Technical Data Sheet

LOCTITE® EA M-31CL™

October 2020

Product description

LOCTITE® EA M-31CL™ provides the following product characteristics:

Technology	Epoxy
Chemical type	Epoxy
Appearance (resin)	Clear colorless to slightly yellow liquid
Appearance (hardener)	Clear colorless to slightly yellow liquid
Appearance (mixed)	Ultra clear
Components	Two part - Resin & Hardener
Mix Ratio, (by weight) resin : hardener	100 : 46
Mix Ratio, (by volume) resin : hardener	2 : 1
Cure	Room temperature cure after mixing
Application	Bonding

LOCTITE® EA M-31CL™ is a low viscosity, medical grade epoxy adhesive. Once mixed, the two component epoxy cures at room temperature with minimal shrinkage to form an ultra clear adhesive bondline with excellent impact resistance. The fully cured epoxy is resistant to a wide range of chemicals and solvents and has excellent dimensional stability over a wide temperature range. Typical applications include bonding, small potting, staking and laminating applications where optical clarity and excellent structural, mechanical and electrical insulating properties are required. LOCTITE® EA M-31CL™ bonds most materials including glass, optical fibers, ceramics, metals, and many rigid plastics. Suitable for use in the assembly of disposable medical devices.

ISO-10993

LOCTITE® EA M-31CL™ 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

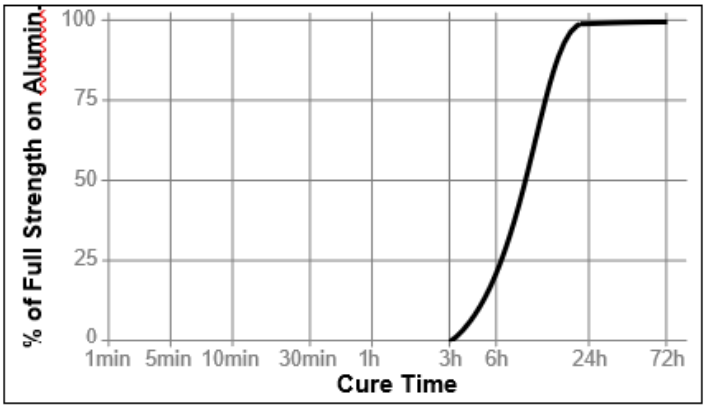
Resin	
Specific gravity @ 25°C	1.1
Flash point - see SDS	
Viscosity, Brookfield - RVT, 25°C , mPa·s (cP):	
Spindle 6, speed 20 rpm,	9,000 to 12,000
Hardener	
Specific gravity @ 25°C	1.0
Flash point - see SDS	
Viscosity, Brookfield - RVT, 25°C , mPa·s (cP):	
Spindle 5, speed 20 rpm,	1,500 to 9,000
Mixed properties	
Specific gravity @ 25°C	1,07

Typical curing performance

Gel time @ 100°C, seconds	90 to 150
Working life, minutes	30
Tack Free Time is the time required to achieve a tack free surface:	
Tack free time, (low humidity), minutes	160

Cure speed vs. time

The graph below shows shear strength developed with time on aluminum (etched & abraded) lapshears @ 25 °C with an average bondline gap of 0.1 to 0.2 mm and tested according to ISO 4587.



Typical properties of cured material
Cured @ 25°C except where noted

Physical properties:

Glass transition temperature, ASTM E 228, °C		70
Elongation, at break, ISO 527-2, %		8
Tensile strength, ISO 527-2	N/mm^2 (psi)	55.2 (8,000)
Shore Hardness, ISO 868, Durometer D		
Cured @22°C for 16 to 18 hours followed by 2 hours @65°C		80 to 90

Electrical Properties:

Dielectric breakdown strength, IEC 60243-1, kV/mm		19.7

Typical performance of cured material

Adhesive properties
Cured for 2 hours @ 65 °C:
Lap Shear Strength, ISO 4587:

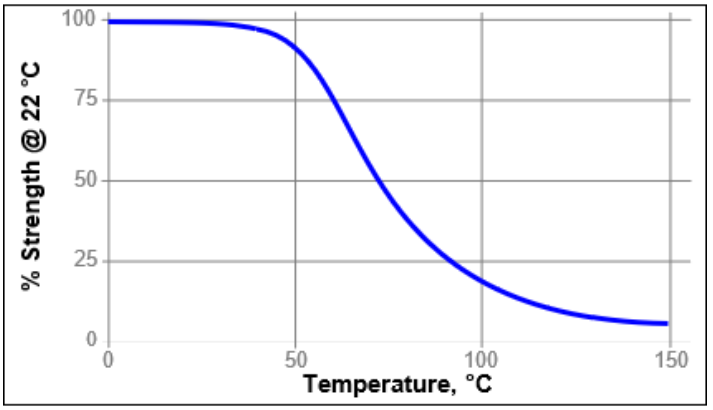
Aluminum (etched & abraded), 0.13mm gap	N/mm^2 (psi)	≥6.9 (≥1,000)

Cured for 5 days @22°C
Lap Shear Strength, ISO 4587:

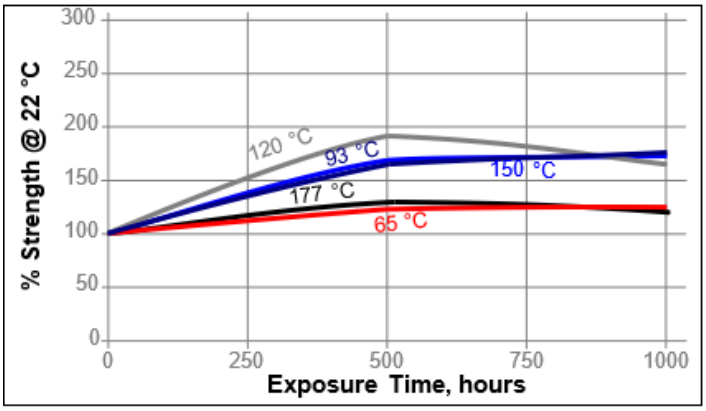
Steel (grit blasted)	N/mm^2 (psi)	21.4 (3,100)
Aluminum (etched & abraded), 0.1 to 0.2mm gap	N/mm^2 (psi)	29.4 (4,270)
Aluminum (anodised)	N/mm^2 (psi)	21.2 (3,070)
Stainless steel	N/mm^2 (psi)	13.6 (1,970)
Polycarbonate	N/mm^2 (psi)	13.4 (1,950)
Nylon	N/mm^2 (psi)	2.4 (350)
Wood (Fir)	N/mm^2 (psi)	12.1 (1.,750)
Block Shear Strength, ISO 13445:	N/mm^2 (psi)	
PVC	N/mm^2 (psi)	7.0 (1,010)
ABS	N/mm^2 (psi)	8.4 (1,220)
Epoxy glass	N/mm^2 (psi)	20.6 (2,980)
Acrylic	N/mm^2 (psi)	1.2 (180)
Glass	N/mm^2 (psi)	24.4 (3,540)

Typical environmental resistance
Cured @ 65°C for 12 hours followed by cure @ 22°C for 4 hours
Lap Shear Strength, ISO 4587:
Aluminum (etched & abraded), 0.1 to 0.2mm gap

Hot Strength
Tested at temperature



Heat aging
Cured for 5 days @22°C, on steel, aged at temperatures indicated, tested @22°C



Chemical/solvent resistance
Cured for 5 days @22°C, on steel, aged under conditions indicated and tested @22°C

		% of initial strength	
Environment	°C	500 h	1000 h
Air	87	155	150
Motor oil (10W30)	87	160	145
Unleaded gasoline	87	120	110
Water/glycol 50/50	87	145	140
Salt fog	22	70	85
95% RH	38	105	115
Condensing Humidity	49	90	90
Water	22	100	90
Acetone	22	100	105
Isopropanol	22	120	120

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.

Effects of Sterilization
In general, products similiar in composition to LOCTITE® EA M-31CL™ subjected to standard sterilization methods, such as EtO and Gamma Radiation (25 to 50 kg cumulative) show excellent bond strength retention.
LOCTITE® EA M-31CL™ 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.

Directions for use

1. For high strength structural bonds, remove surface contaminants such as paint, oxide films, oils, dust, mold release agents and all other surface contaminants.
2. Use gloves to minimize skin contact. DO NOT use solvents for cleaning hands.
3. Dual Cartridges: To use simply insert the cartridge into the application gun and start the plunger into the cylinders using light pressure on the trigger. Next, remove the cartridge cap and expel a small amount of adhesive to be sure both sides are flowing evenly and freely. If automatic mixing of resin and hardener is desired, attach the mixing nozzle to the end of the cartridge and begin dispensing the adhesive. For hand mixing, expel the desired amount of the adhesive and mix thoroughly. Mix for approximately 15 sec after uniform color is obtained.
4. For maximum bond strength apply adhesive evenly to both surfaces to be joined.
5. Application to the substrates should be made within 30 minutes. Larger quantities and/or higher temperatures will reduce this working time.
6. Join the adhesive coated surfaces and allow to cure at 25°C for 24 hours for high strength. Heat up to 93°C, will speed curing.
7. Keep parts from moving during cure. Contact pressure is neccesary. Maximum shear strength is obtained with a 0.1 to 0.2 mm bond line.
8. Excessive uncured adhesive can be cleaned up with ketone type solvents.

Storage
Store product in the unopened container in a dry location. Storage information may be indicated on the product package labeling.

Optimal Storage: 8°C to 21°C. Storage below 8°C or greater than 28°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.

Product specification
The technical data contained herein are intended as reference only and are not considered specifications for the product. Product specifications are located on the Certificate of Analysis or please contact Henkel representative.

Data ranges
The data contained herein may be reported as a typical value. Values are based on actual test data and are verified on a periodic basis.
Temperature/Humidity Ranges: 23°C / 50% RH = 23±2°C / 50±5% RH

Approval and certificate
Please contact Henkel representative for related approval or certificate of this product.

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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