

LOCTITE® 249™

April 2011

PRODUCT DESCRIPTION

LOCTITE® 249™ provides the following product characteristics:

Technology	Acrylic
Chemical Type	Dimethacrylate ester
Appearance	Blue film ^{LMS}
Components	One component - requires no mixing
Cure	Anaerobic
Secondary Cure	Activator
Application	Threadlocking
Strength	Medium

LOCTITE® 249™ is designed for the locking and sealing of threaded fasteners which require normal disassembly with standard hand tools. The product cures when confined in the absence of air between close fitting metal surfaces and prevents loosening and leakage from shock and vibration. LOCTITE® 249™ is supplied in a low tack film to provide a convenient and easy to use package, especially where a liquid product may be too fluid to stay on a part or be difficult to apply. This product can be used for immediate assembly or days later and provide consistent strength on a variety of metal substrates.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Lubricity, ASTM D5648, K value, ASTM D 5648, %:

3/8 x 16 Zinc Phosphate & Oil Nuts & Bolts:

22.2 kN tension, Control (no product)	0.15
22.2 kN tension, with product	0.19
26.7 kN tension, Control (no product)	0.15
26.7 kN tension, with product	0.19

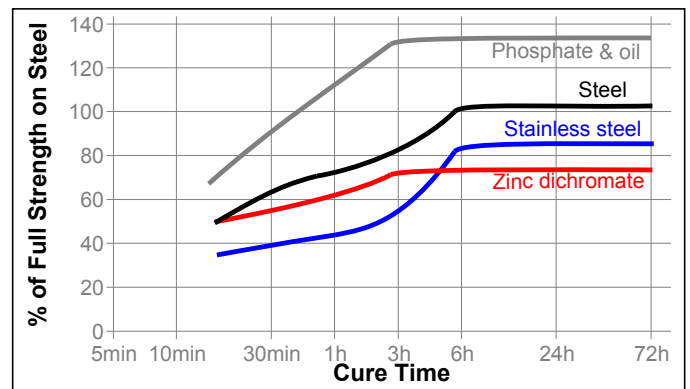
(In critical applications, it is necessary to determine the K values independently. Henkel Corporation makes no warranty of specific performance on any individual fastener)

Flash Point - See SDS

TYPICAL CURING PERFORMANCE

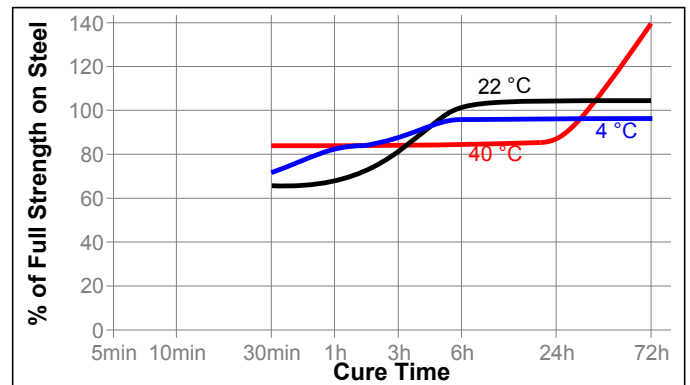
Cure Speed vs. Substrate

The rate of cure will depend on the substrate used. The graph below shows the breakloose strength developed with time on 3/8 x 16 degreased steel nuts & bolts compared to different materials and tested according to ISO 10964, pretorqued to 5 N·m.



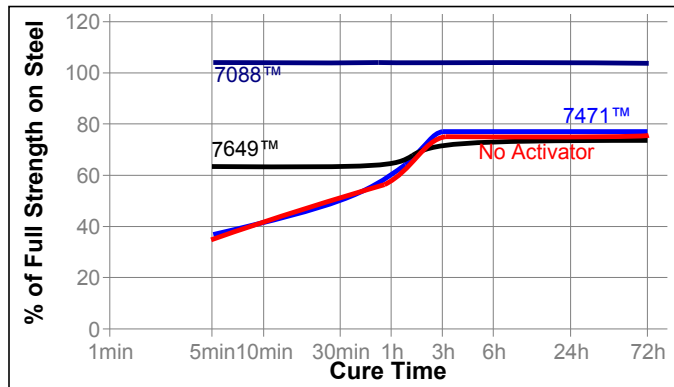
Cure Speed vs. Temperature

The rate of cure will depend on the temperature. The graph below shows the breakloose strength developed with time at different temperatures on 3/8 x 16 degreased steel nuts & bolts and tested according to ISO 10964, pretorqued to 5 N·m.



Cure Speed vs. Activator

Where cure speed is unacceptably long, or large gaps are present, applying activator to the surface will improve cure speed. The graph below shows the breakloose strength developed with time using Activator 7471™, 7649™ or 7088™ on 3/8 x 16 zinc dichromate steel nuts and bolts and tested according to ISO 10964, pretorqued to 5 N·m.



TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 1 hour @ 23 °C

Breakaway Torque, ISO 10964, Unseated:

3/8 x 16 steel nuts and bolts	N·m	≥0.56 ^{LMS}
	(lb.in.)	(≥4.9)

Prevail Torque @ 180°, ISO 10964, Unseated:

3/8 x 16 steel nuts and bolts	N·m	2
	(lb.in.)	(18)

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

3/8 x 16 zinc phosphate & oil nuts and bolts (degreased)	N·m	15
	(lb.in.)	(130)

Cured for 24 hours @ 23 °C

Breakaway Torque, ISO 10964, Unseated:

3/8 x 16 steel nuts and bolts	N·m	8
	(lb.in.)	(70)
3/8 x 16 cadmium nuts and bolts	N·m	0.8
	(lb.in.)	(7)
3/8 x 16 zinc nuts and bolts	N·m	7
	(lb.in.)	(65)
M10 black oxide steel nuts & bolts	N·m	6
	(lb.in.)	(50)

Prevail Torque @ 180°, ISO 10964, Unseated:

3/8 x 16 steel nuts and bolts	N·m	5
	(lb.in.)	(45)
3/8 x 16 cadmium nuts and bolts	N·m	2
	(lb.in.)	(20)
3/8 x 16 zinc nuts and bolts	N·m	4
	(lb.in.)	(35)

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

3/8 x 16 steel nuts and bolts (degreased)	N·m	≥7.3 ^{LMS}
	(lb.in.)	(≥65)
3/8 x 16 black oxide steel nuts and bolts (degreased)	N·m	16
	(lb.in.)	(140)

Cured for 72 hours @ 23 °C

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

3/8 x 16 black oxide steel nuts and bolts (degreased)	N·m	12
	(lb.in.)	(110)
3/8 x 16 cadmium nuts and bolts	N·m	10
	(lb.in.)	(90)
3/8 x 16 stainless steel nuts and bolts	N·m	8
	(lb.in.)	(70)
3/8 x 16 zinc dichromate steel nuts and bolts	N·m	8
	(lb.in.)	(70)
3/8 x 16 galvanized nuts and bolts	N·m	7
	(lb.in.)	(60)

TYPICAL PERFORMANCE OF PRE-APPLIED MATERIAL

3 wraps of LOCTITE® 249™ were pre-applied to bolts. Bolts were kept at @ 22 °C for 1 month. Nuts were then Pre-torqued to 5 N·m. Assemblies were allowed to cure for 72 hours and then tested according to ISO 10964.

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

3/8 x 16 black oxide steel nuts and bolts (degreased)	N·m	15
	(lb.in.)	(138)
3/8 x 16 cadmium nuts and bolts	N·m	9
	(lb.in.)	(80)
3/8 x 16 stainless steel nuts and bolts	N·m	7
	(lb.in.)	(65)
3/8 x 16 zinc dichromate steel nuts and bolts	N·m	8
	(lb.in.)	(70)
3/8 x 16 galvanized nuts and bolts	N·m	5
	(lb.in.)	(45)

TYPICAL ENVIRONMENTAL RESISTANCE

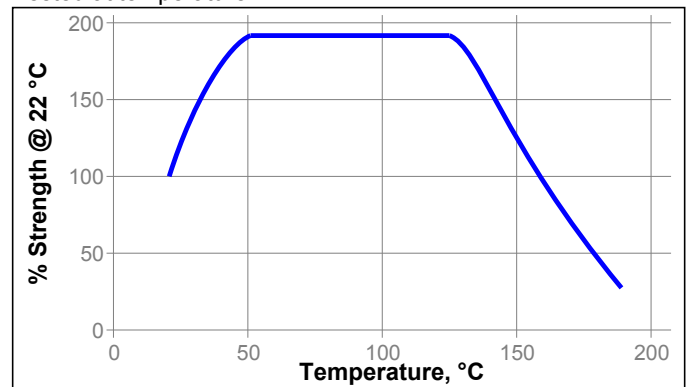
Cured for 72 hours @ 22 °C

Breakloose Torque, ISO 10964, Pre-torqued to 5 N·m:

3/8 x 16 steel nuts & bolts

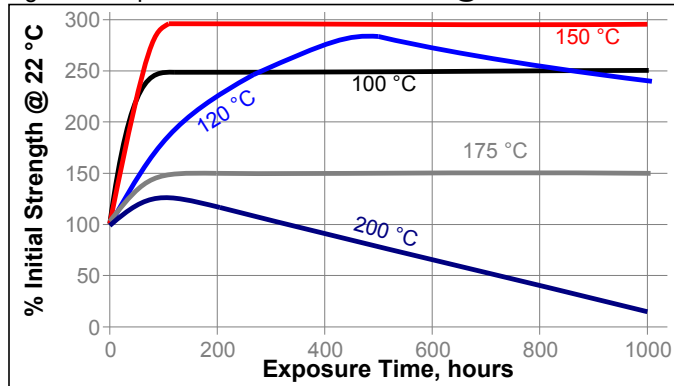
Hot Strength

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
B100 Bio-Diesel	22	200	240	210
Unleaded gasoline	22	200	210	210
Brake fluid	22	200	230	220
Ethanol	22	150	210	230
Acetone	22	200	230	190
E85 Ethanol fuel	22	200	200	210
Water/glycol 50/50	87	220	230	210
Motor oil	125	220	210	180

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).

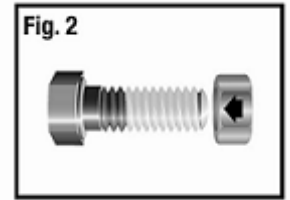
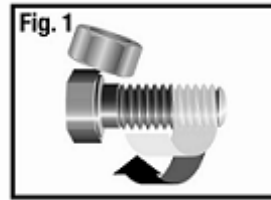
Where aqueous washing systems are used to clean the surfaces before bonding, it is important to check for compatibility of the washing solution with the adhesive. In some cases these aqueous washes can affect the cure and performance of the adhesive.

This product is not normally recommended for use on plastics (particularly thermoplastic materials where stress cracking of the plastic could result). Users are recommended to confirm compatibility of the product with such substrates.

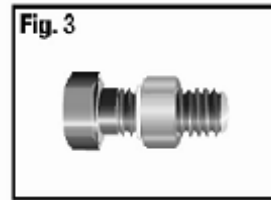
Directions for use:**For Assembly**

- For best results, clean all surfaces (external and internal) with a LOCTITE® cleaning solvent and allow to dry. Threads should be free from damage.
- If the material is an inactive metal or the cure speed is too slow, use appropriate activator. Please see the Cure Speed vs. Activator graph for reference. Allow the activator to dry when needed.
- Determine the engagement area of the completed assembly. Apply the product where there will be contact between the male and female threads. This ensures you are taking full advantage of all the anaerobic thread-locker tape applied.

- Under moderate tension wrap the product onto the male threads in the direction of the threads, i.e. clockwise for standard right-handed threads, as pictured. After wrapping with tape, profile of threads should be visible.



- Assemble and tighten as required. Some rolling material visible in front of the nut during assembly is evidence that the gap is adequately filled.



- For Blind Holes, apply the tape so that the full bond region is covered. Leave excess wraps to overlap the end of the bolt.

For Disassembly

- Remove with standard hand tools.
- In rare instances where hand tools do not work because of excessive engagement length, apply localized heat to nut or bolt to approximately 200 °C. Disassemble while hot.

For Cleanup

- Cured product can be removed with a combination of soaking in a Loctite solvent and mechanical abrasion such as a wire brush.

Typical Usage Table

The following table can be used to estimate the amount of thread-locker tape to be used on various diameter bolts.

Bolt Diameter	# of Wraps
1/4 in / 6.4 mm	3
5/16 in / 7.9 mm	3
3/8 in / 9.5 mm	4
7/16 in / 11.1 mm	6
1/2 in / 12.7 mm	6
9/16 in / 14.3 mm	7
5/8 in / 15.9 mm	8
3/4 in / 19.0 mm	12
7/8 in / 22.2 mm	12
1 in / 25.4 mm	20
1 1/2 in / 38.1 mm	25
2 in / 50.8 mm	30

Loctite Material Specification^{LMS}

LMS dated April 12, 2011. 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: 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 Technical Service Center or Customer Service Representative.

Conversions

$(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$

$\text{kV/mm} \times 25.4 = \text{V/mil}$

$\text{mm} / 25.4 = \text{inches}$

$\mu\text{m} / 25.4 = \text{mil}$

$\text{N} \times 0.225 = \text{lb}$

$\text{N/mm} \times 5.71 = \text{lb/in}$

$\text{N/mm}^2 \times 145 = \text{psi}$

$\text{MPa} \times 145 = \text{psi}$

$\text{N}\cdot\text{m} \times 8.851 = \text{lb}\cdot\text{in}$

$\text{N}\cdot\text{m} \times 0.738 = \text{lb}\cdot\text{ft}$

$\text{N}\cdot\text{mm} \times 0.142 = \text{oz}\cdot\text{in}$

$\text{mPa}\cdot\text{s} = \text{cP}$

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.

Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded, except if otherwise explicitly agreed and except in relation to death or personal injury caused by our negligence and any liability under any applicable mandatory product liability law.

In case products are delivered by Henkel Belgium NV, Henkel Electronic Materials NV, Henkel Nederland BV, Henkel Technologies France SAS and Henkel France SA please additionally note the following:

In case Henkel would be nevertheless held liable, on whatever legal ground, Henkel's liability will in no event exceed the amount of the concerned delivery.

In case products are delivered by Henkel Colombiana, S.A.S. the following disclaimer is applicable:

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. 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.

Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded, except if otherwise explicitly agreed and except in relation to death or personal injury caused by our negligence and any liability under any applicable mandatory product liability law.

In case products are delivered by Henkel Corporation, Resin Technology Group, Inc., or Henkel Canada Corporation, the following disclaimer is applicable:

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

Except as otherwise noted, all trademarks in this document are trademarks of Henkel Corporation in the U.S. and elsewhere. ® denotes a trademark registered in the U.S. Patent and Trademark Office.

Reference 0.3