plate, mPa·s (cP):	
Temperature: 25 °C, Shear Rate: 3,000 s^{-1}	70 to 110
Viscosity, Brookfield - LVF,25°C,mPa·s (cP):	
Spindle 1, speed 30 rpm	90 to 140[LMS]

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	20 to 45
Aluminum	2 to 10
Zinc dichromate	10 to 30
Neoprene	<5
Rubber, nitrile	<5
ABS	1 to 2
PVC	3 to 10
Polycarbonate	5 to 10
Phenolic	<2
Wood (balsa)	<1
Wood (oak)	10 to 30
Wood (pine)	10 to 20
Chipboard	5 to 10
Fabric	10 to 20
Leather	5 to 10
Paper	5 to 10

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.

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}	107×10^{-6}
Coefficient of Thermal Conductivity, ISO 8302, W/(m·K)	0.4
Glass Transition Temperature ISO 11359-2, °C	121
Electrical Properties:	
Volume Resistivity, IEC 60093, Ω·cm	277×10^{15}
Surface Resistivity, IEC 60093, Ω	69×10^{15}

Dielectric Breakdown Strength, IEC 60243-1, kV/mm	33
Dielectric Constant / Dissipation Factor, IEC 60250:	
1 kHz	2.72 / 0.02
1 MHz	2.53 / 0.02
10 MHz	2.42 / 0.01

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 10seconds @ 25°C

Tensile Strength, ISO 6922:

Buna-N	N/mm²	≥6.9[LMS]
	(psi)	(≥1,000)

Cured for 72 hours @ 22°C

Tensile Strength, ISO 6922:

Buna-N	N/mm²	8 to 15
	(psi)	(1,200 to 2,200)
Steel (grit blasted)	N/mm²	7 to 16
	(psi)	(1,000 to 2,300)

Lap Shear Strength, :

Steel (grit blasted)	N/mm²	17 to 24
	(psi)	(2,500 to 3,500)
Aluminum (etched)	N/mm²	2 to 11
	(psi)	(290 to 1,600)
Zinc dichromate	N/mm²	0.5 to 2
	(psi)	(70 to 290)
ABS	N/mm²	7 to 9
	(psi)	(1,000 to 1,300)
PVC	N/mm²	7 to 16
	(psi)	(1,000 to 2,300)
Phenolic	N/mm²	1 to 5
	(psi)	(150 to 730)
Polycarbonate	N/mm²	7 to 11
	(psi)	(1,000 to 1,600)
Nitrile	N/mm²	1 to 2
	(psi)	(150 to 290)
Neoprene	N/mm²	1 to 2
	(psi)	(150 to 290)

TYPICAL ENVIRONMENTAL RESISTANCE

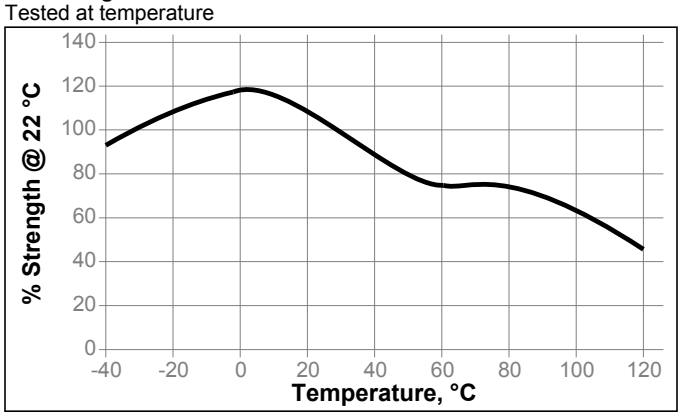
Cured for 1 week @ 22°C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)

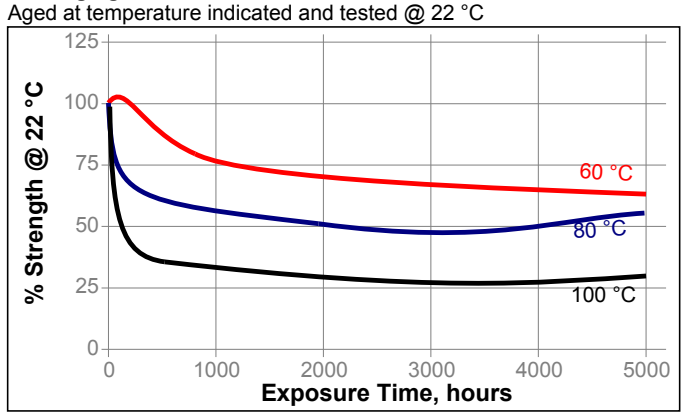
Hot Strength

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	120	110	110	85
Unleaded gasoline	22	85	80	80	75
Ethanol	22	100	105	110	120
Isopropanol	22	100	110	105	120
Water	22	80	70	55	65
98% RH	40	70	60	55	55

Lap Shear Strength, ISO 4587:

Polycarbonate

		% of initial strength			
Environment	**°C**	**100 h**	**500 h**	**1000 h**	**5000 h**
Air	22	120	125	115	130
98% RH	40	120	110	120	115

Effects of Sterilization

In general, products similiar in composition to LOCTITE® 4011™ subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kiloGrays cumulative) show excellent bond strength retention. LOCTITE® 4011™ 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. 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.

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 Henkel Representative.

Loctite Material Specification[LMS]

LMS dated December 29, 2009. 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.

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

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