Technical Data Sheet

LOCTITE® 4311™

January 2018

PRODUCT DESCRIPTION

LOCTITE® 4311™ provides the following product characteristics:

Technology	Cyanoacrylate/UV
Chemical Type	Ethyl cyanoacrylate with photoinitiator
Appearance	Transparent, light yellow-green to dark blue-green liquid[LMS]
Fluorescence	Positive under UV light[LMS]
Components	One part - requires no mixing
Cure	Ultraviolet (UV)/ visible light
Secondary Cure	Humidity
Application	Bonding
Key Substrates	Plastics, Rubbers and Metals

LOCTITE® 4311™ is designed for bonding applications that require very rapid fixturing, fillet cure or surface cure. The UV light cure properties facilitate rapid curing of exposed surface areas thereby minimizing blooming and providing an alternative to solvent borne accelerators. Suitable for use in the assembly of **disposable medical devices**.

ISO-10993

An ISO 10993 Test Protocol is an integral part of the Quality Program for LOCTITE® 4311™. LOCTITE® 4311™ has been qualified to Henkel's ISO 10993 Protocol as a means to assist in the selection of products for use in the medical device industry. Certificates of Compliance are available on Henkel's website or through the Henkel Quality Department.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C 1.06

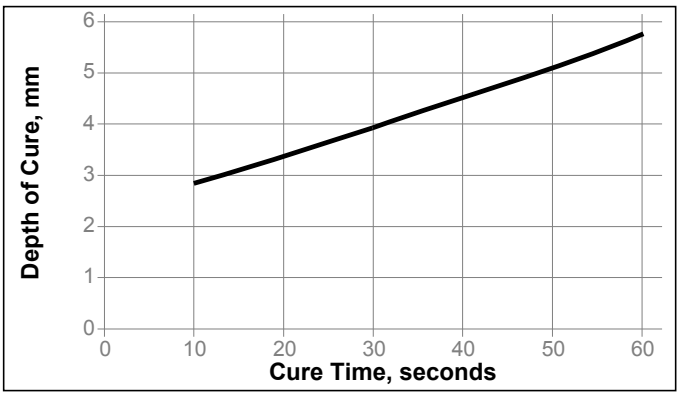
Flash Point - See SDS

Viscosity, Cone & Plate, mPa·s (cP):
Physica MC100, Cone MK 22, shear rate 100 s^{-1} 600 to 1,500[LMS]

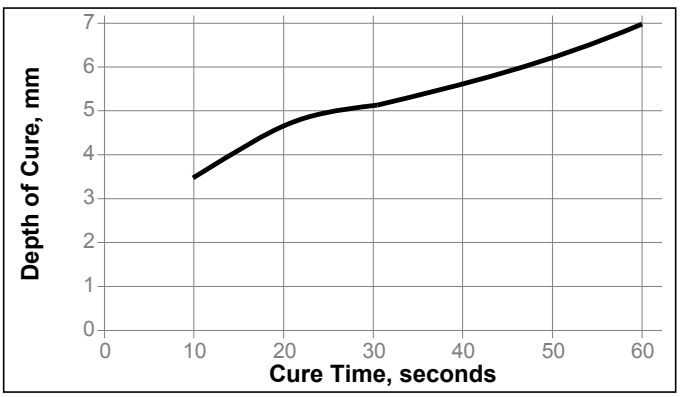
TYPICAL CURING PERFORMANCE

Primary Cure Mechanism, UV

Depth of Cure:
Electrodeless, D bulb, 100 mW/cm² , measured @ 365 nm



LED Flood Array 405nm, 100 mW/cm² , measured @ 405 nm



Tack Free Time / Surface Cure

Tack Free Time is the time in seconds required to achieve a tack free surface

UV/Visible Light Sources:
Electrodeless, H bulb:
30 mW/cm² , measured @ 365 nm ≤10[LMS]
Zeta® 7411-S:
30 mW/cm² , measured @ 365 nm ≤5

CUREJET 405 LED:
65 mW/cm² , measured @ 405 nm ≤5
LED Flood Array 405nm:
65 mW/cm² , measured @ 405 nm ≤5

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 measurements relate to non-UV cure.

Fixture Time, seconds:

ABS	5 to 10
Aluminum (grit blasted)	25 to 40
Neoprene	25 to 40
Phenolic	>300
Polycarbonate	25 to 40
Polyethylene	>300
Polyethylene (Primer 770)	5 to 10
Polypropylene	>300
Polypropylene (plasma treated)	270 to 300
PVC	150 to 180
Steel (degreased)	45 to 60

TYPICAL PROPERTIES OF CURED MATERIAL

Cured @ 100 mW/cm² , measured @ 365 nm, for 30 seconds per side using an Electrodless system, D bulb

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}:		
Pre Tg		62×10^{-6}
Glass Transition Temperature, ASTM E 228, °C		102
Shore Hardness, ISO 868, Durometer D		84
Linear Shrinkage, %		5.8
Water Absorption, ISO 62, %:		
2 hours in boiling water		2.2
7 days in water @ 22 °C		1.3
Elongation, at break, ISO 527-3, %		5.2
Tensile Strength, ISO 527-3	N/mm² (psi)	50 (7,250)
Tensile Modulus, ISO 527-3	N/mm² (psi)	1,860 (269,700)

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured @ 30 mW/cm² , measured @ 365 nm, for 10 seconds using a Zeta® 7400 light source

Block Shear Strength, ISO 13445:

Polycarbonate	N/mm² (psi)	≥9.0[LMS] (≥1,305)

Cured @ 100 mW/cm² , measured @ 365 nm, for 30 seconds using a Zeta® 7411-S light source

Block Shear Strength, ISO 13445:

Acrylic to Acrylic	N/mm² (psi)	14.2 (2,050)
Polycarbonate to Polycarbonate	N/mm² (psi)	22.4 (3,260)
Polycarbonate to Steel (grit blasted)	N/mm² (psi)	13 (1,880)

Cured @ 100 mW/cm² , measured @ 405 nm for 30 seconds using a LED Flood Array 405nm

Block Shear Strength, ISO 13445:

Acrylic to Acrylic	N/mm² (psi)	12.4 (1,800)
Polycarbonate to Polycarbonate	N/mm² (psi)	20.7 (3,000)
Polycarbonate to Steel (grit blasted)	N/mm² (psi)	18.1 (2,620)

Cured @ 1,000 mW/cm² , for 10 seconds using an Electrodeless system, D bulb

Needle Pullout Strength:

Material	22 Gauge Cannula	27 Gauge Cannula
Polycarbonate	N 90 (lb) (20)	N 16 (lb) (3.6)
Polyethylene	N 8 (lb) (2)	N 10 (lb) (2.4)
Polyethylene (plasma treated)	N 98 (lb) (22)	N 55 (lb) (12)
Polypropylene	N 14 (lb) (3.3)	N 14 (lb) (3.3)
Polypropylene (plasma treated)	N 28 (lb) (6.5)	N 25 (lb) (5.7)

Cured for 24 hours @ 22 °C (non-UV cure)

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm (lb/in)	21 (3,040)

Block Shear Strength, ISO 13445:

Acrylic to Acrylic	N/mm² (psi)	9.7 (1,410)
Polycarbonate to Polycarbonate	N/mm² (psi)	6.9 (1,010)
Polycarbonate to Steel (grit blasted)	N/mm² (psi)	12.2 (1,770)

Cured for 48 hours @ 22 °C (non-UV cure)

180° Peel Strength, ISO 8510-2:

Steel (grit blasted)	N/mm (lb/in)	2.9 (16.4)

TYPICAL ENVIRONMENTAL RESISTANCE

Cured @ 30 mW/cm² , measured @ 365 nm, for 10 seconds

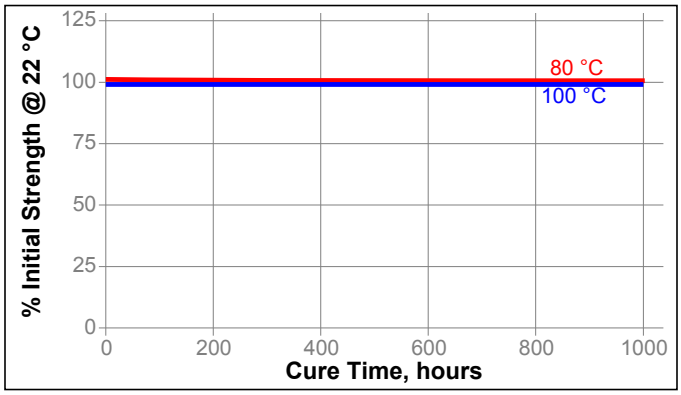
Block Shear Strength, ISO 13445:

Polycarbonate

Heat Aging

Aged at temperature indicated and tested @ 22°C

* **Note:** Substrate failure for all test specimens*



Chemical/Solvent Resistance

aged under conditions indicated and tested @ 22°C

***Note:** Substrate failure for all test specimens*

		% of initial strength			
Environment	**°C**	**24 h**	**100 h**	**500 h**	**1000 h**
Water	22	100	100	100	100
95% RH	40	100	100	100	100
Heptane	22	100	100	100	100
Isopropanol	22	100	100	100	100

Thermal Stability of Needle Assemblies

Aged @ 60°C and tested @ 22 °C

Needle Pullout Strength, % of initial strength	**4 weeks**	**8 weeks**:
Polycarbonate:		
22 Gauge Cannula	75	68
27 Gauge Cannula	112	105
Polypropylene (plasma treated):		
22 Gauge Cannula	96	120
27 Gauge Cannula	90	92

Sterilization Resistance of Needle Assemblies

Sterilized as indicated and tested @ 22 °C

Needle Pullout Strength, % of initial strength:

	Gamma	**ETO**	**Autoclave**	
	30kGy	1 Cycle	1 Cycle	5 Cycles
Polypropylene (plasma treated):				
22 Gauge Cannula	76	75	68	58
27 Gauge Cannula	77	86	88	88

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. This product is light sensitive; exposure to daylight, UV light and artificial lighting should be kept to a minimum during storage and handling.
2. For best performance bond surfaces should be clean and free from grease.
3. Excess adhesive can be dissolved with Loctite cleanup solvents, nitromethane or acetone.

Loctite Material Specification[LMS]

LMS dated January 28, 2010. 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 N/A